Safety Management System Implementation Guidance Material

Civil Aviation Safety Regulation Directorate

Civil Aviation Authority of Nepal

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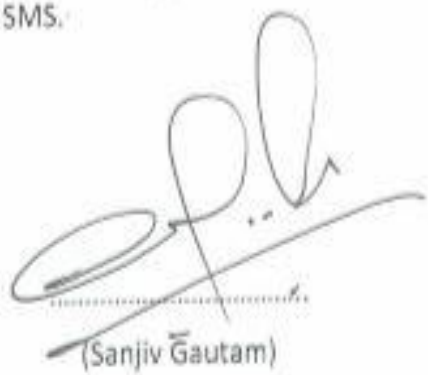
Foreword

This Guidance Material has been prepared pursuant to Rule 82 of Civil Aviation Regulations 2058 for the purpose of providing a guideline for the implementation of SMS by service providers.

Safety cannot be achieved by simply introducing rules or directives concerning the procedures to be followed by the service providers; the effects on safety must be examined at all levels of the organization. It should be made sure that the service providers are in right track and have been adopting the right methods for implementing the laid down rules. The SMS implementers should also be aware that their SMS should lead to achievement of one of civil aviation's key business goals: enhanced safety performance aiming at best practice and moving beyond mere compliance with regulatory requirements.

The purpose of this Guide is to inform and aid the service providers such that an effective SMS appropriate to the size, nature and scope of their organization can be developed. It also intends to provide general guidance and principles to implement an effective SMS. It applies to all service providers who, in accordance to CAR 19, need to implement an SMS.



(Sanjiv Gautam)

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LIST OF ABBREVIATIONS

AE: Accountable Executive

AGA: Aerodrome and Ground Aids

ALARP: As Low as Reasonably Practicable

ALoSP: acceptable level of safety performance

ANS: Air Navigation Services

ANSPs: Air Navigation Service Providers

AOC: Air Operator Certificate

AOC: Air Operator Certificate

ATC: Air Traffic Control

BQS: Barrier Quality Strength

BSID: Brand and Service Improvement Department

BSV: Barrier Strength Value

CAA: Civil Aviation Authority

CAAN: Civil Aviation Authority of Nepal

CAP: Corrective Action Plan

CAR: Civil Aviation Requirement

CBSV: Consolidated BSV

CEO: Chief Executive Officer

CISM: Critical Incident Stress Management

CVR cockpit voice recorder

DEEPAC: Durability, Enforceability, Effectiveness, Practicability, Acceptability, and Cost Benefit

Doc.: Document

EMS: Environmental Management System

ERP: Emergency Response Plan

FDM: Flight Data Monitoring

FDR: flight data recorder

FMS: financial management system

FRMS: Fatigue Risk Management System

FSD: Flight Safety Department

GASP: Global Aviation Safety Plan

HFEMS: Human Factors and Error Management System

HSE: Health and Safety in Employment

ICAO: International Civil Aviation Organization

IFR: Instrument Flight Rule

LOSA: Line Operations Safety Audit

MOC: Management of Change

MoU: Memorandum of Understanding

OECD: Organisation for Economic Co-operation and Development

OHS: Occupational Health and Safety

OHSMS: occupational health and safety management system

ONB: Optimum Number of Barrier

OPS: Operations

ORP: Organization Risk Profile

PRISM: Potential Risk Identified by Safety Management

QMS: Quality Management System

QRM: Quantitative Risk Management

Rpt.: Report

RR: Risk Register

SAFA: Safety Assessment of Foreign Aircraft

SAG: Safety Action Group

SD: standard deviation

SDCPS: safety data collection and processing system

SeMS: security management system

SM: Safety Manager

SMART: Specific, Measurable, Achievable, Relevant, and Time bound.

SMM: Safety Management Manual

SMICG: Safety management International Collaboration Group

SMSIGM: Safety Management System Implementation Guidance Material

SPIs: Safety Performance Indicators

SPTs: Safety Performance Targets

SRB: Safety Review Board

SRM: Safety Risk Management

SSOO: State safety oversight Organization

SSP State safety programme

STDEV: Population Standard Deviation

SWOT: Strength, Weakness, Opportunities and Threat

TBQS: Total BQS

TIA: Tribhuvan International Airport

TNA: Training Risk Analysis

UE/C: Unsafe Event/Consequence

UKCAA: United Kingdom Civil Aviation Authority

RECORD OF AMENDMENTS

Revision No.	Date	Entered By

DEFINITIONS

Acceptable Level of Safety Performance (ALoSP). The level of safety performance agreed by State authorities to be achieved for the civil aviation system in a State, as defined in its State safety programme, expressed in terms of safety performance targets and safety performance indicators.

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

a) a person is fatally or seriously injured as a result of:

— being in the aircraft, or — direct contact with any part of the aircraft, including parts which have become detached from the aircraft, or — direct exposure to jet blast,

except when the injuries are from natural causes, self-inflicted or inflicted by other persons, or when the injuries are to stowaways hiding outside the areas normally available to the passengers and crew; or

b) the aircraft sustains damage or structural failure which:

— adversely affects the structural strength, performance or flight characteristics of the aircraft, and — would normally require major repair or replacement of the affected component,

except for engine failure or damage, when the damage is limited to a single engine, (including its cowlings or accessories), to propellers, wing tips, antennas, probes, vanes, tires, brakes, wheels, fairings, panels, landing gear doors, windscreens, the aircraft skin (such as small dents or puncture holes), or for minor damages to main rotor blades, tail rotor blades, landing gear, and those resulting from hail or bird strike (including holes in the radome); or

c) the aircraft is missing or is completely inaccessible.

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

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

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

Hazard. A condition or an object with the potential to cause or contribute to an aircraft incident or accident.

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

Note.— The types of incidents which are of main interest to the International Civil Aviation Organization for accident prevention studies are listed in the Accident/Incident Reporting Manual (ADREP Manual) (Doc 9156).

Risk mitigation. The process of incorporating defences, preventive controls or recovery measures 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 data. A defined set of facts or set of safety values collected from various aviation-related sources, which is used to maintain or improve safety.

Note.— Such safety data is collected from proactive or reactive safety-related activities, including but not limited to:

a) accident or incident investigations;

b) safety reporting;

c) continuing airworthiness reporting;

d) operational performance monitoring;

e) inspections, audits, surveys; or

f) safety studies and reviews.

Safety information. Safety data processed, organized or analysed in a given context so as to make it useful for safety management purposes.

Safety management system (SMS). A systematic approach to managing safety, including the necessary organizational structures, accountability, responsibilities, policies and procedures.

Safety objective. A brief, high-level statement of safety achievement or desired outcome to be accomplished by the State safety programme or service provider's safety management systems.

Note 1.— Safety objectives are developed from the organization's top safety risks and should be taken into consideration during subsequent development of safety performance indicators and targets.

Safety oversight. A function performed by a State to ensure that individuals and organizations performing an aviation activity comply with safety-related national laws and regulations.

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

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

Safety performance target. The State or service provider's planned or intended target for a safety performance indicator over a given period that aligns with the safety objectives.

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

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

Surveillance. The State activities through which the State proactively verifies through inspections and audits that aviation licence, certificate, authorization or approval holders continue to meet the established requirements and function at the level of competency and safety required by the State.

System. An organized, purposeful structure that consists of interrelated and interdependent elements and components, and related policies, procedures and practices created to carry out a specific activity or solve a problem.

Trigger: An established level or criteria value for a particular safety performance indicator that serves to initiate an action required, (e.g., an evaluation, adjustment or remedial action).

Chapter 1

INTRODUCTION

1.1 Objectives

This SMS Implementation Guidance Material (SMSIGM) aims to provide SMS implementation guidance to all service providers requiring implementation of SMS in Nepal as mentioned in CAR 19 for the purpose of:

- Transferring learning across the aviation industry.
- Building a consistent approach to safety management practices in Nepal.
- Allowing Service Providers to plan for safety at the corporate assuring that risks to operations are reduced to 'as low as reasonably practicable' (ALARP) levels.

1.2 Use of Guidance Material

This Guidance Material is primarily intended as a reference for methods and techniques that can be used when implementing an effective SMS. Besides, this material can also be used to have a general knowledge about SMS and its implementation in aviation industry.

1.3 Describing an SMS

The rapid pace of technological change together with the growth in global aviation activity and complexity has raised new challenges shifting the focus towards a risk-based approach to safety.

An SMS is designed to—

- manage safety to the acceptable level;
- provide for ongoing monitoring and assessment of safety performance;
- make continuous improvements to the level of safety in operations;
- develop and improve the safety culture within the organization.

An SMS should be woven into the fabric of an organization, so that it becomes part of the culture, the way people do their jobs. The concept of developing a 'positive safety culture' is an important and an overall goal for any organization. An SMS is not an added layer of compliance, but is a system that supports the commercial success of the business. It empowers individuals to act safely, and provides the organizational framework to do so.

An SMS includes:

- description of the overall philosophies and principles of the organization with regard to safety (the safety policy);
- clearly defined lines of responsibility and accountability throughout the organization, including a direct safety accountability of the chief executive;
- appointment of key safety personnel for implementation of SMS in an organization;

- Coordination of emergency response planning for the effective implementation of SMS;
- development of SMS manual and documentation of its implementation;
- identification of aviation safety hazards, their assessment, and the management of associated risks;
- Monitoring performance system, including feedback, to ensure effective implementation of corrective actions and continuous improvement;
- Ensuring that personnel are trained and competent to fulfill their safety responsibilities;
- Identification/development of means and mechanisms for effective communication of safety information within and outside of organization.

It requires focus, patience and a clear commitment to the change from those leading the organisation. Each organisation will need to understand what it will be like to keep an effective SMS in place and then be able to demonstrate this in action. This means having an appreciation of the changes is required to be put in place. It is about how personnel will change the way they think and act using the lens of safety management. It is not only thinking about the technical nature of the change required but the adaptive aspects that must happen to implement and sustain the changed approach.

1.4 Benefits of an SMS

Apart from being an ICAO and national requirement, each service provider derives benefits from establishing, documenting and maintaining an SMS. These benefits include:

- Improved safety awareness;
- A focus on optimisation and continuous improvement;
- Provision of evidence of effective risk management;
- Identification of high-risk areas, allowing for the prioritisation of resources;
- Provision of assurance to the leadership of the organisation that formal safety management practices are in place;
- Evidence to the organisation of the importance placed on safety, safety culture and risk management by senior management;
- Elevation of the standard of safety management, which, where applicable, should result in lower insurance premiums if implemented effectively;
- Provision of a competitive advantage in future business and commercial activities.

1.5 The Scalability of SMS

The organisation's system for safety management must correspond to the size of the organisation, the nature and complexity of the activities undertaken by the organisation, and the hazards and associated risks inherent in the activities undertaken by the organization.

One of the characteristics of SMS is that no one system fits all organisations. Civil Aviation Requirement for Safety Management (CAR- 19) requires that the SMS of a service provider shall be commensurate with the size of the service provider and the complexity of its aviation products or services. The Nepalese aviation industry is characterised by a wide variety of organisations and operations. Each organisation has unique features relating to its operations and the associated safety risks, therefore an SMS should be customised to meet the needs of the organisation. Risk is not just a product of the activity that an organisation undertakes in isolation. It is a product of the relationship between the nature of the operations and systems in the context of the size of the organisation and the complexity of the operations and systems used.

Figure 1 shows the inherent hazards and associated risks of those activities connected as a whole within the organisational context and the business and physical environment. It is important to recognise these relationships, which are fundamental to the risk-based approach to SMS. While the size of the organisation can be a starting point, the nature and complexity of its operations and systems (e.g. system for safety reporting, system for rostering etc.) should be equally considered while assessing operational safety risks and the overall complexity of the organisation.

Figure 1.1 Concept of size, nature and complexity in relation to activity risk (Source: SMS New Zealand)

1.6 Size of Organization

According to SMICG, an organisation should initially consider their activities as complex when it has a workforce of more than 20 full time employees involved in the certificated activities. Organisations with less than 20 full time employees may also be considered their activities as complex after collectively assessing the size, nature and complexity of the operations against the hazards and associated risks inherent in their activities. It is important to recognise this relationship as fundamental to the risk based approach to SMS.

Table 1.1: Example of parameters for determining size of an aviation organization

According to SMICG	According to OECD	
Staff (in certificated activities)	**Staff**	**Asset**
1 to 4= very small	1 to 9 = very small	Less than 2 Millions Euro
5 to 20 = small	10 to 49 = small	Less than 10 millions Euro
21 to 249= medium	50 to 250 = medium	Less than250 millions Euro
More than 250 = large	More than 250= large	More than 250 millions Euro

1.7 Nature of Operation and System

The inherent hazards and associated risks of the operation should be considered in the context of the business and physical environment; examples of which are shown in the table below

Table 1.2: Example of determining nature of operation of an aviation organization

Less risk	More risk
Day VFR	• Single engine IFR • Helicopter emergency medical service • Use of night vision imaging system • Extended diversion time operations • Performance based navigation
Local scenic	Charters over hostile terrain (mountainous, remote, etc).
Carriage of freight	Carriage of dangerous goods
High relevant experience and competence among management and/or personnel.	Low relevant experience and competence among management and/or personnel
Steady workload	Peak seasonal workload
Day shift working	Rostered Patterns including night shifts
Multi-crew	Single Pilot

1.8 Complexity of operations and systems

Complexity of organization:

While determining the complexity of an organization, following things need to be considered:

a. Operating environment (mountainous terrain, altiports, etc.);
b. Types of operations (passenger operations, cargo, aerial work, Emergency Medical Services, etc.);
c. Fleet complexity, such as number of aircraft or aircraft types;
d. Number of locations (bases);
e. Maintenance organisations; number of ratings, types of product ratings, specialized work, technologies employed, number of customers and subcontractors;
f. Types of products and parts designed/manufactured;
g. Number of aircraft movements (aerodromes and Air Navigation Service Providers(ANSPs));
h. Surrounding terrain and levels of equipment at aerodromes;
i. Density and complexity of traffic for ANSPs;
j. Extent of contracted activities; and
k. Number of runways and taxiways at aerodromes.

In terms of complexity, an organisation should consider the scope of activities performed under its AOC, including its systems. Table 3 is an example of organisational activities that may determine that it is complex in nature, regardless of the number of full time employees.

Table 1.3: Example of organisational activities that may determine operational complexity

Less Risk	More Risk
Single fleet type	Mixed fleet of- • Fixed/rotor wing • Multiple type certificate holders/models • Differing configurations
Aircraft/equipment of simple construction (eg. Unpressurised aircraft with simple system)	Aircraft/equipment with complex system and methods of construction (eg. Pressurized aircraft with multiple hydraulic/pneumatic/electrical system)
Domestic or International Operations	Domestic plus International operations
Single base of operation	Multiple bases/stations
In-house services	Multiple third party service providers
Paper based reporting system for a small organization	Paper based reporting system for a large organization

Organisations should ask themselves the following questions at all stages of the development,

implementation and functioning of their SMS:

- Is it appropriate for the size of the organisation and nature and complexity of the activities undertaken?
- Is it in place – present and suitable?
- Is it operational?
- Is it being used?
- Is it effective and delivering the expected results?

Service providers in Nepal should determine the size, nature and complexity of the organization on the basis of the parameters providers in example or other best practices.

The development and implementation of an SMS is part of driving improved operational integrity. Once the SMS is in place, a programme of continuous improvement is needed to ensure an ongoing commitment to safety.

***Example** of determining size, nature and complexity of an organization.*

XYZ Airlines Pvt. Ltd. is an imaginary domestic airline operator operating in Nepal. It has declared itself as an airline of average size, risky nature and with complex operation.

The Airline has 53 full time employees with certification requirement to perform duties. It operates VFR and IFR flights to Altiports and in flat terrain areas. It also operates scheduled and chartered scenic mountain flights over high mountain ranges from Kathmandu and Pokhara. Airline operates VFR flights to Altiports and mixed (VFR and IFR) in flat airports in the Terai. Sometimes, it operates in late afternoon (after LLV) and at night as delayed flights. There are more STOL flights during peak tourist seasons. The Airline has 5 aircraft in operation (2 STOL aircraft and 3 non-STOL aircraft) with 2 different types of fleet. This airlines has 3 bases for operation namely Nepalganj, Pokhara and Kathmandu. It operates flights to western hilly areas (Altiports) from Nepalganj; to Manang, Mustang and western mountains from Pokhara; and to Nepalganj, Pokhara and other airports in the Terai from Kathmandu.
Note: XYZ Airlines Pvt. Ltd. has been referred in many of the examples in this guide.

1.9 Management Dilemma (Concept of Production Vs Protection)

1.9.1 In any organization engaged in the delivery of services, production/profitability and safety risks are linked. An organization must maintain profitability to stay in business by balancing output with acceptable safety risks (and the costs involved in implementing safety risk controls). Typical safety risk controls include technology, training, processes and procedures. Implementing safety risk controls comes at a price – money, time, resources – and the aim of safety risk controls is usually to improving safety performance, not production performance. However, some investments in “protection” can also improve “production” by reducing accidents and incidents and thereby their associated costs.

1.9.2 The safety space is a metaphor for the zone where an organization balances desired production/profitability while maintaining required safety protection through safety risk controls.

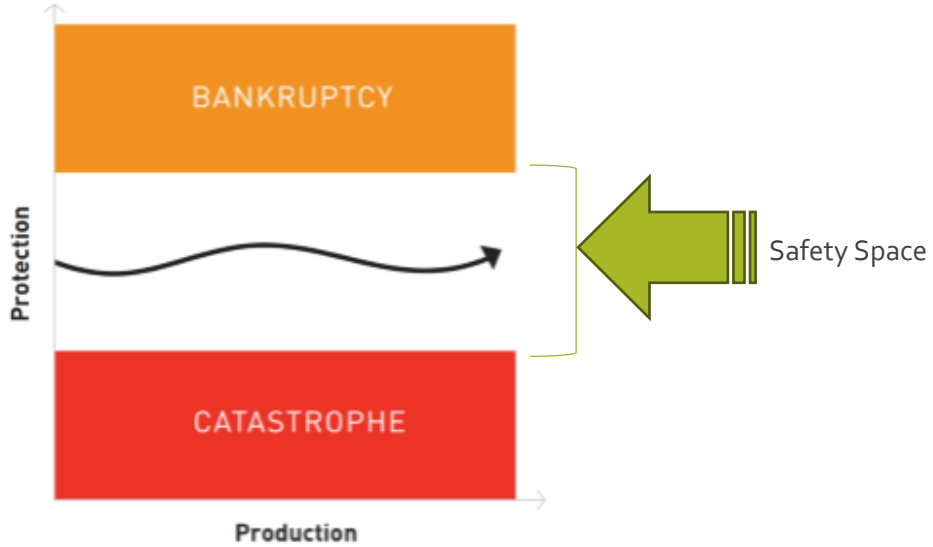


Figure 1.2 Concept of Safety Space (Source Doc 9859, modified)

For example, XYZ Airlines wishes to buy a new aircraft. The decision may provide improvement to business and on- time departures. Such decision-making involves an assessment of both the benefits to the organization as well as the safety risks involved. The allocation of excessive resources to control the risk involved in the introduction of new aircraft may result in the activity becoming unprofitable, thus organization will face bankruptcy.

1.9.3 On the other hand, excess allocation of resources for production at the expense of protection can have an impact on the product or service and can ultimately lead to an accident. It is therefore essential that a safety boundary be defined that provides early warning that an unbalanced allocation of resources exists, or is developing. Organizations use financial management systems to recognize when they are getting too close to bankruptcy and apply the same logic and tools used by safety management to monitor their safety performance. This enables the organization to operate profitably and safely within the safety space. Figure 5 illustrates the boundaries of an organization's safety space. Organizations need to continuously monitor and manage their safety space as safety risks and external influences change over time.

1.9.4 The need to balance profitability and safety (or production and protection) has become a readily understood and accepted requirement from a service provider perspective.

1.10 Senior Management Support

An organization will be unable to implement an effective SMS without the commitment of its senior management. This commitment is required throughout all phases of implementation.

Generally, top level management's support to SMS implementation can be demonstrated by the following activities:

- Promoting the benefits of a SMS to the business;
- Making the head of the organisation the sponsor of the Safety related project;
- Promoting the SMS as a means toward organisational maturity etc.

1.11 GAP analysis and Implementation Plan.

1.11.1 Before implementing an SMS, the service provider should carry out a gap analysis. This compares the service provider's existing safety management processes and procedures with the SMS requirements as determined by the State. It is likely that the service provider already has some of the SMS functions in place. The development of an SMS should build upon existing organizational policies and processes. The gap analysis identifies the gaps that should be addressed through an SMS implementation plan that defines the actions needed to implement a fully functioning and effective SMS.

1.11.2 The SMS implementation plan should provide a clear picture of the resources, tasks and processes required to implement the SMS. The timing and sequencing of the implementation plan may depend on a variety of factors that will be specific to each organization, such as:

a) regulatory, customer and statutory requirements;
b) multiple certificates held (with possibly different regulatory implementation dates);
c) the extent to which the SMS may build upon existing structures and processes;
d) the availability of resources and budgets;
e) interdependencies between different steps (a reporting system should be implemented before establishing a data analysis system); and
f) the existing safety culture.

1.11.3 The SMS implementation plan should be developed in consultation with the accountable executive and other senior managers, and should include who is responsible for the actions along with timelines. The plan should address coordination with external organizations or contractors where applicable.

1.11.4 The SMS implementation plan may be documented in different forms, varying from a simple spread sheet to specialized project management software. The plan should be monitored regularly and updated as necessary. It should also clarify when a specific element can be considered successfully implemented.

See Appendix 1 for sample Gap Analysis and Implementation Plan.

1.12 Phased Approach to Implementation

Service Providers in Nepal can implement their SMS in phases. The phased approach acknowledges the need to effectively manage the workload associated with the development and implementation of SMS within organization. This approach also recognises that some

elements deliver more immediate safety benefits to organisations and that the implementation of some elements is easier once a foundation of understanding has been developed within an organisation.

This guidance material recommends a four-phase implementation plan; it is also assumed that when an SMS element is implemented, the organisation will continue to refine it. As a result, an organisation may be at various phases in the maturity pathways. For example, an organisation may have reached Level four for an element such as organisational and Individual Safety Responsibilities but may be at Phase one for Adoption and Sharing of Best Practice. See appendix 2 for the four- phased implementation.

1.13 SMS framework

Civil Aviation Requirement for Safety Management (CAR- 19) specify the framework for the implementation and maintenance of an SMS. Regardless of the service provider's size, nature and complexity, all elements of the SMS framework apply. The implementation should be tailored to the organization and its activities.

Table 1.4: SMS Framework

Components	Elements
Safety Policy and Objectives	a. Management commitment b. Safety accountability and responsibilities c. Appointment of key safety personnel d. Coordination of Emergency Response Planning e. SMS documentation
Safety Risk Management	a. Hazard identification b. Safety risk assessment and mitigation
Safety Assurance	a. Safety performance monitoring and measurement b. The management of change c. Continuous improvement of the SMS
Safety Promotion	a. Training and education b. Safety communication

1.14 SMS Integration with other Management Systems

1.14.1 Relationship between SMS and Quality Management Systems (QMS)

SMS and QMS share a number of common purposes and processes—

- both depend upon measuring and monitoring;
- both strive for continual improvement;
- some of the same tools, such as auditing and review, are used in both.

However, a QMS does not include all the elements, features and activities of an SMS, as it focuses mainly on compliance, conformance and monitoring. SMS goes further and requires the organisation to identify and manage risk so as to achieve an acceptable level of safety performance. It is not so much a case of replacing QMS by SMS, but instead, realising that they

are complementary and inextricably linked - one cannot build an effective SMS without applying QMS principles.
The application of quality management principles to safety management processes helps to ensure that the requisite system-wide safety measures have been taken to support the organisation in achieving its safety objectives. It is the integration of QMS principles into an SMS, establishing a structured approach to monitoring and improving the processes of managing safety risks, that will assist an organisation in managing safety risks to a point considered 'as low as reasonably practicable'.

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 5:

Table 1.5: comparison between SMS and QMS

SMS	QMS
Safety	Quality
Safety assurance	Quality assurance
Hazard identification and risk control	Quality control
Safety culture	Quality culture
Acceptable level of safety performance	Compliance with requirements
Performance-based	Prescriptive
Organizational human factors	Standards and specifications
Proactive>Predictive	Reactive>Proactive

1.14.2 Relationship between SMS and other management systems

It is important to integrate management systems where possible, and the introduction of an SMS offers this opportunity. The benefits of integrating systems include a reduction in the duplication of resources, a significant improvement in the collation and analysis of safety-related data, a reduction in potentially conflicting objectives, and recognition of safety as the objective of all systems.
A phased approach to integration should be considered; for example, it is not immediately necessary to link existing HSE reporting systems into an operational reporting system, but there may be value in doing so in the future. The following systems can be smoothly integrated

within the SMS framework using the founding principles of a risk-based methodology for robust decision making.

1.14.2.1. Health and safety in employment (HSE)

HSE is a cross-disciplinary system concerned with protecting the safety, health and welfare of people in the workplace. The identification, assessment and management of health and safety hazards and risks is at the heart of the system, and therefore ties in with an SMS.

1.14.2.2 Security management systems

The purpose of a security management system is to systematically protect against danger, damage, loss or crime. Safety management is closely linked to a security management system.

A recent scenario that would have benefited from an integrated approach to the management of risk involved the implementation of reinforced cockpit doors to address security concerns raised by the 11th September 2001 event in the USA eventually contributed to the accident of Germanwings aircraft in the French Alps on 24 March 2015.

1.14.2.3. Environmental management systems (EMS)

The goal of an environmental management system is to identify and improve the environmental impact of an organisation. Organisations are required to demonstrate well-managed environmental practice, but overall, the goal of having an EMS is to positively contribute to the environmental safety of the company and community.

1.14.2.4 Fatigue risk management systems (FRMS)

An FRMS provides organisations with a means to systematically manage the complexities of physical and psychological fatigue-related risks and their effects. There are a number of case studies that demonstrate that the integration of an FRMS within the SMS framework is extremely beneficial, particularly when considered alongside other human factors-related risks.

1.14.2.5 Business management systems

An organisation will have in place a number of business management systems to achieve efficient and profitable outcomes. These may include formal financial management systems, project management processes, compliance management systems, and many others. An effective SMS needs to be integrated with these systems also, and not remain a stand-alone solution. This will result in mutually beneficial outcomes such as financial reporting that takes account of safety initiatives, project management processes that incorporate safety processes (such as reporting),and safety management systems that include safety-related legislation, for example.

1.15 Safety Culture:

Safety culture refers to the enduring value, priority and commitment placed on safety by every individual and every group at every level of the organisation. Safety culture reflects the individual, group and organisational attitudes, norms and behaviours related to the safe provision of services.

According to ICAO Doc. 9859 (4th edition), a safety culture is the natural consequence of having humans in the aviation system. Safety culture has been described in Doc. 9859 as "how people behave in relation to safety and risk when no one is watching". It is an expression of how safety is perceived, valued and prioritized by management and employees in an organization, and is reflected in the extent to which individuals and groups are:

a) aware of the risks and known hazards faced by the organization and its activities;
b) continuously behaving to preserve and enhance safety;
c) able to access the resources required for safe operations;
d) willing and able to adapt when facing safety issues;
e) willing to communicate safety issues; and
f) consistently assessing the safety related behaviours throughout the organization.

1.15.1 Developing a positive safety culture

A positive safety culture has the following features:

a) managers and employees, individually and collectively, want to make decisions and take actions that promote safety;
b) individuals and groups continually critique their behaviours and processes and welcome the critique of others searching for opportunities to change and improve as their environment changes;
c) management and staff share a common awareness of the hazards and risks faced by the organization and its activities, and the need to manage risks;
d) individuals act and make decisions according to a common belief that safety is part of the way they do business;
e) individuals value being informed, and informing others, about safety;
f) individuals trust their colleagues and managers with information about their experiences, and the reporting of errors and mistakes is encouraged to improve how things are done in the future.

The CAAN, in case of SMS, treats a positive safety culture as an effective enabler of the integration of the various SMS elements into a cohesive system. The Standard provides a framework through which an organization can improve its safety culture. This framework allows for the flexibility to account for differing organisational preferences and histories and defines three safety culture objectives:

1. A just, flexible and informed safety culture, led by management, that supports positive and pro-active reporting and learning;
2. Regular measurement of safety culture and an improvement programme;
3. An open climate for reporting and investigating occurrences

See appendix 3 for example of actions that will enable or disable positive safety culture

Chapter 2
SAFETY POLICY AND OBJECTIVES

This component of the SMS framework focuses on creating an environment where safety management can be effective. It is founded on a safety policy and objectives that set out senior management's commitment to safety, its goals and the supporting organizational structure.

2.1 Management Commitment

2.1.1 Management commitment and safety leadership is key to the implementation of an effective SMS and is asserted through the safety policy and the establishment of safety objectives. Management commitment to safety is demonstrated through management decision-making and allocation of resources; these decisions and actions should always be consistent with the safety policy and objectives to cultivate a positive safety culture.

2.1.2 The chief executive and the senior management team promote and demonstrate their commitment to the safety policy through active and visible participation in the system for safety management. This could include evidence of decision making, actions and behaviours that reflect a positive safety culture, recognising positive safety behaviours in others, as well as external activity such as attending relevant industry safety conferences and forums.

2.1.3 Key safety personnel, and where appropriate, staff representative bodies (employee forums, trade unions) should be consulted in the development of the safety policy and safety objectives to promote a sense of shared responsibility.

Safety Policy

2.1.4 The safety policy should be developed and visibly endorsed by senior management, and is to be signed by the accountable executive. "Visible endorsement" refers to making management's active support of the safety policy visible to the rest of the organization. This can be done via any means of communication and through the alignment of activities to the safety policy.

2.1.5 It is the responsibility of management to communicate the safety policy throughout the organization as well as the contractor organizations and also to ensure that the policy together with their responsibilities and obligations in relation to safety management is well understood by all.

2.1.6 The safety policy should be clearly visible, or available, to all personnel (including significant contracted organisations) and should be included in key documentation and communication media.

2.1.7 To reflect the organization's commitment on safety, the safety policy should include a commitment to:

a. establish safety as a core value;
b. continuously improve the level of safety performance;
c. promote and maintain a positive safety culture within the organization;
d. comply with all applicable regulatory requirements;
e. provide the necessary resources to deliver a safe product or service;
f. ensure safety is a primary responsibility of all managers;
g. establish non-punitive reporting policy (just culture); and
h. ensure it is understood, implemented and maintained at all levels.

2.1.8 The safety policy should also make reference to the safety reporting system to encourage the reporting of safety issues and inform personnel of the disciplinary policy applied in the case of safety events or safety issues that are reported.

2.1.9 The disciplinary policy is used to determine whether an error or rule breaking has occurred so that the organization can establish whether any disciplinary action should be taken. To ensure the fair treatment of persons involved, it is essential that those responsible for making that determination have the necessary technical expertise so that the context of the event may be fully considered.

2.1.10 A policy on the protection of safety data and safety information, as well as reporters, can have a positive effect on the reporting culture. The service provider should allow for the de-identification and aggregation of reports to allow meaningful safety analyses to be conducted without having to implicate personnel or entity. A policy allowing for the appropriate de-identification of reports help for continuous reporting and can improve the quality of data collected.

2.1.11 The safety policy should be reviewed periodically to ensure it remains current. The organisation should regularly verify that personnel and contractors throughout the organisation are familiar with and have understood the policy.
See appendix 4 for a sample Safety Policy

Safety objectives

2.1.12.Taking into consideration its safety policy, the service provider should also establish safety objectives to define what it aims to achieve in respect of safety outcomes. Safety objectives should be short, highlevel statements of the organization's safety priorities and

should address its most significant safety risks. Safety objectives may be included in the safety policy (or documented separately), and requires the establishment of safety objectives defining what the organization intends to achieve in terms of safety management. Safety performance indicators (SPIs) and safety performance targets (SPTs) are needed to monitor the achievement of these safety objectives.

2.1.13 Safety objectives describe the specific, tangible products and deliverables against each goal. The safety objectives are qualitative or quantitative statements that define the aspirations and strategic goals of an organization as they relate to the safety of its operational activities or the services it provides.

A well worded objective will be specific, measurable, achievable, realistic and time-bound (SMART):

Specific-	Each objective should be focused on single area only.
Measurable -	Objective should be measurable.
Achievable-	Objective should be within your organization's capabilities.
Relevant -	The objective should be something of importance or significance to safety
Time bound -	Objectives should be relevant for defined period of time.

The safety policy and safety objectives should be periodically reviewed to ensure they remain current (a change in the accountable executive would require its review, for instance).

Example of alignment of Objective, Targets and SPIs

Safety objective -To gain a full picture of the safety hazard.

Safety targets -Conduct quarterly hazard identification workshops.

-Increase the number of voluntary reports received by 20% this year.

Safety performance indicators

- Number of hazard identification workshops carried out this year.

- Number of new hazards identified through workshops conducted this year

- Number of hazard reports received per employee this year versus last year.

See Section 3.1 for further information on Targets and safety performance indicators (SPIs).

Markers of Compliance and performance

1. There is a safety policy that includes a commitment towards achieving the highest safety standards signed by the Accountable Executive
2. The organisation has a safety management system that interfaces with other management system functions (eg compliance monitoring, finance etc).
3. The Accountable Executive and the senior management team promote and demonstrate their commitment to the Safety Policy through active and visible participation in the safety management system.
4. The safety policy is communicated to all employees (including contract staff) with the intent that they are made aware of their individual contributions and obligations with regard to Safety.
5. The safety policy includes a commitment to continuous improvement, to observe all applicable legal requirements, standards and best practice providing appropriate resources and defining safety as a primary responsibility of all Managers.
6. (C) The safety policy actively encourages safety reporting
7. The safety policy is reviewed periodically to ensure it remains current.
8. (C) A Just Culture policy has been defined that clearly identifies the conditions under which punitive action would be considered (e.g. illegal activity, negligence or willful misconduct)
9. (C) There is evidence of decision making, actions and behaviours that reflect a positive safety culture.

Markers of Excellence and Best Practices

10. Personnel at all levels are involved in the establishment and maintenance of the safety management system.
11. There is one safety policy used throughout the organisation and it is implemented at all levels of the organisation.
12. The safety policy is clearly visible, or available, to all personnel (including significant contracted organisations) and is included in key documentation and communication media
13. Safety policy objectives drive the organisation's goals and mission statements
14. The organisation regularly verifies that personnel throughout the organisation are familiar with and have understood the policy and its message.
15. The Accountable Executive demonstrates their commitment by attending significant safety conferences.
16. (C) The Just culture policy is endorsed by management and staff representatives

Note: (C) indicates marker for safety culture

2.2 Safety Accountability and Responsibilities

2.2.1 The accountable executive, typically the chief executive officer, is the person who has ultimate authority over the safe operation of the organization. The accountable executive establishes and promotes the safety policy and safety objectives that instill safety as a core organizational value. They should: have the authority to make decisions on behalf of the organization, have control of resources, both financial and human, be responsible for ensuring appropriate actions are taken to address safety issues and safety risks, and they should be responsible for responding to accidents and incidents.

2.2.2 The service provider is required to identify the accountable executive, placing the responsibility for the overall safety performance at a level in the organization with the authority to take action to ensure the SMS is effective.

2.2.3 One of the most effective ways the accountable executive can be visibly involved, is by leading regular executive safety meetings. As they are ultimately responsible for the safety of the organization, being actively involved in these meetings allows the accountable executive to:

a. review safety objectives;
b. monitor safety performance and the achievement of safety targets;
c. make timely safety decisions;
d. allocate appropriate resources;
e. hold managers accountable for safety responsibilities, performance and implementation timelines; and
f. be seen by all personnel as an executive who is interested in, and in charge of, safety.

2.2.4 The accountable executive is not usually involved in the day-to-day activities of the organization or the problems faced in the workplace and should ensure there is an appropriate organizational structure to manage and operate the SMS. Safety management responsibility is often delegated to the senior management team and other key safety personnel. Although responsibility for the day-to-day operation of the SMS can be delegated, the accountable executive cannot delegate accountability for the system nor can decisions regarding safety risks be delegated. For example, the following safety accountabilities cannot be delegated:

a. ensuring safety policies are appropriate and communicated;
b. ensuring necessary allocation of resources (financing, personnel, training, acquisition); and
c. setting of the acceptable safety risk limits and resourcing of necessary controls.

2.2.5 It is appropriate for the accountable executive to have the following safety accountabilities:

a. provide enough financial and human resources for the proper implementation of an effective SMS;
b. promote a positive safety culture;

c. establish and promote the safety policy;
d. establish the organization's safety objectives;
e. ensure the SMS is properly implemented and performing to requirements; and
f. see to the continuous improvement of the SMS.

2.2.6 The accountable executive's authorities include, but are not limited to, having final authority:

a. for the resolution of all safety issues; and
b. over operations under the certificate, authorization or approval of the organization, including the authority to stop the operation or activity.

2.2.7 The authority to make decisions regarding safety risk tolerability should be defined. This includes who can make decisions on the acceptability of risks as well as the authority to agree that a change can be implemented. The authority may be assigned to an individual, a management position or a committee.

2.2.8 Authority to make safety risk tolerability decisions should be commensurate with the manager's general decision-making and resource allocation authority. A lower level manager (or management group) may be authorized to make tolerability decisions up to a certain level. Risk levels that exceed the manager's authority must be escalated for consideration to a higher management level with greater authority.

2.2.9 Accountabilities and responsibilities of all personnel, management and staff, involved in safety-related duties supporting the delivery of safe products and operations should be clearly defined. The safety responsibilities should focus on the staff member's contribution to the safety performance of the organization. The management of safety is a core function; as such every senior manager has a degree of involvement in the operation of the SMS.

2.2.10 All defined accountabilities, responsibilities and authorities should be stated in the service provider's SMS documentation and should be communicated throughout the organization. Safety accountabilities and responsibilities are integral components of Job Description of all personnel in organization.

2.2.11 Lines of safety accountability throughout the organization and how they are defined will depend on the type and complexity of the organization, and their preferred communication methods. Typically, the safety accountabilities and responsibilities will be reflected in organizational charts, documents defining departmental responsibilities, and personnel job or role descriptions.

2.2.12 The service provider should aim to avoid conflicts of interest between staff members' safety responsibilities and their other organizational responsibilities. They should allocate their SMS accountabilities and responsibilities, in a way that minimizes any overlaps and/or gaps.

2.2.13 The general objectives of Safety responsibilities and accountabilities are:

a. An approved, clearly documented, and recognised system for the management of safety.
b. Management structure, responsibilities, accountabilities and authorities are clearly defined and documented.

These objectives can be achieved by ensuring the following actions:

- Authorities, responsibilities and accountabilities of Management team have been defined and documented for the management of safety in organization. This include accountable executive and other top level management personnel (generally heads of line management).
- Delineation of responsibility for the development, oversight and implementation of the SMS is clearly documented and understood.
- Procedures are in place to address the need to review safety authorities, responsibilities, and accountabilities after any significant organisational change and are periodically being reviewed to determine whether they are suitable and effective.

c. A clearly defined safety manager that is independent of line management and with required resources.

This objective can be achieved by ensuring the following actions:

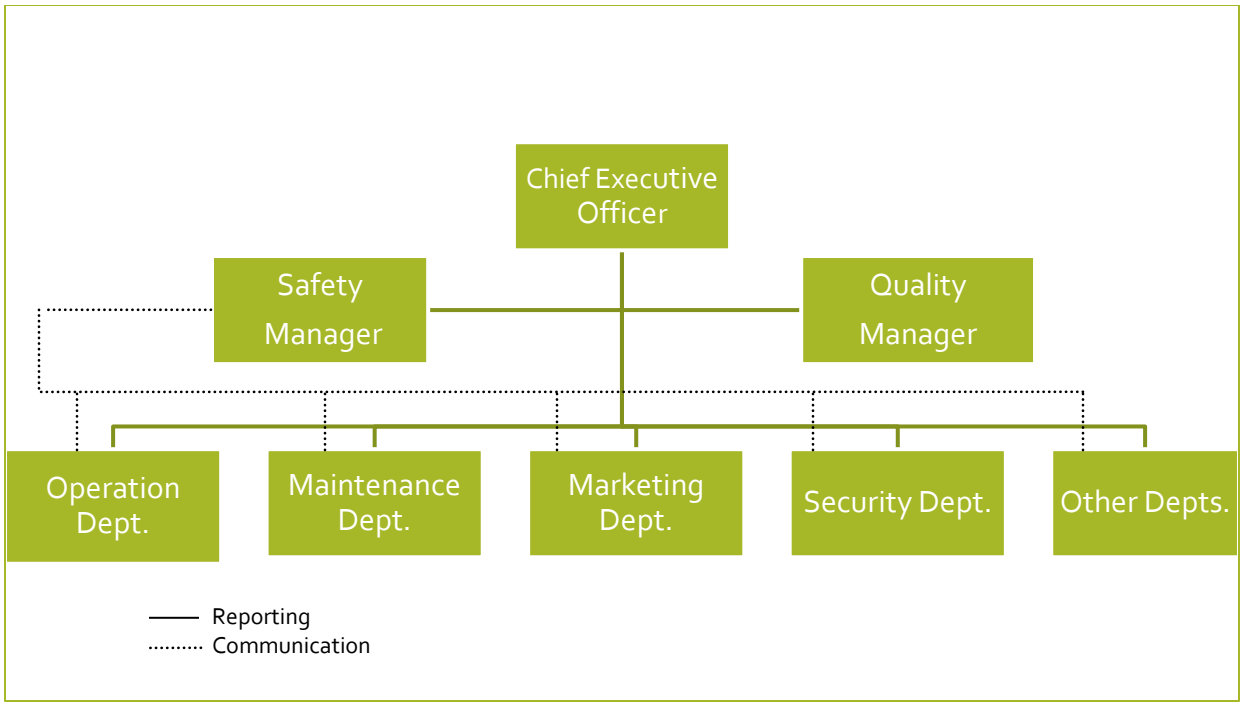
- A safety manager has been appointed to develop and maintain the SMS who is independent of line management and has the authority to develop and maintain an effective SMS.
- The safety manager has direct and uninhibited access to Accountable Executive, other departments and the resources required for the proper development and maintenance of the SMS.

d. Clear understanding and acceptance of safety management accountabilities and responsibilities by all relevant staff and contractors.

This objective can be achieved by ensuring the following actions:

- All staff and contractors are aware of how their actions impact the safety of the wider operation and how the actions of others impact safety.
- Accountability for safety in the organisation is understood by all relevant staff and contractors.
- The organisation regularly reviews and assesses documented safety management responsibilities.

Below is a sample SMS organization structure of an airline operator (XYZ Company Pvt. Ltd) with integrated SMS concept.



In the organization Structure both the Safety Manager and the Quality Manager perform the Safety Management Systems' functions. They both have a direct reporting line to the CEO. The safety functions are dispersed throughout the organisation to the Operations, Maintenance and other departments. The Safety Manager and the Quality Manager coordinate with each other and then with the departmental chiefs, assisting them in the fulfilment of their safety management functions. It is more consistent with the systems approach to safety management.

Markers of compliance and performance

1. An Accountable Executive has been appointed with full responsibility and ultimate accountability for the SMS to ensure it is properly implemented and performing effectively.
2. The Accountable Executive has control of the financial and human resources required for the implementation of an effective SMS
3. The Accountable Executive is fully aware of his SMS roles and responsibilities in respect of the safety policy, safety standards and safety culture of the organisation.
4. Safety accountabilities, authorities and responsibilities are defined and documented throughout the organisation.
5. Staffs at all levels are aware of and understand their safety accountabilities, authorities and responsibilities regarding all safety management processes, decisions and actions.
6. (C) Safety management is shared across the organisation (and is not just the responsibility of the Safety Manager and his/her team).
7. There are documented management organisational diagrams and job descriptions for all personnel

Markers of Excellence and Best Practices

8. There is evidence of employee involvement and consultation in the establishment and operation of the SMS.
9. (C) There is evidence that safety management system principles have penetrated all levels of the organisation and safety is part of the everyday language.
10. Safety accountabilities throughout the organisation are clearly documented and individuals sign for their accountabilities.
11. Key safety activities are clearly described in senior management duties and responsibilities are incorporated into personnel performance targets.
12. Management rewards positive safety behaviours and contributions

Note: (C) indicates marker for safety culture

2.3 Appointment of key safety personnel

2.3.1. Appointment of a competent person as safety manager is essential to an effectively implemented and functioning SMS. The safety manager may be identified by different titles. For the purpose of this guidance material, the generic term “safety manager” is used. The person carrying out the safety manager function is responsible for the performance of the SMS and for the delivery of safety services to the other departments in the organization.

2.3.2 The safety manager advises the accountable executive and line managers on safety management matters, and is responsible for coordinating and communicating safety issues within the organization, with authority as well as with external members of the aviation community. Functions of the safety manager include, but are not limited to:

a. develop the SMS implementation Plan
b. perform/facilitate hazard identification and safety risk analysis;
c. monitor corrective actions and evaluate their results;

d. provide periodic reports on the organization's safety performance;
e. maintain SMS documentation and records;
f. plan and facilitate staff safety training;
g. advise AE on all safety matters
h. provide independent advice on safety matters;
i. monitor safety concerns in the aviation industry and their perceived impact on the organization's operations aimed at product and service delivery; and
j. Coordinate for and be involved in the development and updating of ERP.
k. Carry out safety promotion activities including bulletins, reports, posters, pamphlets
l. Administering any safety related surveys, investigations, audits etc.
m. Ensuring that risk assessments are conducted when applicable
n. Monitoring the industry for safety concern that could affect the organization
o. Conduct management of change for any significant change in organization
p. coordinate and communicate within the organization together with the State's CAA and other State authorities as necessary on issues relating to safety. Through the established communication processes.

2.3.3 In most organizations, an individual is appointed as the safety manager. Depending on the size, nature and complexity of the organization, the 'safety manager' role may be an exclusive function or it may be combined with other duties. Moreover, some organizations may need to allocate the role to a group of persons. The organization must ensure that the option chosen does not result in any conflicts of interest. Where possible, the safety manager should not be directly involved in the product or service delivery but should have a working knowledge of these. The appointment should also consider potential conflicts of interest with other tasks and functions. Such conflicts of interest could include:

a. competition for funding (e.g. financial manager being the safety manager);

b. conflicting priorities for resources; and
c. where the safety manager has an operational role and the ability to assess the SMS effectiveness of the operational activities the safety manager is involved in.

An example of conflicting responsibilities
It might be a small organisation where the senior person responsible for the system for safety management is also responsible for occurrence investigation and crew training and competency assessment. Clearly if an investigation indicates that there may be deficiencies in crew training, there is a potential for conflict of interest. Having an independent competent person conduct or at least review the investigation and recommendations would be appropriate in that case. Similarly if the senior person responsible for the system for safety management (and therefore safety assurance) is also responsible for the control and scheduling of maintenance, performing an audit on their own work would clearly have the potential for conflict of interest. Again, the use of an independent competent person to perform the audit would be appropriate.

2.3.4. The safety manager should be a senior management position not lower than or subservient to the production or operational functions (line management) of the organization.

2.3.5 In cases where the function is allocated to a group of persons, (e.g. when service providers extend their SMS across multiple activities) one of the persons should be designated as "lead" safety manager, to maintain a direct and unequivocal reporting line to the accountable executive.

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

a. safety/quality management experience;
b. operational experience related to the product or service provided by the organization;
c. technical background to understand the systems that support operations or the product/service provided;
d. interpersonal skills;
e. analytical and problem-solving skills;
f. project management skills;
g. oral and written communications skills; and
h. an understanding of human factors.

See appendix 5 for a sample job description of Safety Manager.

2.3.7 Depending on the size, nature and operational complexity of the organization, additional staff may support the safety manager. The safety manager and supporting staff are responsible for ensuring the prompt collection and analysis of safety data and appropriate distribution within the organization of related safety information such that safety risk decisions and controls, as necessary, can be made.

2.3.8 Service providers should establish appropriate safety committees that support the SMS functions across the organization. This should include determining who should be involved in the safety committee and frequency of the meetings.

2.3.8 The highest-level safety committee, normally referred to as a Safety Review Board (SRB), includes the accountable executive and senior managers with the safety manager. The SRB is strategic and deals with high-level issues related to safety policies, resource allocation and organizational performance. The SRB monitors the:

a) effectiveness of the SMS;
b) SAG functions regarding timely response in implementing necessary safety risk control actions;
c) safety performance against the organization's safety policy and objectives;
d) overall effectiveness of safety risk mitigation strategies;
e) effectiveness of the organization's safety management processes which support:
   i. the declared organizational priority of safety management; and

ii. promotion of safety across the organization.

Example of composition of SRB of an airline operator (XYZ Airlines Pvt. Ltd.)	
1. Accountable Executive	*Chairperson*
2. Chief Operation Dept.	*Member*
3. Quality Manager	*Member*
4. Safety Manager	*Member*
5. Chief of Maintenance Dept.	*Member*
6. Chief of Marketing Dept.	*Member*
7. Chief of Security Dept.	*Member*
8. *Person designated by AE*	*Member Secretary*

2.3.9 Once a strategic direction has been developed by the highest-level safety committee, implementation of safety strategies should be coordinated throughout the organization. This may be accomplished by creating safety action groups (SAGs) that are more operationally focused. SAGs are normally composed of managers and front-line personnel of relevant department and are chaired by a designated manager. Safety manager coordinates among the SAGs and brings the decisions of those SAGs to SRB. SAGs are tactical entities that deal with specific implementation issues in accordance with the strategies developed by the SRB. The SAGs:

a) identify safety hazards within the organziation and outside of organization including contractor organizations.
b) Conduct SRM activities for the identified hazard with appropriate safety risk controls;
c) analyze the safety data to determine risk areas and monitor the safety performance of the organization;
d) Ensure the effective implementation of safety risk controls through assurance activities ie audit, inspection survey etc.
e) Develop and forward to the SRB the organization Safety Objectives, SPIs and SPTs;
f) Conduct Management of Change for significant changes in organization; and
g) review the effectiveness of implementation of specific safety risk controls and investigation recommendations.

2.3.10 In small organization there is only one SAG and is normally composed of managers, supervisors and front – line officers from all relevant departments and is chaired by Safety Manager.

Example of composition of SAG (XYZ Airlines Pvt. Ltd.)	
1. Safety Manager	*Chairperson*
2. designated representative of Quality Assurance Dept.	*Member*
3. designated representative of Operation Dept.	*Member*
4. designated representative of Maintenance Dept.	*Member*
5. designated Safety Officer by SM	*Member Secretary*

Markers of compliance and performance

1. A competent person with the appropriate knowledge, skills and experience has been nominated to manage the operation of the SMS and fulfils the required job functions and responsibilities.
2. There is a direct reporting line between the Safety Manager and the Accountable Manager.
3. The organisation has allocated sufficient resources to manage the SMS including, but not limited to, manpower for safety investigation, analysis, auditing and promotion.
4. Staffs in key safety roles are kept current through additional training and attendance at conferences and seminars.
5. The organisation has established a structured safety committee or board, appropriate for the size and complexity of the organisation, consisting of a full range of senior management representatives.

Markers of Excellence and Best practices

6. The Safety Review Board or its equivalent monitors the safety performance of the operations and the effectiveness of the SMS and is normally chaired by the accountable executive.
7. The person (s) responsible for managing and maintaining the SMS is/are given appropriate status in the organisation reflecting the importance of the safety role within the organisation and is independent of line management.
8. Safety committees include stakeholders and significant contracted organisations.
9. Safety committees are focused on safety issues and attendees are actively encouraged to participate.

2.4 Coordination with Emergency Response Planning

2.4.1 By definition, an emergency is a sudden, unplanned situation or event requiring immediate action. Coordination of emergency response planning refers to planning for activities that take place within a limited period of time during an unplanned aviation operational emergency situation. An emergency response plan (ERP) is an integral component of a service provider's SRM process to address aviation-related emergencies, crises or events. Where there is a possibility of a service provider's aviation operations or activities being compromised by emergencies such as a public health emergency/pandemic, these scenarios should also be addressed in its ERP as appropriate. The ERP should address foreseeable emergencies as identified through the SMS and include mitigating actions, processes and controls to effectively manage aviation-related emergencies.

2.4.2 The overall objective of the ERP is the safe continuation of operations and the return to normal operations as soon as possible. This should ensure an orderly and efficient transition from normal to emergency operations, including assignment of emergency responsibilities and delegation of authority. It includes the period of time required to re-establish "normal" operations following the emergency. The ERP identifies actions to be taken by responsible personnel during an emergency. Most emergencies will require coordinated action between

different organizations, possibly with other service providers and with other external organizations such as non-aviation-related emergency services. The ERP should be easily accessible to the appropriate key personnel as well as to the coordinating external organizations.

2.4.3 According to Civil Aviation Requirements for Safety Management (CAR -19) service providers subject to implementation of SMS are required to the development of an emergency response planning. Coordination of ERP applies only to those service providers that are required to establish and maintain an ERP. This coordination should be exercised as part of the periodic testing of the ERP.

2.4.4 The organisation's intentions regarding, and commitment to dealing with, emergency situations and their corresponding recovery controls, should be documented and be commensurate to the size and complexity of the organisation. The emergency response plan (ERP) should have procedures for:

a. orderly and efficient transition from normal to emergency situations and return to normal
b. delegation of emergency authority
c. assignment of emergency responsibilities
d. authorisation by key personnel for actions mandated by the plan
e. coordination of efforts to handle the emergency
f. planned and coordinated action to manage and minimise the risks associated with an incident/accident.
g. Procedures of Critical Incident Stress Management (CISM) for the return of the victims of incidents to the pre -incidents state.

2.4.5. To improve effectiveness of ERP, and to ensure designated emergency response team members are prepared, the plan should periodically be tested by conducting regular exercises. Training in emergency response may take two forms, table-top and/or full-scale exercises.

Table-top exercise

The table-top exercise is designed to provide training, to evaluate plans and procedures, and to resolve questions of coordination and emergency response team responsibilities in an informal format.

Full-Scale exercise

The full-scale exercise is the most comprehensive test. It is intended to evaluate the operational capability of the emergency management system by creating an emergency environment with actual mobilisation and deployment of resources and personnel. The decision to conduct a full scale exercise should be coordinated with other local organisations and agencies where practicable.

2.4.6 The frequency of testing of ERP depends on organization's size, nature and operational complexity. Ideally, ERP is tested annually by table top and bi-annually by full scale exercise. In case of an occurrence of accident/incident requiring full scale application of ERP, the full scale exercise can be skipped for that period of time.

2.4.7 At the conclusion of an exercise or actual emergency, a formal review should take place. It should measure the effectiveness of the plan with feedback from participants and by assessing the impact. Such feedbacks form a basis for evaluation and revision of policies, plans and procedures.

Markers of compliance and Performance

1. An emergency response plan that reflects the size, nature and complexity of the operation has been developed and defines the procedures, roles, responsibilities and actions of the various organisations and key personnel.
2. The organisation has a process to communicate and distribute the ERP procedures and key personnel have easy access to the ERP at all times.
3. The ERP is periodically tested for the adequacy of the plan and the results reviewed to improve its effectiveness

Markers of excellence and best practices

4. The organisation has Memorandums of Understanding (MoUs) or agreements with other organisations for mutual aid and the provision of emergency services.
5. The organisation has implemented Critical Incident Stress Management (CISM) for its staff

2.5 SMS Documentation

2.5.1 The SMS documentation should include a "SMS manual", which describes the service provider's SMS policies, processes and procedures to facilitate the organization's internal administration, communication and maintenance of the SMS. It should help personnel to understand how the organization's SMS functions, and how the safety policy and objectives will be met. The documentation should include a system description that provides the boundaries of the SMS. It should also help clarify the relationship between the various policies, processes, procedures and practices, and define how these link to the service provider's safety policy and objectives. The documentation should be adapted and written to address the day-to-day safety management activities that can be easily understood by personnel throughout the organization.

2.5.2. The SMS manual also serves as a primary safety communication tool between the service provider and key safety stakeholders (e.g. CAA for the purpose of regulatory acceptance, assessment and subsequent monitoring of the SMS). The SMS manual may be a stand-alone document, or it may be integrated with other organizational documents (or documentation) maintained by the service provider. Where details of the organization's SMS processes are

already addressed in existing documents, appropriate cross-referencing to such documents is enough. This SMS document must be kept up to date. CAA acceptance is required before significant amendments are made to the SMS manual, as it is a controlled manual.

2.5.3 Policies, procedures and processes developed for an SMS should be integrated within existing systems such as Quality Management System (QMS), Human Factor and Error Management System (HFEMS), Environmental Management System (EMS), Occupational Health and Safety (OHS), etc.

Example of integration of SMS with QMS
Safety personnel, during their routine work of safety risk management, put in place the corrective actions regarding a particular risk identified. They confirm whether such corrective actions work effectively together with ensuring continuous improvement of SMS through inspections and follow ups. If these corrective actions are included in the checklist of Quality/Compliance, integration of SMS with QMS takes effect.

2.5.4 The SMS manual should include a detailed description of the service provider's policies, processes and procedures including but not limited to:

a. safety policy and safety objectives;
b. reference to any applicable regulatory SMS requirements;
c. system description;
d. safety accountabilities, responsibilities and authorities of key safety personnel;
e. voluntary and mandatory safety reporting system processes and procedures;
f. hazard identification methods and procedures;
g. safety risk assessment processes and procedures;
h. safety investigation procedures;
i. procedures for establishing and monitoring safety performance indicators;
j. SMS training processes and procedures;
k. safety communication processes and procedures;
l. internal audit procedures;
m. management review processes.
n. management of change procedures;
o. SMS documentation and management procedures;
p. coordination of emergency response planning etc.

Control and maintenance of SMS documentation

2.5.5 Robust document control should ensure current versions of relevant documents are available at all locations where operations are performed, and obsolete documents are promptly removed from all points of use.

2.5.6 Each organisation should have a document control process to ensure that the SMS documentation is regularly reviewed and updated. Changes should be approved at the delegated level of authority, assessed for risk impacts, and be accepted by the regulator as part of the exposition as required by the Rules.

2.5.7 SMS documentation also includes the compilation and maintenance of operational records substantiating the existence and ongoing operation of the SMS. Operational records are the outputs of the SMS processes and procedures such as the SRM and safety assurance activities. SMS operational records should be stored and kept in accordance with the organization existing retention period requirement. Typical SMS operational records should include but not limited to:

a) hazards log/ register and hazard/safety reports;
b) SPIs, SPTs and related charts;
c) record of completed safety risk assessments;
d) record of Management of Change;
e) SMS internal review, audits, inspections, surveys and investigation reports;
f) SMS/safety training and evaluation records;
g) SMS/safety committee meeting minutes;
h) SMS implementation plan;
i) gap analysis to support implementation plan etc.

Markers of compliance and performance

1. There is documentation that describes the safety management system and the interrelationships between all of its elements.
2. SMS documentation, including SMS related records, are regularly reviewed and updated with appropriate version control in place
3. SMS documentation is readily available to all personnel

Markers of excellence and best practices

4. Safety Management processes are integrated into existing organisational manuals.
5. The company has analysed and uses the most appropriate medium for the delivery of documentation at both the corporate and operational levels.

Chapter 3
SAFETY RISK MANAGEMENT

3.1 Service providers should ensure they are managing their safety risks. This process is known as safety risk management (SRM), which includes hazard identification, safety risk assessment and safety risk mitigation.

3.2 The SRM process 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 can often identify potential hazards at any point in the operation or activity life cycle.

3. 3 Understanding the system and its operating environment is essential for the achievement of high level of safety performance. Having a detailed system description that defines the system and its interfaces will help. Hazards may be identified from internal and external sources. Safety risk assessments and safety risk mitigations will need to be continuously reviewed to ensure they remain effective. Figure 3.1 provides an overview of the hazard identification and safety risk management process for a service provider.

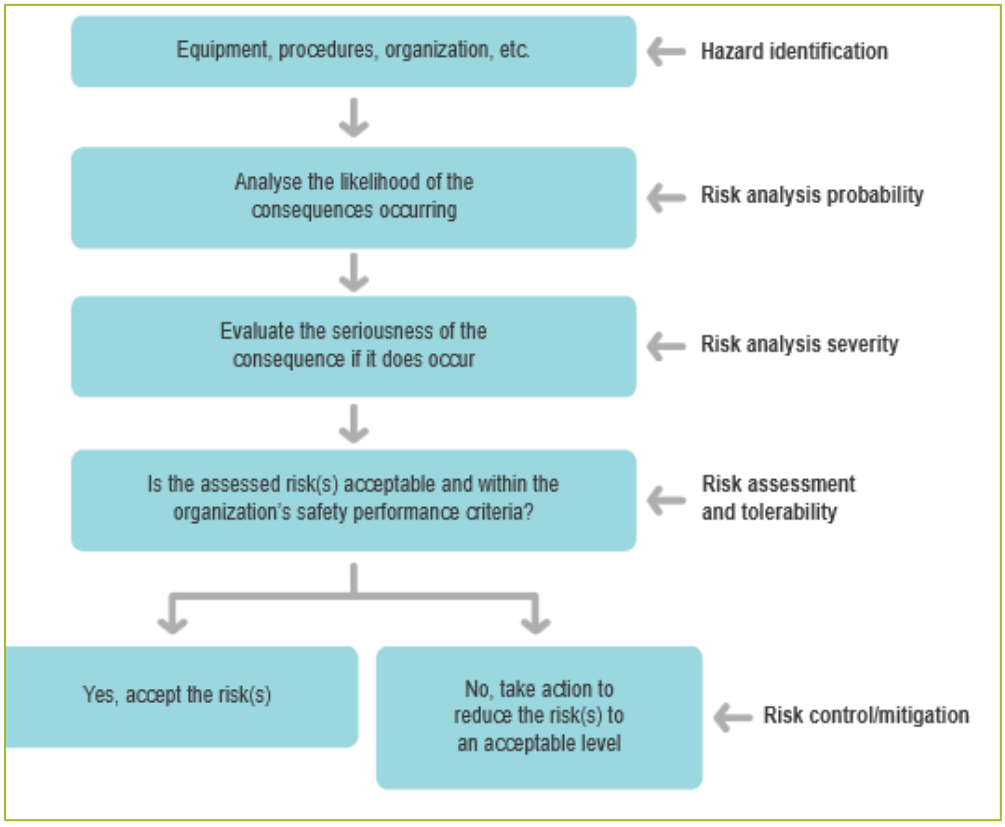


Figure 3.1: Hazard identification and safety risk management process (Source- ICAO Doc. 9859)

3.4 Hazard Identification

Hazard identification is the first step in the SRM process. It is important to employ realism and lateral thinking in hazard identification. The organisation should not only identify 'obvious' hazards that could affect the operation, but also the potentially complex events. Hazard identification should, where practicable, be based on a combination of reactive, proactive and predictive safety data collection. The organization should develop and maintain a formal process to identify hazards that could impact aviation safety in all areas of operation and activities. This includes equipment, facilities and systems. Any aviation safety-related hazard identified and controlled is beneficial for the safety of the operation. It is important to also consider hazards that may exist as a result of the SMS interfaces with external organizations.

3.4.1 Sources for hazard identification

There are a variety of sources for hazard identification for example: internal or external sources to the organization.

3.4.1.1 Internal Source

Internal Source implies hazard identification from a source within an organization. Some internal sources include:

a) Voluntary and mandatory safety reporting systems: this provides everyone, including staff from external organizations, with opportunities to report hazards and other safety issues to the organization;
b) Normal operations monitoring: this uses observational techniques to monitor the day-to-day operations and activities such as line operations safety audit (LOSA);
c) Automated monitoring systems: this uses automated recording systems to monitor parameters that can be analysed such as flight data monitoring (FDM), ATC radar data monitoring, ATC – pilot communication Record etc;
d) Audits: these can be used to identify hazards in the task or process being audited. These should also be coordinated with organizational changes to identify hazards related to the implementation of the change;
e) Safety survey/Inspection;
f) Safety occurrence trend analysis;
g) Feedback from training: training that is interactive (two way) can facilitate identification of new hazards from participants;
h) Internal safety investigations: hazards can be identified during internal safety investigation and follow-up reports on accidents/incidents;
i) Task Analysis – developed specifically to identify hazards associated with human factors, procedural errors and the 'man-machine interface'. By breaking a task down into individual elements, hazards associated with the task can be identified; and

j) Brainstorming – typically a free discussion within a group in a specific topic. Brainstorming can be effective in identifying underlying hazards that may be overlooked by regular methods etc.

3.4.1.2 External Sources

External source implies hazard identification from a source outside of an organization. Some external sources include:

a) State mandatory and voluntary safety reporting systems: some States share summaries of the safety reports received from service providers;
b) Aviation accident report: reviewing accident reports- which may be related to accidents in the same State or to a similar aircraft type, region or operational environment;
c) State oversight audits and third-party audits: external audits can sometimes identify hazards. These may be documented as an unidentified hazard or captured less obviously within an audit finding;
d) Trade associations and information exchange systems: many trade associations and industry groups are able to share safety data that may include identified hazards;
e) Brainstorming – typically a free discussion within a group in a specific topic. Brainstorming can be effective in identifying underlying hazards that may be overlooked by regular methods etc.

3.4.2 Safety reporting system

3.4.2.1 One of the main sources of hazard identification, both internal and external, is the safety reporting system especially the voluntary safety reporting system. Whereas the mandatory system is normally used for incidents that have occurred, the voluntary system provides an additional reporting channel for potential safety issues such as hazards, near misses or errors. They can provide valuable information to the State and service provider.

3.4.2.2 It is important that service providers provide appropriate protections to encourage people to report what they see or experience. For example, enforcement action may be waived for reports of errors, or in some circumstances, rule-breaking. It should be clearly stated that reported information will be used solely to support the enhancement of safety. The intent is to promote an effective reporting culture and proactive identification of potential safety deficiencies.

3.4.2.3 Voluntary safety reporting systems should be confidential, requiring that any identifying information about the reporter is known only to the custodian to allow for follow-up action. The role of custodian should be kept to a few individuals, typically restricted to the safety manager and personnel involved in the safety investigation. Maintaining confidentiality will help facilitate the disclosure of hazards leading to human error, without fear of retribution or embarrassment. Voluntary safety reports may be de-identified and archived once 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.

3.4.2.4 Personnel at all levels and across all disciplines are encouraged to identify and report hazards and other safety issues through their safety reporting systems. To be effective, safety reporting systems should be readily accessible to all personnel. Depending on the situation, a paper-based, web-based or desktop form can be used. Everyone should be made aware of the benefits of safety reporting and what should be reported.

3.4.2.5 Anybody who submits a safety report should receive feedback on what decisions or actions have been taken. The alignment of reporting system requirements, analysis tools and methods can facilitate exchange of safety information as well as comparisons of certain safety performance indicators. Feedback to reporters in voluntary reporting schemes also serves to demonstrate that such reports are considered seriously. This helps to promote a positive safety culture and encourage future reporting.

3.4.2.6 There may be a need to filter reports on entry when there are a large number of safety reports. This may involve an initial safety risk assessment to determine whether further investigation is necessary and what level of investigation is required.

3.4.2.7 Safety reports are often filtered through the use of taxonomy, or a classification system. Filtering information using taxonomy can make it easier to identify common issues and trends. The service provider should develop taxonomies that cover their type(s) of operation. The disadvantage of using taxonomy is that sometimes the identified hazard does not fit cleanly into any of the defined categories. The challenge then is to use taxonomies with the appropriate degree of detail; specific enough that hazards are easy to allocate, yet generic enough that the hazards are valuable for analysis. Some States and international trade associations have developed taxonomies that could be used. Chapter 5 contains additional information on taxonomies.

3.4.3 Features of a successful hazard identification process

The following factors lead to successful hazard identification—

a. the hazard identification process should be appropriate and relevant to the organisation i.e. provides an adequate depth of analysis
b. appropriate members of the workforce are actively involved and regular and ongoing consultation occurs
c. all methods, results, assumptions and data are fully documented
d. the documented identification of hazards is regularly maintained (e.g. updates from alerts and occurrences) and used as a live document
e. timely feedback and outcomes provided to the reporter and wider organisation where appropriate

f. active and visible engagement from senior management encouraging personnel at all levels to proactively report hazards, errors and near misses .
g. the adoption of a Just Culture reporting policy by the organisation will ensure that personnel are confident in submitting hazard reports.

3.4.4 Analysis of safety hazard reports

The analysis of safety reports is necessary to validate the contents of the reports, establish any trends, (good or bad) and assess the significance of the reported information i.e. the potential to cause or contribute to an aircraft incident or accident. This will assist the organisation in identifying safety risks and their potential consequences, and hence determine priorities for subsequent safety action. The assessment of the consequences of the risk and associated control strategies are part of the risk management process. Therefore, effective analysis of safety reports becomes a key source of information for safety risk management.

3.4.5 Collation, storage and distribution of safety data

The outcomes from hazard identification form the basis of the subsequent steps of the risk management process, namely the risk assessment and control measures. The main requirements are that the hazard identification documentation:

a. clearly points out the hazards, underlying causes and control measures where appropriate;
b. contains a numbering system for hazards and controls to allow easy identification and tracking;
c. contains sufficient information to support the subsequent steps of risk management;
d. is easy to administer;
e. can directly accommodate the process of revisiting and updating the knowledge of hazards, details of hazards, incidents, control measures, lessons from incidents and accidents;
f. is managed under a document control system. Depending on the size and complexity of the organisation, an electronic system for the management of identified hazards may be easier to use for the maintenance of records etc.

Note: If organisations need to receive safety reports from a third party, consider using an effective means of information transfer that is appropriate to the needs of the organization.

Below is a sample hazard registration sheet:

Sample of a hazard registration sheet

Item No.	Reported Date	Area/ Operation/ Equipment	Hazard (H)				Unsafe Event (UE) (Reported/Projected)	Consequence (C) (Reported/ Projected)	Recommended Action		
			Generic Hazard	Specific Hazard	Hazard Code	Source of information			Corrective Action (yes/No)	SRM Action (Yes/ No)	SRM Priority Level (H/M/L)

Explanatory Note with examples:

1. Source of Information: Hazard information as may be extracted from - Voluntary Hazard Rpt, Occurrence Notification/ Investigation Rpt, Internal Audit Rpt, External Audit Rpt, Hazard Survey Rpt, Operational Data Review Rpt, Operational Trial Report
2. Specific Hazard/ Threat: If more than one Hazard/ Threat identified, register such additional Hazard/ Threat under new row/ item
3. Hazard ID code:
a. Area: OPS, ANS, AGA,
b. Organization: TIA ATS
c. Hazard No: 001
d. Priority Level: High (H)- Accident, Medium (M)- Severe Incident, Low (L)- Incident
e. Year: 2018
f. Example: ANS-TIAATS-001-H-2018
4. Reported/ Projected (UE/ C): Annotate UE/ C description as a "Reported" occurrence or a "Projected" occurrence. If multiple H>UE>C combinations involved, register each combination under a new Row (Each single H>UE>C combination will constitute one potential SRM Task)
5. Corrective Action: If the Hazard can be effectively eliminated through conventional corrective action (eg disposal, repair, replacement, modification), annotate YES with the action taken/ recommended. Otherwise annotate NO.
6. SRM Action: Annotate YES to indicate systematic SRM action is recommended (or has been taken already). Annotate NO if systematic SRM action is not recommended (or not necessary).
7. Priority Level: SRM or Corrective Action Priority Level based on (Annex 13) occurrence category of the projected (or reported) Unsafe Event or Consequence. Accident – High (H); Serious Incident - Medium; Incident - Low.

3.4.6 Hazard Tracking

3.4.6.1 Risk treatment does not end upon implementation. Hazard tracking is a dynamic process in which hazards and their associated safety risk information and requirements are tracked. This information is updated throughout the lifecycle of a system or change.

3.4.6.2 The purpose of hazard tracking and risk reduction is to assure a closed-loop process for managing safety hazards and risks. Tracking includes:

a. Documenting safety requirements

b. Providing the status of requirements validation and verification
c. Verifying implementation
d. Updating the current and predicted residual risk levels prior to acceptance
e. Assessing the effectiveness of existing and recommended safety requirements to control identified hazards

3.4.6.3 A hazard tracking system can help organisations verify the effectiveness of the risk controls and mitigations through continuous monitoring. If the mitigations are found ineffective in reducing the risk to an acceptable level, the change proponent and/or team should reassess the risk and implement additional mitigations until further monitoring demonstrates that the risk has been mitigated to an acceptable level. Hazards with low associated risk by definition meet safety requirements for the target level of safety and may not require further mitigation.

3.5 Service provider internal Safety Investigation:

3.5.1 Effective safety management depends on quality investigations to analyse safety occurrences and safety hazards, and report findings and recommendations to improve safety in the operating environment.

3.5.2 There is a clear distinction between accident and incident investigations under Annex 13 and service provider internal safety investigations. Investigation of accidents and serious incidents under Annex 13 are the responsibility of the State, as defined in Annex 13. This type of information is essential to disseminate lessons learned from accidents and incidents. Service provider internal safety investigations are conducted by service providers as part of their SMS to support hazard identification and risk assessment processes. There are many safety occurrences that fall outside of Annex 13 that could provide a valuable source of hazard identification or identify weaknesses in risk controls. These problems might be revealed and remedied by a safety investigation led by the service provider.

3.5.3 This guidance material relates only to internal safety investigations that are conducted in response to an accident or incident (e.g. reactive), as well as those conducted in response to adverse trending of hazards and risks, or cases where more in-depth follow-up is required (e.g. proactive).

3.5.4 The primary objective of the service provider internal safety investigation is to understand what happened, and how to prevent similar situations from occurring in the future by eliminating or mitigating safety deficiencies. This is achieved through careful and methodical examination of the event and by applying the lessons learned to reduce the probability and/or consequence of future recurrences. Service provider safety investigations are an integral part of the service provider's SMS.

3.5.5 Service provider internal investigations of safety occurrences and hazards are an essential activity of the overall risk management process in aviation. The benefits of conducting a safety investigation include:

a. gaining a better understanding of the events leading up to the occurrence;
b. identifying contributing human, technical and organizational factors;
c. identifying hazards and conducting risk assessments;
d. making recommendations to reduce or eliminate unacceptable risks; and
e. identifying lessons learned that should be shared with the appropriate members of the aviation community.

3.5.6 Responsibility for conducting safety investigations

3.5.6.1 Internal safety investigations should be conducted by personnel having competency based training in incident investigation and where practicable such personnel be independent of the operation. They should be trained in accident/incident investigation techniques focused, at least, on route cause analysis, human factor analysis, organization factor analysis, interviewing techniques, use of safety critical data in investigation and investigation report writing.

3.5.6.2 The duties and responsibilities for the management of internal safety investigations should be documented with consideration of:

- the scope of the investigation and what 'triggers' an investigation;
- the composition of the investigation team, including specialist assistance if required;
- the system of keeping the records of outcomes are recorded for follow up and trend analysis; and
- allocation of time for completion of investigation.

3.5.6.3 The role of the investigator is to identify where corrective or preventive actions are necessary using appropriate causal analysis methodologies. It is for the organisation's management to decide what those actions should be and how to implement them.

3.5.7 Defining the scope of an investigation

3.5.7.1 Ideally, all safety reports should be investigated. However, resources can be limited, so the effort expended should be proportional to the perceived benefit in terms of potential for identifying systemic hazards and risks to the organisation. Reports or themes that demonstrate a high risk should be investigated with high priority and in greater depth than those with low risk.

3.5.7.2 The extent of the investigation will depend on the actual and potential consequences of the event or risk level associated with a hazard. This can be determined through an initial risk assessment of the actual outcome(s) or potential outcome(s).

3.5.7.3 Since the level of risk is the product of consequence and likelihood, trying to assign a risk level to an event that has occurred provides little value; the likelihood is irrelevant – it has happened and past events cannot be managed. However, when deciding whether to investigate an event and to what extent, consideration should be given to the other potential outcomes in the same contextual setting. By considering alternative, credible outcomes and considering the effectiveness of existing risk treatments or controls, it is possible to assign a risk level to this and similar events.

3.5.8 Steps of an effective safety investigation

3.5.8.1 Commencing a safety investigation

The following steps should be considered when launching an internal safety investigation—

- a safety investigator should be appointed;
- involved personnel and companies should be notified;
- a repository of all information relating to the investigation should be established (e.g. a file in the safety reporting dataset); and
- the repository for investigation information should be secure and confidential to ensure the integrity of the data.

3.5.8.2 Gathering evidence

The first step in the investigation process is to gather all factual information about the occurrence. Factual information can come from a number of different sources, depending on the nature of the occurrence. Some of the most common sources in the context of aviation-related occurrences include the following—

- interviews with involved personnel, crew and witnesses;
- recordings; and
- records and documentation, e.g. maintenance logs, manuals, notices and other correspondence etc.

3.5.8.3 Interpreting the facts

Once the evidence is gathered, all the information should be analysed to identify ‘what’ happened and, more importantly, ‘why’ it happened. It is often easy to identify ‘what’ happened; the factual information should reveal this. The ‘why’ it happened can be challenging, but this is where the real lessons and safety benefits are. Investigators should keep asking the question ‘why’ until they get to the real cause(s).

It is often worthwhile to use pre-established and proven analytical methodologies to help identify and organise the causal links of an occurrence. This will help to avoid bias, misidentification, or misinterpretation.

3.5.9 Developing recommendations

3.5.9.1 If faced with a group of similar occurrences or similar causes, it may be appropriate to group the information into emerging themes. The reasons for these trends should be identified from a holistic point of view.

3.5.9.2 Identifying appropriate findings and recommendations is the key focus of any investigation, and it is vital to remain focused on organisational learning, rather than pinpointing individual failings or corrective measures. When making recommendations consider phraseology that emphasises the safety-related improvements attainable by implementation.

3.5.10 Distributing and presenting the safety investigation report

It is important to consider how the distribution of safety investigation reports is controlled. The final report needs to be presented to all personnel and organisations involved. It must be communicated to those who have findings/recommendations assigned to them through communication mechanisms such as that mentioned in 5.5.4. It is important to remember that distributing a report with commercially sensitive information may not always be possible. Therefore, summaries of reports may be a more appropriate means of communicating outcomes.

3.5.11 Monitoring safety investigation outcomes

Once the report has been presented, the actions resulting from the findings and recommendations need to be monitored and recorded as a function of 'closing the loop'.

3.5.12 Selecting and training safety investigators

A competent safety investigator is vital to the outcome of an organisation's safety investigation. The organisation should identify training needs in relation to performing investigation activities relevant to the complexity and activities of the organisation. The following are the typical knowledge, experience and skill requirements of a safety investigator:

- trained in safety investigation and have suitable subject matter expertise;
- technically competent and have experience in interpreting occurrence information to determine causal factors;
- well-developed research and listening skills to gather all necessary evidence and interpret it appropriately;
- proficient in written and verbal communication skills;
- integrity;
- be able to act independently; and
- present reports which are a clear representation of the facts and causes.

This role is not necessarily required on a full time basis, (either amongst existing personnel/crew or externally).

Compliance and Performance Markers

1. The organisation has a reporting system to captures errors, hazards and near misses that is simple to use and accessible to all staff.
2. The organisation has proactively identified all the major hazards and assessed the risks related to its current activities.
3. The safety reporting system provides feedback to the reporter of any actions taken (or not taken) and, where appropriate, to the rest of the organisation.
4. Safety investigations are carried out to identify underlying causes and potential hazards for existing and future operations.
5. Safety reports are acted on in a timely manner.
6. Hazard identification is an ongoing process and involves all key personnel and appropriate stakeholders.
7. Personnel responsible for investigating reports are trained in investigation techniques.
8. (C) Investigations establish causal/contributing factors (why it happened, not just what happened)
9. (C) Personnel express confidence and trust in the organisations reporting policy.
10. Human performance related hazards are being identified.

Markers of excellence and best practices

11. There is an active reporting system indicated by reporting levels of more than 1 report per employee per year.
12. (C) Safety Report
13. s include the reporter's own errors and events that the reporter would not normally report (events where no-one was watching)
14. The reporting system empowers personnel to propose preventative and corrective actions.
15. (C) The reporting system is actively used throughout the organisation.
16. The reporting system is available to contracted organisations and customers to make reports.
17. There is a process in place to analyse safety data to look for trends and gain useable management information.

Note: (C) indicates the safety culture

3.6 Safety Risk Assessment and Mitigation

3.6.1 Reactive and proactive risk management

3.6.1.1 Risk management can be conducted in a combination of reactive and proactive manners. The objective is to ensure that ongoing operations remain safe and planned operations can be undertaken safely.

- Reactive risk management responds to events that have already happened, such as serious incidents or accidents. The objective is to avoid the recurrence of the same or similar events.
- Proactive risk management actively seeks to identify safety risks through the analysis of the organisation's environment, activities and processes. It uses predictive and monitoring techniques like analytical tools. It is especially applicable to identifying the possible negative future outcomes or events of new or changing parts of the organisation.

3.6.1.2 One form of risk management should not preclude any other. Reactive risk management strategies should be favoured to obtain information on risk and errors in the initial phases of the organisation's SMS implementation plan, as well as monitoring and follow-up phases. As the reactive risk management gets more mature, the organisation should focus more on proactive risk management. Proactive strategies include a thorough hazard analysis of business processes. After identifying hazards, the organisation can manage the associated risks.

3.6.2 Safety Risk Management (SRM) techniques

3.6.2.1 The service provider must develop a safety risk assessment model and procedures which will allow a consistent and systematic approach for the assessment of safety risks. This should include a method that will help determine what safety risks are acceptable or unacceptable and to prioritize actions.

Some of the techniques are as follows:

- risk matrix
- bow-tie
- fault and event trees
- Quantitative Risk Assessment (QRA)
- SWOT analysis (strength, weaknesses, opportunities and threats).

3.6.2.2 Selection will depend on the level of information required to better understand the risk and to manage it. The main considerations when selecting risk assessment techniques are—

- they should be suitable for the size and complexity of the organisation and the nature of the hazards present;
- they should assist in understanding and selecting control measures;

- they should adequately differentiate between outcomes on a risk basis (i.e. likelihood and consequence); and
- they should help in assessing the potential effect of risk reduction measures.

3.6.2.3 The SRM tools used may need to be reviewed and customized periodically to ensure they are suitable for the service provider's operating environment. The service provider may find more sophisticated approaches that better reflect the needs of their operation as their SMS matures. The service provider and CAAN should agree on a methodology.

3.6.2.4 More sophisticated approaches to safety risk classification are available. These may be more suitable if the service provider is experienced with safety management or operating in a high-risk environment.

3.6.2.5 The safety risk assessment process should use whatever safety data and safety information is available. Once safety risks have been assessed, the service provider will engage in a data-driven decision-making process to determine what safety risk controls are needed.

3.6.2.6 Safety risk assessments sometimes have to use qualitative information (expert judgement) rather than quantitative data due to unavailability of data. Using the safety risk matrix allows the user to express the safety risk(s) associated with the identified hazard in a quantitative format. This enables direct magnitude comparison between identified safety risks. A qualitative safety risk assessment criterion such as "likely to occur" or "improbable" may be assigned to each identified safety risk where quantitative data is not available.

3.6.2.7 For service providers that have operations in multiple locations with specific operating environments, it may be more effective to establish local safety committees to conduct safety risk assessments and safety risk control identification. Advice is often sought from a specialist in the operational area (internal or external to the service provider). Final decisions or control acceptance may be required from higher authorities so that the appropriate resources are provided.

3.6.2.8 How service providers go about prioritizing their safety risk assessments and adopting safety risk controls is their decision. As a guide, the service provider should find the prioritization process:

a) assesses and controls highest safety risk;
b) allocates resources to highest safety risks;
c) effectively maintains or improves safety;
d) achieves the stated and agreed safety objectives and SPTs; and
e) satisfies the requirements of the State's regulations with regard to control of safety risks.

3.6.2.9 After safety risks have been assessed, appropriate safety risk controls can be implemented. It is important to involve the "end users" and subject matter experts in determining appropriate safety risk controls. Ensuring the involvement of right people will maximize the practicality of safety risk chosen mitigations. A determination of any unintended consequences, particularly the introduction of new hazards, should be made prior to the implementation of any safety risk controls.

3.6.2.10 Once the safety risk control has been agreed and implemented, the safety performance should be monitored to assure the effectiveness of the safety risk control. This is necessary to verify the integrity, efficiency and effectiveness of the new safety risk controls under operational conditions.

3.6.2.11 The SRM outputs should be documented. This should include the hazard and any consequences, the safety risk assessment and any safety risk control actions taken. These are often captured in a register so they can be tracked and monitored. This SRM documentation becomes a historical source of organizational safety knowledge which can be used as reference when making safety decisions and for safety information exchange. This safety knowledge provides material for safety trend analyses and safety training and communication. It is also useful for internal audits to assess whether safety risk controls and actions have been implemented and are effective.

3.6.2.12 Normally, SRM of any safety hazard is conducted by Safety Action Group (SAG) or by other body formed for the particular purpose and endorsed by higher body (ie, Safety Review Board) for allocation of resources and effective implementation of corrective actions applied.

3.6.3 Risk management Process

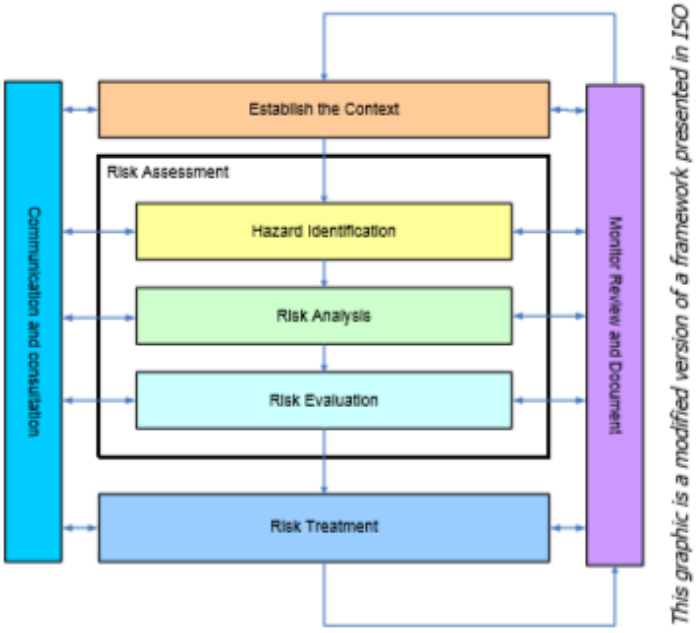


Figure: 3.2 Sample Safety Risk Management Process (Source: CANSO – Safety Management System Implementation Guide)

3.6.3.1 It is critical that the steps of 'communicate and consult' and 'monitor and review' are ongoing throughout the risk management process. These two activities provide validation that the risk management process is effective, is meeting its objectives, and is supported through ongoing interaction with key personnel. It is recommended that readers research each of the above steps to develop an understanding of the risk management process.

3.6.4. Safety risk probability

3.6.4.1Safety risk probability is the likelihood that a safety consequence or outcome will occur. It is important to envisage a variety of scenarios so that all potential consequences can be considered. The following questions can assist in the determination of probability:

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 issues?
c) What is the number of personnel following, or subject to, the procedures in question?
d) What is the exposure of the hazard under consideration? For example, during what percentage of the operation is the equipment or activity in use?

3.6.4.2Taking into consideration any factors that might underlie these questions will help when assessing the probability of the hazard consequences in any foreseeable scenario.

3.6.4.3 An occurrence is considered foreseeable if any reasonable person could have expected the kind of occurrence to have happened under the same circumstances. Identification of every conceivable or theoretically possible hazard is not possible. Therefore, good judgment is required to determine an appropriate level of detail in hazard identification. Service providers should exercise due diligence when identifying significant and reasonably foreseeable hazards related to their product or service.

3.6.4.4Table 3.1 presents a typical safety risk probability classification table. It 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. This example uses qualitative terms; quantitative terms could be defined to provide a more accurate assessment. This will depend on the availability of appropriate safety data and the sophistication of the organization and operation.

Table 3.1: Safety Risk Probability matrix

Likelihood	*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

Note.— This is an example only. The level of detail and complexity of tables and matrices should be adapted to the particular needs and complexities of each organization. It should also be noted that organizations might include both qualitative and quantitative criteria.

For those events that have a quantitative record upon which to draw, a table such as that in Figure 3.2 can be useful.

Quantitative Definition	Probability of Event per Operational Hour per Sector	Severity Class				
		5	4	3	2	1
Frequent	$P_s>10^{-3}$	E	C	A	A	A
Occasional	$P_3=10^{-4}$ to 10^{-5}	E	D	C	B	A
Remote	$P_3=10^{-5}$ to 10^{-6}	E	D	D	C	B
Improbable	$P_3=10^{-6}$ to 10^{-7}	E	D	D	D	C
Extremely Remote	$P_s<10^{-7}$	E	D	D	D	D

Figure 3.2: Assessing Probability (Source: ICAO Doc. 9859)

3.6.5 Safety risk severity

3.6.5.1 Once the probability assessment has been completed, the next step is to assess the severity, taking into account the potential consequences related to the hazard. Safety risk severity is defined as the extent of harm that might reasonably be expected to occur as a consequence or outcome of the identified hazard. The severity classification should consider:

a) fatalities or serious injury which would occur as a result of:
   i. being in the aircraft;
   ii. having direct contact with any part of the aircraft, including parts which have become detached from the aircraft; or
   iii. having direct exposure to jet blast; and
b) damage:

2. damage or structural failure sustained by the aircraft which:
   i. adversely affects the structural strength, performance or flight characteristics of the aircraft;
   ii. would normally require major repair or replacement of the affected component;

2. damage sustained by ATS or aerodrome equipment which:

i. adversely affects the management of aircraft separation; or

ii. adversely affects landing capability.

3.6.5.2 The severity assessment should consider all possible consequences related to a hazard, taking into account the worst foreseeable situation. Table 3.2 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.

Table 3.2: Example Safety Risk Severtiy

Severity	*Meaning*	*Value*
Catastrophic	• Aircraft / equipment destroyed • Multiple deaths	A
Hazardous	• A large reduction in safety margins, physical distress or a workload such that operational personnel 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 operational personnel to cope with adverse operating conditions as a result of an 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	• Few consequences	E

3.6.6 Safety risk tolerability

3.6.6.1The safety risk index rating is created by combining the results of the probability and severity scores. In the example above, it is an alphanumeric designator. The respective

severity/probability combinations are presented in the safety risk assessment matrix in Table 3.3The safety risk assessment matrix is used to determine safety risk tolerability. Consider, for example, a situation where the safety risk probability has been assessed as Occasional (4), and the safety risk severity has been assessed as Hazardous (B), resulting in a safety risk index of (4B).

Table 3.3: Example of Safety Risk Matrix

Safety Risk		*Severity*				
Probability		*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

Note.— In determining the safety risk tolerability, the quality and reliability of the data used for the hazard identification and safety risk probability should be taken into consideration.

3.6.6.2 The index obtained from the safety risk assessment matrix should then be exported to a safety risk tolerability table that describes — in a narrative form — the tolerability criteria for the particular organization. Table 3.4 presents an example of a safety risk tolerability table. Using the example above, the criterion for safety risk assessed as '4B' falls in the “intolerable” category. In this case, the safety risk index of the consequence is unacceptable. The organization should therefore take risk control action to reduce:

a) the organization’s exposure to the particular risk, i.e., reduce the probability component of the risk to an acceptable level;
b) the severity of consequences related to the hazard, i.e., reduce the severity component of the risk to an acceptable level; or
c) both the severity and probability so that the risk is managed to an acceptable level.

3.6.6.3 Safety risks are conceptually assessed as acceptable, tolerable or intolerable. Safety 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 mitigation action is required or activities are stopped. Table 3.4 shows the intolerable, tolerable and acceptable regions with ranges of safety risk indices.

Table 3.4: Example of safety risk tolerability

Safety Risk Index Range	Safety Risk Description	Recommended Action
5A, 5B, 5C, 4A, 4B, 3A	INTOLERABLE	Take immediate action to mitigate the risk or stop the activity. Perform priority safety mitigation to ensure additional or enhanced preventative controls are in place to bring down the safety risk index to tolerable.
5D, 5E, 4C, 4D, 4E, 3B, 3C, 3D, 2A, 2B, 2C, 1A	TOLERABLE	Can be tolerated based on the safety risk mitigation. If may require management decision to accept the risk.
3E, 2D, 2E, 1B 1C, 1D, 1E	ACCEPTABLE	Acceptable as is. No further safety risk mitigation required.

3.6.6.4 The ALARP principle, shown in Figure 3.3, has been adopted by many service providers, as it provides additional guidance on when sufficient measures have been taken to reduce risk. If the risk reduction required to make the safety risk acceptable is not possible, then deployment of the change or modification to the system may have to be reconsidered.

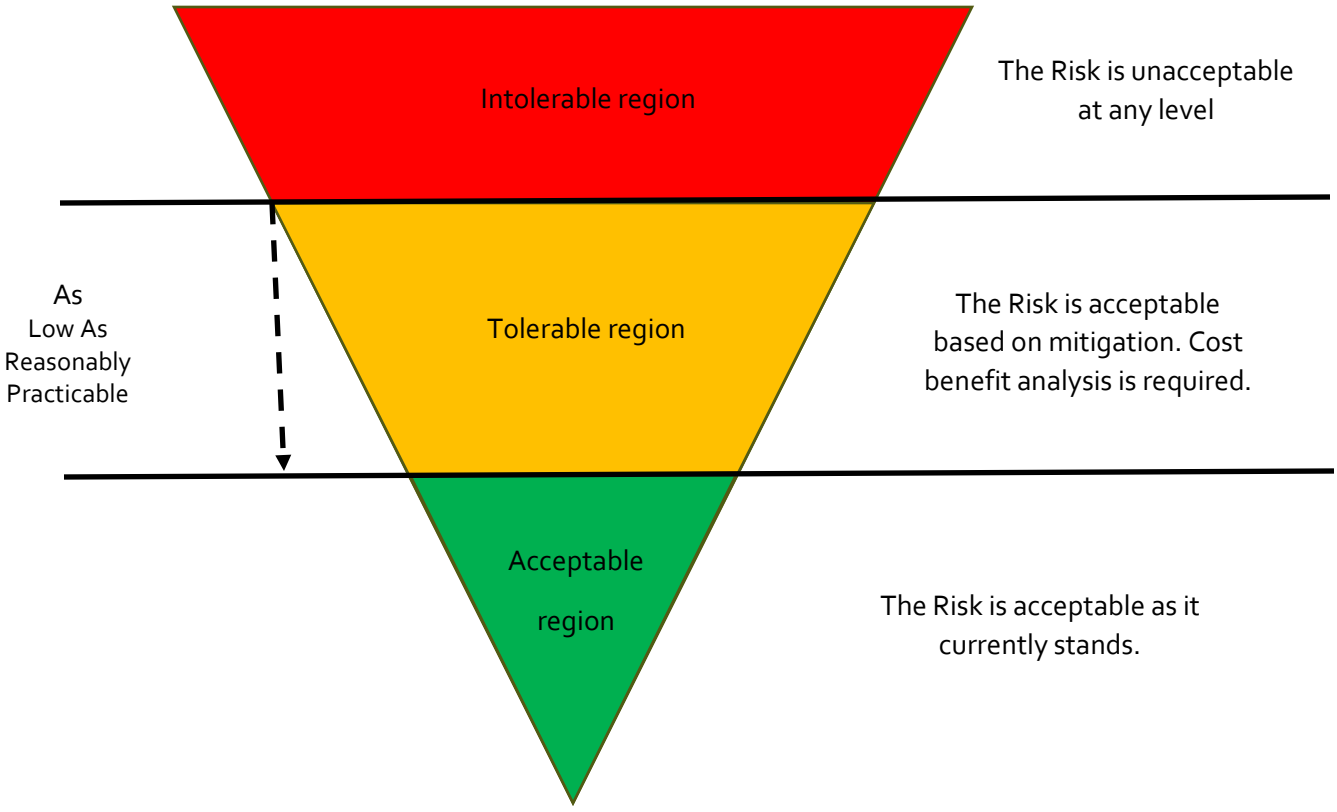


Figure 3.3 ALARP Chart (Source: ICAO Doc. 9859)

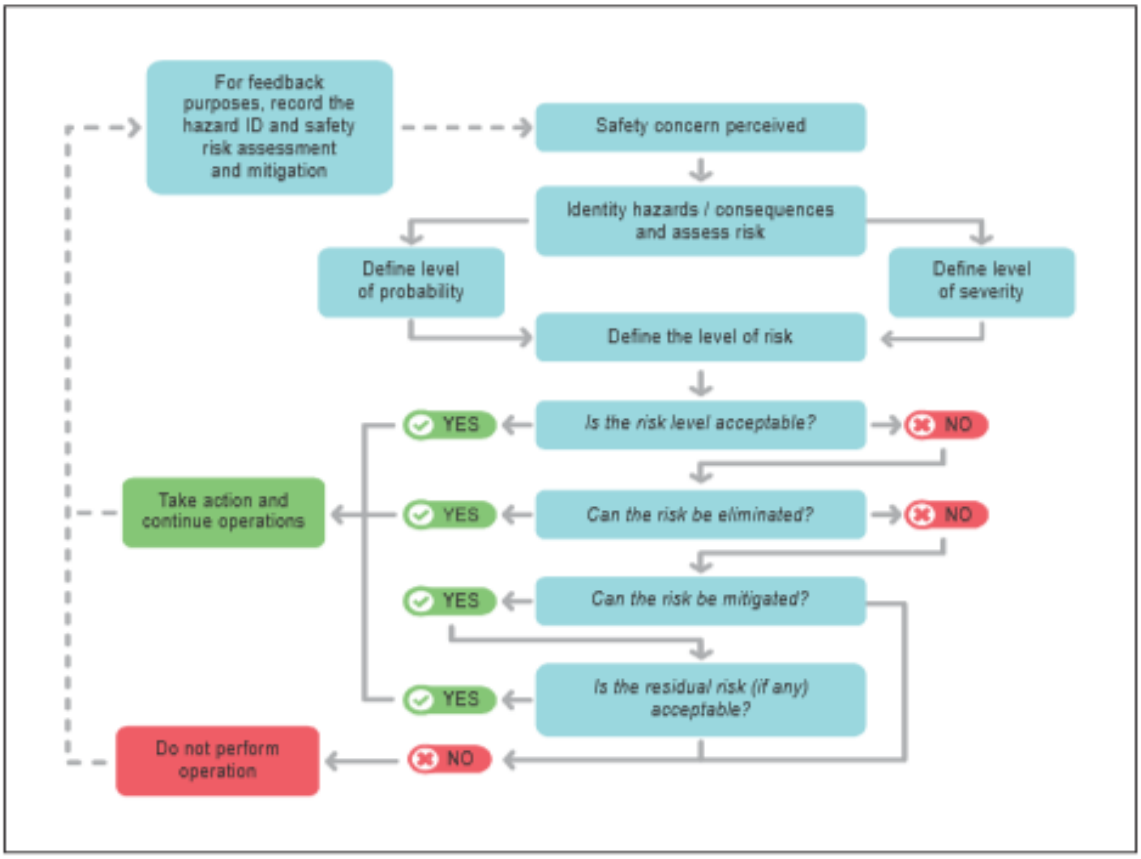


Figure 3.4: Safety risk management decision aid (Source: ICAO Doc. 9859)

3.6.7 Safety risk management documentation

3.5.7.1 Safety risk management activities should be documented, including any assumptions underlying the probability and severity assessment, decisions made, and any safety risk mitigation actions taken. This may be done using a spread sheet or table. Some organizations may use a database or other software where large amounts of safety data and safety information can be stored and analysed.

3.6.7.2 Maintaining a hazard register minimizes the likelihood that the organization will lose sight of its known hazards. When hazards are identified, they can be compared with the known hazards in the register to see if the hazard has already been registered, the priority level of hazards and what action(s) are likely to take to mitigate it. Hazard registers are usually in a table format and typically include: date, category of hazard, the generic and specific hazard, ultimate event and consequences, source of hazard, assessment of existing associated risks, priority of hazards etc. Table 3.5 is an example of hazard registration sheet.

Table 3.5: Hazard Registration Sheet

Item No.	Reported Date	Area/ Operation/ Equipment	Hazard (H)				Unsafe Event (UE) (Reported/Projected)	Consequence (C) (Reported/ Projected)	Recommended Action		
			Generic Hazard	Specific Hazard	Hazard Code	Source of information			Corrective Action (yes/No)	SRM Action (Yes/ No)	SRM Priority Level (H/M/L)

Explanatory Note with examples:

1. Source of Information: Hazard information as may be extracted from - Voluntary Hazard Rpt, Occurrence Notification/ Investigation Rpt, Internal Audit Rpt, External Audit Rpt, Hazard Survey Rpt, Operational Data Review Rpt, Operational Trial Report
2. Specific Hazard/ Threat: If more than one Hazard/ Threat identified, register such additional Hazard/ Threat under new row/ item
3. Hazard ID code:
    a. Area: OPS, ANS, AGA, ….
    b. Organization: TIA ATS
    c. Hazard No: 001
    d. Priority Level: High (H)- Accident, Medium (M)- Severe Incident, Low (L)- Incident
    e. Year: 2018
    f. Example: ANS-TIA ATS-001-H-2018
4. Reported/ Projected (UE/ C): Annotate UE/ C description as a "Reported" occurrence or a "Projected" occurrence. If multiple H>UE>C combinations involved, register each combination under a new Row (Each single H>UE>C combination will constitute one potential SRM Task)
5. Corrective Action: If the Hazard can be effectively eliminated through conventional corrective action (eg disposal, repair, replacement, modification), annotate YES with the action taken/ recommended. Otherwise annotate NO.
6. SRM Action: Annotate YES to indicate systematic SRM action is recommended (or has been taken already). Annotate NO if systematic SRM action is not recommended (or not necessary).
7. Priority Level: SRM or Corrective Action Priority Level based on (Annex 13) occurrence category of the projected (or reported) Unsafe Event or Consequence. Accident – High (H); Serious Incident - Medium; Incident - Low.

3.6.7.3 SRM is a one of the core activities of SMS of an organization. SRM helps to manage the risk of any hazard identified to acceptable level (or tolerable level with top level management decisions) with details of safety risk measures put in place and timeline and person responsible for implementation. Table 3.6 is an example of structured SRM.

Table 3.6: Safety Risk Management (SRM) worksheet

(Fill the SRM worksheet for each hazard in the order (a) to (r))

Date:

Generic Hazard (a): .....
Specific Hazard (b): .....

Hazard ID. (c)	Type of operation or activity (d)	Unsafe event (UE) (e)	Consequence (f)	Existing Measures		Future Measures		Action by whom and when
				Mitigating Barriers (h)	BSV* (i)	Mitigating Barriers (n)	BSV* (o)	

Existing Risk Probability (j)		**Resultant Risk Probability (p)**	
Existing Risk Severity (g)		**Resultant Risk Severity (m)**	
Existing Risk Index (k)		**Resultant Risk Index (q)**	
Existing Risk Tolerability (l)		**Resultant Risk Tolerability (r)**	

SRM Project Team/SAG Members (Name and Signature)

1.
2.
3.
4.
5.
6.

*Barrier Strength Value

Barrier Strength Value (BSV) is calculated by considering the value of quality of each mitigating barrier on the basis of elements of Durability, Enforceability, Effectiveness, Practicability, Acceptability and Cost and benefit (DEEPAC). See Appendix 5 for the detailed process of SRM.

3.6.7.4 The maintenance Risk Register (RR) helps to give a consolidated picture of exposed risk and its management of an organization over a particular time period. Risk register illustrates the comprehensive information of Ultimate consequence of hazard, risk management and current status. An example of RR has been presented in table 3.7.

Table 3.7: Risk Register

Hazard Code	SRM Date	Ultimate Consequence	Existing Risk				Resultant Risk				Status		
			Severity	Probability	Risk Index	Risk Tolerability	Severity	Probability	Risk Index	Risk Tolerability	open	Close/date	Remarks

3.6.8 Safety Risk Management implementation

3.6.8.1 The way in which a service provider implements its risk management process is critical to its on-going success. Implementation should consider:

a. The size and complexity of the organisation;
b. The scale of the changes to both process and practice.

If the initial gap analysis identified the need for only small amendments to risk management practices, the implementation challenge is much less than when an entire risk management process is under consideration. Figure 3.5 shows an example of imlementating risk management in an ANSP.

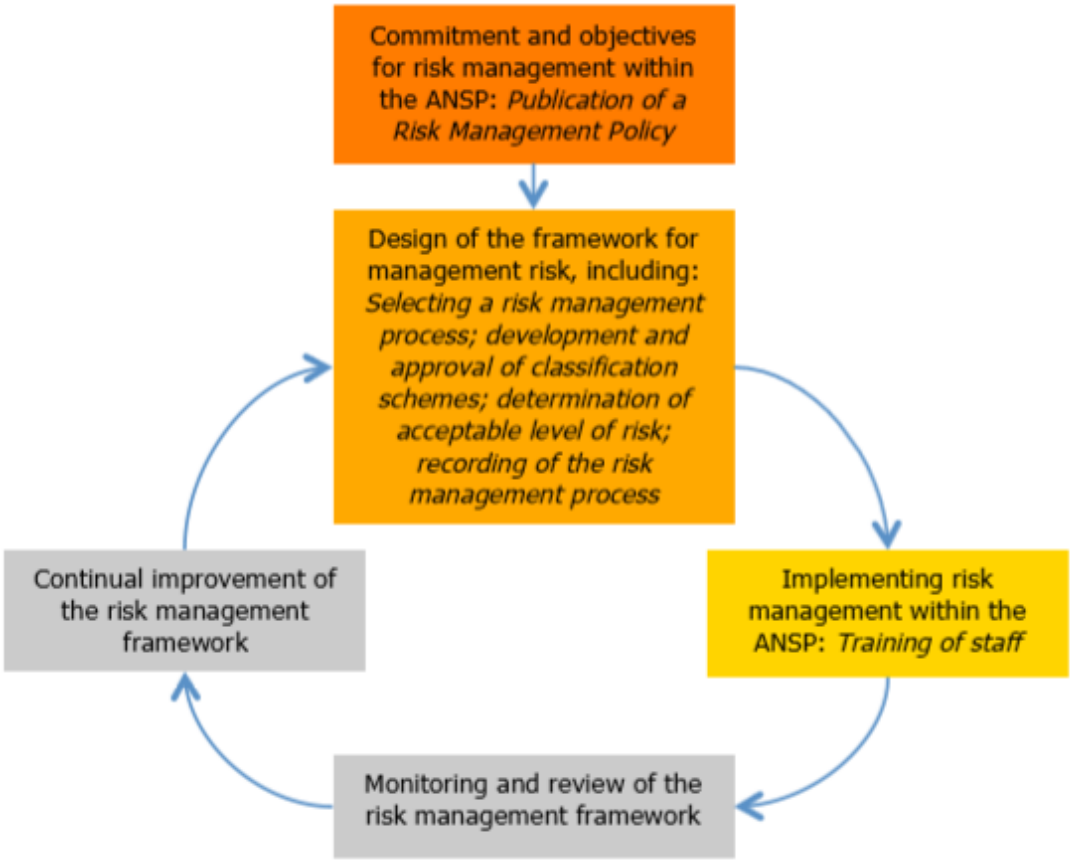


Figure 3.5 Implementing Risk Management in an ANSP (Source: CANSO- SMS implementation Guide)

3.6.8.2 Elements that need to be addressed during implementation process is depcited by the Following Figure 3.6

Figure 3.6 Implementation Activities (Source: CANSO- SMS implementation Guide)

Compliance and Performance markers

1. There is a structured process for the management of risk that includes the assessment of risk associated with identified hazards, expressed in terms of likelihood and severity
2. There are criteria for evaluating the level of risk the organisation is willing to accept and risk assessments and ratings are appropriately justified.
3. The organisation has risk control strategies that deliver effective and robust mitigations and controls and where applicable corrective action.
4. Corrective actions resulting from the risk assessment, including timelines and allocation of responsibilities are documented.
5. Risk management is embedded in day to day activities and routinely applied in decision making processes.
6. Senior management have visibility of medium and high risk hazards and their mitigation and controls.
7. The CAA significant 7 are being considered and addressed as appropriate.

Excellence and best practice markers

8. There is evidence that risks are being managed to as low as reasonably practical
9. The organisation uses its risks management results to develop best practice guidelines that it shares with the industry.
10. The risk management processes are reviewed and improved on a periodic basis

Chapter 4

SAFETY ASSURANCE

4.1 Civil Aviation Requirement for Safety Management (CAR -19) requires that service providers develop and maintain the means to verify the safety performance of the organization and to validate the effectiveness of safety risk controls. The safety assurance component of the service provider's SMS provides these capabilities.

4.2 Safety assurance consists of processes and activities undertaken to determine whether the SMS is operating according to expectations and requirements. This involves continuously monitoring its processes as well as its operating environment to detect changes or deviations that may introduce emerging safety risks or the degradation of existing safety risk controls. Such changes or deviations may then be addressed through the SRM process.

4.3 Safety assurance activities should include the development and implementation of actions taken in response to any identified issues having a potential safety impact. These actions continuously improve the performance of the service provider's SMS.

4.4 Safety assurance processes and activities include ongoing examination, analysis and assessment of the controls throughout the daily operation of the system. The safety assurance and quality assurance processes are very similar as both require analysis, documentation, auditing, and a formal review of the system. A comparison with the quality management system "Plan-Do-Check-Act" approach is shown below:

QMS	SMS
Plan	Safety Policy Principal safety objective(s) Safety performance targets
Do	Risk management
Check	Monitoring and Measuring Safety Performance Internal Audit Programme Management of Change
Act	Continuous Improvement of the SMS Communication of Safety –critical Information.

4.5 Safety performance monitoring and measurement

4.5.1 Verification of the safety performance and validation of the effectiveness of safety risk controls requires the use of a combination of internal audits and the establishment and monitoring of SPIs. Assessing the effectiveness of the safety risk controls is important as their application does not always achieve the results intended. This will help identify whether the

right safety risk control was selected and may result in the application of a different safety risk control strategy.

4.5.2 Internal audit

4.5.2.1 Internal audits are performed to assess the effectiveness of the SMS and identify areas for potential improvement. Most aviation safety regulations are generic safety risk controls that have been established by the State. Ensuring compliance with the regulations through the internal audit is a principal aspect of safety assurance.

4.5.2.2 It is also necessary to ensure that any safety risk controls are effectively implemented and monitored. The causes and contributing factors should be investigated and analysed where non-conformances and other issues are identified. The main focus of the internal audit is on the policies, processes and procedures that provide the safety risk controls.

4.5.2.3 Internal audits are most effective when conducted by persons or departments independent of the functions being audited. Such audits should provide the accountable executive and senior management with information on the status of:

a. compliance with regulations;
b. compliance with policies, processes and procedures;
c. the effectiveness of safety risk controls;
d. the effectiveness of corrective actions; and
e. the effectiveness of the SMS as a whole.

4.5.2.4 Some organizations cannot ensure appropriate independence of an internal audit, in such cases, the service provider should consider engaging external auditors (e.g. independent auditors or auditors from another organization).

4.5.2.5 Planning of internal audits should take into account the safety criticality of the processes, the results of previous audits and assessments (from all sources), and the implemented safety risk controls. Internal audits should identify non-compliance with regulations and policies, processes and procedures. They should also identify system deficiencies, lack of effectiveness of safety risk controls and opportunities for improvement.

4.5.2.5Assessing for compliance and effectiveness are both essential to achieving safety performance. The internal audit process can be used to determine both compliance and effectiveness. The following questions can be asked to assess compliance and effectiveness of each process or procedure:

A) Determining compliance

1) Does the required process or procedure exist?
2) Is the process or procedure documented (inputs, activities, interfaces and outputs defined)?
3) Does the process or procedure meet requirements (criteria)?

4) Is the process or procedure being used?
5) Are all affected personnel following the process or procedure consistently?
6) Are the defined outputs being produced?
7) Has a process or procedure change been documented and implemented?

B) Assessing effectiveness

a. Do users understand the process or procedure?
b. Is the purpose of the process or procedure being achieved consistently?
c. Are the results of the process or procedure what the "customer" asked for?
d. Is the process or procedure regularly reviewed?
e. Is a safety risk assessment conducted when there are changes to the process or procedure?
f. Have process or procedure improvements resulted in the expected benefits?

4.5.2.6 In addition, internal audits should monitor progress in closing previously identified non-compliances. These should have been addressed through root cause analysis and the development and implementation of corrective and preventive action plans. The results from analysis of cause(s) and contributing factors for any non-compliance should feed into the service provider's SRM processes.

4.5.2.7 The results of the internal audit process become one of the various inputs to the SRM and safety assurance functions. Internal audits inform the service provider's management of the level of compliance within the organization, the degree to which safety risk controls are effective and where corrective or preventive action is required.

4.5.2.8 CAA may provide additional feedback on the status of compliance with regulations, and the effectiveness of the SMS and industry associations or other third parties selected by the service provider to audit their organization and processes. Results of such second- and third-party audits are inputs to the safety assurance function, providing the service provider with indications of the effectiveness of their internal audit processes and opportunities to improve their SMS.

4.5.3 Safety performance monitoring

4.5.3.1 Safety performance monitoring is conducted through the collection of safety data and safety information from a variety of sources typically available to an organization. Data availability to support informed decision-making is one of the most important aspects of the SMS. Using this data for safety performance monitoring and measurement are essential activities that generate the information necessary for safety risk decision-making.

4.5.3.2 Safety performance monitoring and measurement should be conducted observing some basic principles. The safety performance achieved is an indication of organizational behaviour and is also a measure of the effectiveness of the SMS. This requires the organization to define:

4.5.3.3 Safety objectives

4.5.3.3.1Safety objectives are brief, high-level statements of safety achievements or desired outcomes to be accomplished. Safety objectives provide direction to the organization's activities and should therefore be consistent with the safety policy that sets out the organization's high-level safety commitment. They are also useful to communicate safety priorities to personnel and the aviation community as a whole. Establishing safety objectives provides strategic direction for the safety performance management process and provides a sound basis for safety related decision-making.

Safety objectives may be:

a) process-oriented: stated in terms of safe behaviours expected from operational personnel or the performance of actions implemented by the organization to manage safety risk; or
b) outcome-oriented: encompass actions and trends regarding containment of accidents or operational losses.

4.5.3.3.2The suite of safety objectives should include a mix of both process-oriented and outcome-oriented objectives to provide enough coverage and direction for the SPIs and SPTs. Safety objectives on their own do not have to be specific, measurable, achievable, relevant and timely (SMART), provided the safety objectives and accompanying SPIs and SPTs form a package that allows an organization to demonstrate whether it is maintaining or improving its safety performance

Examples of safety objective	
Process-oriented	*Increase safety reporting levels*
Outcome-oriented	*Reduce rate of adverse apron safety events (high-level)* *Or* *Reduce the annual number of adverse apron safety events from the previous year.*

4.5.3.3.3 Update of Safety objectives

4.5.3.4.1Safety performance management is not intended to be "set and forget". Safety performance management is dynamic and central to the functioning of every State and every service provider, and should be reviewed and updated:

a) routinely, in accordance with the periodic cycle established and agreed upon by the high-level safety committee;
b) based on inputs from safety analyses; and
c) in response to major changes in the operation, top risks or environment.

4.5.3.4 Safety performance indicators (SPIs)

4.5.3.4.1 SPIs are tactical parameters related to the safety objectives and therefore are the reference for data collection. A more complete and realistic picture of the service provider's safety performance will be achieved if SPIs encompass a wide spectrum of indicators. This should include:

a) low probability/high severity events (e.g. accidents and serious incidents);
b) high probability/low severity events (e.g. uneventful operational events, non-conformance reports, deviations etc.): and
c) process performance (e.g. training, system improvements and report processing).

4.5.3.4.2 Qualitative and quantitative indicators

4.5.3.4.2.1 SPIs are used to help senior management know whether or not the organization is likely to achieve its safety objective; they can be qualitative or quantitative. Quantitative indicators relate to measuring by the quantity, rather than its quality, whereas qualitative indicators are descriptive and measure by quality. Quantitative indicators are preferred over qualitative indicators because they are more easily counted and compared.

4.5.3.4.2.2 Quantitative indicators can be expressed as a number (x incursions) or as a rate (x incursions per n movements). In some cases, a numerical expression will be sufficient. However, just using numbers may create a distorted impression of the actual safety situation if the level of activity fluctuates.

For example,

1. *If air traffic control records three altitude busts in July and six in August, there may be great concern about the significant deterioration in safety performance. But August may have seen double the movements of July meaning the altitude busts per movement, or the rate, has decreased, not increased. This may or may not change the level of scrutiny, but it does provide another valuable piece of information that may be vital to data-driven safety decision-making.*
2. *An SPI could measure the number of runway incursions. But if there were fewer departures in the monitored period, the result could be misleading. A more accurate and valuable performance measure would be the number of runway incursions relative to the number of movements, e.g. x incursions per 1 000 movements.*

4.5.3.4.3 Lagging and leading indicators

Lagging Indicators:

4.5.3.4.3.1 The two most common categories used by service providers to classify their SPIs are lagging and leading. Lagging SPIs measure events that have already occurred. They are also referred to as "outcome-based SPIs" and are normally (but not always) the negative outcomes the organization is aiming to avoid. Leading SPIs measure processes and inputs being

implemented to improve or maintain safety. These are also known as "activity or process SPIs" as they monitor and measure conditions that have the potential to lead to or contribute to a specific outcome.

4.5.3.4.3.2 Lagging SPIs help the organization understand what has happened in the past and are useful for long-term trending. They can be used as a high-level indicator or as an indication of specific occurrence types or locations, such as "types of accidents per aircraft type" or "specific incident types by region". Because lagging SPIs measure safety outcomes, they can measure the effectiveness of safety mitigations. They are effective at validating the overall safety performance of the system.

***For example**, monitoring the "number of ramp collisions per number of movements between vehicles following a redesign of ramp markings" provides a measure of the effectiveness of the new markings (assuming nothing else has changed). The reduction in collisions validates an improvement in the overall safety performance of the ramp system; which may be attributable to the change in question.*

4.5.3.4.3.3 Trends in lagging SPIs can be analysed to determine conditions existing in the system that should be addressed. Using the previous example, an increasing trend in ramp collisions per number of movements may have been what led to the identification of sub-standard ramp markings as an area in need of mitigation.

4.5.3.4.3.4 Lagging SPIs are divided into two types:

a) low probability/high severity: outcomes such as accidents or serious incidents. The low frequency of high severity outcomes means that aggregation of data (at industry segment level or regional level) may result in more meaningful analyses.

***An example** of this type of lagging SPI would be "aircraft and/or engine damage due to bird strike".*

b) high probability/low severity: outcomes that do not necessarily manifest themselves in a serious accident or incident, these are sometimes also referred to as precursor indicators. SPIs for high probability/low severity outcomes are primarily used to monitor specific safety issues and measure the effectiveness of existing safety risk mitigations.

***An example** of this type of precursor SPI would be "bird radar detections", which indicates the level of bird activity rather than the amount of actual bird strikes.*

Leading Indicators:

4.5.3.4.3.5 Leading indicators are measures that focus on processes and inputs that are being implemented to improve or maintain safety. These are also known as "activity or process SPIs"

as they monitor and measure conditions that have the potential to become or to contribute to a specific outcome.

Examples *of leading SPIs driving the development of organizational capabilities for proactive safety performance management include such things as "percentage of staff who have successfully completed safety training on time" or "frequency of bird scaring activities".*

4.5.3.4.3.6 Leading SPIs may also inform the organization about how their operation copes with change, including changes in its operating environment. The focus will be either on anticipating weaknesses and vulnerabilities as a result of the change, or monitoring the performance after a change.

An example *of an SPI to monitor a change in operations would be "percentage of sites that have implemented procedure X".*

4.5.3.4.3.7 For a more accurate and useful indication of safety performance, lagging SPIs, measuring both "low probability/high severity" events and "high probability/low severity" events should be combined with leading SPIs.

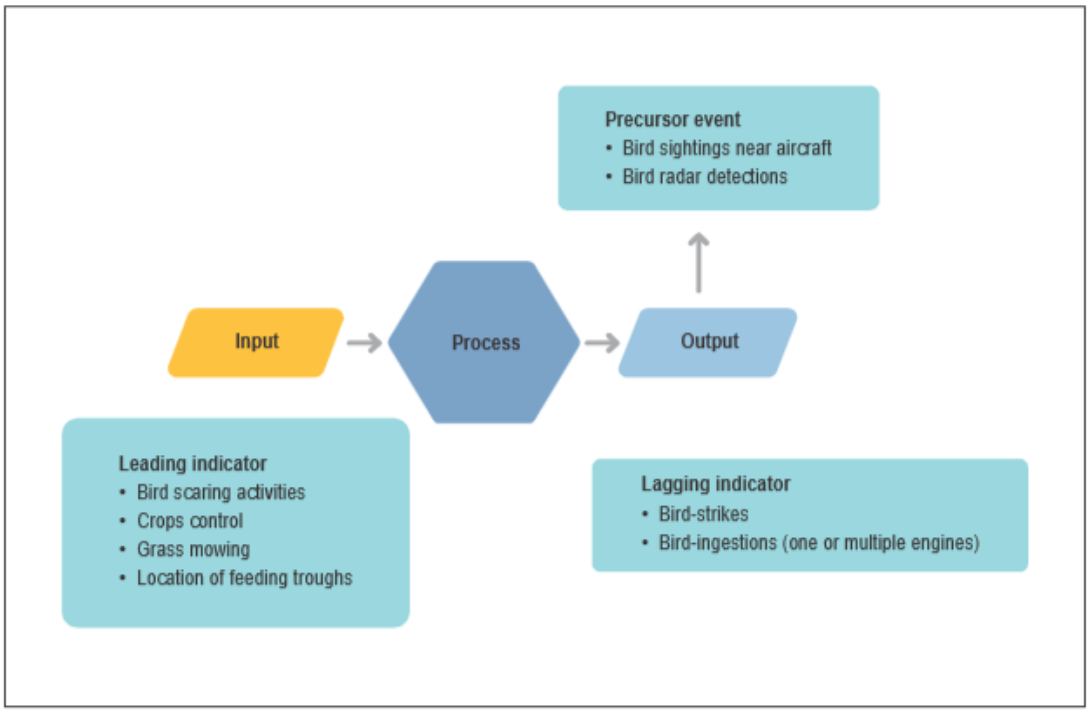


Figure 4.2: Leading vs Lagging indicator concept phases (Source: ICAO Doc. 9859)

Ideally, SPIs should be:

a) related to the safety objective they aim to indicate;
b) selected or developed based on available data and reliable measurement;

c) appropriately specific and quantifiable; and
d) realistic, by taking into account the possibilities and constraints of the organization.

4.5.3.4.3.8 A combination of SPIs is usually required to provide a clear indication of safety performance. There should be a clear link between lagging and leading SPIs. Ideally lagging SPIs should be defined before determining leading SPIs. Defining a precursor SPI linked to a more serious event or condition (the lagging SPI) ensures there is a clear correlation between the two. All of the SPIs, lagging and leading, are equally valid and valuable. An example of these linkages is illustrated in Figure 4-2.

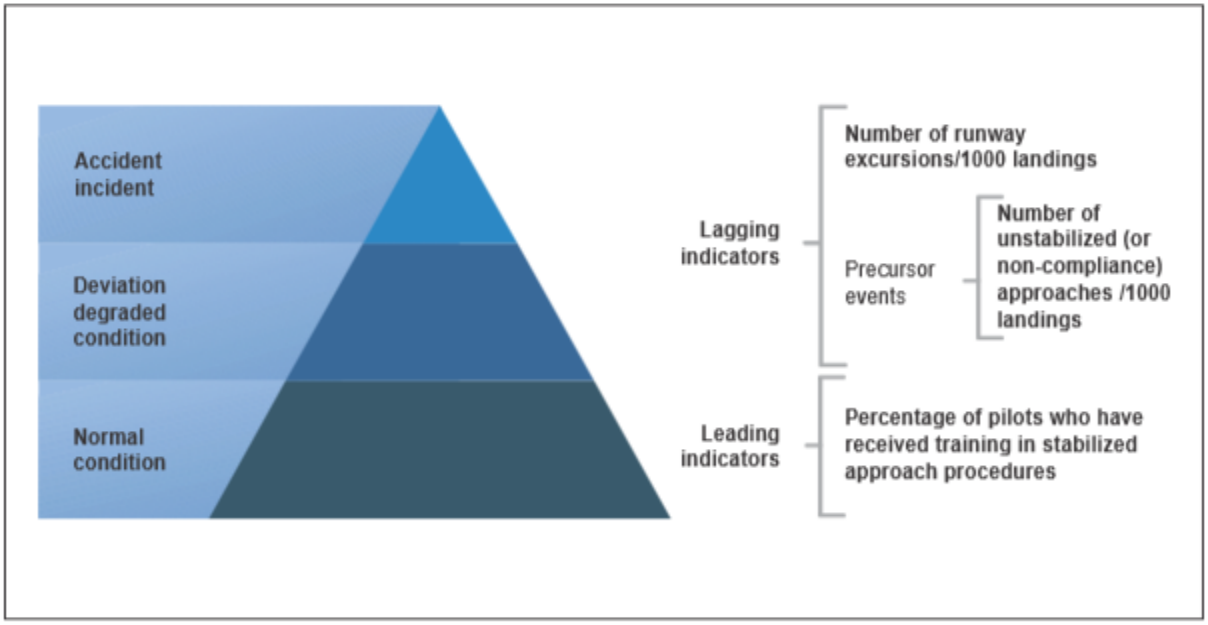


Figure 4.2: Examples of links between lagging and leading indicators (Source: ICAO Doc. 9859)

Identifying high risk areas will facilitate the determination of SPIs and safety objectives. After deciding significant risk from the areas of risk as SPIs, the safety objectives of an organization can be set based on them. The objectives can also be set in accordance to the identified high risk areas. The SPIs can then be selected from among the high risk areas. In both cases, the SPIs and the safety objectives must be aligned with each other.

4.5.3.4.3.9 It is important to select SPIs that relate to the organization's safety objectives and vice versa. Having SPIs that are well defined and aligned will make it easier to identify SPTs, which will show the progress being made towards the attainment of safety objectives. This allows the organization to assign resources for greatest safety effect by knowing precisely what is required, and when and how to act to achieve the planned safety performance.

For example *XYZ Airlines Pvt. Ltd. sets* ***Safety objective*** *of "reduce the number of runway excursions by 50 per cent in three years" and an associated, well-aligned* ***SPI*** *of "number of runway excursions per thousand departures across all aerodromes". If the number of excursions drops initially when monitoring commences, but starts to climb again after twelve months, the organization could choose to reallocate resources away from an area where, according to the SPIs, the safety objective is being easily achieved and towards the reduction of runway excursions to alleviate the undesirable trend.*

Defining SPIs

4.5.3.4.3.10 SPIs are the parameters that provide the organization with a view of its safety performance: where it has been; where it is now; and where it is headed, in relation to safety. This picture acts as a solid and defensible foundation upon which the organization's data-driven safety decisions are made. These decisions, in turn, positively affect the organization's safety performance. The identification of SPIs should therefore be realistic, relevant, and linked to safety objectives, regardless of their simplicity or complexity.

4.5.3.4.3.11 It is likely the initial selection of SPIs will be limited to the monitoring and measurement of parameters representing events or processes that are easy and/or convenient to capture (safety data that may be readily available). Ideally, SPIs should focus on parameters that are important indicators of safety performance, rather than on those that are easy to attain.

4.5.3.4.3.12 The contents of each SPI should include:

a) a description of what the SPI measures;
b) the purpose of the SPI (what it is intended to manage and who it is intended to inform);
c) the units of measurement and any requirements for its calculation;
d) who is responsible for collecting, validating, monitoring, reporting and acting on the SPI (these may be staff from different parts of the organization);
e) where or how the data should be collected; and
f) the frequency of reporting, collecting, monitoring and analysis of the SPI data.

4.5.3.4.3.13 When establishing SPIs service providers should consider:

a) Measuring the right things: Determine the best SPIs that will show the organization is on track to addressing its high risk areas in alignment with safety objectives. Also consider what are the biggest safety issues and safety risks faced by the organization, and identify SPIs which will show effective control of these.
b) Availability of data: Is there data available which aligns with what the organization wants to measure? If there isn't, there may be a need to establish additional data collection sources. For small organizations with limited amounts of data, the pooling of data sets may

also help to identify trends. This may be supported by industry associations who can collate safety data from multiple organizations.

c) Reliability of the data: Data may be unreliable either because of its subjectivity or because it is incomplete.
d) Common industry SPIs: It may be useful to agree on common SPIs with similar organizations so that comparisons can be made between organizations. The regulator or industry associations may enable these.
e) 4.5.3.4.3.14Safety performance management is an ongoing activity. Safety risks and/or availability of data change over time. Initial SPIs may be developed using limited resources of safety information. Later, more reporting channels may be established, more safety data may be available and the organization's safety analysis capabilities will likely mature. It may be appropriate for organizations to develop simple (broader) SPIs initially. As they gather more data and safety management capability, they can consider refining the scope of SPIs and SPTs to better align with the desired safety objectives. Small non-complex organizations may elect to refine their SPIs and SPTs and/or select generic (but specific) indicators which apply to most aviation systems. Some examples of generic indicators would be:
    a) events including structural damage to equipment;
    b) events indicating circumstances in which an accident nearly occurred;
    c) events in which operational personnel or members of the aviation community were fatally or seriously injured;
    d) events in which operational personnel became incapacitated or unable to perform their duties safely;
    e) rate of voluntary occurrence reports; and
    f) rate of mandatory occurrence reports.

SPIs and safety reporting

4.5.3.4.3.14 Changes in operational practices may lead to underreporting until their impact is fully accepted by potential reporters. This is known as "reporting bias". Changes in the provisions related to the protection of safety information and related sources could also lead to either under-reporting or over-reporting. In both cases, reporting bias may distort the intent and accuracy of the data used for the SPI. Employed judiciously, safety reporting may still provide valuable data for the management of safety performance.

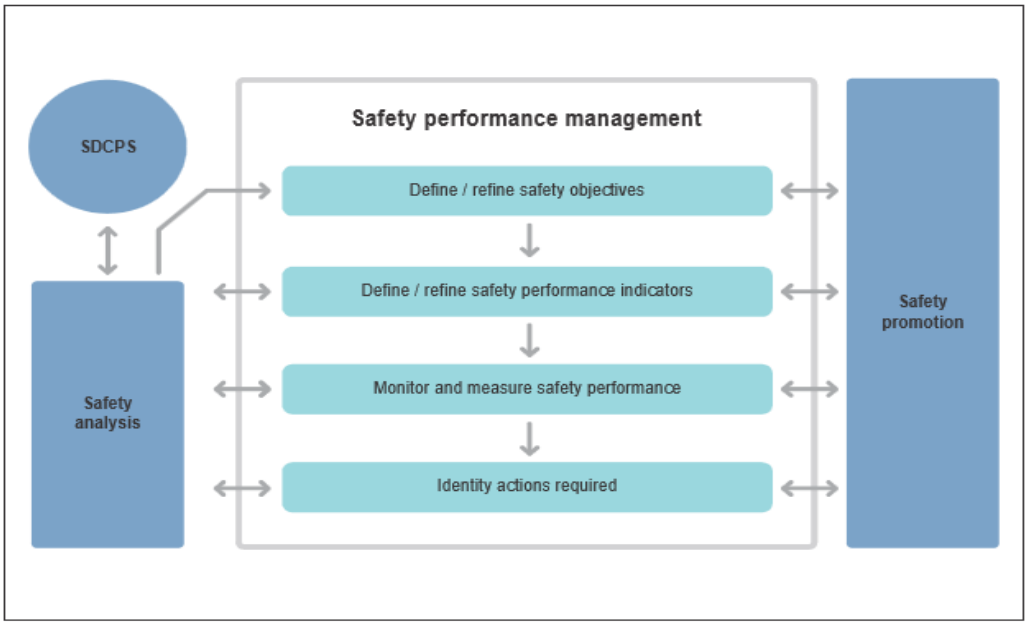


Figure 4.3: Safety performance management process (Source: ICAO Doc. 9859)

4.5.3.4.3.15 Once SPIs have been established, the service provider should consider whether it is appropriate to identify SPTs and alert levels. SPTs are useful in driving safety improvements but, implemented poorly, they have been known to lead to undesirable behaviours wherein individuals and departments become too focused on achieving the target and perhaps losing sight of what the target was intended to achieve rather than an improvement in organizational safety performance. In such cases, it may be more appropriate to monitor the SPI for trends.

4.5.3.4.3.16 The following activities can provide sources to monitor and measure safety performance:

a) Safety studies are analyses to gain a deeper understanding of safety issues or better understand a trend in safety performance.
b) Safety data analysis uses the safety reporting data to uncover common issues or trends that might warrant further investigation.
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. This may require validation via data collection to determine if corrective action is required. Nonetheless, surveys may provide an inexpensive and valuable source of safety information.
d) Safety audits focus on assessing the integrity of the service provider's SMS and supporting systems. Safety audits can also be used to evaluate the effectiveness of installed safety risk controls or to monitor compliance with safety regulations. Ensuring independence and objectivity is a challenge for safety audits. Independence and objectivity can be achieved by engaging external entities or internal audits with protections in place - policies, procedures, roles, communication protocols.

e) Findings and recommendations from safety investigations can provide useful safety information that can be analysed against other collected safety data.
f) Operational data collection systems such as FDA, radar information can provide useful data of events and operational performance.

4.5.3.4.3.17 The organization should monitor the performance of established SPIs and SPTs to identify abnormal changes in safety performance. SPTs should be realistic, context specific and achievable when considering the resources available to the organization and the associated aviation sector.

4.5.3.4.3.18 Primarily, safety performance monitoring and measurement provides a means to verify the effectiveness of safety risk controls. In addition, they provide a measure of the integrity and effectiveness of SMS processes and activities.

4.5.3.5 Setting safety performance targets (SPTs)

4.5.3.5.1 Safety performance targets (SPTs) define short-term and medium-term safety performance management desired achievements. They act as "milestones" that provide confidence that the organization is on track to achieving its safety objectives and provide a measurable way of verifying the effectiveness of safety performance management activities. SPT setting should take into consideration factors such as the prevailing level of safety risk, safety risk tolerability, as well as expectations regarding the safety of the particular aviation sector. The setting of SPTs should be determined after considering what is realistically achievable for the associated aviation sector and recent performance of the particular SPI, where historical trend data is available.

4.5.3.5.2 If the combination of safety objectives, SPIs and SPTs working together are SMART, it allows the organization to more effectively demonstrate its safety performance. There are multiple approaches to achieving the goals of safety performance management, especially, setting SPTs. One approach involves establishing general high-level safety objectives with aligned SPIs and then identifying reasonable levels of improvements after a baseline safety performance has been established. These levels of improvements may be based on specific targets (e.g. percentage decrease) or the achievement of a positive trend. Another approach which can be used when the safety objectives are SMART is to have the safety targets act as milestones to achieving the safety objectives. Either of these approaches are valid and there may be others that an organization finds effective at demonstrating their safety performance. Different approaches can be used in combination as appropriate to the specific circumstances.

4.5.3.5.3 Setting targets with safety objectives

4.5.3.5.3.1 Targets are established with senior management agreeing on safety objectives. The organization then identifies appropriate SPIs that will show improvement of safety performance towards the agreed safety objective(s). The SPIs will be measured using existing data sources,

but may also require the collection of additional data. The organization then starts gathering, analysing and presenting the SPIs. Trends will start to emerge, which will provide an overview of the organization's safety performance and whether it is steering towards or away from its safety objectives. At this point the organization can identify reasonable and achievable SPTs for each SPI. Sometimes, Safety objectives may not be SMART in nature but can be effectively achieved provided there is perfect alignment between SPIs, SPTs and Objectives.

4.5.3.5.3.2 Safety objectives can be difficult to communicate and may seem challenging to achieve; by breaking them down into smaller concrete safety targets, the process of delivering them is easier to manage. In this way, targets form a crucial link between strategy and day-to-day operations. Organizations should identify the key areas that drive the safety performance and establish a way to measure them. Once an organization has an idea what their current level of performance is by establishing the baseline safety performance, they can start setting SPTs to give everyone in the State a clear sense of what they should be aiming to achieve. The organization may also use benchmarking to support setting performance targets. This involves using performance information from similar organizations that have already been measuring their performance to get a sense of how others in the community are doing.

An example of the relationship between safety objectives (SMART), SPIs and SPTs is illustrated in Figure 4-4. In this example, the organization recorded 100 runway excursions per million movements in 2018. It has been determined this is too many, and organization set Objective, SPI, and Target to measure the safety performance as follows:

Objective (SMART): *Reduction of the number of runway excursions by fifty per cent by 2022.*

SPI*: RWY excursions per million movements per year.*

SPT*: an average reduction of 12.5% per year over the reporting period (four years).*

As shown in Figure 4.4 the progress is expected to be greater in the first years and less so in the later years. This is represented by the curved projection towards their objective.

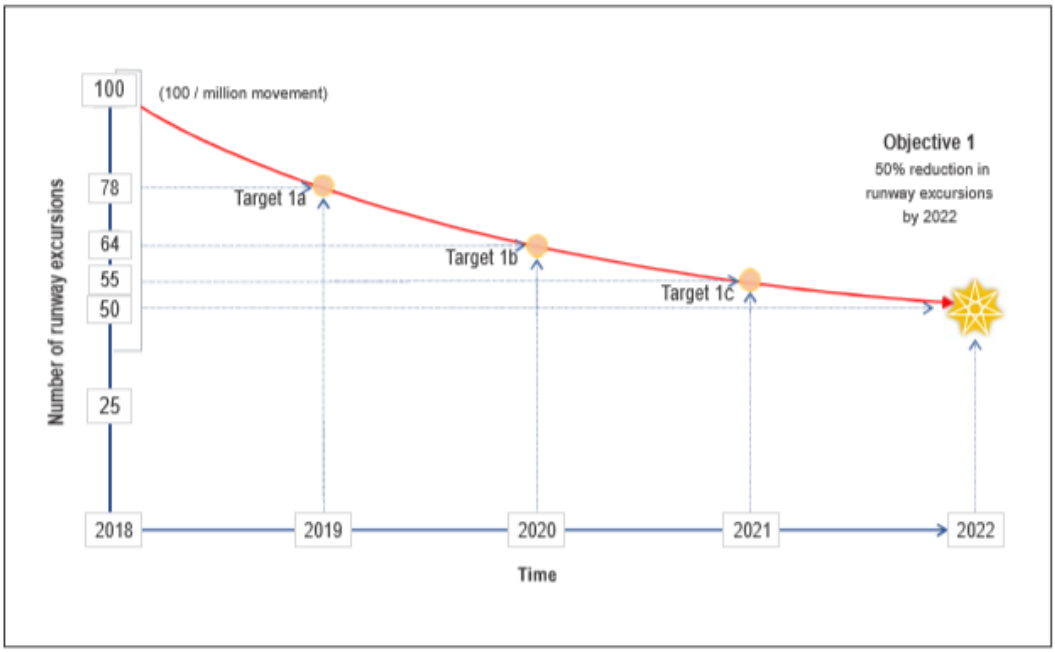


Figure 4.4: Example SPTs with SMART safety objectives (Source: ICAO Doc. 9859)

4.5.3.5.4 Additional considerations for SPI and SPT selection

When selecting SPIs and SPTs, the following should also be considered:

a) Workload management. Creating a workable amount of SPIs can help personnel manage their monitoring and reporting workload. The same is true of the SPIs complexity, or the availability of the necessary data. It is better to agree on what is feasible, and then prioritize the selection of SPIs on this basis. If an SPI is no longer informing safety performance, or been given a lower priority, consider discontinuing in favour of a more useful or higher priority indicator.
b) Optimal spread of SPIs. A combination of SPIs that encompass the focus areas will help gain an insight to the organization's overall safety performance and enable data-driven decision-making.
c) Clarity of SPIs. When selecting an SPI, it should be clear what is being measured and how often. SPIs with clear definitions aid understanding of results, avoid misinterpretation, and allow meaningful comparisons over time.
d) Encouraging desired behaviour. SPTs can change behaviours and contribute to desired outcomes. This is especially relevant if achievement of the target is linked to organizational rewards, such as management remuneration. SPTs should foster positive organizational and individual behaviours that deliberately result in defensible decisions and safety

performance improvement. It is equally important to consider the potential unintended behaviours when selecting SPIs and SPTs.

e) Choosing valuable measures. It is imperative that useful SPIs are selected, not only ones which are easy to measure. It should be up to the organization to decide what the most useful safety parameters are; those that guide the organization to improve decision-making, safety performance management, and achievement of its safety objectives.
f) Achieving SPTs. This is a particularly important consideration, and linked to the desired safety behaviours. Achieving the agreed SPTs is not always indicative of safety performance improvement. The organization should distinguish between just meeting SPTs and actual, demonstrable organizational safety performance improvement.

4.5.3.5.5 Precautions while setting SPTs

It is not always necessary or appropriate to define SPTs as there may be some SPIs that are better to monitor for trends rather than use to determine a target. Safety reporting is an example of when having a target could either discourage people not to report (if the target is not to exceed a number) or to report trivial matters to meet a target (if the target is to reach a certain number). There may also be SPIs better used to define a direction of travel to target continuous safety performance improvement (i.e. to reduce the number of events) rather than used to define an absolute target, as these may be difficult to determine. The following should also be considered in deciding appropriate SPTs:

a) Drive undesirable behaviours: if managers or organizations are too focused on achievement of the numbers as an indicator of success they may not achieve the intended improvement in safety performance.
b) Operational targets: too much focus on achieving operational targets (such as: on time departures, reduction in overhead costs, etc.) without a balance of SPTs can lead to "achieving the operational targets" while not necessarily improving safety performance.
c) Focus on quantity rather than quality: this can encourage personnel or departments to meet the target but in doing so deliver a poor product or service.
d) Cap innovation: although not intended, once a target is met this can lead to a relaxation and that no further improvements are needed and complacency can set in.
e) Organizational conflict: targets can create conflict between departments and organizations as they argue over who is responsible rather than focusing on trying to work together.

4.5.3.5.6 Baseline safety performance

Baseline safety performance is the safety performance at the commencement of the safety performance measurement process, the datum point from which progress can be measured Understanding how the organization plans to progress towards its safety objectives requires that they know where they are, in relation to safety. Once the organization's safety performance structure (safety objectives, indicators, targets, triggers) has been established and

is functioning, it is possible to learn their baseline safety performance through a period of monitoring.

4.5.3.5.7 Refinement of SPIs and SPTs

The set of SPIs and SPTs selected by an organization should be periodically reviewed to ensure their continued meaningfulness as indications of organizational safety performance. Some reasons behind discontinuation or change of SPIs and SPTs include:

a) SPIs continually report the same value (such as zero per cent or 100 per cent); these SPIs are unlikely to provide meaningful input to senior management decision-making;
b) SPIs that have similar behaviour as such are considered a duplication;
c) the SPT for an SPI implemented to measure the introduction of a programme or targeted improvement has been met;
d) another safety concern becomes a higher priority to monitor and measure;
e) to gain a better understanding of a particular safety concern by narrowing the specifics of an SPI (i.e. reduce the "noise" to clarify the "signal"); and
f) risk areas have changed and as a consequence the SPIs require updating to remain relevant.

4.5.3.6 Safety triggers (alert levels)

4.5.3.6.1A trigger is an established level or criteria value that serves to trigger (start) an evaluation, decision, adjustment or remedial action related to the particular indicator. One method for setting out-of-limits trigger criteria for SPTs is the use of the population standard deviation (STDEVP) principle. This method derives the standard deviation (SD) value based on the preceding historical data points of a given safety indicator. The SD value plus the average (mean) value of the historical data set forms the basic trigger value for the next monitoring period. The SD principle (a basic statistical function) sets the trigger level criteria based on actual historical performance of the given indicator (data set), including its volatility (data point fluctuations). A more volatile historical data set will usually result in a higher (more generous) trigger level value for the next monitoring period. Triggers provide early warnings which enable decision makers to make informed safety decisions, and thus improve safety performance.

4.5.3.6.2 It should be noted that trigger values serve to trigger (start) an evaluation, decision, adjustment or remedial action related to the particular indicator. An SPI being triggered is not necessarily catastrophic or an indication of failure. It is merely a sign that the activity has moved beyond the predetermined limit. The trigger aims to attract the attention of decision makers who are now in a position to take remedial action, or not, depending on the circumstances.

An example of trigger levels *based on standard deviations (SDs) is provided in Figure 4-5 below. In this example, data-driven decisions and safety mitigation actions may need to be taken when the trend goes beyond +1SD or +2SD from the mean of the preceding period. Often the trigger levels (in this case +1SD, +2SD or beyond +2SD) will align with decision management levels and urgency of action.*

Formulae to find Standard Deviation:

- *The Excel spreadsheet formula is "=STDEVP".*
- *For the purpose of manual standard deviation calculation, the formula is:*

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

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.

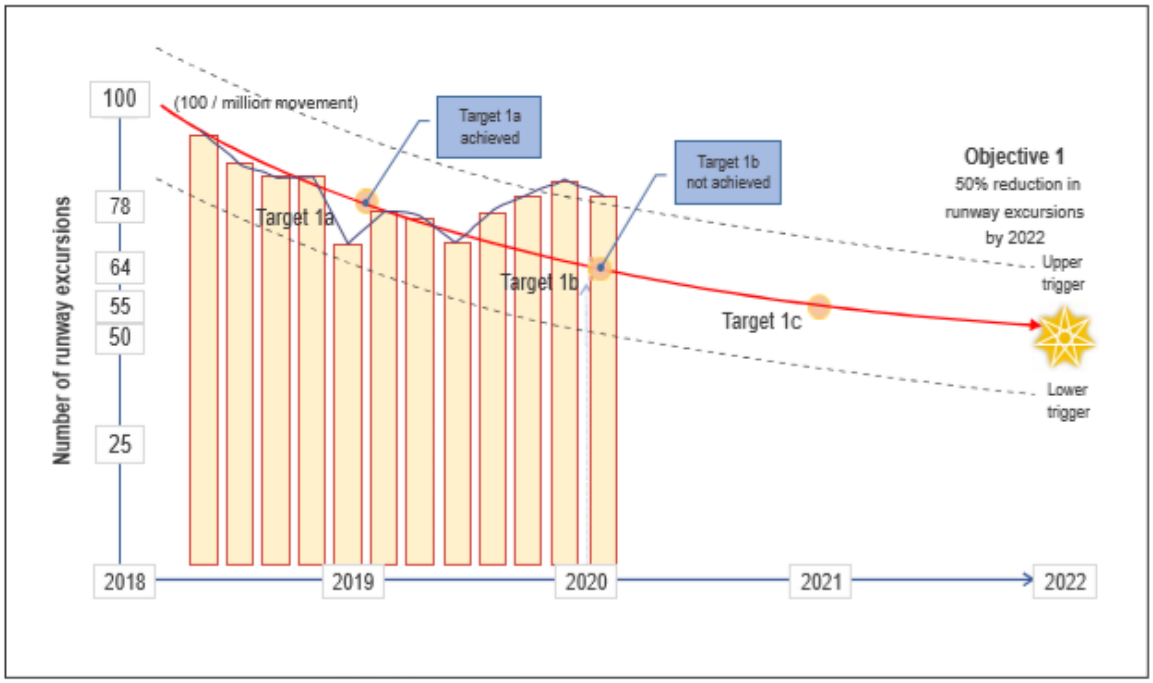


Figure 4.5: Example of setting safety triggers (Source: ICAO Doc. 9859)

4.6 Management of Change

4.6.1 Service providers experience change due to a number of factors including, but not limited to:

a) organizational expansion or contraction (ie. introduction of new technology or equipment; new fleet etc.)
b) changes in key personnel;

c) significant changes in staffing levels;
d) significant restructuring of the organization;
e) business improvements that impact safety; these may result in changes to internal systems, processes or procedures that support the safe delivery of the products and services;
f) changes to the organization's operating environment;
g) changes to the SMS interfaces with external organizations; and
h) changes in external regulatory requirements, economic changes and emerging risks;
i) physical changes (new facility or base, aerodrome layout changes etc.) etc.

4.6.2 Change may affect the effectiveness of existing safety risk controls. In addition, new hazards and related safety risks may be inadvertently introduced into an operation when change occurs. Hazards should be identified and related safety risks assessed and controlled as defined in the organization's existing hazard identification or SRM procedures.

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

a) Criticality. How critical is the change? The service provider should consider the impact on their organization's activities, and the impact on other organizations and the aviation system.
b) Availability of subject matter experts. It is important that key members of the aviation community are involved in the change management activities; this may include individuals from external organizations.
c) Availability of safety performance data and information. What data and information is available that can be used to give information on the situation and enable analysis of the change.
d) Stability of systems and operational environments. Changes may be the result of programmed activities such as growth, operations to new destinations, changes in fleets, changes in contracted services, or other changes directly under the control of the organisation. Changes in the operational environment are also important, such as economic or financial conditions, changing regulatory requirements, or changes in the physical environment such as cyclical changes in weather patterns.
e) Past performance: Past performance of critical systems may be an indicator of future performance. Trend analysis in the safety assurance process should be used to track safety performance measures over time and factored into the planning of future activities under situations of change. While past performance should provide lessons, it should not constrain the efforts of an organization to evolve and improve their safety performance.
f) Change leadership management: Change leadership is about the phases of change and its impact and emotions associated with each of the phases. It requires leaders and the organisation as a whole to address the mind-sets and to develop the practices and behaviours that support people to adapt to change.

4.6.4 Small incremental changes often go unnoticed, but the cumulative effect can be considerable. Changes, large and small, might affect the organization's system description, and may lead to the need for its revision. Therefore, the system description should be regularly reviewed to determine its continued validity, given that most service providers experience regular, or even continuous, change.

4.6.5 The change management process should include the following activities:

a) understand and define the change; this should include a description of the change and why it is being implemented;
b) understand and define who and what it will affect; this may be individuals within the organization, other departments or external people or organizations. Equipment, systems and processes may also be impacted.
c) identify hazards related to the change and carry out a safety risk assessment; this should identify any hazards directly related to the change. The impact on existing hazards and safety risk controls that may be affected by the change should also be reviewed. This step should use the existing organization's SRM processes;
d) develop an action plan; this should define what is to be done, by whom and by when. There should be a clear plan describing how the change will be implemented and who will be responsible for which actions, and the sequencing and scheduling of each task;
e) sign off on the change; this is to confirm that the change is safe to implement. The individual with overall responsibility and authority for implementing the change should sign the change plan; and
f) make assurance plan; this is to determine what follow-up action is needed. Consider how the change will be communicated and whether additional activities (such as audits) are needed during or after the change. Any assumptions made need to be tested.

See Appendix- 7 for a sample structured process of Management of Change.

4.7. Continuous improvement of SMS

4.7.1 CAR - 19 requires that the service provider monitor and assess its SMS processes to maintain or continuously improve the overall effectiveness of the SMS. Maintenance and continuous improvement of the service provider's SMS effectiveness is supported by safety assurance activities that include the verification and follow up of actions and the internal audit processes. It should be recognized that maintaining and continuously improving the SMS is an ongoing journey as the organization itself and the operational environment will be constantly changing.

4.7.2 SMS effectiveness should not be based solely on SPIs; service providers should aim to implement a variety of methods to determine its effectiveness, measure outputs as well as outcomes of the processes, and assess the information gathered through these activities. Such methods may include:

a) **Audits**; this includes internal audits and audits carried out by other organizations;
b) **Monitoring of occurrences**: monitor the recurrence of safety events including accidents and incidents as well as errors and rule-breaking situations;
c) **Safety surveys**; including cultural surveys providing useful feedback on staff engagement with the SMS. It may also provide an indicator of the safety culture of the organization; See Appendix- 7 for an example of a safety survey questions.
d) **Management reviews**; examine whether the safety objectives are being achieved by the organization and are an opportunity to look at all the available safety performance information to identify overall trends. It is important that senior management review the effectiveness of the SMS. This may be carried out as one of the functions of the highest-level safety committee;
e) **Evaluation of SPIs and SPTs**; possibly as part of the management review. It considers trends and, when appropriate data is available, can be compared to other service providers or State or global data; and
f) **Addressing lessons learnt**; from safety reporting systems and service provider safety investigations. These should lead to safety improvements being implemented.

4.7.3 Combining the processes of management review, performance monitoring and internal audits closes the quality loop; this will allow the organisation to monitor and review its SMS and to take action to continually improve it.

4.7.4 Internal Audit Programme

4.7.4.1 An audit is a methodical, planned review to determine how activities are being conducted, and whether they are being conducted in accordance with published procedures. Safety auditing is closely linked with quality management processes. Regular safety auditing determines conformity with safety risk controls, such as operational procedures, and assesses the performance of those controls, including identifying previously unrecognised safety-related risks.

4.7.4.2 Auditing has traditionally focused on compliance with regulations and conformance with policies and procedures. However, with changing perspectives, it is being recognised that there is more value in looking at the effectiveness (performance) of those policies and procedures; particularly in safety management system. Therefore service providers should use Internal safety auditing as a tool to ensure compliance (the organisation meeting its obligations) and to monitor safety performance.

4.7.4.3 Safety Manager should ensure that there are regular internal audits of the safety-related functions of operational and support processes. Internal audits should also extend to any subcontractors used to accomplish those functions.

4.7.4.4 Developing a safety audit programme

4.7.4.4.1 The following guidelines are intended to assist organisations in developing an audit capability.

a) Establishing an audit schedule:
schedule of audits covering one or two years will help the organisation plan its audit activities and resources. The schedule should show the planned date of each audit, a brief scope description and the names of the auditors. Consideration should be given to how, and by whom, this schedule will be maintained, and how relevant personnel can access it.

b) Setting the scope of the audit programme:
The audit scope describes the breadth of operational disciplines or areas to be covered and depends on the focus area for the audit. The nature and scope of audits need to be driven primarily by the safety significance of an operational area.

c) Setting audit objectives:
Audit objectives define tangible achievements expected from each audit. It is advisable to set out the detailed objectives well in advance of the audit to help the auditors to plan and conduct the audit.

> ***For example**, for an audit of Flight Dispatch, one of the audit objectives might be to 'determine how dispatch errors are identified, managed and reported to ascertain the effectiveness of safety processes.'*

d) Determining the frequency of audits:

While determining the frequency of audits, the following should be taken into consideration—

- the level of risk posed by the part of the operation or organisation to be audited:
- any compliance-related considerations (e.g. will external audits be conducted?)
- the resources available to conduct audits (don't overwhelm what may be limited resources).

> ***For example**, an audit on one operational area may only be necessary once every two years, but an area which has known or suspected issues may need auditing once every six months. Audit schedules should be changed to match changing risk levels: if an area is perceived to have increasing risk levels, more frequent or additional audits should be scheduled – and the reasons recorded.*

e) Outlining audit methodology

It is important to outline the policies, processes and methodologies required to conduct internal safety audits. The person managing the audit programme should select and determine the methods for collectively conducting an audit, depending on the defined audit objectives, scope and criteria.

f) Documentation of processes:

All audit processes need to be clearly documented so that they are easy to understand and, most importantly, allow audits to be conducted in a standardised manner.

4.7.4.5 Conducting safety audits and monitoring outcomes

4.7.4.5.1 An audit should include the following steps—

a) Planning the audit
   Careful planning helps the auditor to prepare tools appropriate to the audit objective and scope. One tool is the audit checklist, which should be used to identify the functions to be audited and to ensure that nothing is missed; it might include specific questions to allow the auditor to ascertain the effectiveness of the quality and safety processes. Checklists should never be used merely to show compliance by ticking boxes.
b) Conducting the audit
   To conduct effective audits—
   - Focus on how – and if – the documented procedures are practised, and whether the current practices and procedures are conducive to effective and safe operations;
   - Use open-ended questions, asked in a neutral manner, and maintain a high level of engagement with personnel in the audited department;
   - Provide an initial summary of findings or observations to the auditees at the conclusion of the audit.
c) Writing the audit report
   It is essential that the content of the audit report is accurate, and that findings are supported by robust evidence that can be understood by the reader.
d) Disseminating and tracking audit findings
   The audit report should be formally presented to the auditees so that they can address any findings. Actions to address the findings need to be tracked in a transparent and systematic manner (e.g. agenda item at a monthly safety committee meeting).

4.7.4.6 Selecting and training auditors

4.7.4.6.1Auditors should receive formal training to develop competence in auditing skills and techniques, and should be encouraged, or even required, to gain formal auditor qualifications. An effective auditor would also be expected—

- to act in a strictly trustworthy and unbiased manner;
- to disclose any potential conflicts of interest;
- not to disclose the findings or any other information gained in the course of the audit to any third party unless authorised to do so;
- to demonstrate highest level of ethical conduct and should not involve in acts that may eventually affect his/her performance as an auditor.

4.7.4.6.2 Operational independence ensures auditors are not put in a position where their objectivity may be affected by conflicting responsibilities or loyalties. Small organisations might consider employing a third party to conduct audits; the third party could be a similar organisation.

4.7.5 Management Review

The purpose of a management review is to ensure continuing suitability, adequacy and effectiveness of the organisation's safety processes and procedures, and to assess opportunities for improvement and the need for changes to the system of safety management.

4.7.5.1 Safety oversight

Safety oversight is the means by which an organisation has visibility of its safety risks and the processes it uses to continually monitor and review its strategic and operational functions. While safety oversight is often associated with the regulator or organisations such as CAA, each organisation is responsible for maintaining oversight of its own operations. The management review process is a key tool in maintaining oversight. By reviewing the performance of the SMS, it provides the means to determine where improvements can be made and how their implementation will be managed. This can be achieved by reactively monitoring and reviewing operational activity, while proactive monitoring processes will increase the organisation's ability to make forward-looking safety decisions.

A good management review leading to sound decisions will require that decision makers understand data collection sources, risk context and analysis methods. It is important to consider a broad approach and a variety of actions to address any issues resulting from the review process;

***for example**, procedures may need to be reviewed and changed, targeted educational campaigns may need to be implemented, etc.*

4.7.5.2 The management review process

4.7.5.2.1The input to the management review should consider, among other things, information on:

- results and trends from audits and safety investigations;
- status of preventative and corrective actions;
- changes that could affect the safety management system;
- continuous improvement;
- an examination of safety performance indicators and target results;
- action points from previous meeting;
- appropriateness of existing safety policy and objectives;
- planned SMS-related training and resources versus training achieved and resources fielded.

These inputs may then be used to measure the effectiveness of the SMS, and the review team can then decide on any changes that need to be made to improve the SMS, whether it is the processes and procedures, the allocation of resources, or even the basic policies and objectives.

4.7.5.2.3 The output of the management review should include clear and documented decisions and actions related to:

- improvement of the effectiveness of the safety management system and its processes;
- improvement of product or service related to client requirements;
- resource needs.

Accountability for implementing each action should be assigned to an individual with the appropriate responsibility, and the appropriate resources allocated.

4.7.5.3 Frequency of management reviews

4.7.5.3.1 Management reviews should be conducted as often as necessary to ensure the effectiveness of the system is truly tested. This should reflect the size and complexity of the organisation, coupled with the amount of information to be reviewed. The frequency and nature of reviews should also take into consideration the different levels of monitoring that takes place, such as the activities of safety groups or committees. The review should not occur so often that top level management would focus on less important things than the SMS as a whole. On the other hand, it should take place often enough to avoid situations where decisions are made too late to address threats to the SMS. An ad hoc review could also be conducted after a particular large or unusual event, or ahead of changes.

4.7.5.3.2 The organisation should consider the following when setting the frequency of its management reviews:

- anticipated changes or threats to the operations and SMS. New systems require more attention and resource allocation to follow up and close action item;
- establishing a list of significant safety items that would trigger a management review between planned sessions.

Compliance and Performance markers

1. Safety objectives have been established that are specific, measurable, agreable, relevant and time-based.
2. Safety performance indicators have been defined, promulgated and are being monitored and analysed for trends.
3. Safety performance indicators are linked to the organisation's safety objectives and reflect state safety risks and the related precursors where appropriate.
4. Risk mitigations and controls are being verified/audited to confirm they are working and effective.
5. Safety audits and surveys are carried out that focus on the safety performance of the organisation and its services and assess normal operations.
6. Safety objectives and performance indicators are reviewed and updated periodically and are considered in resource allocation.
7. Safety Assurance and Compliance Monitoring activities feed back into the hazard identification and risk management process.
8. Safety assurance takes into account activities carried out in all directly contracted organisations.
9. The organisation is monitoring its current, future and third party safety risks and is taking action to address unacceptable safety risks

Excellence and best practice markers

10. When establishing and reviewing objectives and performance indicators, the organisation considers:- hazards and risks; financial, operational and business requirements; view of interested parties.
11. Safety objectives and performance indicators encompass all areas of the organisation
12. Performance measurements have been defined for serious safety risks identified on the safety risk profile.
13. Personnel at all levels are aware of the safety performance measurements in their areas of responsibility and the results of performance measurements are transmitted to them.
14. The organisation uses a combination of leading and lagging indicators to measure the safety performance of the organsiation.

Chapter 5
SAFETY PROMOTION

5.1 Safety promotion encourages a positive safety culture and helps achieve the service provider's safety objectives through the technical competence that is continually enhanced through training and education, effective communication, and information-sharing. Senior management provides the leadership to promote the safety culture throughout an organization.

5.2 Effective safety management cannot be achieved solely by mandate or strict adherence to policies and procedures. 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.

5.3 The service provider should establish and implement processes and procedures that facilitate effective two-way communication throughout all levels of the organization. This should include clear strategic direction from the top of the organization and the enabling of "bottom-up" communication that encourages open and constructive feedback from all personnel.

5.4 Training and education

5.4.1 Who needs to undertake safety training

5.4.1.1 All personnel should take part in the organisation's safety training programme appropriate for their safety responsibilities. In particular, all operational/support personnel, managers, supervisors, senior managers, senior persons and the chief executive should be trained and be competent to perform their SMS duties.

Subcontractors may also require training on the use of the SMS or how to integrate their practices with the organisation's SMS, and on the organisation's expectations regarding safe working practices, hazard identification and safety reporting processes.

5.4.1.2 CAR 19 requires that "the service provider shall develop and maintain a safety training programme that ensures that personnel are trained and competent to perform their SMS duties." It also requires that "the scope of the safety training programme be appropriate to each individual's involvement in the SMS." The safety manager is responsible for ensuring there is a suitable safety training programme in place. This includes providing appropriate safety information relevant to specific safety issues met by the organization. Personnel who are trained and competent to perform their SMS duties, regardless of their level in the organization, signify management's commitment to an effective SMS. The training programme should include initial and recurrent training requirements to maintain competencies. Basic safety training should consider, as a minimum, the following:

Contents of Basic Safety Training

1. organizational safety policies and safety objectives;
2. organizational roles and responsibilities related to safety;
3. SMS fundamentals;
4. basic SRM principles;
5. Safety culture, hazard identification and safety reporting;
6. the organization SMS processes and procedures;
7. organization Just culture policy including enforcement actions.
8. SMS and human factors.
9. safety communication.

5.4.1.3 Recurrent safety training should focus on changes to the SMS policies, processes and procedures, and should highlight any specific safety issues relevant to the organization or lessons learned.

5.4.1.4 The training programme should be tailored to the needs of the individual's role within the SMS. For example, the level and depth of training for managers involved in the organization's safety committees will be more extensive than for personnel directly involved with delivery of the organization's product or services. Personnel not directly involved in the operations require only a high level overview of the organization's SMS.

5.4.2 Training needs analysis

5.4.2.1 For most organizations, a formal training needs analysis (TNA) is necessary to ensure there is a clear understanding of the operation, the safety duties of the personnel and the available training. A typical TNA will normally start by conducting an audience analysis, which usually includes the following steps:

a) Every one of the service provider's staff will be affected by the implementation of the SMS, but not in the same way or to the same degree. Identify each staff grouping and in what ways they will interact with the safety management processes, inputs and outputs - in particular with safety duties. This information should be available from the position/role descriptions. Normally groupings of individuals will start to emerge that have similar learning needs.
b) Identify the knowledge and competencies needed to perform each safety duty and required by each staff grouping.
c) Conduct an analysis to identify the gap between the current safety skill and knowledge across the workforce and those needed to effectively perform the allocated safety duties.
d) Identify the most appropriate skills and knowledge development approach for each group with the aim of developing a training programme appropriate to each individual or group's involvement in safety management. The training programme should also consider the staff's ongoing safety knowledge and competency needs; these needs will typically be met through a recurrent training programme.

5.4.2.2 It is also important to identify the appropriate method for training delivery. The main objective is that, on completion of the training, personnel are competent to perform their SMS duties. Competent trainers are usually the single most important consideration; their commitment, teaching skills and safety management expertise will have a significant impact on the effectiveness of the training delivered. The safety training programme should also specify responsibilities for development of training content and scheduling as well as training and competency records management.

5.4.2.3 The organization should determine who should be trained and to what depth, and this will depend on their involvement in the SMS. Most people working in the organization have some direct or indirect relationship with aviation safety, and therefore have some SMS duties. This applies to any personnel directly involved in the delivery of products and services, and personnel involved in the organization's safety committees. Some administrative and support personnel will have limited SMS duties and will need some SMS training, as their work may still have an indirect impact on aviation safety.

5.4.2.4 The service provider should identify the SMS duties of personnel and use the information to examine the safety training programme and ensure each individual receives training aligned with their involvement with SMS. The safety training programme should specify the content of safety training for:

- operational staff;
- accountable executive and senior managers (top level management team);
- Safety Manager and other core safety personnel;
- others.

5.4.2.5 Operational staff should be provided at least, the Basic SMS training and the recurrent training regularly. If the personnel has specific safety related job, the additional training should also be provided.

5.4.2.6 There should be specific safety training for the accountable executive and senior managers that includes the following topics with periodic refresher training:

Contents of Safety Training for accountable executive and senior managers

1. SMS accountabilities and responsibilities;
2. compliance with national and organizational safety requirements;
3. management commitment;
4. allocation of resources;
5. organization safety policy;
6. promotion of a positive safety culture;
7. Organization just culture policy including enforcement actions;
8. Internal and external safety communication;
9. organization SPIs, safety objective, SPTs and alert levels.
10. Safety assurance processes including Management of Change (MOC).

5.4.2.7 There should be a comprehensive safety training with focus on implementation of the core SMS elements for Safety Manager and other core safety personnel with primary responsibility of SMS implementation in the organization. The contents of this type of training should be the basic safety training together with other elements of SMS and its implementation. A Sample safety training programme for Safety manager and other safety personnel is as follows:

Chapter 1	Course Orientation a. Instructors and participants introduction b. Course objective and goals c. Course outline d. Administration and Evaluation
Chapter 2	Safety Management Fundamentals a. Concept of Safety and Safety Culture b. Accident Causation – Reason Model c. The Organizational Accident and Risk Profile. d. Evolution and changing safety paradigm e. Balancing production and protection f. Concept of corporate safety and safety within departments g. Human Factors in Safety Management
Chapter 3	Safety Management Requirements a. ICAO requirements for SMS (Annex -19 and Doc. 9859) b. State Safety Management (including NASP and SSP – Nepal) c. SMS framework and acceptance requirements d. CAAN Safety Occurrence system procedure, 2016. e. Safety data collection, analysis, exchange and protection in Nepal.
Chapter 4	Safety Policy and Objectives

	a. Development of safety policy b. Turning policy into procedures c. SMS organization, committees and Accountabilities d. Emergency preparedness and planning e. SMS manual and other documentation
Chapter 5	Safety Risk Management a. Understanding hazard and consequences b. Identifying and prioritizing hazards c. Safety risk assessment and tolerability matrix d. Risk control and mitigation e. Exercise on Hazard identification and risk assessment.
Chapter 6	Safety Assurance and Safety Promotion a. Safety performance monitoring and measurement b. Exercise on development of Safety Objectives, SPIs and SPT. c. Safety reporting and investigation d. The management of change e. Exercise on Management of Change. f. Continuous improvement of SMS g. Enforcement policy and procedure h. The need and requirements for SMS training i. Safety communication and awareness
Chapter 7	SMS Implementation a. SMS Implementation Planning ➢ Integration of safety management system with other systems. ➢ System description ➢ Gap Analysis and SMS Implementation plan. ➢ Exercise on Gap analysis and implementation plan. b. The phased approach of SMS implementation
Exercises	➢ Hazard Identification and Risk Management (HIRM)- Chapter 5 ➢ Development of Safety Objectives, SPIs, and SPTs - Chapter 6 ➢ Conduction of Management of Change (MOC)- Chapter 6 ➢ Performance of GAP analysis and development of SMS implementation plan- Chapter 7

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5.4.2.8 The safety professional should have three types of competencies which are as follows:

1. **Critical competency** is one that should be mastered for the role. The safety professional is considered a subject matter expert in this area.
2. **Essential competency** is one that should be well understood by a safety professional for application in the role.
3. **Support competency** is one of which a safety professional should have a general knowledge when performing the role.

Figure 5.1 provides a high-level example of how a service provider implements core competency requirements for its safety professionals. Each organisation may have a different approach to determining its competency requirements and might identify roles other than the five listed below or assign different safety functions to those roles.

Roles / Competencies	SMS Developer	SMS Implementation	Safety Case Developer	Investigator	SMS Assessor
Risk Management					
Safety Programmes					
System Thinking					
Auditing					
Safety Requirements Validation and Verification					
Facilitation					
Training					
Risk Management Documentation Development					
Investigation					
Safety Culture and Promotion					
Safety Data and Trend Analysis					

Critical	Should be a subject matter expert for this competency
Essential (E)	Should have proficiency in this competency
Support (S)	Should be knowledgeable of this competency

Figure 5.1: Suggested Core Competency Proficiency Levels (Source: CANSO-SMS implementation).

5.4.2.9 Competency methods should be developed to assure that the safety professional is periodically assessed; this could be accomplished through the organisation's work performance assessment or through more formal competency methods.

5.4.2.10 Other staff in organization should be provided detailed overview of SMS processes.

5.4.2.11 The main purpose of the safety training programme is to ensure that personnel, at all levels of the organization, maintain their competence to fulfill their safety roles; therefore competencies of personnel should be reviewed on a regular basis.

5.4.3 Determining the timeframes of the safety training programme

With respect to timeframes for the training programme, both initial and recurrent training requirements need to be considered, developed and appropriately resourced. Normally, initial training demands for longer time than the refresher training because refresher training focuses on changes of subject matter, highlight any specific safety issues relevant to the organization or lessons learned.

5.4.4 Evaluating Effectiveness of trainings

The effectiveness of training should be evaluated after training to ensure the training provided delivered the required amount of knowledge to the trainees, performance gaps identified before training does not exist anymore, the trainer's level of knowledge on subject matter satisfies the expected level, the time allocated and facilities provided were appropriate, the delivery approach was appropriate and effective etc. The process should be able to identify the current training deficiencies, if any, and improve the future trainings.

This can be achieved by—

a) assessing the trainees level of knowledge through examination;
b) assessing other aspects of trainings and level of knowledge of trainer through survey / questionnaire, interview etc.;
c) assessing personnel as they perform tasks to determine whether there is still evidence of skill or knowledge deficiency; and
d) Other evaluation tools/methods as appropriate.

5.4.5 Training, Training programme and qualification documentation

Training, Training programmes and safety qualification achieved after training should be documented for each activity area in the organisation. A training file should be developed for all personnel, including management, to identify and record their training and competency requirements and achievements.

5.5 Safety Communication

5.5.1 The service provider should communicate the organization's SMS objectives and procedures to all appropriate personnel. There should be a communication strategy that enables safety communication to be delivered by the most appropriate method based on the individual's role and need to receive safety related information. This may be done through safety newsletters, notices, bulletins, briefings or training courses. 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 communication therefore aims to:

a) ensure that staff are fully aware of the SMS; this is a good way of promoting the organization's safety policy and safety objectives.
b) convey safety-critical information; Safety critical information is specific information related to safety issues and safety risks that could expose the organization to safety risk. This could be from safety information gathered from internal or external sources such as lessons learned or related to safety risk controls. The service provider determines what information is considered safety critical and the timeliness of its communication.
c) raise awareness of new safety risk controls and corrective actions; The safety risks faced by the service provider will change over time, and whether this is a new safety risk that has been identified or changes to safety risk controls, these changes will need to be communicated to the appropriate personnel.
d) provide information on new or amended safety procedures; when safety procedures are updated it is important that the appropriate people are made aware of these changes.
e) promote a positive safety culture and encourage personnel to identify and report hazards; safety communication is two-way. It is important that all personnel communicate safety issues to the organization through the safety reporting system.
f) provide feedback to personnel submitting safety reports on what actions have been taken to address any concerns identified.

5.5.2 What to communicate throughout the organisation

The following information needs to be regularly communicated to personnel in a systematic and measurable manner:

- leadership commitment to the SMS, its objectives and safety performance;
- safety risk information; risks identified, methods of treatment, residual risks, etc;
- identified hazards and required controls;
- personnel feedback on safety report submissions;
- safety reporting trends and statistics;
- changes to operational activities that may affect safety or existing procedures;

• outcomes of safety investigations, audits and associated corrective and preventive actions;

• lessons learnt and 'good-to-know' safety information.

5.5.3 What to communicate outside of the organisation

Service providers should consider whether any of the safety information needs to be communicated to external organizations. Normally, the following information should be communicated to external organizations as required—

- potential hazards, risks or occurrences that may affect others;
- lessons learned and solutions to identified hazards and risks;
- potential risks associated with change (e.g. new infrastructure, regulatory changes, etc.).

5.5.4 Methods of communication

The methods and the content of safety communication are likely to differ according to the audience. The methods used to escalate information are important in determining how it is received and understood. One common way to achieve this is through regular safety committee meetings, where personnel and managers can proactively and openly discuss safety risks. Examples of external communication can be in the form of case studies that others may relate to, synopses of investigations undertaken, or through presentations at industry meetings. Information dissemination can be achieved in a number of different ways, and it is important to use more than just one medium, ensuring there is a mixture of both active communication (e.g. the ability to interact and receive feedback) and passive communication. Some examples are—

5.5.4.1 Active methods of communication

- Regular safety-related meetings;
- Senior management conveying strategic safety information, goals and objectives (top down);
- Personnel informing management on safety issues (bottom up). This is usually more tactical information about what is going on in functional/ departmental areas; and
- Team briefings and 'road show' initiatives.

5.5.4.2 Passive methods of communication

- the publication of an organisational safety magazine or newsletter;
- web-based presentation;
- forums;
- emails.

The methods of communication should be commensurate with the size, nature and complexity of the organisation.

5.5.5 Safety promotion supports safety communication goals and objectives. It is closely linked with safety training and the dissemination of safety information. It refers to those activities which the organisation carries out to ensure that personnel understand—

- why SMS procedures are in place;
- what safety management means;
- why particular safety actions are taken, etc.

Safety promotion provides a mechanism through which lessons from safety investigations and other safety-related activities are made available to all affected personnel.

5.5.6 How to promote safety effectively

5.5.6.1 Safety promotion activities should complement education and communication initiatives. The organisational safety promotion programme should be based on several different communication methods for reasons of flexibility and cost. Typical methods are—

- Spoken word: perhaps the most effective method, especially if supplemented with a visual presentation;
- Written word: the most popular method because of speed and economy, the printed safety promotion material also competes for attention with considerable amounts of other printed material;
- Electronic media: the use of the internet offers significant potential for improvement in the promotion of safety. This could include electronic newsletters, blogs, feedback tools such as surveys, etc.

5.5.6.2 Service providers should assess the effectiveness of their safety communication by checking whether personnel have received and understood any safety critical information that has been distributed. This can be done as part of the internal audit activities or when assessing the SMS effectiveness.

5.5.6.3 Safety promotion activities should be carried out throughout the life cycle of the SMS, not only in the beginning.

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Appendix 1: Gap Analysis and Implementation Plan (Source: ICAO Doc. 9859)

Gap Analysis

Component 1 — SAFETY POLICY AND OBJECTIVES			
Element 1.1 — Management commitment and responsibility			
1.1-1	Is there a safety policy in place? [5.3.7 to 5.3.15; 5.5.3]	☐ Yes ☐ No ☐ Partial	
1.1-2	Does the safety policy reflect senior management's commitment regarding safety management? [5.3.7 to 5.3.15]	☐ Yes ☐ No ☐ Partial	
1.1-3	Is the safety policy appropriate to the size, nature and complexity of the organization? [5.3.7 to 5.3.15]	☐ Yes ☐ No ☐ Partial	
1.1-4	Is the safety policy relevant to aviation safety? [5.3.7 to 5.3.15]	☐ Yes ☐ No ☐ Partial	

No.	*Aspect to be analysed or question to be answered*	*Answer*	*Status of implementation*
1.1-5	Is the safety policy signed by the accountable executive? [5.3.7 to 5.3.15; 5.5.3]	☐ Yes ☐ No ☐ Partial	
1.1-6	Is the safety policy communicated, with visible endorsement, throughout the [Organization]? [5.5.3]	☐ Yes ☐ No ☐ Partial	
1.1-7	Is the safety policy periodically reviewed to ensure it remains relevant and appropriate to the [Organization]? [5.5.3]	☐ Yes ☐ No ☐ Partial	
Element 1.2 — Safety accountabilities			
1.2-1	Has [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? [5.3.16 to 5.3.26; 5.5.2]	☐ Yes ☐ No ☐ Partial	
1.2-2	Does the accountable executive have full control of the financial and human resources required for the operations authorized to be conducted under the operations certificate? [5.3.16 to 5.3.26]	☐ Yes ☐ No ☐ Partial	

1.2-3	Does the Accountable Executive have final authority over all aviation activities of his organization? [5.3.16 to 5.3.26]	☐ 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? [5.3.16 to 5.3.26]	☐ Yes ☐ No ☐ Partial	
1.2-5	Is there a safety committee or review board for the purpose of reviewing SMS and safety performance? [5.3.27 to 5.3.33; Appendix 4]	☐ 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? [5.3.27 to 5.3.33; Appendix 4]	☐ Yes ☐ No ☐ Partial	
1.2-7	Does the safety committee include relevant operational or departmental heads as applicable? [5.3.27 to 5.3.33; Appendix 4]	☐ Yes ☐ No ☐ Partial	
1.2-8	Are there safety action groups that work in conjunction with the safety committee (especially for large/complex organizations)? [5.3.27 to 5.3.33; Appendix 4]	☐ Yes ☐ No ☐ Partial	
Element 1.3 — Appointment of key safety personnel			
1.3-1	Has [Organization] appointed a qualified person to manage and oversee the day-to-day operation of the SMS? [5.3.27 to 5.3.33; 5.5.2; Appendix 2]	☐ Yes ☐ No ☐ Partial	
1.3-2	Does the qualified person have direct access or reporting to the accountable executive concerning the implementation and operation of the SMS? [5.3.27 to 5.3.33; 5.5.2; Appendix 2, 6.1]	☐ Yes ☐ No ☐ 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. [Appendix 2, 6.4]	☐ 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 [Appendix 2, 6.4]	☐ Yes ☐ No ☐ Partial	
Element 1.4 — Coordination of emergency response planning			
1.4-1	Does [Organization] have an emergency response/contingency plan appropriate to the size, nature and complexity of the organization? [Appendix 3]	☐ 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? [Appendix 3, 4 f)]	☐ 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? [Appendix 3, 4 e)]	☐ Yes ☐ No ☐ Partial	
1.4-4	Is there a plan and record for drills or exercises with respect to the ERP? [Appendix 3, 5 c)]	☐ 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? [Appendix 3, 4 d)]	☐ 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? [Appendix 3, 5 d)]	☐ Yes ☐ No ☐ Partial	
1.4-7	Is there a procedure for periodic review of the ERP to ensure its continuing relevance and effectiveness? [Appendix 3, 5 f)]	☐ 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? [5.3.36 to 5.3.38]	☐ Yes ☐ No ☐ Partial	
1.5-2	Does the SMS documentation address the organization's SMS and its associated components and elements? [5.3.36 to 5.3.38; 5.4.1; Appendix 4]	☐ Yes ☐ No ☐ Partial	
1.5-3	Is [Organization] SMS framework in alignment with the regulatory SMS framework? [5.3.36 to 5.3.38; 5.4.1; Appendix 4]	☐ Yes ☐ No ☐ Partial	
1.5-4	Does [Organization] maintain a record of relevant supporting documentation pertinent to the implementation and operation of the SMS? [5.3.36 to 5.3.38; 5.5.5]	☐ Yes ☐ No ☐ Partial	
1.5-5	Does [Organization] have an SMS implementation plan to establish its SMS implementation process, including specific tasks and their relevant implementation milestones? [5.4.4]	☐ Yes ☐ No ☐ Partial	

1.5-5	Does [Organization] have an SMS implementation plan to establish its SMS implementation process, including specific tasks and their relevant implementation milestones? [5.4.4]	☐ 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? [5.4.4]	☐ Yes ☐ No ☐ Partial	
1.5-7	Is the SMS implementation plan endorsed by the accountable executive? [5.4.4; 5.5.2]	☐ 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? [5.3.42 to 5.3.52; 5.5.4]	☐ 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? [5.3.42 to 5.3.52]	☐ Yes ☐ No ☐ Partial	
2.1-3	Does [Organization] SDCPS include procedures for incident/accident reporting by operational or production personnel? [5.3.42 to 5.3.52; 5.5.4; Chapter 4, Appendix 3]	☐ 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? [5.3.42 to 5.3.52; 5.5.4]	☐ Yes ☐ No ☐ Partial	
2.1-5	Does [Organization] have procedures for investigation of all reported incident/accidents?. [5.3.42 to 5.3.52; 5.5.4]	☐ 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? [2.13.9; 5.3.50 f); 5.5.5]	☐ 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? [5.3.5.1]	☐ Yes ☐ No ☐ Partial	

Element 2.2 — Safety risk assessment and mitigation			
2.2-1	Is there a documented hazard identification and risk mitigation (HIRM) procedure involving the use of objective risk analysis tools? [2.13; 2.14; 5.3.53 to 5.3.61]	☐ Yes ☐ No ☐ Partial	
2.2-2	Is the risk assessment reports approved by departmental managers or at a higher level where appropriate? [2.15.5; 5.3.53 to 5.3.61]	☐ Yes ☐ No ☐ Partial	
2.2-3	Is there a procedure for periodic review of existing risk mitigation records? [5.5.4]	☐ Yes ☐ No ☐ Partial	
2.2-4	Is there a procedure to account for mitigation actions whenever unacceptable risk levels are identified? [5.5.4]	☐ Yes ☐ No ☐ Partial	
2.2-5	Is there a procedure to prioritize identified hazards for risk mitigation actions? [5.5.4]	☐ Yes ☐ No ☐ Partial	
2.2-6	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? [5.5.4]	☐ 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? [5.3.66 to 5.3.73; 5.4.5; 5.5.4; 5.5.5; Appendix 6]	☐ 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? [5.3.66 to 5.3.73; 5.4.5; Appendix 6]	☐ Yes ☐ No ☐ Partial	
3.1-3	Do the safety performance indicators include alert/target settings to define unacceptable performance regions and planned improvement goals? [5.3.66 to 5.3.73; 5.4.5; 5.5.4; 5.5.5; Appendix 6]	☐ Yes ☐ No ☐ Partial	
3.1-4	Is the setting of alert levels or out-of-control criteria based on objective safety metrics principles? [5.3.66 to 5.3.73; 5.4.5; Appendix 6]	☐ 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)? [5.3.66 to 5.3.73; 5.4.5; 5.5.4; 5.5.5; Appendix 6]	☐ Yes ☐ No ☐ Partial	
3.1-6	Are safety performance indicators and their associated performance settings developed in consultation with, and subject to, the civil aviation authority's agreement? [5.3.66 to 5.3.73; 5.4.5.2; 5.5.4; 5.5.5]	☐ Yes ☐ No ☐ 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? [5.4.5; Appendix 6, Table 5-A6-5 b)]	☐ Yes ☐ No ☐ Partial	
3.1-8	Are the safety performance indicators periodically reviewed? [5.4.5; Appendix 6]	☐ 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? [5.3.74 to 5.3.77; 5.5.4]	☐ Yes ☐ No ☐ Partial	
No.	*Aspect to be analysed or question to be answered*	*Answer*	*Status of implementation*
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? [5.3.74 to 5.3.77; 5.5.4]	☐ 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? [5.5.4]	☐ 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? [5.5.4]	☐ 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? [5.3.78 to 5.3.82; 5.5.4; 5.5.5]	☐ Yes ☐ No ☐ Partial	

3.3-2	Is there a current internal SMS audit/assessment plan? [5.3.78 to 5.3.82; 5.5.4; 5.5.5]	☐ Yes ☐ No ☐ Partial	
3.3-3	Does the SMS audit plan include the sampling of completed/existing safety risk assessments? [5.5.5]	☐ Yes ☐ No ☐ Partial	
3.3-4	Does the SMS audit plan include the sampling of safety performance indicators for data currency and their target/alert settings performance? [5.4.5; 5.5.5]	☐ Yes ☐ No ☐ Partial	
3.3-5	Does the SMS audit plan cover the SMS interface with subcontractors or customers where applicable? [5.4.1; 5.5.5]	☐ Yes ☐ No ☐ Partial	
3.3-6	Is there a process for SMS audit/assessment reports to be submitted or highlighted for the accountable manager's attention where appropriate. [5.3.80; 5.5.5]	☐ 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? [5.3.86 to 5.3.91; 5.5.5]	☐ Yes ☐ No ☐ Partial	
4.1-2	Has the accountable executive undergone appropriate SMS familiarization, briefing or training? [5.3.86 to 5.3.91; 5.5.5]	☐ Yes ☐ No ☐ Partial	
4.1-3	Are personnel involved in conducting risk mitigation provided with appropriate risk management training or familiarization? [5.3.86 to 5.3.91; 5.5.5]	☐ Yes ☐ No ☐ Partial	
4.1-4	Is there evidence of organization-wide SMS education or awareness efforts? [5.3.86 to 5.3.91; 5.5.5]	☐ 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? [5.3.92; 5.3.93; 5.5.5]	☐ Yes ☐ No ☐ Partial	
4.2-2	Is there evidence of a safety (SMS) publication, circular or channel for communicating safety (SMS) matters to employees? [5.3.92; 5.3.93; 5.5.5]	☐ Yes ☐ No ☐ Partial	
4.2-3	Are [Organization] SMS manual and related guidance material accessible or disseminated to all relevant personnel? [5.3.92; 5.3.93; 5.5.5]	☐ Yes ☐ No ☐ Partial	

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
etc.							

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.																
etc.																

Appendix 2: Four-Phased SMS implementation (Source: ICAO Doc. 9859)

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.

Appendix 3: Actions that will enable or disable positive safety culture in an organization.

Element	General Description	Enablers	Disablers
Commitment to safety			
	Commitment to safety reflects the extent to which appropriate levels within the organization have a positive attitude towards safety and recognizes its importance. Senior management should be genuinely committed to achieving and maintaining a high level of safety and give employees' motivation and the means to do so as well.	• Management leads safety culture and is actively motivating its employees to care for safety, not only by talking but by acting as role models • Management provides resources for a range of safety related tasks (e.g. training) • Continuous safety management oversight and governance is established	• Management is actively demonstrating that profit, cost reduction and efficiency come first • Investments to improve safety are often made when required by regulations or after accidents • Neither oversight nor governance with regards to safety management is established
Adaptability			
	Adaptability reflects the extent to which employees and the management are willing to learn from past experiences and are able to take action necessary in order to enhance the level of safety within the organization.	• Employee input is actively encouraged when addressing safety issues • All incidents and audit findings are investigated and acted upon • Organizational processes and procedures are questioned for their safety impact (high extent of self-criticism) • A clear proactive approach to safety is demonstrated and followed	• Employee input on safety issues is not sought from all levels of the employees • Actions are often taken only after accidents or when required by regulations • Organizational processes and procedures are considered adequate as long as no accident occurs (complacency or lack of self-criticism) • Even when an accident occurs the organization is unwilling to question itself. • A reactive approach to safety is demonstrated and followed.
Awareness			
	Awareness reflects the extent to which employees and management are aware of the aviation risks faced by the organization and its activities. From a State perspective personnel are aware of both the safety risks induced by their own activities and the organizations they oversee. Employees and management should be constantly maintaining a high degree of vigilance with respect to safety issues.	• An effective way of hazard identification has been established • Investigations seek to establish the root cause • The organization stays abreast of important safety improvements, and adapts itself accordingly as necessary • The organization systematically evaluates if safety improvements are implemented and working as intended • Where appropriate members of the organization are well aware of the safety risks induced by their individual actions and company operations / activities	• No effort is spent on hazard identification • Investigations stop at the first viable cause rather than seek the root cause • The organization does not stay abreast of important safety improvements • The organization does not evaluate if safety improvements are implemented properly • Where appropriate members of the organization are not aware of the safety risks induced by their individual actions and company operations • Safety data is gathered but not analysed and acted upon

Trust		
Employees contribution to safety thrives in a reporting environment that fosters trust - trust that their actions or omissions, commensurate with their training and experience, will not be punished. A workable approach is to apply a reasonableness test – i.e. is it reasonable that a person with the same level of experience and training might do the same thing. Such an environment is fundamental to effective and efficient safety reporting. Effective safety reporting systems help to ensure that people are willing to report their errors and experiences, so that States and service providers have access to relevant data and information that is necessary to address existing and potential safety deficiencies and hazards. Creating an environment in which people can be confident that safety data and safety information will be used exclusively for improving safety.	• There is a distinction between acceptable and unacceptable behaviour, which is known to all employees. • Occurrences (including accidents and incidents) investigations consider individual as well as organizational factors. • Good aviation safety performance is recognized and rewarded on a regular basis. • There is willingness among employees and operational personnel to report events in which they have been involved.	• There is no identifiable distinction between acceptable and unacceptable behaviour. • Employees are systematically and rigorously punished for human errors. • Accident and occurrence investigations focus on individual factors only. • Good safety performance and safe behaviour is taken for granted.
Behaviour with respect to safety		
Behaviour with respect to safety reflects the extent to which every level of the organization behaves such as to maintain and improve the level of safety. The importance of safety should be recognized and processes and procedures needed to maintain it should be put in place.	• The employees motivate themselves to act safely and by acting as role models • Continuous monitoring of safe behaviour is practised • Intentional unsafe behaviour is not tolerated by management and colleagues • The working conditions support aviation safety at all times	• Employees are not punished for intentional unsafe behaviour to the benefits of their own or other interests • The working conditions provoke behaviour and work-arounds that are detrimental to aviation safety • No monitoring of aviation safety within the organization's products or services is practised • Constructive criticism to the benefit of aviation safety is not welcomed
Information		
Information reflects the extent to which information is distributed to all necessary people within the organization. Employees should be enabled and encouraged to report aviation safety concerns and receive feedback on their reports. Work information related to aviation safety has to be communicated meaningfully to the right people in order to avoid miscommunication that could lead to hazardous aviation system situations and consequences. The State is open to share aviation safety related information to all service providers.	• An open and just safety-reporting environment exists. • Employees are provided with safety-relevant information in a timely manner in order to allow for safe operations or decisions to be made. • Management and supervisors regularly check whether safety-relevant information is understood and acted upon • Knowledge transfer and training with regards to aviation safety is actively practiced (e.g. sharing of lessons learned)	• A blaming safety reporting environment is evident • Safety relevant information is withheld • Safety communication is not monitored for its effectiveness • No knowledge transfer or training is provided

(Source: CANSO- SMS implementation Guide)

Appendix 4: Sample Safety Policy Statement (Source: ICAO Doc. 9859)

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 an appropriate allocation of organizational resources, aimed at achieving the highest level of safety performance and meeting regulatory requirements, 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 [Accountable Executive].

Our commitment is to:

a. 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;
b. ensure that the management of safety is a primary responsibility of all managers and employees;
c. 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;
d. 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 achieve continuous improvement in our safety performance;
e. 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, gross negligence or a deliberate or wilful disregard of regulations or procedures;
f. comply with and, wherever possible, exceed, legislative and regulatory requirements and standards;
g. ensure that sufficient skilled and trained human resources are available to implement safety strategies and processes;
h. 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;
i. establish and measure our safety performance against realistic safety performance indicators and safety performance targets;
j. continually improve our safety performance through continuous monitoring and measurement, regular review and adjustment of safety objectives and targets, and diligent achievement of these; and
k. ensure that externally supplied systems and services to support our operations are delivered meeting our safety performance standards.

(Signed)

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CEO/Managing Director/ or as appropriate

Appendix 5: Sample job description for a safety manager (Source: ICAO Doc. 9859)

1. Overall purpose

The safety manager is responsible to the accountable executive for providing guidance and direction for the planning, implementation and operation of the organization's safety management system (SMS). The safety manager provides SMS-related services to the certificated, non-certificated and third-party areas of the organization that are included in the SMS and may have delegated responsibilities on behalf of persons holding positions required by regulations.

2. Key roles

Safety advocate

Demonstrates an excellent safety behaviour and attitude, follows regulatory practices and rules, recognizes and reports hazards and promotes effective safety reporting.

Leader

Models and promotes an organizational culture that fosters safety practices through effective leadership.

Communicator

- Acts as an information conduit to bring safety issues to the attention of management and to deliver safety information to the organization's staff, contractors and stakeholders.
- Provides and articulates information regarding safety issues within the organization.

Developer

Assists in the continuous improvement of the hazard identification and safety risk assessment schemes and the organization's SMS.

Relationship builder

Builds and maintains an excellent working relationship with the organization's safety action group (SAG) and within the safety services office (SSO).

Ambassador

Represents the organization on government, international organization and industry committees (e.g. ICAO, IATA, CAA, AIB, etc.).

Analyst

Analyses technical data for trends related to hazards, events and occurrences.

Process management

- Effectively utilizes applicable processes and procedures to fulfil roles and responsibilities.
- Investigates opportunities to increase the efficiency of processes.
- Measures the effectiveness and seeks to continually improve the quality of processes.

3. RESPONSIBILITIES

Among other duties, the safety manager is responsible for:

- managing the operation of the safety management system;
- collecting and analysing safety information in a timely manner;
- administering any safety-related surveys;
- monitoring and evaluating the results of corrective actions;
- ensuring that risk assessments are conducted when applicable;
- monitoring the industry for safety concerns that could affect the organization;
- being involved with actual or practice emergency responses;
- being involved in the development and updating of the emergency response plan and procedures; and
- ensuring safety-related information, including organizational goals and objectives, are made available to all personnel through established communication processes.

4. NATURE AND SCOPE

The safety manager must interact with operational personnel, senior managers and departmental heads throughout the organization. The safety manager should also foster positive relationships with regulatory authorities, agencies and product and service providers outside the organization. Other contacts will be established at a working level as appropriate.

5. QUALIFICATIONS

To qualify as a safety manager a person should have:

- full-time experience in aviation safety in the capacity of an aviation safety investigator, safety/quality manager or safety risk manager;
- sound knowledge of the organization's operations, procedures and activities;
- broad aviation technical knowledge;
- an extensive knowledge of safety management systems (SMS) and have completed appropriate SMS training;
- an understanding of risk management principles and techniques to support the SMS;
- experience implementing and/or managing an SMS;
- experience and qualifications in aviation accident/incident investigation and human factors;
- experience and qualifications in conducting safety/quality audits and inspections;
- sound knowledge of aviation regulatory frameworks, including ICAO Standards and Recommended Practices (SARPS) and relevant civil aviation regulations;
- the ability to communicate at all levels both inside and outside the company;

- the ability to be firm in conviction, promote a “just and fair culture” and yet advance an open and non-punitive atmosphere for reporting;
- the ability and confidence to communicate directly to the accountable executive as his advisor and confidante;
- well-developed communication skills and demonstrated interpersonal skills of a high order, with the ability to liaise with a variety of individuals and organizational representatives, including those from differing cultural backgrounds;
- computer literacy and superior analytical skills.

6. AUTHORITY

- Regarding safety matters, the safety manager has direct access to the accountable executive and appropriate senior and middle management.
- The safety manager is authorized under the direction of the accountable executive to conduct safety audits, surveys and inspections of any aspect of the operation in accordance with the procedures specified in the safety management system documentation.
- The safety manager is authorized under the direction of the accountable executive to conduct investigations of internal safety events in accordance with the procedures specified in the organization’s SMS documentation.
- The safety manager should not hold other positions or responsibilities that may conflict or impair his role as an SMS/safety manager. This should be a senior management position not lower than or subservient to the production or operational functions of the organization.

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Appendix 6: Process of Safety Risk Management (Source: Guidance for conducting SRM at ATM, CAAN)

Assess severity of each consequence. For this, plan a brainstorming session within SAG or the group of experts etc. Rational subjective judgement is applied in doing this assessment.

1. Determine the severity

   Severity is independent of likelihood. So, assess the severity in isolation with likelihood and taking into consideration of all the possible worst potential consequences (also called as most credible effects) of the hazard which is nothing but the extent of harm that might reasonably occur. The severity can be determined through the assessment of harm in terms of the fatalities/injuries, damage to the people or properties or any other bad consequences.

2. Identify the severity value to each Ultimate Consequence (UC) with the help of Safety Risk Severity and Likelihood Table as shown in Table 6.
3. Assess likelihood of each consequence. Rational subjective judgement as well as the objective tools are applied in doing this assessment. In doing the likelihood assessment, following steps are to be adopted.

3.1 Determine likelihood

Likelihood is dependent upon the number and quality of barriers deployed in controlling or mitigating the UC of hazard. Following steps to be followed in identifying the likelihood:

a. Identify Barrier Quality Score (BQS), Total BQS (TBQS) and Barrier Strength Value (BSV) for each barrier. Better the quality of barrier better will be the BSV for each barrier. Use Tables 1 and 2 below to ultimately find the BSV for each barrier.

Table 1 - Barrier Quality Assessment

Barrier Quality Element	Barrier Quality Descriptor [High, Moderate,Low, Poor]	Barrier Quality Score [3 (H), 2 (M),1 (L), 0 (P)]
1. Effectiveness	**Low**	
2. Cost-benefit	**High**	
3. Practicality	**Moderate**	
4. Acceptability	**Moderate**	
5. Enforceability	**High**	
6. Durability	**Moderate**	
Total Barrier Quality Score (TBSQ) >>		
BSV (using Table 2 below to correlate with TBSQ)		

1. *Effectiveness: Extent to which the Barrier can mitigate (reduce likelihood/ severity) of UC.*
2. *Cost-Benefit: Extent to which the perceived benefits of the Barrier outweigh the costs.*
3. *Practicality: Extent to which the Barrier can be implemented, in terms of technology, financial and administrative resources.*
4. *Acceptability: Extent to which the Barrier is consistent with other stakeholders' paradigms or requirements.*
5. *Enforceability: Extent to which the Barrier can be monitored or surveyed for compliance/ implementation.*
6. *Durability: Extent to which the Barrier will be sustainable.*

Table 2 – TBQS to BSV Correlation

TBQS Range	Barrier Strength	Strength Description	BSV
0 to 3	Poor	Weak, superficial or insignificant Barrier	**1**
4 to 7	Fair	Barely viable or adequate Barrier	**2**
8 to 11	Good	Reasonable or acceptable Barrier	**3**
12 to 15	Very Good	Effective, recognized and established Barrier	**4**
16 to 18	Excellent	Best, most robust and standard Barrier	**5**

b. Identify Optimum Number of Barriers (ONB) for respective Severity Value of UC.

Table 3 - Optimum Number of Barriers & Applicable CBSV-Likelihood Tables

Severity Value of UC	Severity Descriptor	Optimum Number of Barriers (ONB)	Optimum CBSV (ONB x 5 [Max BSV])	Applicable CBSV-Likelihood Table
E	Negligible	2	10	**Table 5.1**
D	Minor	3	15	**Table 5.2**
C	Moderate	4	20	**Table 5.3**
B	Major	6	30	**Table 5.4**
A	Catastrophic	8	40	**Table 5.5**

c. Identify Consolidated BSV (CBSV) and Optimum CBSV

Table 4 - Consolidated Barrier Strength Value (CBSV) Assessment		
Barrier Sequence No.	**Assessed BSV** (from Table 2for each Barrier)	***Note to Optimum CBSV:*** *Where actual number of barriers exceed the Optimum Number of Barriers (ONB) as mentioned in Table 3 above, select the barriers with the highest BSVs to obtain your CBSV.*
1		
2		
3		
4		
5		
6		
7		
8		
		<<< CBSV (BSV of all barriers) ***Note:****CBSV is the summation of BSVof all barriers.*
		<<< Optimum CBSV (CBSV of optimum number of barriers (ONB) only, where applicable)**

Identify the Likelihood Value of each UC by correlating Optimum CBSV to Likelihood with the help of Tables 5.1 to 5.5 as appropriate to the Severity Value of each UC.

Table 5.1: Optimum CBSV-Likelihood Correlation (Severity Value E)		
OCBSV Range	**Likelihood Value**	**Likelihood Descriptor**
0-1	5	Certain/ frequent
2-3	4	Likely/ occasional
4-5	3	Possible/ remote
6-7	2	Unlikely/ improbable
8-10	1	Exceptional/ Extremely Improbable

Table 5.2: Optimum CBSV-Likelihood Correlation (Severity Value D)		
OCBSV Range	**Likelihood Value**	**Likelihood Descriptor**
0-2	5	Certain/ frequent
3-5	4	Likely/ occasional
6-8	3	Possible/ remote
9-11	2	Unlikely/ improbable
12-15	1	Exceptional/ Extremely Improbable

Table 5.3: Optimum CBSV-Likelihood Correlation (Severity Value C)		
OCBSV Range	**Likelihood Value**	**Likelihood Descriptor**
0-3	5	Certain/ frequent
4-7	4	Likely/ occasional
8-11	3	Possible/ remote
12-15	2	Unlikely/ improbable
16-20	1	Exceptional/ Extremely Improbable

Table 5.4: Optimum CBSV-Likelihood Correlation (Severity Value B)		
OCBSV Range	**Likelihood Value**	**Likelihood Descriptor**
0-5	5	Certain/ frequent
6-11	4	Likely/ occasional
12-17	3	Possible/ remote
18-23	2	Unlikely/ improbable
24-30	1	Exceptional/ Extremely Improbable

Table 5.5: Optimum CBSV-Likelihood Correlation (Severity Value A)		
OCBSV Range	**Likelihood Value**	**Likelihood Descriptor**
0-7	5	Certain/ frequent
8-15	4	Likely/ occasional
16-23	3	Possible/ remote
24-31	2	Unlikely/ improbable
32-40	1	Exceptional/ Extremely Improbable

Assess the safety risk. It is the combination of likelihood and severity of the consequence assessed above is also known as Risk Index. Determine whether the risk is intolerable, tolerable or acceptable in your organization with the help of Safety Risk Tolerability Matrix as shown in Table 7.

Table 6: combined table for Likelihood and Severity of a consequence

Likelihood	Meaning	Value	Severity	Meaning	Value
Frequent	Likely to occur many times (has occurred frequently)	5	Catastrophic	• Equipment destroyed • Multiple deaths	A
Occasional	Likely to occur sometimes (has occurred infrequently)	4	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
Remote	Unlikely to occur, but possible (has occurred rarely)	3	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 an increase in workload or as a result of conditions impairing their efficiency • Serious incident • Injury to persons	C
Improbable	Very unlikely to occur (not known to have occurred)	2	Minor	• Nuisance • Operating limitations • Use of emergency procedures • Minor incident	D
Extremely improbable	Almost inconceivable that the event will occur	1	Negligible	• Few consequences	E

Table 6: Safety Risk Tolerability Matrix

Tolerability Description	Assessed Risk Index	Suggested Criteria
Intolerable Region	**5A, 5B, 5C, 4A, 4B, 3A**	Unacceptable under the existing circumstances.
Tolerable Region	**5D, 5E, 4C, 4D, 4E, 3B, 3C, 3D, 2A, 2B, 2C, 1A**	Acceptable based on risk mitigation. It may require management decision.
Acceptable Region	**3E, 2D, 2E, 1B 1C, 1D, 1E**	Acceptable

Appendix 7: Sample process of Management of Change

(Source: UK CAA- SMS implementation, modified)

Management of Change (MOC)

MOC REF:

1.What is the change?

Describe the change including timescales

2.Who?

Detailwho is responsible to implement the change and who needs to be involved

3 Define the major components or activities of the change

This will help you identify the main risks of each component or activity that will be populated in table 7 below

4 Who does the change affect?

Consider who it affects individuals, departments and organisations?Who needs to be notified of the change?

5 What is the impact of the change?

Consider why the change is taking place and the impact on the organisation and its processes and procedures. Will it impact the safety culture? Does it meet all regulatory requirements?

6 What follow up action is needed? (assurance)

Consider how the change will be communicated and whether additional activities such as audits are needed during the change and after the change has taken place

7. Safety Risk Management (SRM) Worksheet

(Fill the SRM worksheet for each hazard in the order (a) to (r)) Date:

Generic Hazard (a): ……

Specific Hazard (b): ……

Hazard ID. (c)	Type of operation or activity (d)	Unsafe event (UE) (e)	Consequence (f)	Existing Measures		Future Measures		Action by whom and when
				Mitigating Barriers (h)	BSV* (i)	Mitigating Barriers (n)	BSV* (o)	
				Existing Risk Probability (j)		**Resultant Risk Probability (p)**		
				Existing Risk Severity (g)		**Resultant Risk Severity (m)**		
				Existing Risk Index (k)		**Resultant Risk Index (q)**		
				Existing Risk Tolerability (l)		**Resultant Risk Tolerability (r)**		

*Barrier Strength Value

(Note: For SRM the process of SRM included in appendix- 5 can be followed).

The management of change processes and procedures have been followed and the change can be implemented	
Post Holder acceptance signature	Name: Date:
Safety Manager acceptance signature	Name Date:

The identified risks are considered tolerable and change is acceptable to implement	
Final Acceptance Signature	Name Date:

Appendix -8: Example of Safety Survey questions (Source: SMS Pro.)

A set of 30 good questions for aviation safety survey

For the most part, safety surveys are fairly straightforward. Here are recommended practices for safety surveys:

- Give safety surveys regularly, such as 1-2 times per year.
- Use the same questions each time, though you may format them differently so that they "appear" to be different;
- Have each question be on a number-scale, such as 1 (strongly disagree) to 5 (strongly agree);
- If you want to use good questions for safety surveys, gather questions from other surveys, such as in this article or from other operators; and
- Gather surveys and store the results in a database or spreadsheet.

Here are 30 good questions for safety surveys in aviation SMS.

Survey Questions for Hazard Reporting Culture

1. I believe that my company has an effective hazard reporting process
2. I feel comfortable reporting issues with hazard reporting process
3. I think our hazard reporting process is very easy to use
4. I think that reporting issues has obvious value for my safety
5. I never feel pressure to NOT report some types of issues
6. I always report any dangerous work practices I see

Survey Questions for How Employees Feel About Management

7. I think that management is effective at managing safety issues
8. I feel very comfortable approaching safety management directly with safety concerns
9. I feel that my safety directly benefits from safety management's decisions
10. I think management tries hard to improve safety
11. I think Safety manager often discuss safety issues with myself and/or other employees
12. I think management gives good feedback regarding the company's safety performance

Survey Questions for Safety Culture

13. I feel that my coworkers encourage each other to work safely
14. I think management places more emphasis on performing tasks safely rather than quickly

15. Management praises employees if they see them working safely
16. I think employees follow polices/procedures/rules most of the time
17. I think managers are aware of the main safety problems I deal with in the workplace
18. After reporting issues, I think management tries to find the reason for the issue rather than blaming people

Survey Questions for Safety Guidance from SMS

20. I feel that I am given enough training to easily complete my tasks
21. I have checklists that I use to complete routine tasks
22. I have procedures that I can consult if I don't know how to complete one of my duties
23. I think that I am kept informed when changes are made which may affect safety
24. In the case of an emergency, there is an emergency response document I can follow for what to do and who to contact
25. I feel management does a good job following up with me regarding issues I have reported

Survey Questions for How Employees Feel About the SMS

25. I feel that our safety program makes a big difference in my safety
26. I think our safety program is performing very well
27. I know how to easily access safety policies, procedures, checklists, and other resources related to safety
28. I feel that I was adequately trained on the purpose and goals of our SMS
29. I know how to easily access our company goals
30. Safety audits/inspections are carried out regularly

Appendix- 9: Industry best practices in Nepal

Aviation organizations across Nepal have adopted some provisions in such a way that they can be exemplary for other organizations as well. A few individual case studies have been selected to be mentioned as industry best practices.

1. Proactive Hazard Identification

On an advanced step, NAC has adopted the PRISM system, acronym for Potential Risks Identified by Safety Management; the sole intent of it being a platform for identifying the probable risks of hazards underlying in their system through safety system/staff, triggered either by safety inspection, safety analysis or other external information on safety matters.

a. PRISM (Potential Risk Identified by Safety Management) Register has been developed by Safety office.

b. Hazards identified proactively from other sources than reporting is documented and included for general risk analysis of organization in PRISM file from the sources such as Safety Reports (inspections, proactive and predictive issues), Flight Data Analysis, QA audit findings, CAAN and other CAA findings, SAFA inspections, investigation findings etc.

2. Safety Culture Promotion

a. As a part of Safety Promotion within Himalaya Airlines, the Brand and Service Improvement Department (BSID) in coordination with Flight Safety Department (FSD) has taken the initiative to conduct a Safety Quiz on quarterly basis. The quiz questions are created with the intention for promoting the safety awareness and reporting culture within Airline i.e. just, transparent and non-punitive. The Quiz results with the Quiz winner's photo are published in Airline's quarterly e-newsletter "Himalaya Airlines Check In" which further motivates the employees to actively participate in the Quiz.

b. A multiple choice question is circulated to all Airline staff via mail. The participants giving the correct answer are eligible for the lucky draw conducted by BSID in presence of the representatives from all airline departments. During the lucky draw session, interactive discussion is held to reaffirm the understanding of the essence of the question and appropriate answer. The quiz questions are based on the Company Safety Policy and the Safety Management System (SMS) of Himalaya Airlines. In order to participate in the quiz, the Airlines staff diligently reads the Company Safety Policy and the Safety Management System manual to find the correct answer for the Quiz question.

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