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ALBANIA CIVIL AVIATION AUTHORITY

GUIDANCE MATERIAL SAFETY MANAGEMENT SYSTEM (SMS)

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Approved by:

Maksim Et'hemaj

Executive Director of Albanian Civil Aviation Authority

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0. **Administration**

0.1 Record of Amendments

The table below describes the dates and reason for the different amendments of the current Guidance Material. A vertical black line on the left-hand side of the page identifies the changes with the previous version.

Issue No.	Revision No	Date	Amended by	Reason
01	00	02/11/2015		Initial Issue
02	00	15/05/2024		Major Amendments

0.2 Approval List

Action	Name and position	Date	Signature
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0.3 Revision table

Page #	Issue No.	Revision No.	Date	Edited by

0.4 Distribution List

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0.5 Definitions & Acronyms

When the following terms are used in the manual, they have the meanings indicated below.

Term	Definition
Accountable executive	A single, identifiable person having responsibility for the effective and efficient performance of the aerodrome operator's SMS.
Change management	A formal process to manage changes within an organization in a systematic manner, so that changes which may impact identified hazards and risk mitigation strategies are accounted for, before the implementation of such changes.
Defences	Specific mitigating actions, preventive controls or recovery measures put in place to prevent the realization of a hazard or its escalation into an undesirable consequence.
Errors	An action or inaction by an operational person that leads to deviations from organizational, or the operational person's, intentions or expectations.
Hazard	A condition or an object with the potential to cause or contribute to an aircraft incident or accident.
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 Aerodrome Operators safety management system. *Note.— 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 ACAA to ensure that individuals and organizations performing an aviation activity comply with safety-related national laws and regulations.
Safety performance	Aerodrome operator'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	Aerodrome operator'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.
Surveillance	The ACAA activities through which the ACAA proactively verifies through inspections and audits that aviation 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).
Runway Safety Team	A team comprised of representatives from the aerodrome operator, air traffic service providers, airlines or aircraft operators, pilot and air traffic controllers associations and any other group with a direct involvement in runway operations at a specific aerodrome, that advise the appropriate management on the potential runway safety issues and recommend mitigation strategies.

0.6 Abbreviations and Acronyms

Abbreviation	Meaning
ACAA	Albanian Civil Aviation Authority
AKISA	National Authority of Investigation for Safety and Operation in Albanian Civil Aviation
ANSP	Air Navigation Service Provider
AO	Aerodrome Operators
ATS	Air Traffic Service
D3M	Data-driven decision-making
Doc	Document
ERP	Emergency response plan
FDA	Flight data analysis
FDM	Flight Data M**onitoring**
FDR	Flight data recorder
FMS	Financial management system
FRMS	Fatigue risk management systems
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
iSTARS	Integrated Safety Trend Analysis and Reporting System
LOSA	Line operations safety audit
MO	Minister's Order
OHSMS	Occupational health and safety management system
OSHE	Occupational safety, health and environment

QMS	Quality management system
RST	Runway Safety Team
RWY	Runway
SAG	Safety action group
SD	Standard deviation
SDCPS	Safety data collection and processing system
SeMS	Security management system
SMM	Safety management manual
SMS	Safety Management System
SPI	Safety performance indicator
SPT	Safety performance target
SRB	Safety review board
SRM	Safety risk management
STDEVP	Population standard deviation
TNA	Training needs analysis

1. INTRODUCTION

1.1 What is Safety Management?

1.1.1 Safety management seeks to proactively mitigate safety risks before they result in aviation accidents and incidents. Through the implementation of safety management, Aerodrome Operators can manage their safety activities in a more disciplined, integrative and focused manner. Possessing a clear understanding of its role and contribution to safe operations enables an AO, to prioritize actions to address safety risks and more effectively manage its resources for the optimal benefit of aviation safety.

1.1.2 The effectiveness of an AO's safety management activities is strengthened when implemented in a formal and institutionalized way through safety management systems (SMSs).

1.1.3 ACAA shall require that an SMS is developed and maintained by AO under its authority, as identified in Annex 19 — Safety Management, in MO No. 58, dated 13.3.2024 "Regulation for certification, registration of aerodromes and operation obligations and responsibilities falling on aerodrome operators, transposing Annex 14", MO No. 170, dated 13.09.2022 "Regulation for determining the requirements and administrative procedures related to the aerodromes in the Republic of Albania", and AMC, GM, CS accepted by ACAA Executive Director Decision No. 15, dated 26.10.2022, to continuously improve safety performance by identifying hazards, collecting and analysing data, and continuously assessing and managing safety risks.

1.2 Benefits of Safety Management

There are many benefits to implementing safety management, some of which include:

a) Strengthened safety culture – An organization's safety culture can be strengthened by making visible the commitment of management and actively involving personnel in the management of safety risk. When management actively endorses safety as a priority, it is typically well-received by personnel and becomes part of normal operations.

b) Documented, process-based approach to assure safety – Establishes a clear and documented approach to achieving safe operations that is understandable by personnel and can be readily explained to others. In addition, clearly defining baseline performance allows controlled changes when continuously improving the safety programme/system, thereby helping the organization optimize resources required to implement change.

c) Better understanding of safety-related interfaces and relationships – The process of documenting and defining safety management interfaces can benefit the organization's understanding of the inter process relationships, leading to an enhanced understanding of the end-to-end process and exposing opportunities for increased efficiencies.

d) Enhanced early detection of safety hazards – Improves the AO's ability to detect emerging safety issues, which can prevent accidents and incidents through the proactive identification of hazards and management of safety risks.

e) Safety data-driven decision-making – Improves the AO's ability to gather safety data for the purpose of safety analysis. With some strategic thinking to determine what questions need to be answered, the resulting safety information can aid decision makers, in near real-time, to make better-informed, valid decisions. An important aspect of this decision-making is the allocation of resources to areas of greater concern or need.

f) Enhanced communication of safety – Provides a common safety language throughout an organization. A common safety language is a key enabler to the development of a common understanding of the organization's safety goals and accomplishments. In particular, it provides an appreciation for the organization's safety objectives and its safety performance indicators (SPIs) and safety performance targets (SPTs), which provide the direction and motivation for safety. Personnel will be more aware of the organization's performance and the progress being made toward achieving the defined safety objectives, as well as how they contribute to the organization's success. The common safety language enables AO's with multiple aviation businesses to aggregate safety information across organizational entities. It is necessary to support the management of interfaces across the aviation system.

g) Evidence that safety is a priority – Demonstrates how management supports and enables safety, how safety risks are identified and managed, and how safety performance is continually improved, resulting in increased confidence by the aviation community, internal and external to the organization. This also results in personnel who are confident about the organization's safety performance, which can lead to the increased attraction and retention of high caliber staff. It also allows for ACAA to develop confidence in the safety performance of Aerodrome Operators.

h) Possible financial savings – May allow for some aerodrome operator to qualify for a discount on their insurance premiums and/or a reduction to their workers' compensation premiums based on their SMS results.

i) Improved efficiencies – Possible reduction in the cost of operations by exposing inefficiencies in existing processes and systems. Integration with other internal or external management systems may also save on additional costs.

j) Cost avoidance – Through the proactive identification of hazards and safety risk management (SRM), the cost incurred due to accidents and incidents can be avoided. In such cases, direct costs may include: injuries; property damage; equipment repairs; and schedule delays. Indirect costs may include: legal action; loss of business and damaged reputation; tools and training; increased insurance premiums; loss of staff productivity; equipment recovery and clean-up; loss of use of equipment leading to short-term replacement equipment; and internal investigations.

1.3 Implementing Safety Management System

Establishing a solid foundation is essential to achieving effective safety management implementation. The following aspects should be addressed as the first steps in implementing SMS requirements:

a) Senior management commitment: It is essential that senior management of all Aerodrome Operators is committed to effective safety management implementation.

b) Compliance with prescriptive requirements: The Aerodrome Operators should ensure that they have processes in place to ensure continued compliance with the established prescriptive requirements.

c) Enforcement regime: The ACAA should establish an enforcement policy and frameworks to enable parties to manage and resolve deviations and minor violations.

d) Safety information protection: It is essential that AO's put in place a protective system to ensure the continued availability of safety data and safety information.

1.3.1 System description

The system description is a summary of the Aerodrome Operators processes, activities and interfaces that need to be assessed for hazard identification and safety risk assessment that is covered by their safety system. It describes the aviation system, within which the AO functions, and the various entities and authorities involved. It includes interfaces within the organization, as well as interfaces with external organizations that contribute to the safe delivery of services. The system description provides a starting point to implement the SMS.

1.3.2 Interfaces

1.3.2.1 When an Aerodrome Operator is considering implementing safety management it is important to consider the safety risks induced by interfacing entities. Interfaces can be internal (e.g. between operations and maintenance, or finance, human resources or legal departments), or they can be external (e.g. contracted services). Aerodrome Operators have greater control over any related safety risks when interfaces are identified and managed. Interfaces are defined as part of the system description.

1.3.3 Interface safety impact assessment

1.3.3.1 Once an AO has identified its interfaces, the safety risk posed by each interface is assessed using the organization's existing safety risk assessment processes. Based on the safety risks identified, the Aerodrome Operator may consider working with other organizations to determine an appropriate safety risk control strategy. Organizations working collaboratively may be able to identify more interface hazards; assessing any related safety risks and determining mutually appropriate controls. Collaboration is highly desirable because the safety risk perception may vary between organizations.

1.3.3.2 It is also important to recognize that each organization involved is responsible for identifying and managing any identified hazards that affect its organization. The criticality of the interface may differ for each organization. Each organization might reasonably apply different safety risk classifications and have different safety risk priorities (in terms of safety performance, resources, time).

1.3.4 Monitoring and management of interfaces

1.3.4.1 Aerodrome Operator is responsible for ongoing monitoring and management of their interfaces to ensure the safe provision of services. An effective approach to interface SRM is to establish formal agreements between interfacing organizations with clearly defined monitoring and management responsibilities. Documenting and sharing all interface safety issues, safety reports and lessons learned, as well as safety risks between interfacing organizations will ensure clear understanding. Sharing enables transfer of knowledge and working practices that could improve the safety effectiveness of each organization.

1.4 Implementation planning

1.4.1 Performing a gap analysis before embarking on the implementation of SMS will allow an organization to identify the gap between the current organizational structures and processes, and those required for effective SMS operation.

1.4.2 The SMS implementation plan is, as the name implies, a plan for SMS implementation. It provides a clear description of the resources, tasks and processes required, and an indicative timing and sequencing of key tasks and responsibilities.

1.5 Maturity assessment

1.5.1 Soon after the key components and elements of the SMS are implemented, periodic assessments should be conducted to monitor how effectively it is working. As the system matures, the organization should seek assurance that it is operating as intended and is effective at achieving its stated safety objectives and targets. Safety management system takes time to mature and the aim should be to maintain or continuously improve the safety performance of the organization.

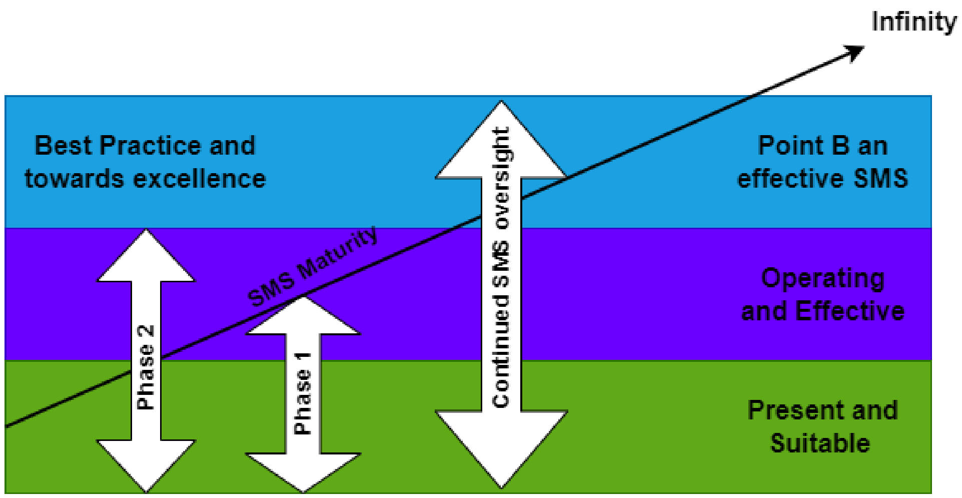

Figure 1-1 Illustration of Safety Maturity

1.6 Size and complexity considerations

1.6.1 Each Aerodrome Operator is different. SMSs are designed to be tailored to meet the specific needs of each AO. All components and all elements of SMS are interconnected and interdependent, and necessary to function effectively. It is important that SMS requirements are not implemented only in a prescriptive manner. The traditional prescriptive requirements are to be complemented with a performance-based approach.

1.6.2 The programme/system is designed to deliver the desired outcomes for each organization without undue burden. SMS, well implemented, are intended to complement and enhance the organization's existing systems and processes. Effective safety management system will be achieved through thoughtful planning and implementation, ensuring each requirement is addressed in ways that fit the organization's culture and operating environment.

1.7 Integrating the basic elements

It is important to note that all systems are composed of three basic elements: people; processes; and technology. Safety management is no exception. When establishing or maintaining the different processes, activities and functions, AOs should ensure they have considered the intention of each requirement and, most importantly, how they will work together to enable the organization to meet its safety objectives.

1.8 Integrated Risk Management

1.8.1 The aviation system as a whole comprises many and different functional systems such as finance, environment, safety and security (See Figure 1-2). The latter two are the primary operational domains of the greater aviation system. As concepts they share important features as they are all concerned with the risk of events with consequence of various magnitudes. Nevertheless, they differ in the important element of intent. Security is concerned with malicious, intentional acts to disrupt the performance of a system. Safety focuses on the negative impact to the concerned systems' performance caused by unintended consequences of a combination of factors.

1.8.2 In the operational context, all of the functional systems produce some sort of risk that needs to be appropriately managed to lessen any adverse consequence. Traditionally, each system has developed sector specific risk management frameworks and practices designed to address the distinct characteristics of each system. Most of those risk management practices include comprehensive analysis on intra-system consequences, often referred to as the management of unintended consequences. Another aspect is inter-system consequences resulting from system specific risk management processes. This relates to the fact that an effective risk management strategy of one specific sector can have an adverse impact on another operational sector of aviation. In aviation, the most often emphasized inter-system dependence is the safety/security dilemma. Effective security measures may have negative impacts on safety, and vice versa. Safety and security domains may differ in the element of underlying intent, but they converge in their common goal to protect people and assets (e.g. addressing cyber threats and risks requires coordination across the aviation safety and security domains).

1.8.3 Successful risk management in aviation should aim for overall risk reduction in the system, including all of the involved functional systems. This process requires the analytical assessment of the whole system at the highest level of the Aerodrome Operator. The assessment and integration of functional system needs and interdependence are referred to as integrated risk management (IRM). IRM focuses on the overall risk reduction of the organization. This is achieved through the quantitative and qualitative analysis of both the inherent risks, and the effectiveness and impact of sector-specific risk management processes. IRM has a system-wide responsibility to coordinate, harmonize and optimize risk management processes with the single goal of risk reduction. IRM cannot replace the operating specific risk managements of the functional systems, and does not intend to delegate additional duties and responsibilities to them. IRM is a distinct high-level concept to leverage the expert advice of sector specific risk management and provide holistic feedback to achieve the highest level of system performance at a socially acceptable level.

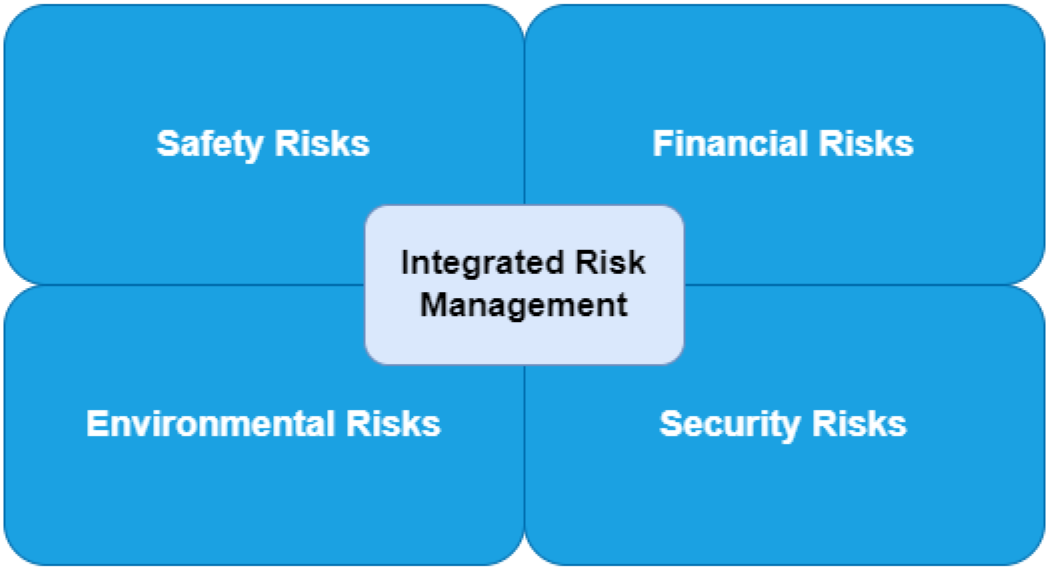

Figure 1-2. Integrated Risk Management

2. SAFETY MANAGEMENT FUNDAMENTALS

2.1 The concept of safety and its evolution

2.1.1 This chapter provides an overview of fundamental safety management concepts and practices. It is important to understand these fundamentals before focusing on the specifics of safety management found in the subsequent chapters.

2.1.2 Within the context of aviation, safety is "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".

2.1.3 Aviation safety is dynamic. New safety hazards and risks continuously emerge and must be mitigated. As long as safety risks are kept under an appropriate level of control, a system as open and dynamic as aviation can still be kept safe.

2.1.4 Progress in aviation safety can be described by four approaches, which roughly align with eras of activity. The approaches are listed below and are illustrated in Figure 2-1.

a) Technical — From the early 1900s until the late 1960s, aviation emerged as a form of mass transportation in which identified safety deficiencies were initially related to technical factors and technological failures. The focus of safety endeavours was therefore placed on the investigation and improvement of technical factors (the aircraft, for example). By the 1950s, technological improvements led to a gradual decline in the frequency of accidents, and safety processes were broadened to encompass regulatory compliance and oversight.

b) Human factors — By the early 1970s, the frequency of aviation accidents had significantly declined due to major technological advances and enhancements to safety regulations. Aviation became a safer mode of transportation, and the focus of safety endeavours was extended to include human factors, including such things as the "man/machine interface". Despite the investment of resources in error mitigation, human factors continue to be cited as a recurring factor in accidents. Human factors tended to focus on the individual, without fully considering the operational and organizational context. It was not until the early 1990s that it was acknowledged that individuals operate in a complex environment that included multiple factors which could affect behaviour.

c) Organizational — During the mid-1990s, safety began to be viewed from a systemic perspective and began encompassing organizational factors as well as human and technical factors. The notion of an "organizational accident" was introduced. This perspective considered the impact of such things as organizational culture and policies on the effectiveness of safety risk controls. Additionally, routine safety data collection and analysis using reactive and proactive methodologies enabled organizations to monitor known safety risks and detect emerging safety trends. These enhancements provided the learning and foundation which lead to the current safety management approach.

d) **Total system** — From the beginning of the 21st century, many AO had embraced the safety approaches of the past and evolved to a higher level of safety maturity. They have begun implementing SMSs and are reaping the safety benefits. However, safety systems to date have focused largely on individual safety performance and local control, with minimal regard for the wider context of the total aviation system. This has led to growing recognition of the complexity of the aviation system and the different organizations that all play a part in aviation safety. There are many examples of accidents and incidents showing that the interfaces between organizations have contributed to negative outcomes.

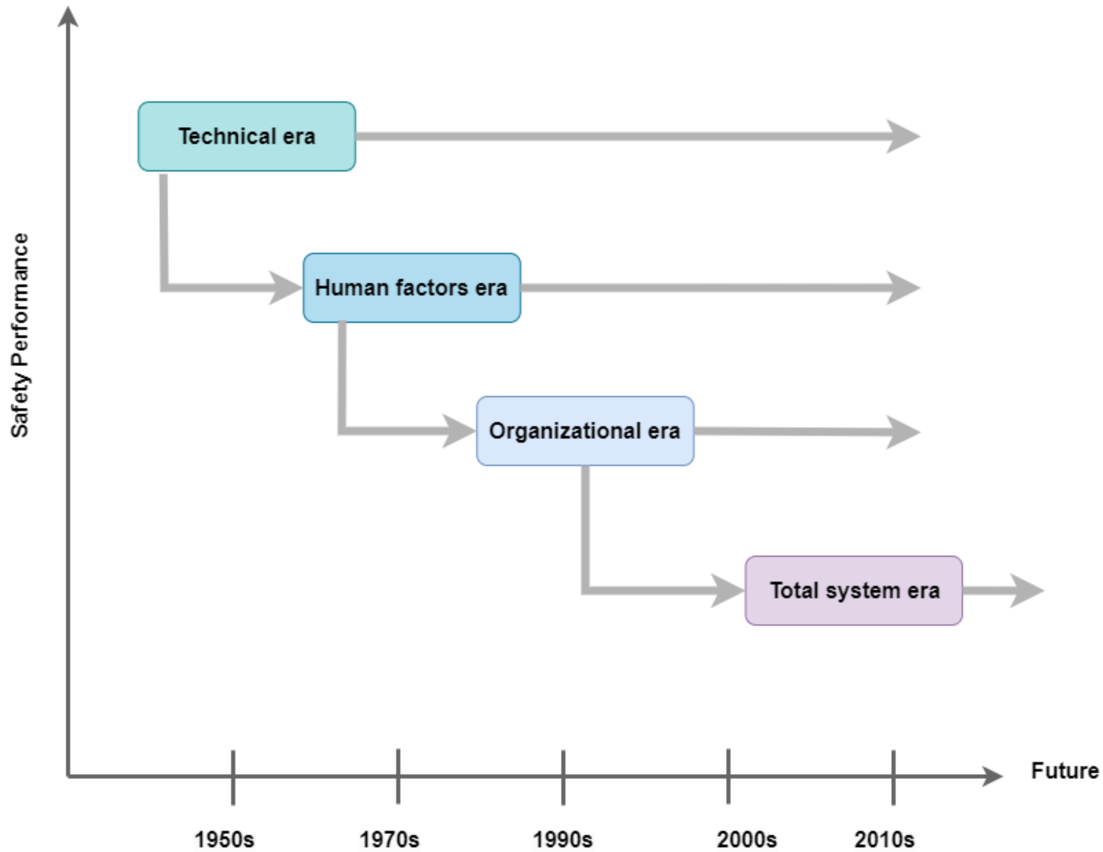

Figure 2-1. The evolution of safety

2.1.5 The steady, compounding evolution of safety has led AO to a point where they are giving serious consideration to the interactions and interfaces between the components of the system: people, processes, and technologies. This has led to a greater appreciation for the positive role people play in the system.

2.1.6 For the collaborative total system approach to flourish, the interfaces and interactions between the organizations need to be well understood and managed.

2.2 Humans in the system

2.2.1 How people think about their responsibilities towards safety and how they interact with others to perform their tasks at work significantly affects their organization's safety performance. Managing safety needs to address how people contribute, both positively and negatively, to organizational safety. Human factors is

about: understanding the ways in which people interact with the world, their capabilities and limitations, and influencing human activity to improve the way people do their work. As a result, the consideration of human factors is an integral part of safety management, necessary to understand, identify and mitigate risks as well as to optimize the human contributions to organizational safety.

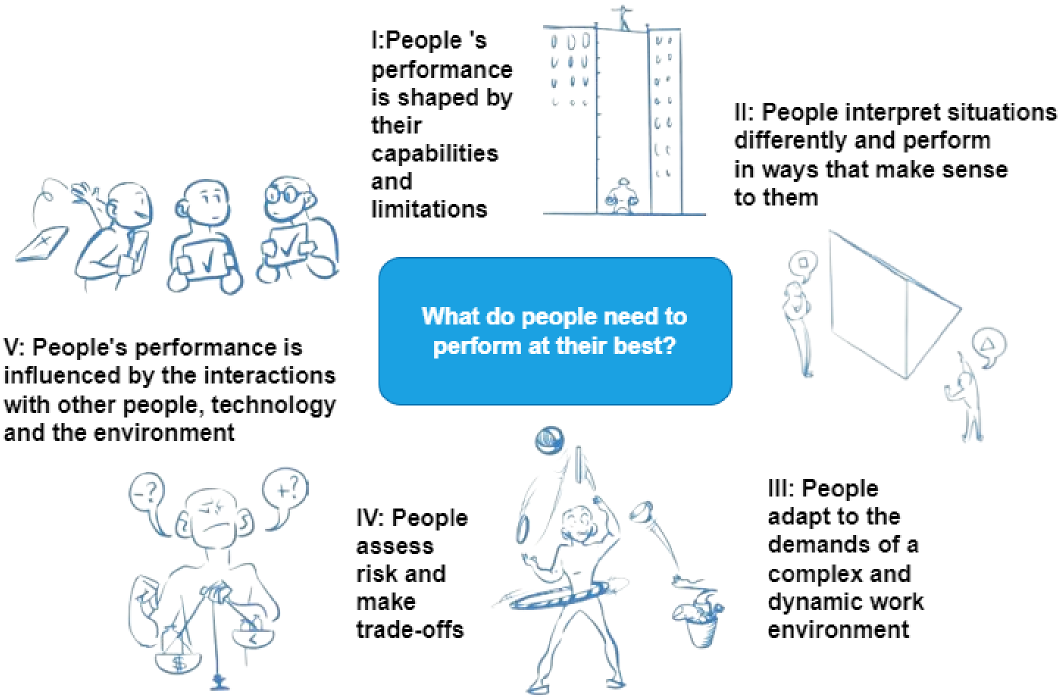

Figure 2-2. People in the system

2.2.2 The following are key ways in which safety management processes consider human factors:

a) senior management commitment to creating a working environment that optimizes human performance and encourages personnel to actively engage in and contribute to the organization's safety management processes;

b) responsibilities of personnel with respect to safety management are clarified to ensure common understanding and expectations;

c) personnel are provided with information by the organization that:

1) describes the expected behaviours in respect to the organizational processes and procedures;

2) describes what actions will be taken by the organization in response to individual behaviours;

d) human resourcing levels are monitored and adjusted to ensure there are enough individuals to meet operational demands;

e) policies, processes and procedures are established to encourage safety reporting;

f) safety data and safety information are analysed to allow consideration of those risks related to variable human performance and human limitations, with particular attention to any associated organizational and operational factors;

g) policies, processes and procedures are developed that are clear, concise and workable, with the aim of:

1) optimizing human performance;
2) preventing inadvertent errors;
3) reducing the unwanted consequences of variable human performance; the effectiveness of these are continually monitored during normal operations;

h) ongoing monitoring of normal operations includes assessment of whether processes and procedures are followed and, when they are not followed, investigations are carried out to determine the cause;

i) safety investigations include the assessment of contributing human factors, examining not only behaviours but reasons for such behaviours (context), with the understanding that in most case people are doing their best to get the job done;

j) management of change process includes consideration of the evolving tasks and roles of the human in the system;

k) personnel are trained to ensure they are competent to perform their duties, the effectiveness of training is reviewed and training programmes are adapted to meet changing needs.

2.2.3 The effectiveness of safety management depends largely on the degree of senior support and management commitment to create a working environment that optimizes human performance and encourages personnel to actively engage in and contribute to the organization's safety management processes.

2.2.4 To address the way that the organization influences human performance there must be senior level support to implement effective safety management. This includes management commitment to create the right working environment and the right safety culture to address human factors. This will also influence the attitudes and behaviours of everyone in the organization.

2.2.5 A number of models have been created to support the assessment of human factors on safety performance. The SHELL Model is well known and useful to illustrate the impact and interaction of the different system components on the human, and emphasizes the need to consider human factors as an integrated part of SRM.

2.2.6 Figure 2-2 illustrates the relationship between the human (at the centre of the model) and workplace components. The SHELL Model (see Figure 2-3) contains four satellite components:

a) **Software (S):** procedures, training, support, etc.;
b) **Hardware (H):** machines and equipment;

c) **Environment (E):** the working environment in which the rest of the L-H-S system must function; and

d) **Liveware (L):** other humans in the workplace.

Figure 2-3. SHELL Model

2.2.7 **Liveware.** The critical focus of the model is the humans at the front line of operations, and depicted in the centre of the model. However, of all the dimensions in the model, this is the one which is least predictable and most susceptible to the effects of internal (hunger, fatigue, motivation, etc.) and external (temperature, light, noise, etc.) influences. Although humans are remarkably adaptable, they are subject to considerable variations in performance. Humans are not standardized to the same degree as hardware, so the edges of this block are not simple and straight. The effects of irregularities at the interfaces between the various SHELL blocks and the central Liveware block should be understood to avoid tensions that may compromise human performance. The jagged edges of the modules represent the imperfect coupling of each module. This is useful in visualizing the following interfaces between the various components of the aviation system:

a) Liveware-Hardware (L-H). The L-H interface refers to the relationship between the human and the physical attributes of equipment, machines and facilities. This considers the ergonomics of operating the equipment by personnel, how safety information is displayed and how switches and operating levers are labelled and operated so they are logical and intuitive to operate.

b) Liveware-Software (L-S). The L-S interface is the relationship between the human and the supporting systems found in the workplace, e.g. regulations, manuals, checklists, publications, processes and procedures, and computer software. It includes such issues as the recency of experience, accuracy, format and presentation, vocabulary, clarity and the use of symbols. L-S considers the processes and procedures - how easy they are to follow and understand.

c) Liveware-Liveware (L-L). The L-L interface is the relationship and interaction between people in their work environment. Some of these interactions are within the organization (colleagues, supervisors, managers), many are between individuals from different organizations with different roles (air traffic controllers with pilots, pilots with engineers etc.). It considers the importance of communication and interpersonal skills, as well as group dynamics, in determining human performance. The advent of crew resource management and its extension to air traffic services (ATS) and maintenance operations has enabled organizations to consider team performance in the management of errors. Also within the scope of this interface are staff/management relationships and organizational culture.

d) Liveware-Environment (L-E). This interface involves the relationship between the human and the physical environment. This includes things such as temperature, ambient light, noise, vibration and air quality. It also considers the externally environmental factors, such as weather, infrastructure and terrain.

2.3 Accident Causation

2.3.1 The “Swiss-Cheese” (or Reason) Model, illustrates that accidents involve successive breaches of multiple defences. These breaches can be triggered by a number of enabling factors such as equipment failures or operational errors. The Swiss-Cheese Model contends that complex systems such as aviation are extremely well defended by layers of defences (otherwise known as “barriers”). A single-point failure is rarely consequential. Breaches in safety defences can be a delayed consequence of decisions made at the higher levels of the organization, which may remain dormant until their effects or damaging potential are activated by certain operating conditions (known as latent conditions). Under such specific circumstances, human failures (or “active failures”) at the operational level act to breach the final layers of safety defence. The Reason Model proposes that all accidents include a combination of both active failures and latent conditions.

2.3.2 Active failures are actions or inactions, including errors and rule-breaking, that have an immediate adverse effect. They are viewed, with the benefit of hindsight, as unsafe acts. Active failures are associated with front-line personnel (pilots, air traffic controllers, aircraft maintenance engineers, etc.) and may result in a harmful outcome.

2.3.3 Latent conditions can exist in the system well before a damaging outcome. The consequences of latent conditions may remain dormant for a long time. Initially, these latent conditions are not perceived as harmful, but under certain conditions may become clear when the operational level defences are breached. People far removed in time and space from the event can create these conditions. Latent conditions in the system may include those created by the safety culture; equipment choices or procedural design; conflicting organizational goals; defective organizational systems; or management decisions.

2.3.4 The “organizational accident” paradigm assists by identifying these latent conditions on a system-wide basis, rather than through localized efforts, to minimize active failures by individuals. Importantly, latent conditions, when created, had good intentions. Organizational decision makers are often balancing finite resources, and potentially conflicting priorities and costs. The decisions taken by decision makers, made on a daily basis in large organizations, might, in particular circumstances, unintentionally lead to a damaging outcome.

2.3.5 Figure 2-4 illustrates how the Swiss-Cheese Model assists in understanding the interplay of organizational and managerial factors in accident causation. Multiple defensive layers are built into the aviation system to protect against variations in human performance or decisions at all levels of the organization. But each layer typically has weaknesses, depicted by the holes in the slices of “Swiss cheese”. Sometimes all of the weaknesses align (represented by the aligned holes) leading to a breach that penetrates all defensive barriers and may result in a catastrophic outcome. The Swiss-Cheese Model represents how latent conditions are ever present within the system and can manifest through local trigger factors.

2.3.6 It is important to recognize that some of the defences, or breaches, can be influenced by an interfacing organization. It is therefore vitally important that aerodrome operators assess and manage these interfaces.

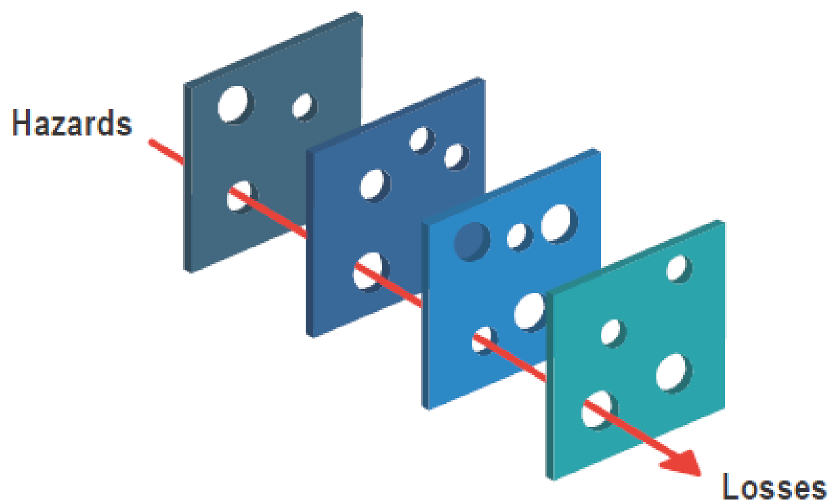

Figure 2-4. Concept of accident causation

2.3.7 "Swiss–Cheese" applications for safety management

2.3.7.1 The "Swiss-Cheese" Model can be used as an analysis guide by Aerodrome Operators by looking past the individuals involved in an incident or identified hazard, into the organizational circumstances which may have allowed the situation to manifest. It can be applied during SRM, safety surveillance, internal auditing, change management and safety investigation. In each case, the model can be used to consider which of the organization's defences are effective, which can or have been breached, and where the system could benefit from additional defences. Once identified, any weaknesses in the defences can be reinforced against future accidents and incidents.

2.3.7.2 In practice, the event will breach the defences in the direction of the arrow (hazards to losses) as displayed in the rendering of Figure 2-4. The assessments of the situation will be conducted in the opposite direction, in this case losses to hazard. Actual aviation accidents will usually include a degree of additional complexity. There are more sophisticated models which can help Aerodrome Operators to understand how and why accidents happen.

2.3.8 Practical drift

2.3.8.1 Scott A. Snook's theory of practical drift is used to understand how performance of any system "drifts away" from its original design. Tasks, procedures, and equipment are often initially designed and planned in a theoretical environment, under ideal conditions, with an implicit assumption that nearly everything can be predicted and controlled, and where everything functions as expected. This is usually based on three fundamental assumptions that the:

a) technology needed to achieve the system production goals is available;

b) personnel are trained, competent and motivated to properly operate the technology as intended; and

c) policy and procedures will dictate system and human behaviour.

These assumptions underlie the baseline (or ideal) system performance, which can be graphically presented as a straight line from the start of operational deployment as shown in Figure 2-5.

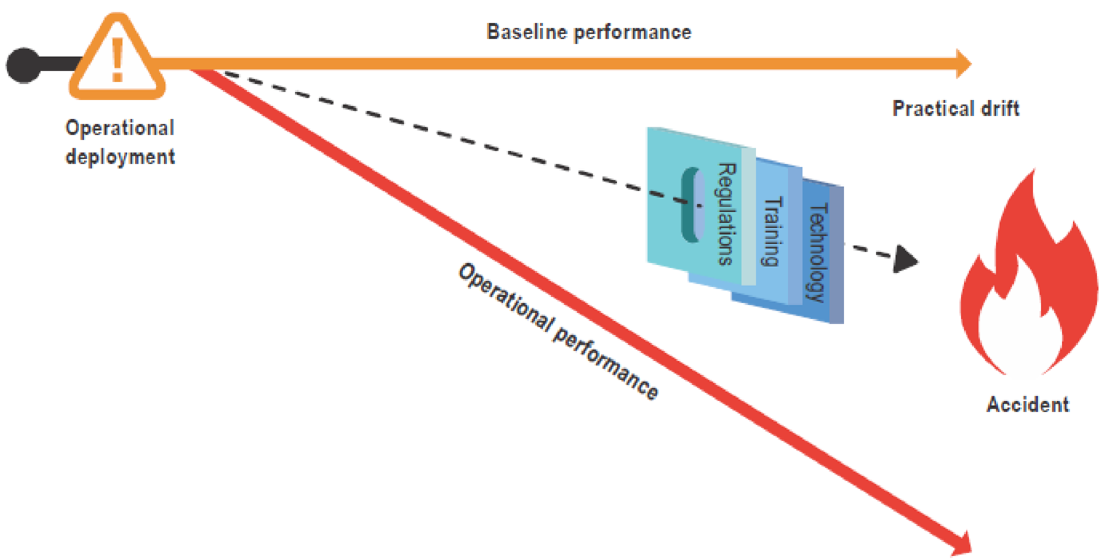

Figure 2-5. Concept of practical drift

2.3.8.2 Once operationally deployed, the system should ideally perform as designed, following baseline performance (orange line) most of the time. In reality, the operational performance often differs from the assumed baseline performance as a consequence of real-life operations in a complex, ever-changing and usually demanding environment (red line). Since the drift is a consequence of daily practice, it is referred to as a “practical drift”. The term “drift” is used in this context as the gradual departure from an intended course due to external influences.

2.3.8.3 Snook contests that practical drift is inevitable in any system, no matter how careful and well thought out its design. Some of the reasons for the practical drift include:

a) technology that does not operate as predicted;

b) procedures that cannot be executed as planned under certain operational conditions;

c) changes to the system, including the additional components;

d) interactions with other systems;

e) safety culture;

f) adequacy (or inadequacy) of resources (e.g. support equipment);

g) learning from successes and failures to improve operations, and so forth.

2.3.8.4 In reality people will generally make the system work on a daily basis despite the system's shortcomings, applying local adaptations (or workarounds) and personal strategies. These workarounds may bypass the protection of existing safety risk controls and defences.

2.3.8.5 Safety assurance activities such as audits, observations and monitoring of SPIs can help to expose activities that are "practically drifting". Analysing the safety information to find out why the drift is happening helps to mitigate the safety risks. The closer to the beginning of the operational deployment that practical drift is identified, the easier it is for the organization to intervene.

2.4 Management Dilemma

2.4.1 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.

2.4.2 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. For example, an aerodrome operator may wish to invest in new equipment. The new equipment may simultaneously provide the necessary efficiency improvements as well as improved reliability and safety performance. 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 safety risk controls may result in the activity becoming unprofitable, thus jeopardizing the viability of the organization.

2.4.3 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 2-6 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.

2.4.4 The need to balance profitability and safety (or production and protection) has become a readily understood and accepted requirement from an aerodrome operator perspective.

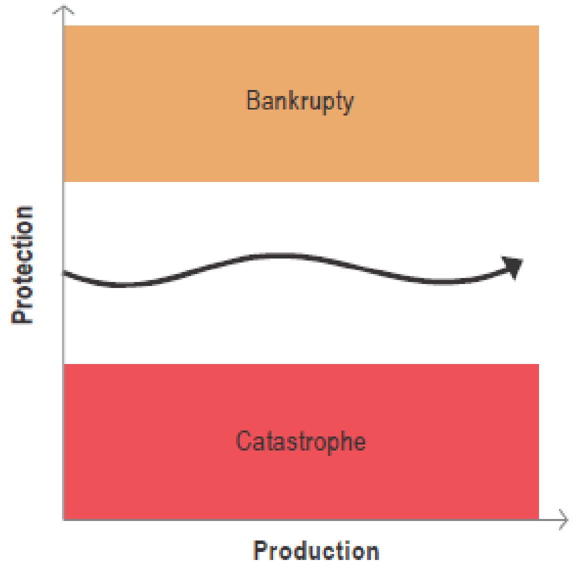

Figure 2-6. Concept of a safety space

2.5 Safety Risk Management

Safety Risk Management (SRM) is a key component of safety management and includes hazard identification, safety risk assessment, safety risk mitigation and risk acceptance. SRM is a continuous activity because the aviation system is constantly changing, new hazards can be introduced and some hazards and associated safety risks may change over time. In addition, the effectiveness of implemented safety risk mitigation strategies must be monitored to determine if further action is required.

2.5.1 Introduction to hazards

2.5.1.1 In aviation, a hazard can be considered as a dormant potential for harm which is present in one form or another within the system or its environment. This potential for harm may appear in different forms, for example: as a natural condition (e.g. terrain) or technical status (e.g. runway markings).

2.5.1.2 Hazards are an inevitable part of aviation activities, however, their manifestation and possible adverse consequences can be addressed through mitigation strategies which aim to contain the potential for the hazard to result in an unsafe condition. Aviation can coexist with hazards so long as they are controlled. Hazard identification is the first step in the SRM process. It precedes a safety risk assessment and requires a clear understanding of hazards and their related consequences.

2.5.2 Understanding hazards and their consequences

2.5.2.1 Hazard identification focuses on conditions or objects that could cause or contribute to the unsafe operation of aircraft or aviation safety-related equipment, products and services (guidance on distinguishing hazards that are directly pertinent to aviation safety from other general/industrial hazards is addressed in subsequent paragraphs).

2.5.2.2 Consider, for example, a fifteen-knot wind. Fifteen-knots of wind is not necessarily a hazardous condition. In fact, a fifteen-knot wind blowing directly down the runway improves aircraft take-off and landing performance. But if the fifteen-knot wind is blowing across the runway, a crosswind condition is created which may be hazardous to operations. This is due to its potential to contribute to aircraft instability. The reduction in control could lead to an occurrence, such as a lateral runway excursion.

2.5.2.3 It is not uncommon for people to confuse hazards with their consequences. A consequence is an outcome that can be triggered by a hazard. For example, a runway excursion (overrun) is a potential consequence related to the hazard of a contaminated runway. By clearly defining the hazard first, one can more readily identify possible consequences.

2.5.2.4 In the crosswind example above, an immediate outcome of the hazard could be loss of lateral control followed by a consequent runway excursion. The ultimate consequence could be an accident. The damaging potential of a hazard can materialize through one or many consequences. It is important that safety risk assessments identify all of the possible consequences. The most extreme consequence - loss of human life - should be differentiated from those that involve lesser consequences, such as: aircraft incidents; increased flight crew workload; or passenger discomfort. The description of the consequences will inform the risk assessment and subsequent development and implementation of mitigations through prioritization and allocation of resources. Detailed and thorough hazard identification will lead to more accurate assessment of safety risks.

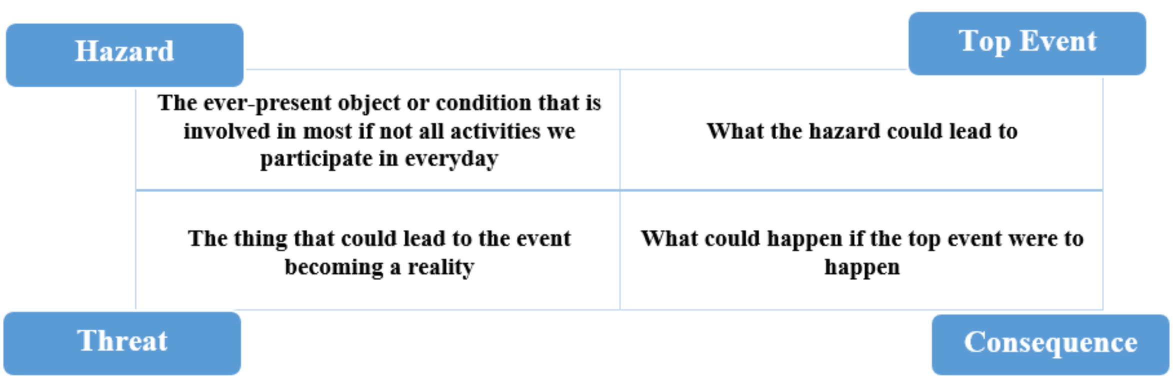

Figure 2-7. Hazard and their consequences

2.5.3 Hazard identification methodologies

2.5.3.1 The two main methodologies for identifying hazards are:

a) **Reactive**. This methodology involves analysis of past outcomes or events. Hazards are identified through investigation of safety occurrences. Incidents and accidents are an indication of system deficiencies and therefore can be used to determine which hazard(s) contributed to the event.

b) **Proactive**. This methodology involves collecting safety data of lower consequence events or process performance and analysing the safety information or frequency of occurrence to determine if a hazard could lead to an accident or incident. The safety information for proactive hazard identification primarily comes from flight data analysis (FDA) programmes, safety reporting systems and the safety assurance function.

2.5.3.2 Hazards can also be identified through safety data analysis which identifies adverse trends and makes predictions about emerging hazards, etc.

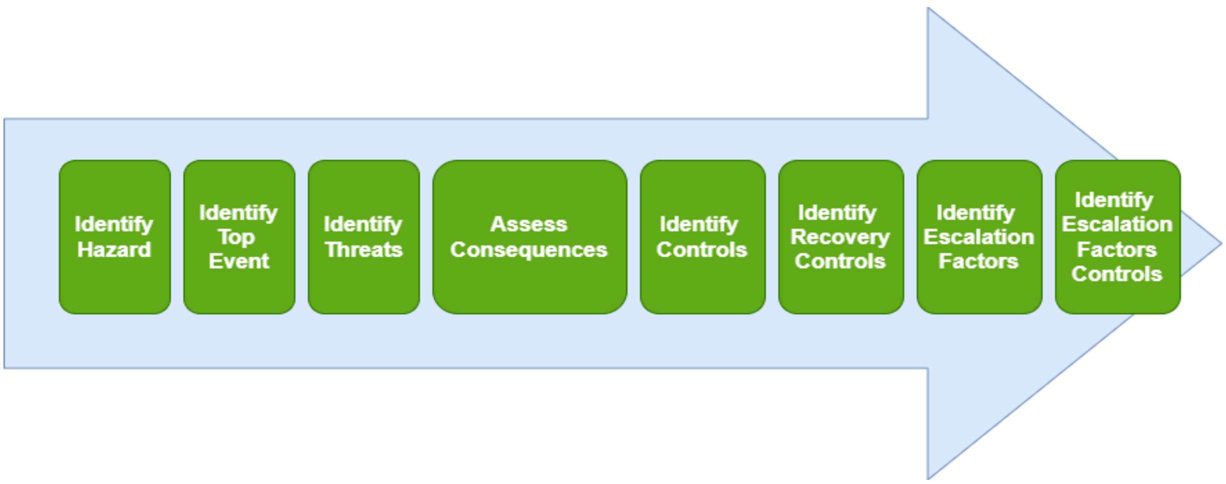

Figure 2-8. Hazard identification

2.5.4 Hazards related to SMS interfaces with external organizations

2.5.4.1 Aerodrome Operator should also identify hazards related to their safety management interfaces. This should, where possible, be carried out as a joint exercise with the interfacing organizations. The hazard identification should consider the operational environment and the various organizational capabilities (people, processes, technologies) which could contribute to the safe performance.

2.5.4.2 As an example, an aircraft turnaround involves many organizations and operational personnel all working in and around the aircraft. There are likely to be hazards related to the interfaces between operational personnel, their equipment and the coordination of the turnaround activity.

2.5.5 Safety risk probability

2.5.5.1 Safety 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?

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

2.5.5.3 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.

2.5.5.4 Table 2-1 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.

Table 2-1. Safety risk probability table

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

2.5.6 Safety risk severity

2.5.6.1 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:

1) being in the aircraft;

2) having direct contact with any part of the aircraft, including parts which have become detached from the aircraft; or

3) having direct exposure to jet blast; and

b) damage:

1) 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.

2.5.6.2 The severity assessment should consider all possible consequences related to a hazard, taking into account the worst foreseeable situation. Table 2-2 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 2-2. Example safety risk severity table

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

2.5.7 Safety risk tolerability

2.5.7.1 The 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 2-3. The safety risk assessment matrix is used to determine safety risk tolerability.

Table 2-3. Example 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

2.5.7.2 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 2-4 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 aerodrome operator 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.

2.5.7.3 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 2- 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 risk mitigation to ensure additional or enhanced preventative controls are in placeto 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. Itmay require management decision to accept the risk.
3E, 2D, 2E, 1B, 1C, 1D, 1E	ACCEPTABLE	Acceptable as is. No further safety risk mitigation required.

2.5.8 Assessing human factors related risks

2.5.8.1 The consideration of human factors has particular importance in SRM as people can be both a source and a solution of safety risks by:

a) contributing to an accident or incident through variable performance due to human limitations;

b) anticipating and taking appropriate actions to avoid a hazardous situation; and

c) solving problems, making decisions and taking actions to mitigate risks.

2.5.8.2 It is therefore important to involve people with appropriate human factors expertise in the identification, assessment and mitigation of risks.

2.5.8.3 SRM requires all aspects of safety risk to be addressed, including those related to humans. Assessing the risks associated with human performance is more complex than risk factors associated with technology and environment since:

a) human performance is highly variable, with a wide range of interacting influences internal and external to the individual. Many of the effects of the interaction between these influences are difficult, or impossible to predict; and

b) the consequences of variable human performance will differ according to the task being performed and the context.

2.5.8.4 This complicates how the probability and the severity of the risk is determined. Therefore, human factors expertise is valuable in the identification and assessment of safety risks. (The management of fatigue using SMS processes is addressed in the Manual for the Oversight of Fatigue Management Approaches (Doc 9966).

2.5.9 Safety risk mitigation strategies

2.5.9.1 Safety risk mitigation is often referred to as a safety risk control. Safety risks should be managed to an acceptable level by mitigating the safety risk through the application of appropriate safety risk controls. This should be balanced against the time, cost and difficulty of taking action to reduce or eliminate the safety risk. The level of safety risk can be lowered by reducing the severity of the potential consequences, reducing the likelihood of occurrence or by reducing exposure to that safety risk. It is easier and more common to reduce the likelihood than it is to reduce the severity.

2.5.9.2 Safety risk mitigations are actions that often result in changes to operating procedures, equipment or infrastructure. Safety risk mitigation strategies fall into three categories:

a) *Avoidance:* The operation or activity is cancelled or avoided because the safety risk exceeds the benefits of continuing the activity, thereby eliminating the safety risk entirely.

b) *Reduction:* The frequency of the operation or activity is reduced, or action is taken to reduce the magnitude of the consequences of the safety risk.

c) *Segregation:* Action is taken to isolate the effects of the consequences of the safety risk or build in redundancy to protect against them.

2.5.9.3 The consideration of human factors is an integral part of identifying effective mitigations because humans are required to apply, or contribute to, the mitigation or corrective actions. For example, mitigations may include the use of processes or procedures. Without input from those who will be using these in "real world" situations and/or individuals with human factors expertise, the processes or procedures developed may not be fit for their purpose and result in unintended consequences. Further, human performance limitations should be considered as part of any safety risk mitigation, building in error capturing strategies to address human performance variability. Ultimately, this important human factors perspective results in more comprehensive and effective mitigations.

2.5.9.4 A safety risk mitigation strategy may involve one of the approaches described above or may include multiple approaches. It is important to consider the full range of possible control measures to find an optimal solution. The effectiveness of each alternative strategy must be evaluated before a decision is made. Each proposed safety risk mitigation alternative should be examined from the following perspectives:

a) *Effectiveness.* The extent to which the alternatives reduce or eliminate the safety risks. Effectiveness can be determined in terms of the technical, training and regulatory defences that can reduce or eliminate safety risks.

b) *Cost/benefit.* The extent to which the perceived benefits of the mitigation outweighs the costs.

c) *Practicality.* The extent to which mitigation can be implemented and how appropriate it is in terms of available technology, financial and administrative resources, legislation, political will, operational realities, etc.

d) *Acceptability.* The extent to which the alternative is acceptable to those people that will be expected to apply it.

e) *Enforceability.* The extent to which compliance with new rules, regulations or operating procedures can be monitored.

f) *Durability.* The extent to which the mitigation will be sustainable and effective.

g) *Residual safety risks.* The degree of safety risk that remains subsequent to the implementation of the initial mitigation and which may necessitate additional safety risk control measures.

h) *Unintended consequences.* The introduction of new hazards and related safety risks associated with the implementation of any mitigation alternative.

i) *Time.* Time required for the implementation of the safety risk mitigation alternative.

2.5.9.5 Corrective action should take into account any existing defences and their (in)ability to achieve an acceptable level of safety risk. This may result in a review of previous safety risk assessments that may have been impacted by the corrective action. Safety risk mitigations and controls will need to be verified/audited to ensure that they are effective. Another way to monitor the effectiveness of mitigations is through the use of SPIs.

2.5.10 Safety risk management documentation

2.5.10.1 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.

2.5.10.2 Maintaining a register of identified hazards 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, and what action(s) were taken to mitigate it. Hazard registers are usually in a table format and typically include: the hazard, potential consequences, assessment of associated risks, identification date, hazard category, short description, when or where it applies, who identified it and what measure have been put in place to mitigate the risks.

2.5.10.3 Safety risk decision-making tools and processes can be used to improve the repeatability and justification of decisions taken by organizational safety decision makers. An example of a safety risk decision aid is provided below in Figure 2-9.

2.5.11 Cost-benefit analysis

Cost-benefit or cost-effectiveness analysis is normally carried out during the safety risk mitigation activities. It is commonly associated with business management, such as a regulatory impact assessment or project management processes. However, there may be situations where a safety risk assessment may have a significant financial impact. In such situations, a supplementary cost-benefit analysis or cost-effectiveness process to support the safety risk assessment may be warranted. This will ensure cost-effectiveness analysis or justification of recommended safety risk control actions has been taken into consideration, with the associated financial implications.

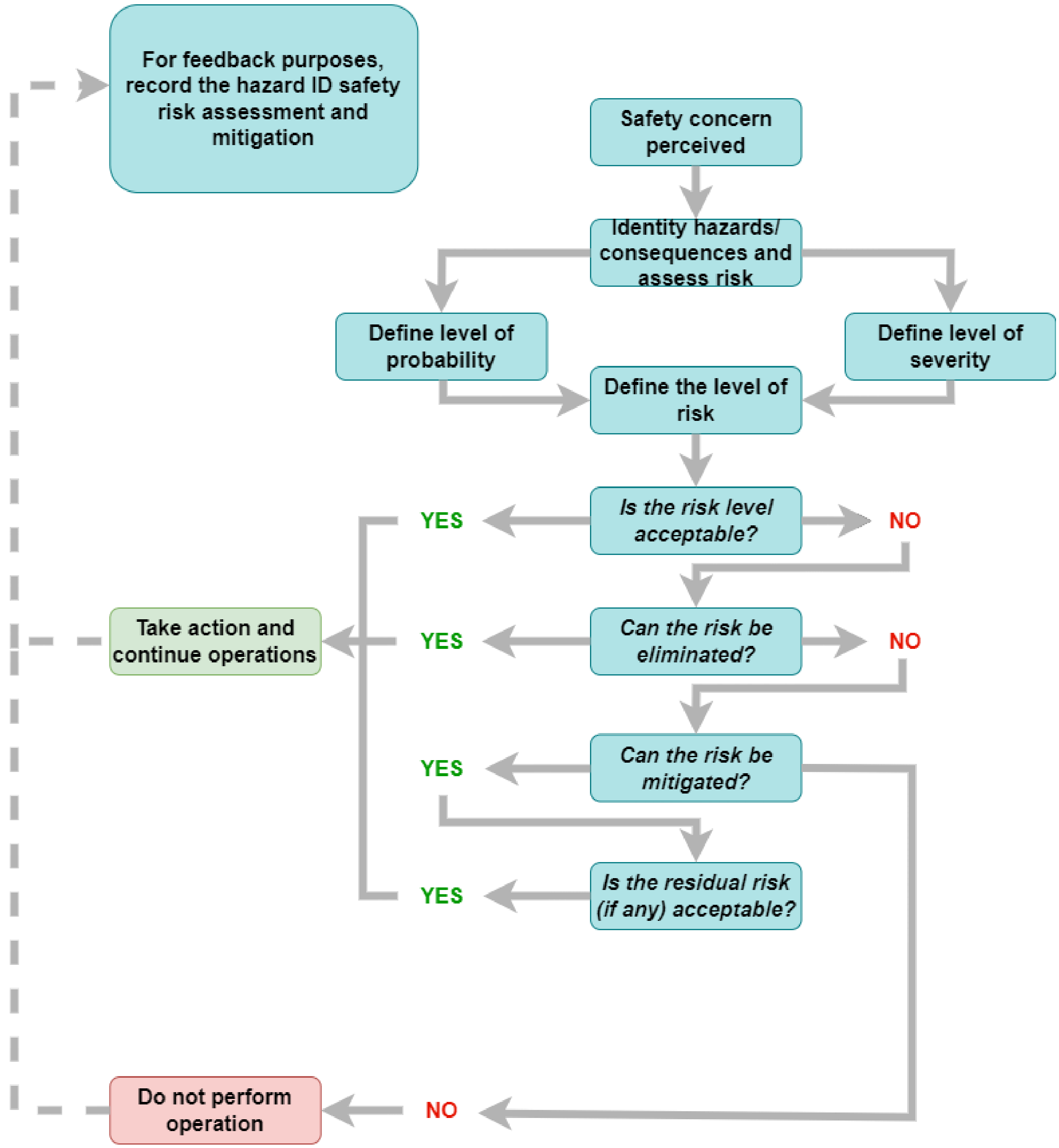

Figure 2-9. Safety risk management decision aid

3.SAFETY CULTURE

3.1 Introduction

3.1.1 A safety culture is the natural consequence of having humans in the aviation system. Safety culture has been described 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 behaviors throughout the organization.

3.1.2 Aerodrome Operator should promote a positive safety culture with the aim of fostering effective safety management implementation through the SMS. This chapter provides guidance on the promotion of a positive safety culture.

3.2 Safety Culture and Safety Management

3.2.1 Whether an organization realizes it or not, it will have a number of different "safety cultures" that reflect group-level attitudes and behaviors. No two organizations are identical, and even within the same organization, different groups may have various ways of thinking about safety, talking about safety and acting on safety issues. This variation may be appropriate for different activities.

3.2.2 How safety values are incorporated into practices by management and personnel directly affects how key elements of the SMS are established and maintained. As a consequence, safety culture has a direct impact on safety performance. If someone believes that safety is not that important then workarounds, cutting corners, or making unsafe decisions or judgements may be the result, especially when the risk is perceived as low and there is no apparent consequence or danger. The safety culture of an organization therefore significantly influences how their SMS develops and how effective it becomes. Safety culture is arguably the single most important influence on the management of safety. If an organization has instituted all the safety management requirements but does not have a positive safety culture, it is likely to underperform.

3.2.3 When the organization has a positive safety culture, and this is visibly supported by upper- and middle management, front-line personnel tend to feel a sense of shared responsibilities towards achieving the organization's safety objectives. Effective safety management also supports efforts to drive towards an increasingly positive safety culture by increasing the visibility of management's support and improving active involvement of personnel in managing safety risk.

3.2.4 A positive safety culture relies on a high degree of trust and respect between personnel and management. Time and effort are needed to build a positive safety culture, which can be easily damaged by management decisions and actions, or inactions. Continuous effort and reinforcement are needed. When leadership actively endorses safe practices, it becomes the normal way of doing things. The ideal situation is a fully implemented and effective SMS and a positive safety culture. Hence, an aerodrome operator safety culture is often seen as a reflection of the maturity of its SMS. Effective safety management empowers a positive safety culture and a positive safety culture empowers effective safety management.

3.2.5 Safety culture and its influence on safety reporting

3.2.5.1 SMSs are sustained by safety data and safety information that is necessary to address existing and potential safety deficiencies and hazards, including safety issues identified by personnel. The success of a reporting system depends entirely on the continuous flow of information from, and feedback to, organizations and individuals. The protection of safety data, safety information and related sources is essential to ensure continued availability of information. For example, in voluntary safety reporting systems, this may be realized through a system that is confidential, and not used for purposes other than maintaining or improving safety. The benefits are twofold. Often personnel are the closest to safety hazards, so a voluntary reporting system enables them to actively identify these hazards and suggest workable solutions. At the same time, the regulator or management is able to gather important safety information and build trust with the organizations or operational personnel who are reporting the information.

3.2.5.2 Whether organizations or individuals are willing to report their experiences and errors is largely dependent on the perceived benefits and disadvantages associated with reporting. Safety reporting systems may be anonymous or confidential. In general, in an anonymous reporting system a reporter does not provide their identity. In this case there is no opportunity for further clarification of the report's contents, or the ability to provide feedback. In a confidential reporting system, any identifying information about the reporter is known only to a designated custodian. If organizations and individuals who report safety issues are protected and treated in a fair and consistent manner, they are more likely to divulge such information and work with the regulator or management to effectively manage the associated safety risk(s).

3.2.6 Safety culture and organizational change

3.2.6.1 Safety management requires that organizations manage the safety risks associated with organizational and operational changes. Staff concerns about workload, job security and access to training are associated with significant change in organizations and can have a negative impact on safety culture. The degree to which staff feel involved in the development of change and understand their role in the process will also influence the safety culture.

3.3 Developing a positive safety culture

3.3.1 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 behaviors 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.

3.3.2 Actions by management and employees can help drive their safety culture to be more positive. Table 3-1 provides examples of the types of management and employee actions that will enable or disable a positive safety culture in an organization. Organizations should focus on providing enablers and removing any disablers to promote and achieve a positive safety culture.

Table 3-1. Examples of actions that will enable or disable a positive safety culture

Element / General Description	Enablers	Disablers
Commitment to safety		
Commitment to safety reflects the extent to which senior management 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 also.	• 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 regard to safety management is established.
Adaptability		
Adaptability reflects the extent to which employees and 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.	• An effective way of hazard identification has been established; • Investigations seek to establish the root cause;	• No effort is spent on hazard identification;

	• 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.	• 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 analyzed and acted upon.
Behavior with respect to safety		
Behavior 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 behavior is practiced; • Intentional unsafe behavior is not tolerated by management and colleagues; • The working conditions support aviation safety at all times.	• Employees are not punished for intentional unsafe behavior to the benefits of their own or other interests; • The working conditions provoke behavior and work around that are detrimental to aviation safety; • No monitoring of aviation safety within the organization's products or services is practiced; • 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.	• 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 regard 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.
Trust		
Employee 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	• There is a distinction between acceptable and unacceptable behavior, which is known to all employees; • Occurrences (including accidents and incidents) investigations	• There is no identifiable distinction between acceptable and unacceptable behavior; • Employees are systematically and rigorously punished for human errors;

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 Aerodrome Operator have access to relevant data and information that is necessary to address existing and potential safety deficiencies and hazards. These systems create an environment in which people can be confident that safety data and safety information will be used exclusively for improving safety.	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.	• Accident and occurrence investigations focus on individual factors only; • Good safety performance and safe behavior is taken for granted.

3.4 Monitoring safety culture

3.4.1 Safety culture is subject to many influences and organizations may choose to assess their safety culture to:

a) understand how people feel about the organization and how importantly safety is perceived;

b) identify strengths and weaknesses;

c) identify differences between various groups (subcultures) within an organization; and

d) examine changes over time (e.g. in response to significant organizational changes such as following an accident, a change in senior management or altered industrial relations arrangement).

3.4.2 There are a number of tools which are used to assess safety culture maturity, usually in combination:

a) questionnaires;

b) interviews and focus groups;

c) observations; and

d) document reviews.

3.4.3 Assessing safety culture maturity can provide valuable insight, leading to actions by management that will encourage the desired safety behaviors. It should be noted that there is a degree of subjectivity with such assessments and they may reflect the views and perceptions of the people involved at a particular moment only. Also, scoring safety culture maturity can have unintended consequences by inadvertently encouraging the organization to strive to achieve the "right" score, rather than working together to understand and improve the safety culture.

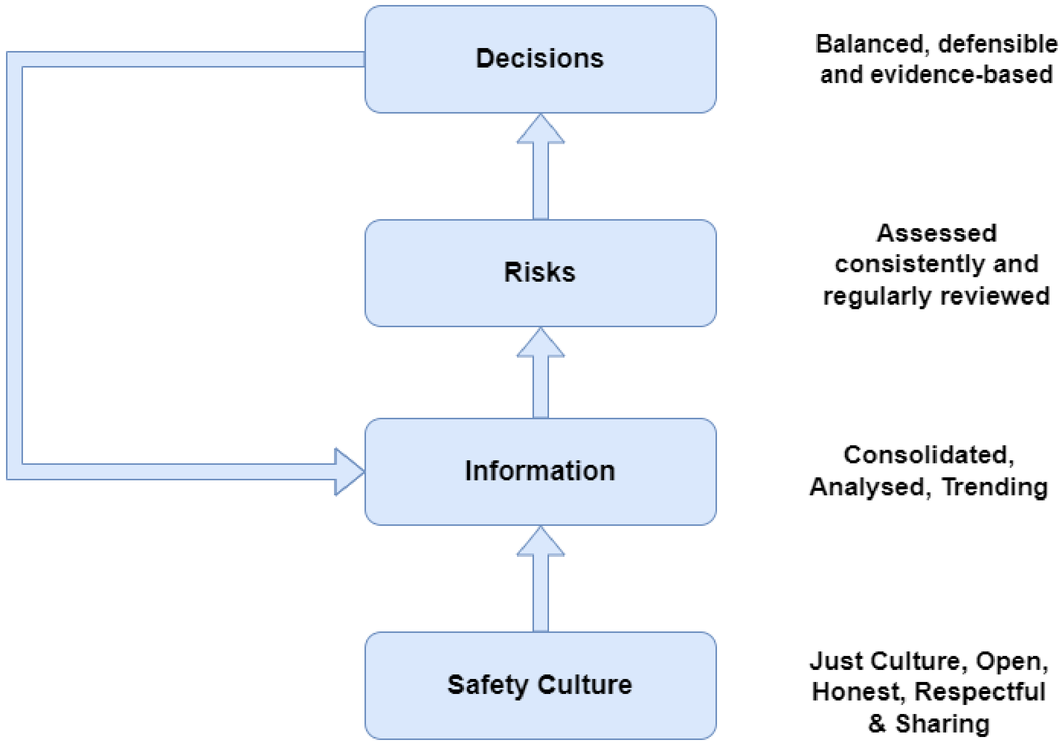

Figure 3-1 Safety Culture

4.SAFETY PERFORMANCE MANAGEMENT

4.1 Introduction

4.1.1 Safety performance management is central to the functioning of SMSs. Properly implemented, it will provide an organization with the means to determine whether its activities and processes are working effectively to achieve its safety objectives. This is accomplished through the identification of safety performance indicators (SPIs), which are used to monitor and measure safety performance. Through the identification of SPIs, information obtained will allow senior management to be aware of the current situation and support decision-making, including determining whether actions are required to further mitigate safety risks to ensure the organization achieves its safety goals.

4.1.2 The generic safety performance management process is shown in Figure 4-1 below.

4.1.3 Safety performance management helps the organization to ask and to answer the four most important questions regarding safety management:

a) What are the organization's top safety risks? Derived from a review of aviation accident and incident data as well as predictive analysis to identify and define emerging risks.

b) What does the organization want to achieve in terms of safety and what are the top safety risks that need to be addressed? The organization's safety objectives.

c) How will the organization know if it is making progress toward its safety objectives? Through SPIs, SPTs and, if practicable, safety triggers.

d) What safety data and safety information are needed to make informed safety decisions? Including the allocation of the organization's resources.

Figure 4-1. Safety Performance Management process

4.2 Safety performance management and interfaces

4.2.1 When Aerodrome Operators are considering implementing safety management, it is important to consider the safety risks induced by interfacing entities. Interfaces can be internal (e.g. between operations and maintenance or finance, human resources or legal departments), or they can be external (e.g. other aerodrome operators or contracted services). Hazards and related risks at the interface points are among the most common contributors to safety occurrences. Aerodrome Operator have greater control over interface-related risks when their interfaces are identified and managed. Interfaces should be defined in the organization's system description.

4.2.2 ACAA and Aerodrome Operators are responsible for ongoing monitoring and management of their interfaces to ensure safe outcomes. The safety risk posed by each interface should, ideally, be collaboratively assessed by the interfacing entities. Collaboration is highly desirable because the perception of safety risks and their tolerability may vary between the interfacing organizations. Sharing of interface risk management, through the establishment and monitoring of SPIs, encourages the mutual awareness of safety risks rather than ignorance or potentially one-sided risk management. It also creates an opportunity for transfer of knowledge and working practices that could improve the safety effectiveness of both organizations.

4.2.3 For this reason, SPIs should be agreed and established to monitor and measure the risks and the effectiveness of mitigating actions. A formal interface management agreement between interfacing organizations, with clearly defined monitoring and management responsibilities, is an example of an effective approach.

4.3 Safety objectives

4.3.1 Safety 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. The management of safety performance should be a primary consideration when amending policies or processes, or allocating the organization's resources in pursuit of improving safety performance.

Figure 4-2. Safety Objective

4.3.2 Safety objectives may be:

a) *process-oriented:* stated in terms of safe behaviors 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.

4.3.3 The 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.

Table 4-1. Examples of safety objectives

Examples of safety objectives	
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.

4.3.4 An organization may also choose to identify safety objectives at the tactical or operational level or apply them to specific projects and processes. A safety objective may also be expressed by the use of other terms with a similar meaning (e.g. goal or target).

Figure 4-3. An Aerodrome Operator example

4.4 Safety Performance Indicators and Safety Performance Targets

4.4.1 Types of safety performance indicators

Qualitative and quantitative indicators

4.4.1.1 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. The choice of indicator depends on the availability of reliable data that can be measured quantitatively. Each option, qualitative or quantitative, involves different kinds of SPIs, and requires a thoughtful SPI selection process. A combination of approaches is useful in many situations, and can solve many of the problems which may arise from adopting a single approach. An example of a qualitative indicator for an Aerodrome Operator can be the assessment of the safety culture.

4.4.1.2 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.

4.4.1.3 For this reason, where appropriate, SPIs should be reflected in terms of a relative rate to measure the performance level regardless of the level of activity. This provides a normalized measure of performance; whether the activity increases or decreases. As example, 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.

Lagging and leading indicators

4.4.1.4 The two most common categories to classify 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.

4.4.1.5 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.

4.4.1.6 Trends in lagging SPIs can be analyzed 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 a mitigation.

4.4.1.7 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 did 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.

4.4.1.8 Aviation safety measures have historically been biased towards SPIs that reflect "low probability/high severity" outcomes. This is understandable in that accidents and serious incidents are high profile events and are easy to count. However, from a safety performance management perspective, there are drawbacks in an overreliance on accidents and serious incidents as a reliable indicator of safety performance. For instance, accidents and serious incidents are infrequent (there may be only one accident in a year, or none) making it difficult to perform statistical analysis to identify trends. This does not necessarily indicate that the system is safe. A consequence of a reliance on this sort of data is a potential false sense of confidence that an organization's or system's safety performance is effective, when it may in fact be perilously close to an accident.

4.4.1.9 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.

4.4.1.10 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".

4.4.1.11 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".

4.4.1.12 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 4-4 illustrates the concept of leading and lagging indicators that provide a more comprehensive and realistic picture of the organization's safety performance.

4.4.2 Selecting and defining SPIs

4.4.2.1 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.

4.4.2.2 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.

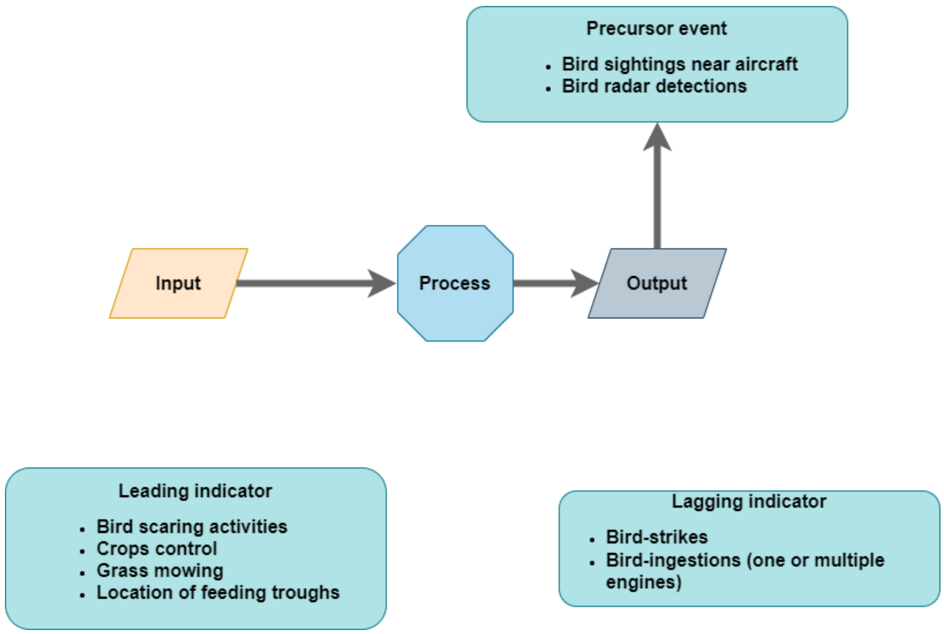

Figure 4-4. Leading vs Lagging indicator concept phases

4.4.2.3 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.

4.4.2.4 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 4-5.

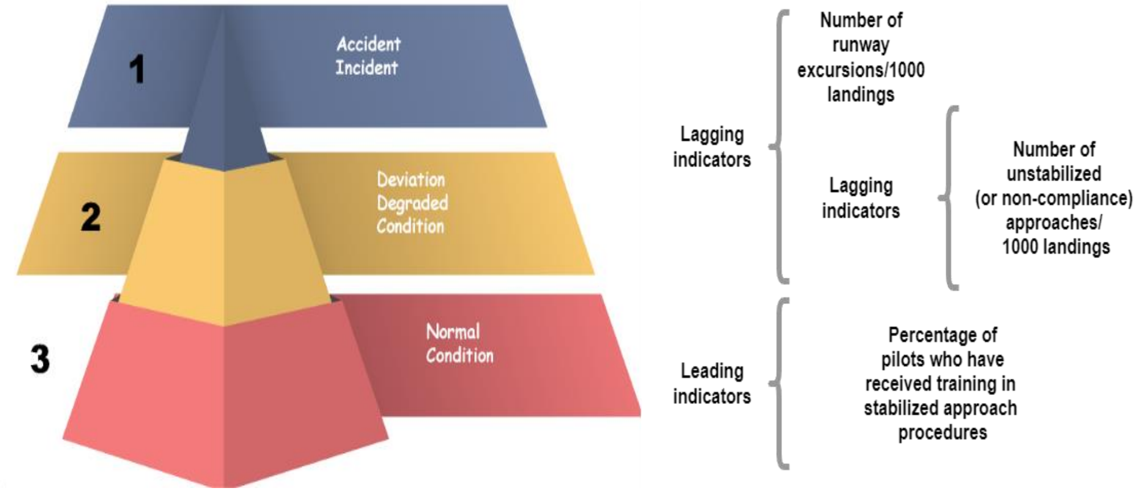

Figure 4-5. Examples of links between lagging and leading indicators

4.4.2.5 It is important to select SPIs that relate to the organization's safety objectives. 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.

Defining SPIs

4.4.2.6 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.

SPIs and safety reporting

4.4.2.7 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 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.

4.4.3 Setting safety performance targets

4.4.3.1 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.

4.4.3.2 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.

Setting targets with high-level safety objectives

4.4.3.3 Targets are established with senior management agreeing on high-level 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, analyzing 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.

Setting targets with SMART safety objectives

4.4.3.4 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 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.

4.4.3.5 An example of the relationship between safety objectives, SPIs and SPTs is illustrated in Figure 4-6. In this example, the organization recorded 100 runway excursions per million movements in 2018. It has been determined this is too many, and an objective to reduce the number of runway excursions by fifty per cent by 2022 has been set. Specific targeted actions and associated timelines have been defined to meet these targets. To monitor, measure and report their progress, the organization has chosen "RWY excursions per million movements per year" as the SPI. The organization is aware that progress will be more immediate and effective if specific targets are set which align with the safety objective. They have therefore set a safety target which equates to an average reduction of 12.5 per year over the reporting period (four years). As shown in the graphical representation, 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. In the Figure 4-6:

a) the SMART safety objective is "50 per cent reduction in RWY excursions rate by 2022";

b) the SPI selected is the "number runway excursions per million movements per year"; and

c) the safety targets related to this objective represent milestones for reaching the SMART safety objective and equate to a ~12 per cent reduction each year until 2022;

   1) SPT 1a is "less than 78 runway excursions per million movement in 2019";

   2) SPT 1b is "less than 64 runway excursions per million movement in 2020";

   3) SPT 1c is "less than 55 runway excursions per million movement in 2021".

Figure 4-6. Example SPTs with SMART safety objectives

Additional considerations for SPI and SPT selection

4.4.3.6 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 favor 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 behavior.* SPTs can change behaviors 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 behaviors that deliberately result in defensible decisions and safety performance improvement. It is equally important to consider the potential unintended behaviors 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 behaviors. 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. It is imperative that the organization consider the context within which the target was achieved, rather than looking at an SPT in isolation. Recognition for overall improvement in safety performance, rather than an individual SPT achievement, will foster desirable organizational behaviors and encourage exchange of safety information that lies at the heart of both SRM and safety assurance.

Caveats on setting SPTs

4.4.3.7 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 behaviors; 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.

4.4.4 Safety Performance Measurement

Getting safety performance measurement right involves deciding how best to measure the achievement of the safety objectives. Organizations should take the time to develop their strategic awareness of what it is that drives safety improvement for their safety objectives.

4.4.5 Use of SPIs and SPTs

SPIs and SPTs can be used in different ways to demonstrate safety performance. It is crucial that organizations tailor, select and apply various measurement tools and approaches depending on their specific circumstances and the nature of what is being measured. For instance, in some cases, organizations could adopt SPIs that all have specific associated SPTs. In another situation, it may be preferable to focus on achieving a positive trend in the SPIs, without specific target values. The package of selected performance metrics will usually employ a combination of these approaches.

4.5 Monitoring safety performance

4.5.1 Once an organization has identified the targets based on the SPIs they believe will deliver the planned outcome, they must ensure the stakeholders follow through by assigning clear responsibility for delivery.

4.5.2 Mechanisms for monitoring and measuring the organization's safety performance should be established to identify what changes may be needed if the progress made isn't as expected and reinforce the commitment of the organization to meet its safety objectives.

4.5.3 Baseline safety performance

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. 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.

4.5.4 Refinement of SPIs and SPTs

4.5.4.1 SPIs and associated SPTs will have to be reviewed to determine if they are providing the information needed to track the progress being made toward the safety objectives and to ensure that the targets are realistic and achievable.

4.5.4.2 Safety 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.

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.

4.5.4.3 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 to continue, discontinue or change 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 and 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) safety objectives have changed and as a consequence the SPIs require updating to remain relevant.

4.5.5 Safety triggers

4.5.5.1 A brief perspective on the notions of triggers is relevant to assist in their eventual role within the context of the management of safety performance by an organization.

4.5.5.2 A 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.

4.5.5.3 Once SPTs and trigger settings (if used) have been defined, their associated SPI may be tracked for their respective performance status. A consolidated summary of the overall SPT and trigger performance outcome of the complete SPIs package may also be compiled and/or aggregated for a given monitoring period. Qualitative values (satisfactory/unsatisfactory) may be assigned for each SPT achievement and each trigger level not breached. Alternatively, numeric values (points) may be used to provide a quantitative measurement of the overall performance of the SPIs package.

4.5.5.4 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.

4.5.5.5 Figure 4-7 below is an extension of the previous example, “50 per cent reduction in runway excursions by 2022”. In this scenario, it is now the year 2020. The organization has been collecting safety data (SPI – “No runway excursions/million movement/yr”) and working with stakeholders to reduce the instances. The SPT for 2019 (<78 runway excursions/million movement in year) was achieved. However, the SPI shows that, not only was the SPT for 2020 (<64 runway excursions/million movement in year) not achieved, the number of excursions has exceeded the trigger in two consecutive reporting periods. The decision makers have been alerted to the deterioration in safety performance and are in a position to make decisions based on the data to take further action(s). Their data-driven decisions will aim to drive the safety performance back to within the acceptable zone, and on track to achieve their safety objective.

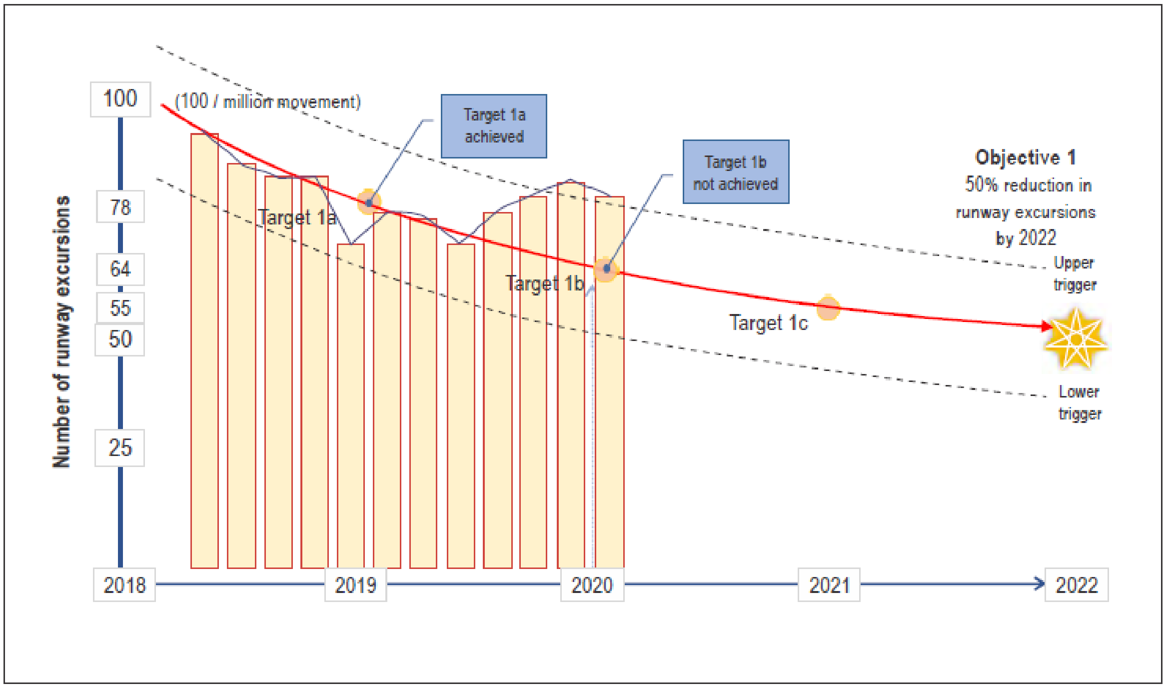

Figure 4-7 Example of setting safety triggers

4.5.6 Identifying actions required

4.5.6.1 Arguably the most important outcome of establishing a safety performance management structure is the presentation of information to the organization's decision makers so they can make decisions based on current, reliable safety data and safety information. The aim should always be to make decisions in accordance with the safety policy and towards the safety objectives.

4.5.6.2 In relation to safety performance management, data-driven decision-making is about making effective, well-informed decisions based on the results of monitored and measured SPIs, or other reports and analysis of safety data and safety information. Using valid and relevant safety data combined with information that provides context supports the organization in making decisions that align with its safety objectives and targets. Contextual information may also include other stakeholder priorities, known deficiencies in the data, and other complementary data to evaluate the pros, cons, opportunities, limitations and risks associated with the decision. Having the information readily available and easy to interpret helps to mitigate bias, influence and human error in the decision-making process.

4.5.7 Update of safety objectives

Safety performance management is not intended to be "set and forget". Safety performance management is dynamic and central to the functioning of every aerodrome operator, 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.

5.SAFETY DATA COLLECTION AND PROCESSING SYSTEMS

5.1 Introduction

5.1.1 Safety data is what is initially reported or recorded as the result of an observation or measurement. It is transformed to safety information when it is processed, organized, integrated or analysed in a given context to make it useful for management of safety. Safety information may continue to be processed in different ways to extract different meanings.

5.1.2 The effective management of safety is highly dependent on the effectiveness of safety data collection, analysis and overall management capabilities. Having a solid foundation of safety data and safety information is fundamental for safety management, since it is the basis for data-driven decision-making. Reliable safety data and safety information is needed to identify trends, make decisions and evaluate safety performance in relation to safety targets and safety objectives, and to assess risk.

5.1.3 Aerodrome Operator should develop and maintain a formal process to collect, record, act on and generate feedback on hazards in their activities, based on a combination of reactive and proactive methods of safety data collection.

5.1.4 Organizations should ensure they have personnel qualified to collect and store safety data, and the competencies needed to process safety data. This usually requires individuals with strong information technology skills as well as knowledge of data requirements, data standardization, data collection and storage, data governance and the ability to understand potential queries that may be needed for analysis. Additionally, the organization should ensure that each SDCPS has a designated custodian to apply the protection to safety data, safety information and related sources.

5.2 Safety data and safety information collection

5.2.1 Objectives at different levels of the aviation system

5.2.1.1 Mandatory and voluntary safety reporting systems as well as automated data capture systems allows aerodrome operators to identify hazards and supports safety performance management activities at the aerodrome operators level. There are many benefits to sharing safety information, not least of which is the identification of hazards that are beyond the view of a single aerodrome operator.

5.2.2 Determining what to collect

5.2.2.1 Aerodrome Operator needs to determine what safety data and safety information it must collect to support the safety performance management process and make safety decisions. Safety data and safety information requirements can be determined using a top-down and/or a bottom-up approach. The chosen approach can be influenced by different considerations, such as national and local conditions and priorities, or the need to provide the data to support the monitoring of the SPIs.

5.2.2.2 Identifying and collecting the safety data should be aligned with the aerodrome operator's need to effectively manage safety. In some cases, the SRM process will highlight the need for additional safety data to better assess the impact (the level of probability and severity) and determine the associated risks. Equally, the safety performance management process may highlight a need for additional information for a more comprehensive understanding of a particular safety issue or to facilitate the establishment or refinement of SPIs.

5.2.2.3 Possible bias needs to be taken into account when collecting and using safety data and safety information. For example, the language used in voluntary reports can sometimes be emotive or aimed at achieving the objectives of an individual, which may not necessarily be in the best interests of the whole organization. In these cases, the information should be used judiciously.

5.2.2.4 Aerodrome Operators should consider taking an integrated approach to the collection of safety data that come from different sources, both internal and external. Integration allows organizations to get a more accurate view of their safety risks and the organization's achievement of its safety objectives. It is worth noting that safety data and safety information that initially seems to be unrelated, may later turn out to be critical for identifying safety issues and supporting data-driven decision-making.

5.2.2.5 It is advisable to streamline the amount of safety data and safety information by identifying what specifically supports the effective management of safety within their organization. The safety data and safety information collected should support the reliable measure of the system's performance and the assessment of known risks, as well as the identification of emerging risks, within the scope of the organization's activities. The safety data and safety information required will be influenced by the size and complexity of the organization's activities.

5.2.2.6 Figure 5-1 provides examples of typical safety data and safety information, which in many cases are already available. Coordination among departments or divisions is necessary to streamline efforts for reporting and collecting safety data to avoid duplication.

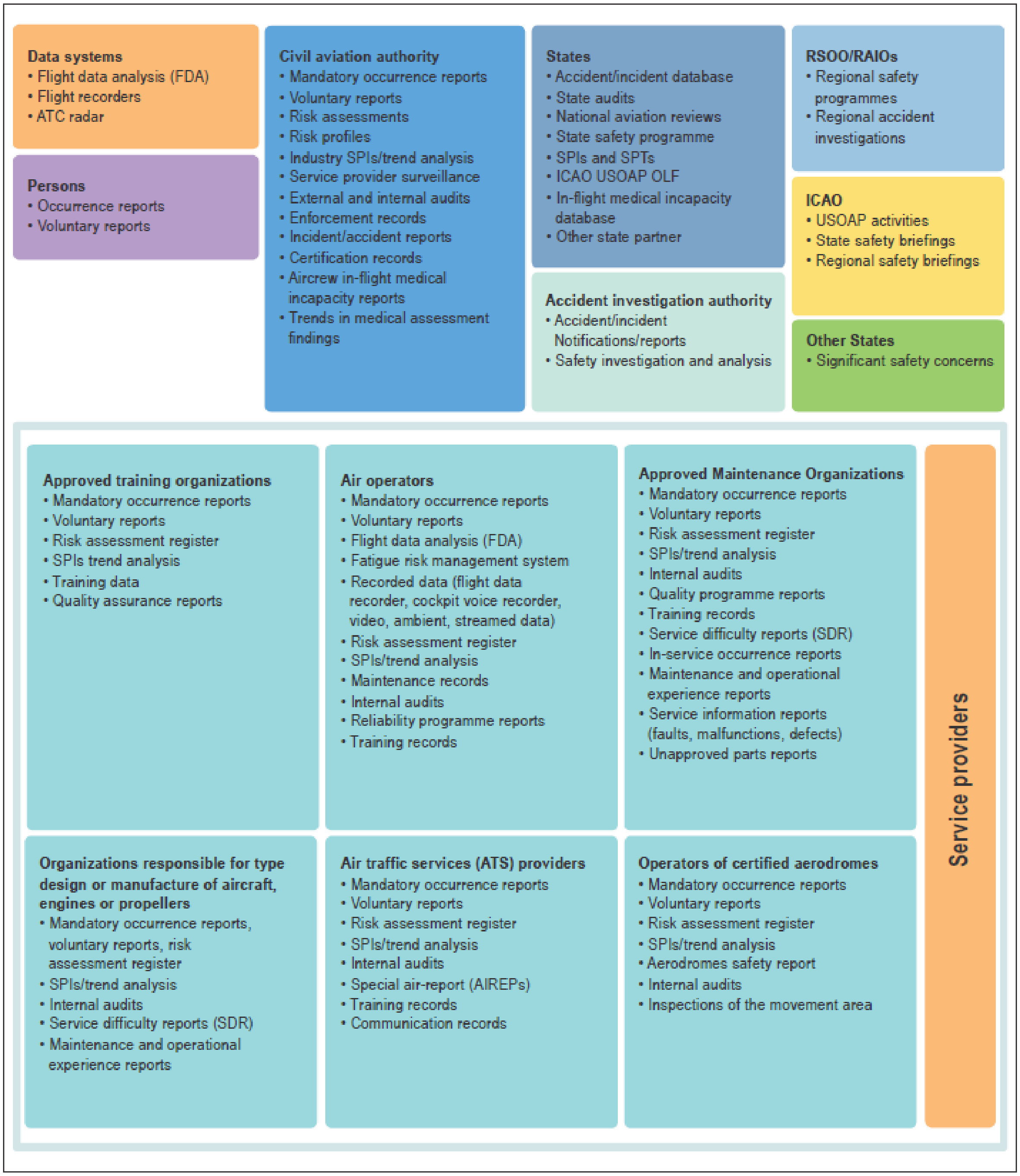

Figure 5-1. Typical safety data and safety information sources

5.3 Mandatory and voluntary safety reporting systems

5.3.1 Mandatory occurrence reporting systems tend to collect more technical information (e.g. hardware failures) than human performance aspects.

5.3.2 Voluntary safety reporting systems should be established to collect safety data and safety information not captured by the mandatory safety reporting system. These reports go beyond typical incident reporting. Voluntary reports tend to illuminate latent conditions, such as inappropriate safety procedures or regulations, human error, etc. One way to identify hazards is through voluntary reporting.

5.4 Results of inspections, audits or surveys

Inspections, audits or surveys, can also be a useful input to the pool of safety data and safety information. The safety data and safety information from these interactions can be used as evidence of the efficacy of the surveillance programme itself.

5.5 Optimal safety data and safety information collection

Much of the safety data and safety information used as the basis for data-driven decision-making comes from routine, everyday operations which are available from within the organization. The organization should first identify what specific question the safety data and safety information aims to answer or what problem needs to be addressed. This will help determine the appropriate source and clarify the amount of data or information needed.

5.6 Taxonomies

5.6.1 Safety data should ideally be categorized using taxonomies and supporting definitions so that the data can be captured and stored using meaningful terms. Common taxonomies and definitions establish a standard language, improving the quality of information and communication. The aviation community's capacity to focus on safety issues is greatly enhanced by sharing a common language. Taxonomies enable analysis and facilitate information sharing and exchange. Some examples of taxonomies include:

a) Aircraft model: The aerodrome operator can build a database with all models certified to operate.

b) Airport: The aerodrome operator may use ICAO or International Air Transport Association (IATA) codes to identify airports.

c) Type of occurrence: An aerodrome operator may use taxonomies developed by ICAO and other international organizations to classify occurrences.

5.7 Safety Data Processing

Safety data processing refers to the manipulation of safety data to produce meaningful safety information in useful forms such as diagrams, reports, or tables. There are a number of important considerations related to safety data processing, including: data quality, aggregation, fusion, and filtering.

5.7.1 Data quality

5.7.1.1 Data quality relates to data that is clean and fit for purpose. Data quality involves the following aspects:

a) cleanliness;
b) relevance;
c) timeliness; and
d) accuracy and correctness.

5.7.1.2 Data cleansing is the process of detecting and correcting (or removing) corrupt or inaccurate records from a record set, table, or database and refers to identifying incomplete, incorrect, inaccurate or irrelevant parts of the data and then replacing, modifying, or deleting the dirty or coarse data.

5.7.1.3 Relevant data is data which meets the aerodrome operators needs and represents their most important issues. An aerodrome operator should assess the relevance of data based on its needs and activities.

5.7.1.4 Safety data and safety information timeliness is a function of its currency. Data used for decisions should reflect what is happening as close to real time as possible. Judgement is often required based on the volatility of the situation.

5.7.1.5 Data accuracy refers to values that are correct and reflect the given scenario as described. Data inaccuracy commonly occurs when users enter the wrong value or make a typographical error. This problem can be overcome by having skilled and trained data entry personnel or by having components in the application such as spell check. Data values can become inaccurate over time, also known as “data decay”. Movement is another cause of inaccurate data. As data is extracted, transformed and moved from one database to another, it may be altered to some extent, especially if the software is not robust.

5.7.2 Aggregation of safety data and safety information

Data aggregation is when safety data and safety information is gathered and stored in the aerodrome operators SDCPS and expressed in a summary form for analysis. To aggregate safety data and safety information is to collect them together, resulting in a larger data set. In the case of SDCPS, individual items of safety data are aggregated into a database without giving one piece of safety data precedence over another. A common aggregation purpose is to get information about a particular group or type of activity based on specific variables such as: location; fleet type; or professional group. Data aggregation can sometimes be helpful across multiple organizations or regions that do not have enough data to ensure proper de-identification to protect the sources of the safety data and safety information, and to support analysis.

5.7.3 Data fusion

Data fusion is the process of merging multiple safety data sets to produce more coherent, linked and useful safety data than that provided by any individual set of safety data. The integration of safety data sets followed by its reduction or replacement improves the reliability and usability of said data.

5.7.4 Filtering of safety data and safety information

Safety data filtering refers to a wide range of strategies or solutions for refining safety data sets. This means the data sets are refined into simply what the decision-maker needs, without including other data that can be repetitive, irrelevant or even sensitive. Different types of data filters can be used to generate reports or present the data in ways that facilitate communication.

5.8 Safety data and safety information management

5.8.1 Safety data and safety information management can be defined as the development, execution and supervision of plans, policies, programmes and practices that ensure the overall integrity, availability, usability, and protection of the safety data and safety information used by the aerodrome operator.

5.8.2 Safety data and safety information management which addresses the necessary functions will ensure that the aerodrome operator's safety data and safety information is collected, stored, analysed, retained and archived, as well as governed, protected and shared, as intended. Specifically, it should identify:

a) what data will be collected;

b) data definitions, taxonomy and formats;

c) how the data will be collected, collated and integrated with other safety data and safety information sources;

d) how the safety data and safety information will be stored, archived and backed up; for example, database structure, and, if an IT system, supporting architecture;

e) how the safety data and safety information will be used;

f) how the information is to be shared and exchanged with other parties;

g) how the safety data and safety information will be protected, specific to the safety data and safety information type and source; and

h) how quality will be measured and maintained.

5.8.3 Without clearly defined processes to produce safety information, an aerodrome operator cannot achieve defensible, reliable, and consistent information upon which data-driven decisions are confidently made.

5.9 Data governance

Data governance is the authority, control and decision-making over the processes and procedures that support an aerodrome operator's data management activities. It dictates how safety data and safety information are collected, analysed, used, shared and protected. Data governance ensures that the data management system(s) has the desired effect through the key characteristics of integrity, availability, usability and protection as described below.

Integrity — Data integrity refers to the reliability of the sources, information, and events it contains. However, data integrity includes the maintenance and the assurance of the accuracy and consistency of data over its entire life-cycle. This is a critical aspect to the design, implementation and usage of the SDCPS when storing, processing, or retrieving the data.

Availability — It should be clear who has permission to use or share the stored safety data and safety information. This has to take into account the agreement between the data/information owner and custodian. For the entities that are allowed to use the data, it should be clear how to gain access and how to process it. A variety of techniques exist to maximize data availability, including redundancy of storage locations and data access methods and tools.

Usability — In order to maximize returns on safety data and safety information, it is important to also consider usability standards. Humans are continuously interacting and engaging with safety data and safety information as they are acquired. Organizations should minimize human error as automation applications are applied. Tools which can increase usability include data dictionaries and metadata repositories. As human interaction evolves towards big data applications and machine learning processes, it will become increasingly important to better understand human usability as it is applied to machines to minimize safety data and safety information miscalculations in the future.

Protection — ACAA will ensure that safety data, safety information and related sources are afforded appropriate protection.

5.10 Metadata management

5.10.1 Metadata is defined as a set of data that describes and gives information about other data, in other words, data about data. Using metadata standards provides a common meaning or definition of the data. It ensures proper use and interpretation by owners and users, and that data is easily retrieved for analysis.

5.10.2 It is important that aerodrome operator catalogue their data based on its properties, including but not limited to:

a) what the data is;
b) where it comes from (the original source);
c) who created it;
d) when it was created;
e) who used it;
f) what it was used for;
g) frequency of collection; and
h) any processing or transformation.

5.10.3 Metadata provides a common understanding of what the data is and ensures correct use and interpretation by its owners and users. This can also identify errors in the data collection which leads to continuous improvements of the program.

6.SAFETY ANALYSIS

6.1 Introduction

6.1.1 Safety analysis is the process of applying statistical or other analytical techniques to check, examine, describe, transform, condense, evaluate and visualize safety data and safety information in order to discover useful information, suggest conclusions and support data-driven decision-making. Analysis helps organizations to generate actionable safety information in the form of statistics, graphs, maps, dashboards and presentations. Safety analysis relies on the simultaneous application of statistics, computing and operations research. The result of a safety analysis should present the safety situation in ways that enable decision makers to make data-driven safety decisions.

6.1.2 Safety analysis may be a new function that aerodrome operator may need to establish. Aerodrome Operator should consider the skills necessary to analyse safety information and decide whether this role, with appropriate training, should be an extension of an existing position or whether it would be more efficient to establish a new position, outsource the role, or use a hybrid of these approaches.

6.1.3 In parallel with the human resourcing considerations should be an analysis of the existing software, and business and decision-making policies and processes. To be effective, the safety analysis should be integrated with the aerodrome operator's existing core tools, policies and processes.

6.1.4 Safety data and safety information analysis can be conducted in many ways, some requiring more robust data and analytic capabilities than others. The use of suitable tools for analysis of safety data and safety information provides a more accurate understanding of the overall situation by examining the data in ways that reveal the existing relationships, connections, patterns and trends that exist within.

6.1.5 An aerodrome operator with a mature analysis capability is better able to:

a) establish effective safety metrics;

b) establish safety presentation capabilities (e.g. safety dashboard) for ready interpretation of safety information by decision makers;

c) monitor safety performance of a given sector, organization, system or process;

d) highlight safety trends, safety targets;

e) alert safety decision makers, based on safety triggers;

f) identify factors that cause change;

g) identify connections or "correlations" between or among various factors;

h) test assumptions; and

i) develop predictive modelling capabilities.

6.1.6 Aerodrome Operator should include a range of appropriate information sources in their safety analysis, not just “safety data”. Examples of useful additions to the data set include: weather, terrain, traffic, demographics, geography, etc. Having access to and exploiting a broader range of data sources will ensure analysts and safety decision makers are aware of the bigger picture, within which the safety decisions are made.

6.2 Types of analysis

Analysis of safety data and safety information also allows decision makers to compare information to other groups (i.e. a control or comparison group) to help draw conclusions from the safety data. Common approaches include descriptive analysis (describing), inferential analysis (inferring) and predictive analysis (predicting), as illustrated in Figure 6-1.

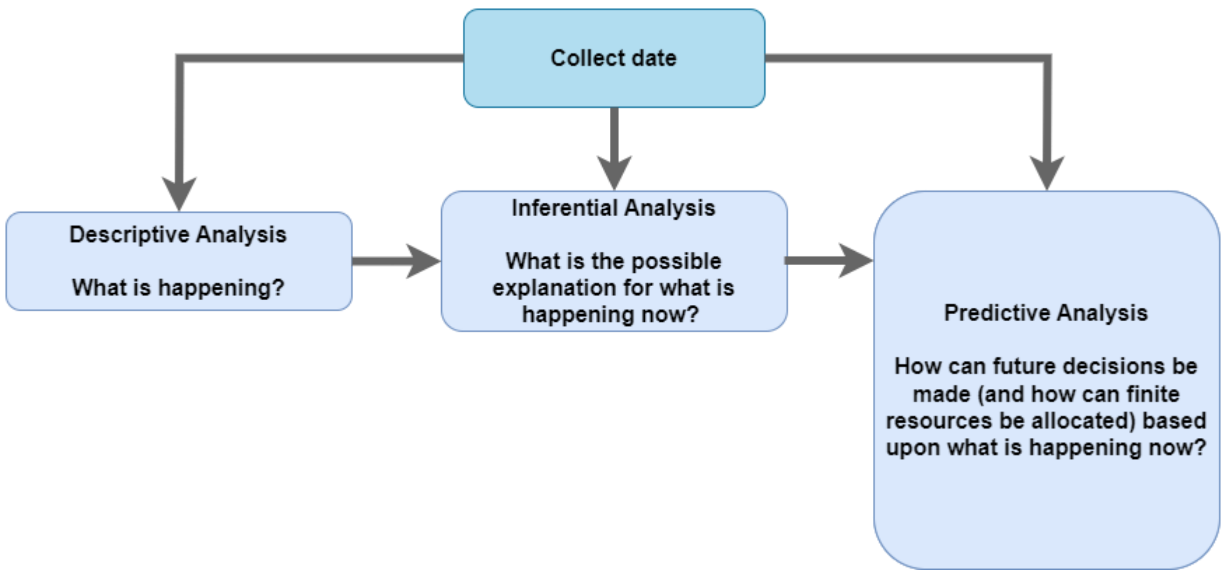

Figure 6-1. Common statistical analysis types

6.2.1 Descriptive analysis

6.2.1.1 Descriptive statistics are used to describe or summarize data in ways that are meaningful and useful. They help describe, show or summarize data in ways so patterns can emerge from the data and help to clearly define case studies, opportunities and challenges. Descriptive techniques provide information about the data, however, they do not allow users to make conclusions beyond the analysed data or to reach conclusions regarding any hypotheses about the data. They are a way to describe the data.

6.2.1.2 Descriptive statistics are helpful because if we simply presented the raw data, particularly in large quantities, it would be hard to visualize what the data is showing us. Descriptive statistics enable users to present and see the data in a more meaningful way, allowing simpler interpretation of the data. Tools such as tables and matrices, graphs and charts and even maps are examples of tools used for summarizing data. Descriptive statistics include measures of central tendency such as mean (average), median and mode, as well as measures of variability such as range, quartiles, minimum and maximum, frequency distributions, variance and standard deviation (SD). These summaries may either be the initial basis for describing the data as part of a more extensive statistical analysis or they may be sufficient in and of themselves for a particular investigation.

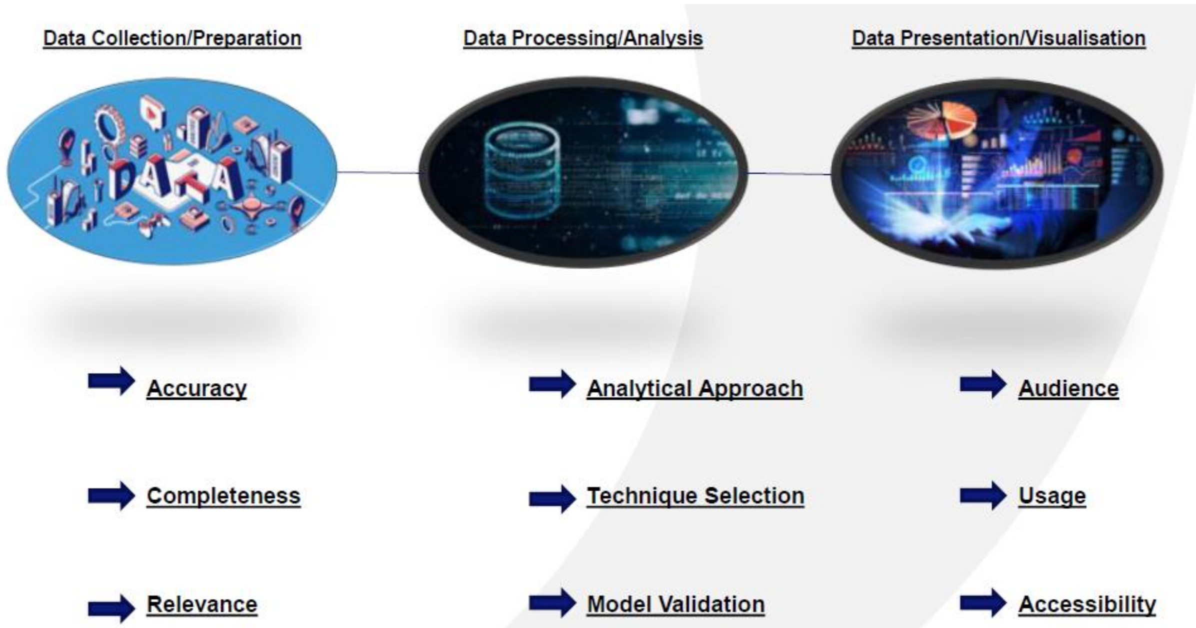

Figure 6-2. Good Data in Good insight out

6.2.2 Inferential analysis

Inferential (or inductive) statistics aim to use the data to learn about the larger population the sample of data represents. It is not always convenient or possible to examine each item of an entire population and to have access to a whole population. Inferential statistics are techniques that allow users of available data to make generalizations, inferences and conclusions about the population from which the samples were taken to describe trends. These include methods for estimating parameters, testing of statistical hypotheses, comparing the average performance of two groups on the same measure to identify differences or similarities, and identifying possible correlations and relationships among variables.

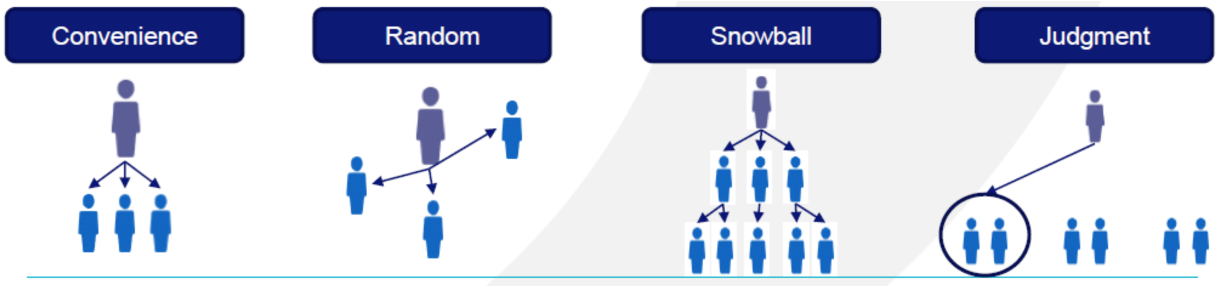

Figure 6-3. Sampling Methods

6.2.3 Predictive analysis

Other types of analyses include probability or predictive analyses that extract information from historical and current data and use it to predict trends and behaviour patterns. The patterns found in the data help identify emerging risks and opportunities. Often the unknown event of interest is in the future, but predictive analysis can be applied to any type of unknown in the past, present or future. The core of predictive analysis relies on capturing relationships between variables from past occurrences and exploiting them to predict the unknown outcome. Some systems allow users to model different scenarios of risks or opportunities with different outcomes. This enables decision makers to assess the decisions they can make in the face of different unknown circumstances and to evaluate how they can effectively allocate limited resources to areas where the highest risks or best opportunities exist.

6.2.4 Combined analysis

6.2.4.1 Various types of statistical analyses are interconnected and often conducted together. For example, an inferential technique may be the main tool used to draw conclusions regarding a set of data, but descriptive statistics are also usually used and presented. Also, outputs of inferential statistics are often used as the basis for predictive analysis.

6.2.4.2 Analytical techniques can be applied to safety analysis in order to:

a) identify the causes and contributing factors related to hazards and elements which are detrimental to the continuous improvement of aviation safety;

b) examine areas for improvement and increase in the effectiveness of safety controls; and

c) support ongoing monitoring of safety performance and trends.

6.3 Reporting of analysis results

6.3.1 Results of safety data analysis can highlight areas of high safety risk and assist decision makers and managers to:

a) take immediate corrective actions;

b) implement safety risk-based surveillance;

c) define or refine safety policy or safety objectives;

d) define or refine SPIs;

e) define or refine SPTs;

f) set SPI triggers;

g) promote safety; and

h) conduct further safety risk assessment.

6.3.2 The results of a safety analysis should be made available to aviation safety stakeholders in a way that can be easily understood. Safety analysis results may be presented several ways; the following are some examples:

a) Imminent safety alerts;

b) Safety analysis reports;

c) Safety conferences.

6.3.3 It is helpful to translate recommendations into action plans, decisions and priorities that decision makers in the aerodrome operator must consider and, if possible, to outline who needs to do what about the analysis results and by when.

6.3.4 Visualization tools such as charts, graphs, images and dashboards are simple yet effective means of presenting results of data analysis. Several examples of visual data analysis reports can be found on ICAO's integrated Safety Trend Analysis and Reporting System (iSTARS) at https://icao.int/safety/iSTARS.

6.3.5 Safety dashboards

6.3.5.1 The safety performance of the aerodrome operator should be demonstrable and should clearly indicate to all interested parties that safety is being managed effectively. One approach to demonstrating this is through a "safety dashboard", which is a visual representation that enables senior executives, managers, and safety professionals a quick and easy way to view the organization's safety performance.

6.3.5.2 In addition to a real time display of the organization's SPIs and SPTs, dashboards may also include information relating to category, cause and severity of specific hazards. Ideally, the information presented on the dashboard can be customized to display the information required to support the decision-making at varying levels of the organization. The use of triggers is useful for providing basic visuals to highlight if there are any issues to be addressed for a specific indicator. Analysts and decision makers will want the ability to configure the dashboard to display their top indicators as well as a feature which allows them to delve deeper into the metrics.

6.3.5.3 Collecting and analysing the data required for effective management and decision-making is an ongoing process. The results of data analysis may reveal that more and better data must be collected and analysed in support of the actions and decisions that the organization needs to take. Figure 6-4 shows how reporting of analysis results may determine further requirements for data to be collected.

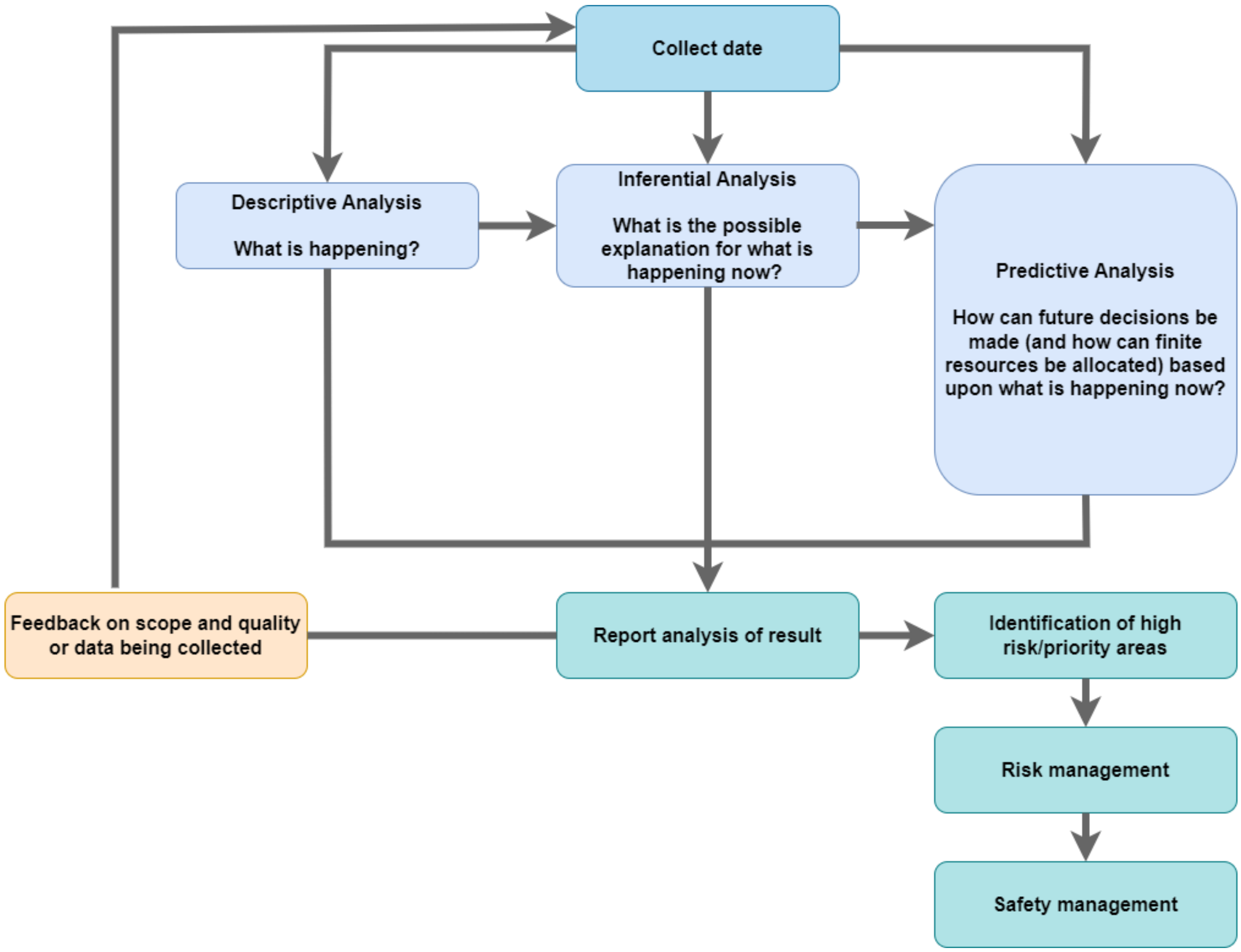

Figure 6-4. D3M integration with safety management

6.4 Safety information sharing and exchange

Safety can be further improved when safety information is shared or exchanged. It ensures a consistent, data-driven and transparent response to safety concerns at the global, State and organizational levels. Sharing of safety information refers to giving, while exchange refers to giving and receiving in return.

6.4.1 Sharing among Aerodrome Operators

Aerodrome Operators should share safety information with other Aerodrome Operators as soon as possible if, in the analysis of the information contained in its SDCPS, safety matters that may be of interest to another Aerodrome Operators are identified.

6.5 Data-Driven Decision-making

6.5.1 The primary purpose of safety analysis and safety reporting is to present a picture of the safety situation to decision makers which will empower them to make decisions based on the data presented. This is known as data-driven decision-making (also referred to as DDDM or D3M), a process-driven approach to decision-making.

6.5.2 Many aviation occurrences have resulted, at least in part, from poor management decisions, which can result in wasted money, labour and resources. The goal of safety decision makers is, in the short term, to minimize poor outcomes and achieve effective results, and in the long term, to contribute to the achievement of the aerodrome operator's safety objectives.

6.5.3 Good decision-making is not easy. Decisions are often made without being able to consider all the relevant factors. Decision makers are also subject to bias that, whether consciously or not, affects decisions made.

6.5.4 The intent of D3M is not necessarily to make the "perfect" or ideal decision, but rather to make a good decision that achieves the short-term objective (about which the actual decision is being made) and works towards satisfying the longer-term objective (improved organizational safety performance). Good decisions meet the following criteria:

a) **Transparent:** the aviation community should know all the factors that influence a decision, including the process used to arrive at the decision.

b) **Accountable:** the decision maker "owns" the decision and the associated outcomes. Clarity and transparency also bring about accountability – it's not easy to hide behind a decision where roles and responsibilities are defined in detail and where expectations associated with the new decision are clearly outlined.

c) **Fair and objective**: the decision maker is not influenced by considerations that are not relevant (e.g. monetary gain or personal relationships).

d) **Justifiable and defendable:** the decision can be shown to be reasonable given the inputs to the decision and the process followed.

e) **Reproducible:** given the same information that was available to the decision maker, and using the same process, another person would arrive at the same decision.

f) **Executable:** the decision is clear enough and that clarity minimizes uncertainty.

g) **Pragmatic:** humans are creatures of emotion, which means eliminating emotion from a decision isn't feasible. However, what can be eliminated are self-serving emotional biases. A healthy question to ask in the face of difficult decisions is: whom does the decision serve?

6.5.5 Advantages of data-driven decision-making

6.5.5.1 D3M enables decision makers to focus on desired safety outcomes which align with the safety policy and objectives, and address various aspects related to change management, safety risk assessments, etc. D3M can assist with decisions related to:

a) changes that can be expected in statutory and regulatory requirements, emerging technologies or resources which may affect the aerodrome operator;

b) potential changes in the needs and expectations of the aviation community and interested parties;

c) various priorities that need to be established and managed (e.g. strategic, operational, resources);

d) new skills, competencies, tools and even change management processes that may be needed to implement new decision(s);

e) risks that must be assessed, managed or minimized;

f) existing services, products and processes that currently provide the most value for interested parties; and

g) evolving demands for new services, products and processes.

6.5.5.2 A structured approach such as D3M drives decision makers to decisions that are aligned with what the safety data is indicating. This requires trust in the safety performance management framework; if there is confidence in the SDCPS, there will be trust in any decisions derived from them.

6.5.6 Common challenges with data-driven decision-making

6.5.6.1 Implementing processes for data collection and analysis takes time and money, as well as expertise and skills that may not be readily available to the organization. The appropriate amount of time and resources vested into the decision-making process needs to be carefully considered. Factors to consider include the amount of money involved in the decision, the extent of the influence of the decision and the decision's safety permanence. If the aerodrome operator does not understand what is involved, then the D3M process may become a source of frustration for safety decision makers, causing them to undermine or abandon the process. Like SMS, D3M and safety performance management require a commitment to build and sustain the structures and skills necessary to maximize the opportunities presented by D3M.

6.5.6.2 It is harder to build trust in data than it is to trust an expert's input and opinion. Adopting the D3M approach requires a shift in the culture and mindset of the organization where decisions are based upon reliable SPIs and the results of other safety data analysis.

6.5.6.3 In some cases the decision-making process may become bogged down in an attempt to find the "best possible" solution, also known as "analysis paralysis". Strategies that can be used to avoid this include:

a) setting a deadline;

b) having a well-defined scope and objective; and

c) not aiming for a "perfect" decision or solution the first time, but rather coming up with a "suitable" and "practical" decision and improving further decisions.

6.5.7 Data-driven decision-making process

6.5.7.1 The D3M process can be a critical tool that increases the value and effectiveness of SMS. Effective safety management depends on making defendable and informed decisions. In turn, effective D3M relies on clearly defined safety data and information requirements, standards, collection methods, data management, analysis and sharing, all of which are components of a D3M process. Figure 6-5 illustrates shows the D3M process.

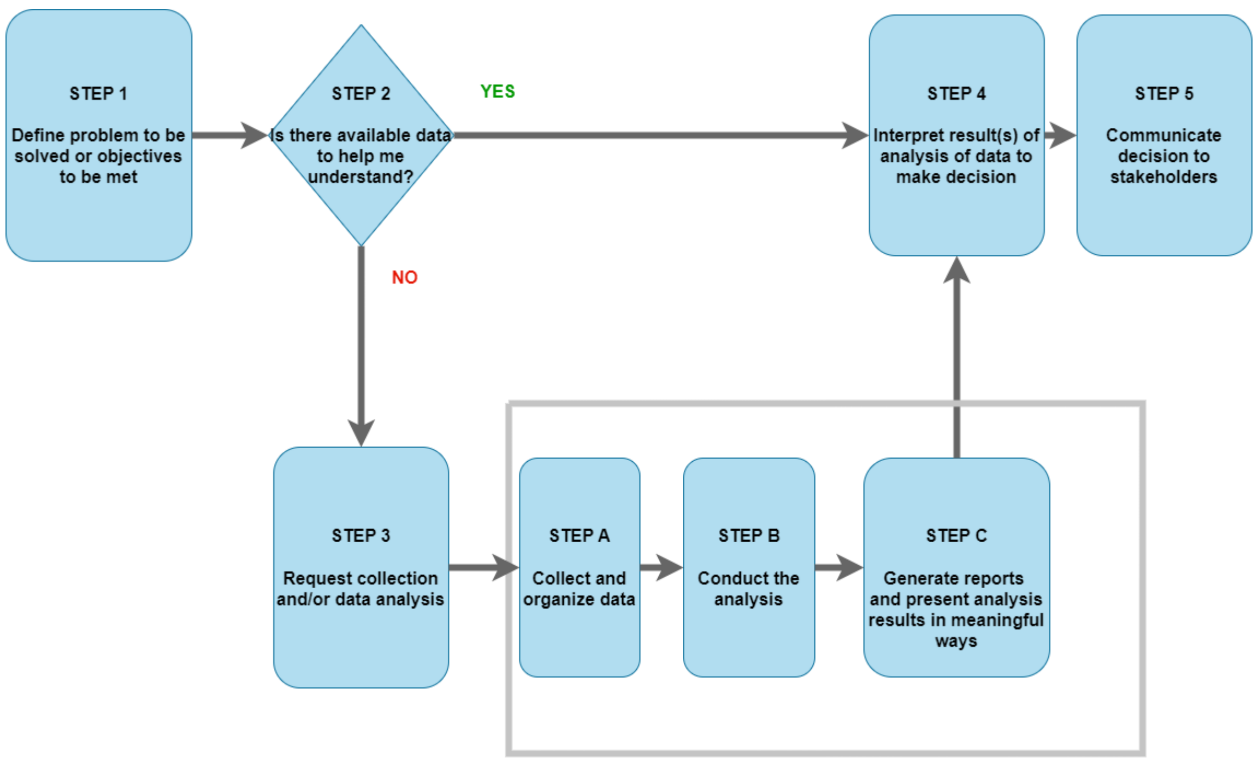

Figure 6-5. Data-driven decision-making phases

Step 1 — Defining the problem or objective

6.5.7.2 The first step in planning and establishing the D3M process is to define the problem that needs to be solved or the safety objective that must be achieved. What is the question that needs to be answered? What decision must the safety decision makers make? How will it align with the more strategic organizational objectives? In the process of defining the problem statement, decision makers should ask themselves the following questions:

a) Does the collection and analysis of data support and relate to the organization's safety objectives or safety targets?

b) Is the required data available? Or can it be obtained in a reasonable manner?

c) Is it practical and feasible to collect and analyse the data?

d) Are the required resources (people, equipment, software, funds) available?

6.5.7.3 In the safety management context, the main problem statements within the aerodrome operator are related to evaluating and selecting safety priorities – in alignment with the safety objectives – and establishing measures for safety risk mitigation.

Step 2 — Access to data to support the decision-making

6.5.7.4 The next step is to identify what data is needed to answer the problem (taking into account the provisions on information protection). No data is any more valuable than other data. Focus should be on whether the available data is appropriate to help answer and resolve the problem. If the data required is available, proceed to step 4. If the right data is not available, the aerodrome operator will need to collect, store, analyse and present new safety data and safety information in meaningful ways.

Step 3 — Request data to support the decision-making

6.5.7.5 If the data isn't already available, the organization needs to find ways of collecting it. This may mean establishing another SPI and perhaps aligned SPTs. Establishing additional indicators can come at a cost. Once the cost is known, the organization should estimate if the benefits outweigh those costs. The focus should primarily be on identifying, monitoring and measuring safety data that is needed to make effective data-driven safety decisions. If the costs outweigh the benefits, consider alternative data sources and/or indicators.

6.5.7.6 In the planning phase of the D3M process, the organization must define what it wants to achieve by establishing the SPTs and SPIs, and analysing the data. Why does the organization need to address the identified problem? What is a reasonable target? And how and where will safety decision makers use the results of data collection and analysis? Having a clear understanding of why the organization needs to collect, analyse, share and exchange safety data and information is fundamental for any SDCPS.

6.5.7.7 The following elements combine to enable an organization to identify trends, make informed decisions, evaluate the safety performance in relation to defined objectives, assess risks or fulfil its requirements:

a) safety performance management - as the safety data and safety information governance framework;

b) SDCPS - as the safety data collection and processing functionality; and

c) D3M as a dependable decision-making process.

Step 4 — Interpret results of data analysis and make data-driven decision

6.5.7.8 The data gathered must be presented to the decision makers at the right time and in meaningful ways. The appropriateness and size of the data sets, the sophistication of the analytics and the skills of the data analysts will only be effective if the data is presented when needed and in formats that make it easy for decision makers to comprehend. The insights gained from the data should inform decision-making, and ultimately, improve safety performance.

6.5.7.9 There are many decision-making models available. Using an agreed and standardized approach will maximize consistency and effectiveness of the organization's data-driven decisions, most include the following steps:

a) assemble a team/group with the necessary skills and experience (e.g. safety action group (SAG));

b) clearly define the safety problem or objective and the context;

c) review the organization's SPTs and safety objectives to ensure continued alignment;

d) review and interpret the safety data to understand what it is indicating;

e) consider and analyse the viable alternatives;

f) consider the risk of feasible actions (or inactions);

g) gain consensus among the decision-making group;

h) commit to the data-driven decision and act on the decision (turning data into action); and

i) monitor and evaluate the outcomes.

Step 5 — Communicate the decision

6.5.7.10 For the safety decision to be effective, it needs to be communicated to stakeholders, these include:

a) staff required to enact the necessary actions;

b) person who reported the situation (if required);

c) all personnel, to ensure they are kept informed of safety improvements (safety promotion); and

d) organizational knowledge managers to ensure the safety decision is incorporated into the learning of the organization.

7.SAFETY MANAGEMENT SYSTEM (SMS)

7.1 Introduction

7.1.1 The purpose of an SMS is to provide aerodrome operator with a systematic approach to managing safety. It is designed to continuously improve safety performance through: the identification of hazards, the collection and analysis of safety data and safety information, and the continuous assessment of safety risks. The SMS seeks to proactively mitigate safety risks before they result in aviation accidents and incidents. It allows aerodrome operator to effectively manage their activities, safety performance and resources, while gaining a greater understanding of their contribution to aviation safety. An effective SMS demonstrates to ACAA the aerodrome operator's ability to manage safety risks and provides for effective management of safety.

7.1.2 SMS is more than a manual and a set of procedures and requires safety management to be integrated into the day-to-day activities of the organization. It requires the development of an organizational culture that reflects the safety policy and objectives.

7.1.3 At the core of the SMS is a formal risk management process that identifies hazards and assesses and mitigates risk. It is important to recognize that even with mitigations in place, some residual risk will remain and an effective SMS will enable organizations to manage this.

7.1.4 Risks generated by contracted activities and other third parties should also be considered. Therefore, when the organization has a formal agreement with another organization this should include provisions for the management of safety. This should also include reporting procedures for safety related matters.

7.2 SMS Framework

7.2.1 Regardless of the aerodrome operator's size and complexity, all elements of the SMS framework apply. The implementation should be tailored to the organization and its activities.

7.2.2 SMS framework is made up of the following four components and twelve elements:

Table 7-1. Components and elements of the ICAO SMS framework

COMPONENT	ELEMENT
1. SAFETY POLICY AND OBJECTIVES	1.1 Management commitment
	1.2 Safety accountability and responsibilities
	1.3 Appointment of key safety personnel
	1.4 Coordination of emergency response planning
	1.5 SMS documentation
2. SAFETY RISK MANAGEMENT	2.1 Hazard identification
	2.2 Safety risk assessment and mitigation
3. SAFETY ASSURANCE	3.1 Safety performance monitoring and measurement

	3.2 The management of change 3.3 Continuous improvement of the SMS
4. SAFETY PROMOTION	4.1 Training and education 4.2 Safety communication

7.2.3 For many organizations there will be some elements of an SMS already in place so carrying out a gap analysis is the first step. Where gaps have been identified these should be included in an implementation plan. The plan should detail the gaps and the actions to be taken (what, when and by whom) to implement an SMS. The plan should be developed to allow prioritizing of the different elements over a period of time. Building an SMS overnight will be far too challenging and a step-by-step approach will deliver a more effective SMS in the end.

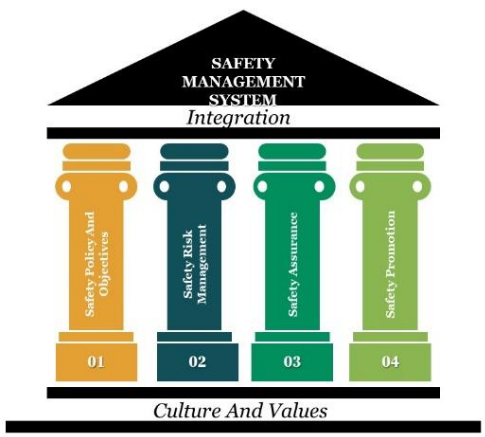

Figure 7-1 SMS Components

7.3 Component 1: Safety policy and objectives

The safety policy and objectives can be divided into the following five areas:

a) Management commitment and responsibility;

b) Safety accountabilities;

c) Appointment of key safety personnel;

d) Coordination of emergency response planning;

e) SMS documentation.

The safety policy outlines the aims and objectives that the organization will use to achieve the desired safety outcomes. It should declare the principles and philosophies that lay the foundation for the organization's safety culture and be communicated to all staff throughout the organization. The creation of a positive safety culture begins with clear, unequivocal direction and ownership from the accountable manager.

In preparing a safety policy, senior management should consult with the key safety personnel, and where appropriate, staff representative bodies (employee forums, trade unions, for example). Consultation will ensure that the safety policy and stated objectives are relevant to all staff. It will generate a sense of shared responsibility for the safety culture in the organization. A positive safety culture is one where all staff are responsible for, and consider the impact of, safety on everything they do.

7.3.1 Management commitment and responsibility

Safety policy

7.3.1.1 The safety policy should be visibly endorsed by senior management and 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.

7.3.1.2 It is the responsibility of management to communicate the safety policy throughout the organization to ensure all personnel understand and work in accordance with the safety policy.

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

a) continuously improve the level of safety performance;

b) promote and maintain a positive safety culture within the organization;

c) comply with all applicable regulatory requirements;

d) provide the necessary resources to deliver a safe product or service;

e) ensure safety is a primary responsibility of all managers; and

f) ensure it is understood, implemented and maintained at all levels.

7.3.1.4 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.

7.3.1.5 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.

7.3.1.6 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 aerodrome operator should allow for the de-identification and aggregation of reports to allow meaningful safety analyses to be conducted without having to implicate personnel. Because major occurrences may invoke processes and procedures outside of the aerodrome operator's SMS, the ACAA may not permit the early de-identification of reports in all circumstances. Nonetheless, a policy allowing for the appropriate de-identification of reports can improve the quality of data collected.

Safety objectives

7.3.1.7 Taking into consideration its safety policy, the aerodrome operator should also establish safety objectives to define what it aims to achieve in respect of safety outcomes. Safety objectives should be short, high-level 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 defines what the organization intends to achieve in terms of safety. Safety performance indicators (SPIs) and safety performance targets (SPTs) are needed to monitor the achievement of these safety objectives.

7.3.1.8 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).

7.3.2 Safety accountability and responsibilities

Accountable executive

7.3.2.1 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 instil 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.

7.3.2.2 There might be challenges for the aerodrome operator to identify the most appropriate person to be the accountable executive, especially in large complex organizations with multiple entities and multiple certificates, authorizations or approvals. It is important the person selected is organizationally situated at the highest level of the organization, thus ensuring the right strategic safety decisions are made.

7.3.2.3 The aerodrome operator 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. Specific safety accountabilities of all members of management should be defined and their role in relation to the SMS should reflect how they can contribute towards a positive safety culture. The safety responsibilities, accountabilities and authorities should be documented and communicated throughout the organization. The safety accountabilities of managers should include the allocation of the human, technical, financial or other resources necessary for the effective and efficient performance of the SMS.

Note.— The term "accountability" refers to obligations which cannot be delegated. The term "responsibilities" refers to functions and activities which may be delegated.

7.3.2.4 In the case where an SMS applies to several different certificates, authorizations or approvals that are all part of the same legal entity, there should be a single accountable executive. Where this is not possible, individual accountable executives should be identified for each organizational certificate, authorization or approval and clear lines of accountability defined; it is also important to identify how their safety accountabilities will be coordinated.

7.3.2.5 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.

7.3.2.6 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.

7.3.2.7 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.

7.3.2.8 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.

7.3.2.9 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.

7.3.2.10 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.

Accountability and responsibilities

7.3.2.11 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 organizational safety outcomes). The management of safety is a core function; as such every senior manager has a degree of involvement in the operation of the SMS.

7.3.2.12 All defined accountabilities, responsibilities and authorities should be stated in the aerodrome operator’s SMS documentation and should be communicated throughout the organization. The safety accountabilities and responsibilities of each senior manager are integral components of their job descriptions. This should also capture the different safety management functions between line managers and the safety manager.

7.3.2.13 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.

7.3.2.14 The aerodrome operator 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.

Accountability and responsibilities and in respect to external organizations

7.3.2.15 An aerodrome operator is responsible for the safety performance of external organizations where there is an SMS interface. The aerodrome operator may be held accountable for the safety performance of products or services provided by external organizations supporting its activities even if the external organizations are not required to have an SMS. It is essential for the aerodrome operator’s SMS to interface with the safety systems of any external organizations that contribute to the safe delivery of their product or services.

7.3.3 Appointment of key safety personnel

7.3.3.1 Appointment of a competent person or persons to fulfil the role of safety manager is essential to an effectively implemented and functioning SMS. The safety manager may be identified by different titles. For the purposes of this manual, the generic term "safety manager" is used and refers to the function, not necessarily to the individual. The person carrying out the safety manager function is responsible to the accountable executive for the performance of the SMS and for the delivery of safety services to the other departments in the organization.

7.3.3.2 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 as well as with external members of the aviation community. Functions of the safety manager include, but are not limited to:

a) manage the SMS implementation plan on behalf of the accountable executive (upon initial implementation);

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) provide independent advice on safety matters;

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

i) coordinate and communicate (on behalf of the accountable executive) with the ACAA and other entities as necessary on issues relating to safety.

7.3.3.3 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.

7.3.3.4 In cases where the function is allocated to a group of persons, (e.g. when aerodrome operator 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.

7.3.3.5 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.

7.3.3.6 Depending on the size, nature and 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.

7.3.3.7 Aerodrome operators 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.

7.3.3.8 The highest-level safety committee, sometimes referred to as a safety review board (SRB), includes the accountable executive and senior managers with the safety manager participating in an advisory capacity. 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) 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:
    1) the declared organizational priority of safety management; and
    2) promotion of safety across the organization.

7.3.3.9 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 and are chaired by a designated manager. SAGs are tactical entities that deal with specific implementation issues in accordance with the strategies developed by the SRB.

7.3.3.10 The SAGs:

a) monitor operational safety performance within their functional areas of the organization and ensure that appropriate SRM activities are carried out;

b) review available safety data and identify the implementation of appropriate safety risk control strategies and ensure employee feedback is provided;

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

d) coordinate the implementation of any actions related to safety risk controls and ensure that actions are taken promptly; and

e) review the effectiveness of specific safety risk controls.

7.3.4 Coordination of emergency response planning

7.3.4.1 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 an aerodrome operator's SRM process to address aviation-related emergencies, crises or events. Where there is a possibility of an aerodrome operators'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.

7.3.4.2 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 entities 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.

7.3.4.3 Coordination of emergency response planning applies only to those aerodrome operators required to establish and maintain an ERP.

7.3.5 SMS Documentation

7.3.5.1 The SMS documentation should include a top-level “SMS manual”, which describes the aerodrome operators ’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 aerodrome operator ’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.

7.3.5.2 The SMS manual also serves as a primary safety communication tool between the aerodrome operator and key safety stakeholders (e.g. ACAA 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 aerodrome operator. 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. ACAA acceptance/approval may be required before significant amendments are made to the SMS manual, as it is a controlled manual.

7.3.5.3 The SMS manual should include a detailed description of the aerodrome operator’s policies, processes and procedures including:

a) safety policy and safety objectives;
b) reference to any applicable regulatory SMS requirements;
c) system description;
d) safety accountabilities and key safety personnel;
e) voluntary and mandatory safety reporting system processes and procedures;
f) hazard identification and safety risk assessment processes and procedures;
g) safety investigation procedures;
h) procedures for establishing and monitoring safety performance indicators;
i) SMS training processes and procedures and communication;
j) safety communication processes and procedures;
k) internal audit procedures;
l) management of change procedures;
m) SMS documentation management procedures; and

n) where applicable, coordination of emergency response planning.

7.3.5.4 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 existing retention periods. Typical SMS operational records should include:

a) hazards register and hazard/safety reports;

b) SPIs and related charts;

c) record of completed safety risk assessments;

d) SMS internal review or audit records;

e) internal audit records;

f) records of SMS/safety training records;

g) SMS/safety committee meeting minutes;

h) SMS implementation plan (during the initial implementation); and

i) gap analysis to support implementation plan.

7.4 Component 2: Safety Risk Management

7.4.1 Aerodrome Operators 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.

7.4.2 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 aerodrome operator's operating environment. Careful analysis of these factors can often identify potential hazards at any point in the operation or activity life cycle.

7.4.3 Understanding the system and its operating environment is essential for the achievement of high safety performance. Having a detailed system description that defines the system and its interfaces will help. Hazards may be identified throughout the operational life cycle from internal and external sources. Safety risk assessments and safety risk mitigations will need to be continuously reviewed to ensure they remain effective. Figure7-2 provides an overview of the hazard identification and safety risk management process for an aerodrome operator.

Note.— Detailed guidance on hazard identification and safety risk assessment procedures is addressed in Chapter 2.

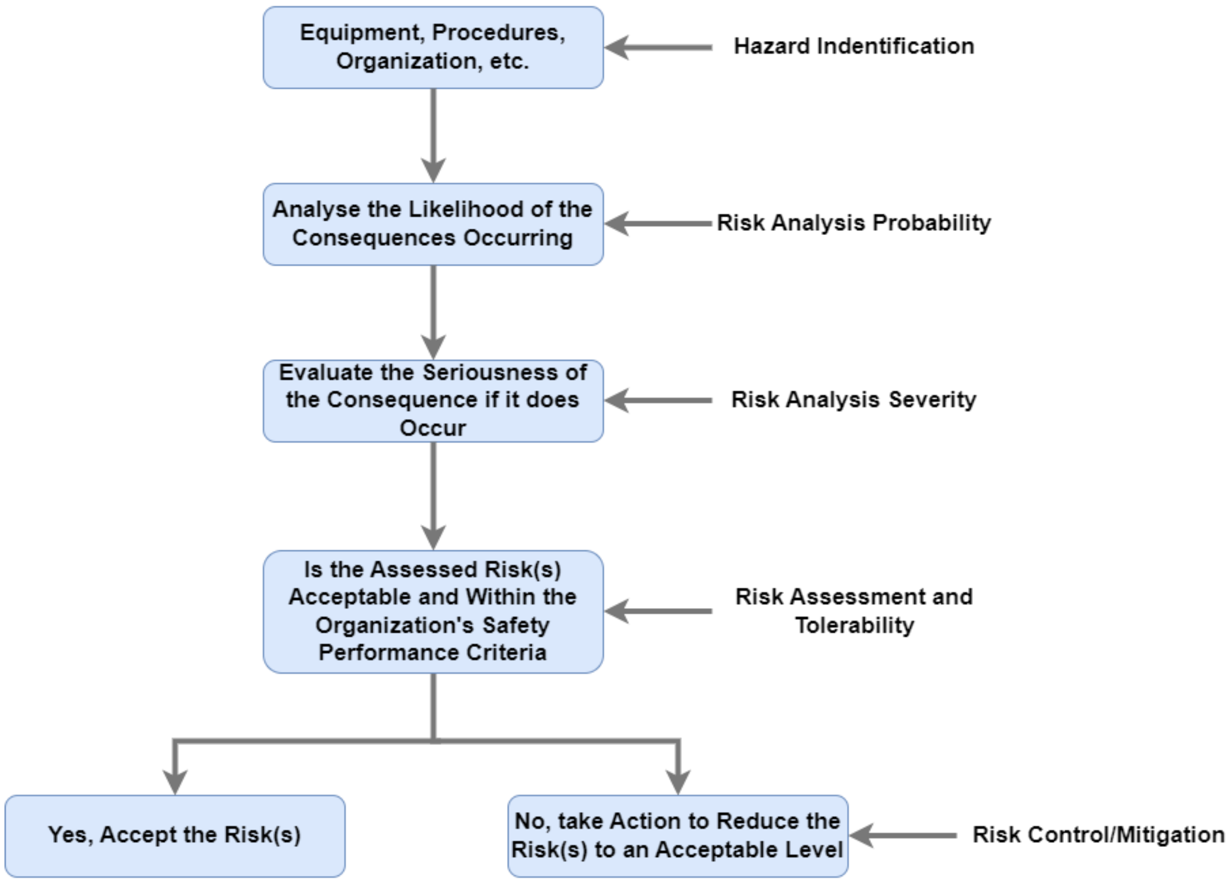

Figure 7-2. Hazard identification and risk management process

7.4.1 Hazard identification

Hazard identification is the first step in the SRM process. The aerodrome operator 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.

Figure 7-3. Workforces that can identify hazard

Sources for hazard identification

7.4.1.1 There are a variety of sources for hazard identification, internal or external to the organization. Some internal sources include:

a) **Normal operations monitoring;** this uses observational techniques to monitor the day-to-day operations and activities such as line operations safety audit (LOSA).

b) **Automated monitoring systems;** this uses automated recording systems to monitor parameters that can be analysed such as flight data monitoring (FDM).

c) **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.

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) **Feedback from training;** training that is interactive (two way) can facilitate identification of new hazards from participants.

f) **Aerodrome operator safety investigations;** hazards identified in internal safety investigation and follow-up reports on accidents/incidents.

Figure 7-4. Sources for hazard identification

7.4.1.2 Examples of external sources for hazard identification include:

a) Aviation accident reports; reviewing accident reports; this may be related to accidents in Albania or to a similar aircraft type, region or operational environment.

b) ACAA mandatory and voluntary safety reporting systems;

c) ACAA 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.

Safety reporting system

7.4.1.3 One of the main sources for identifying hazards 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 provide an additional reporting channel for potential safety issues such as hazards, near misses or errors.

7.4.1.4 It is important that aerodrome operator 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.

7.4.1.5 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.

7.4.1.6 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. Having multiple entry methods available maximizes the likelihood of staff engagement. Everyone should be made aware of the benefits of safety reporting and what should be reported.

7.4.1.7 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.

7.4.1.8 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.

7.4.1.9 Safety reports are often filtered through the use of a taxonomy, or a classification system. Filtering information using a taxonomy can make it easier to identify common issues and trends. The aerodrome operator should develop taxonomies that cover their type(s) of operation. The disadvantage of using a 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.

7.4.1.10 Other methods of hazard identification include workshops or meetings in which subject matter experts conduct detailed analysis scenarios. These sessions benefit from the contributions of a range of experienced operational and technical personnel. Existing safety committee meetings (SRB, SAG, etc.) could be used for such activities; the same group may also be used to assess associated safety risks.

7.4.1.11 Identified hazards and their potential consequences should be documented. This will be used for safety risk assessment processes.

7.4.1.12 The hazard identification process considers all possible hazards that may exist within the scope of the aerodrome operator 's aviation activities including interfaces with other systems, both within and external to the organization. Once hazards are identified, their consequences (i.e. any specific events or outcomes) should be determined.

Investigation of hazards

7.4.1.13 Hazard identification should be continuous and part of the aerodrome operator 's ongoing activities. Some conditions may merit more detailed investigation. These may include:

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

b) significant changes to the organization or its activities.

7.4.2 Aerodrome Operator safety investigation

7.4.2.1 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.

7.4.2.2 Aerodrome Operator safety investigations are conducted by aerodrome operators as part of their SMS to support hazard identification and risk assessment processes.

7.4.2.3 The primary objective of the aerodrome operator 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. Aerodrome Operator safety investigations are an integral part of the aerodrome operator 's SMS.

7.4.2.4 Aerodrome Operator 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.

Investigation triggers

7.4.2.5 An aerodrome operator safety investigation is usually triggered by a notification (report) submitted through the safety reporting system. Figure 7-5 outlines the safety investigation decision process and the distinction between when an aerodrome operator safety investigation should take place and when an investigation under Annex 13 provisions and Decision of the Council of Ministers No. 739, dated 3.12.2021 "On the organization and operation of the Safety Investigation Authority" provision should be initiated.

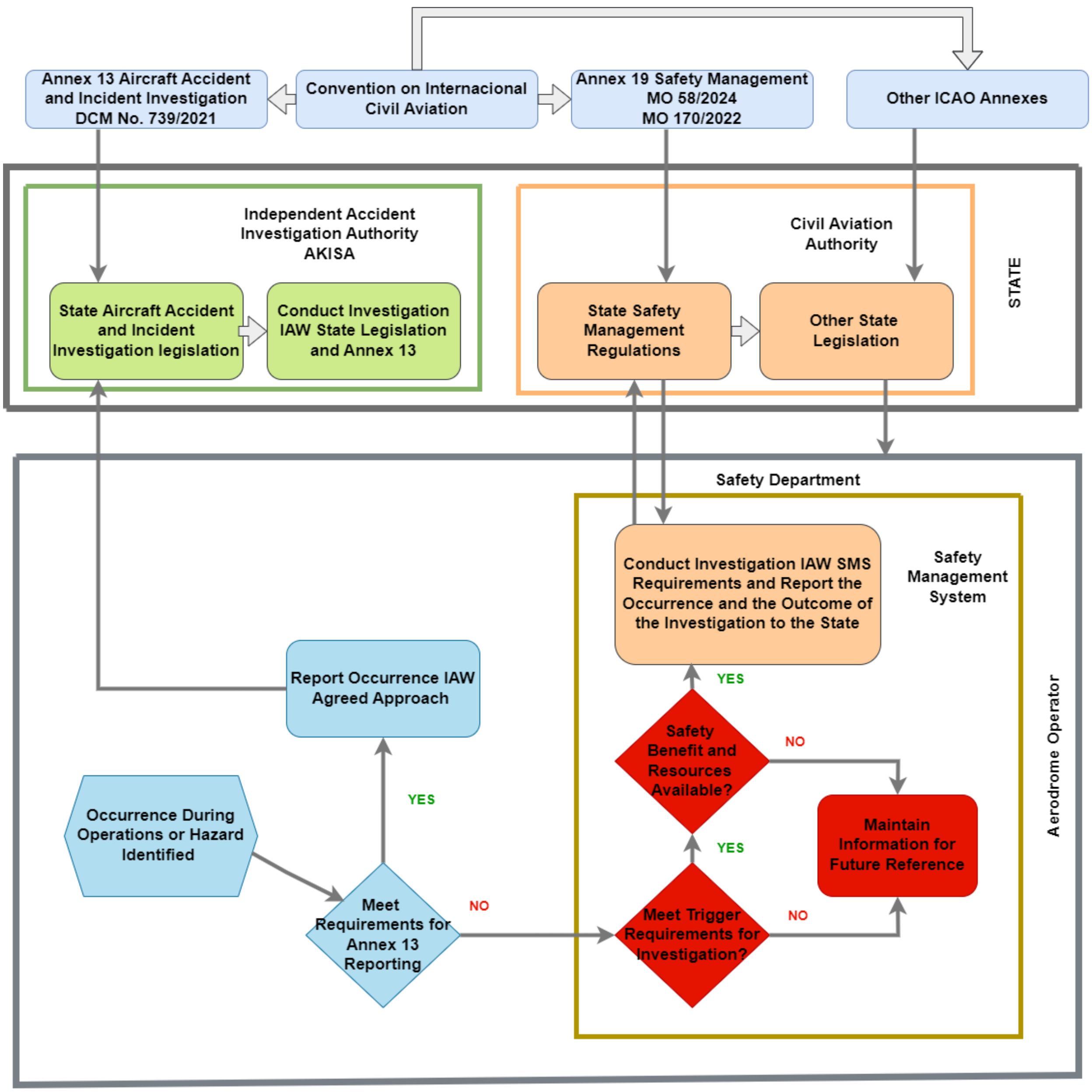

Figure 7-5. Safety investigation decision process

7.4.2.6 Not all occurrences or hazards can or should be investigated; the decision to conduct an investigation and its depth should depend on the actual or potential consequences of the occurrence or hazard. Occurrences and hazards considered to have a high-risk potential are more likely to be investigated and should be investigated in greater depth than those with lower risk potential. Aerodrome Operator should use a structured decision-making approach with defined trigger points. These will guide the safety investigation decisions: what to investigate and the scope of the investigation.

This could include:

a) the severity or potential severity of the outcome;

b) regulatory or organizational requirements to carry out an investigation;

c) safety value to be gained;

d) opportunity for safety action to be taken;

e) risks associated with not investigating;

f) contribution to targeted safety programmes;

g) identified trends;

h) training benefit; and

i) resources availability.

Assigning an investigator

7.4.2.7 If an investigation is to commence, the first action will be to appoint an investigator or where the resources are available, an investigation team with the required skills and expertise. The size of the team and the expertise profile of its members depend on the nature and severity of the occurrence being investigated. The investigating team may require the assistance of other specialists. Often, a single person is assigned to carry out an internal investigation, with support from operations and safety office experts.

7.4.2.8 Aerodrome operator safety investigators are ideally organizationally independent from the area associated with the occurrence or identified hazard. Better results will be obtained if the investigator(s) are knowledgeable (trained) and skilled (experienced) in aerodrome operator safety investigations. The investigators would ideally be chosen for the role because of their knowledge, skills and character traits, which should include: integrity, objectivity, logical thinking, pragmatism, and lateral thinking.

The investigation process

7.4.2.9 The investigation should identify what happened and why it happened and this may require root cause analysis to be applied as part of the investigation. Ideally, the people involved in the event should be interviewed as soon as possible after the event. The investigation should include:

a) establishing timelines of key events, including the actions of the people involved;

b) review of any policies and procedures related to the activities;

c) review of any decisions made related to the event;

d) identifying any risk controls that were in place that should have prevented the event occurring; and

e) reviewing safety data for any previous or similar events.

7.4.2.10 The safety investigation should focus on the identified hazards and safety risks and opportunities for improvement, not on blame or punishment. The way the investigation is conducted, and most importantly, how the report is written, will influence the likely safety impact, the future safety culture of the organization, and the effectiveness of future safety initiatives.

7.4.2.11 The investigation should conclude with clearly defined findings and recommendations that eliminate or mitigate safety deficiencies.

7.4.3 Safety risk assessment and mitigation

7.4.3.1 The aerodrome operator 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.

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

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

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

7.4.3.5 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.

7.4.3.6 For aerodrome operator 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 aerodrome operator). Final decisions or control acceptance may be required from higher authorities so that the appropriate resources are provided.

7.4.3.7 How aerodrome operator go about prioritizing their safety risk assessments and adopting safety risk controls is their decision. As a guide, the aerodrome operator 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 applicable regulations with regard to control of safety risks.

7.4.3.8 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 right people are involved 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.

7.4.3.9 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.

7.4.3.10 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.

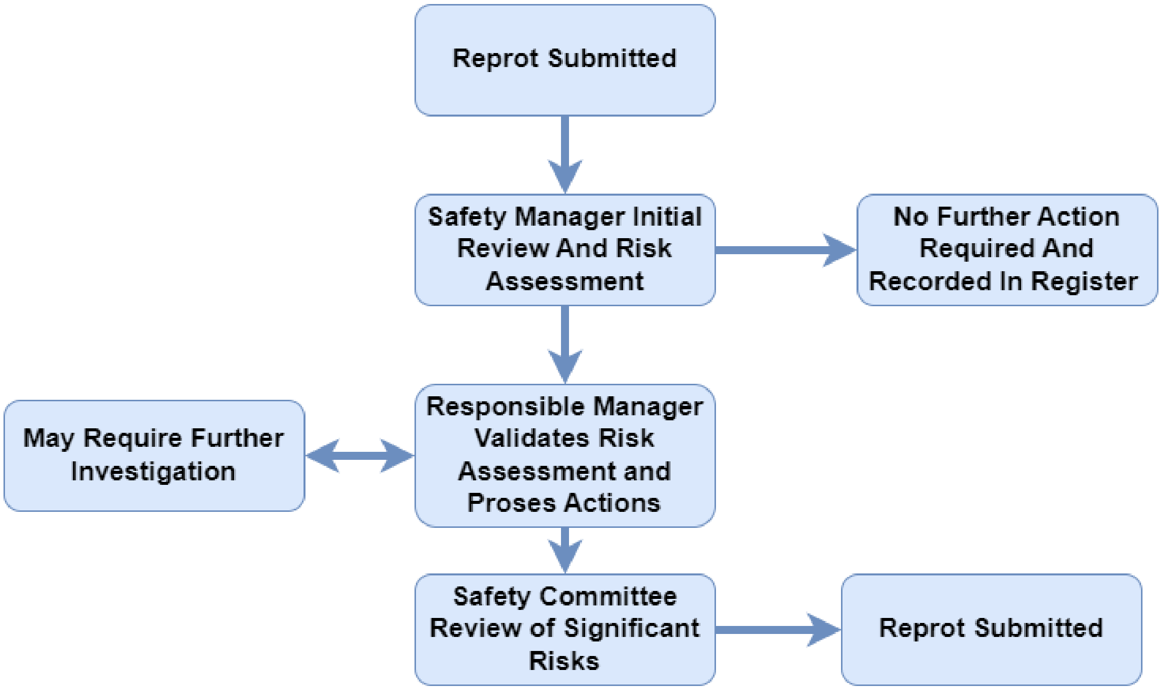

Figure 7-6. Safety risk assessment

7.5 Component 3: Safety Assurance

7.5.1 Aerodrome operator should 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 aerodrome operator 's SMS provides these capabilities.

7.5.2 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.

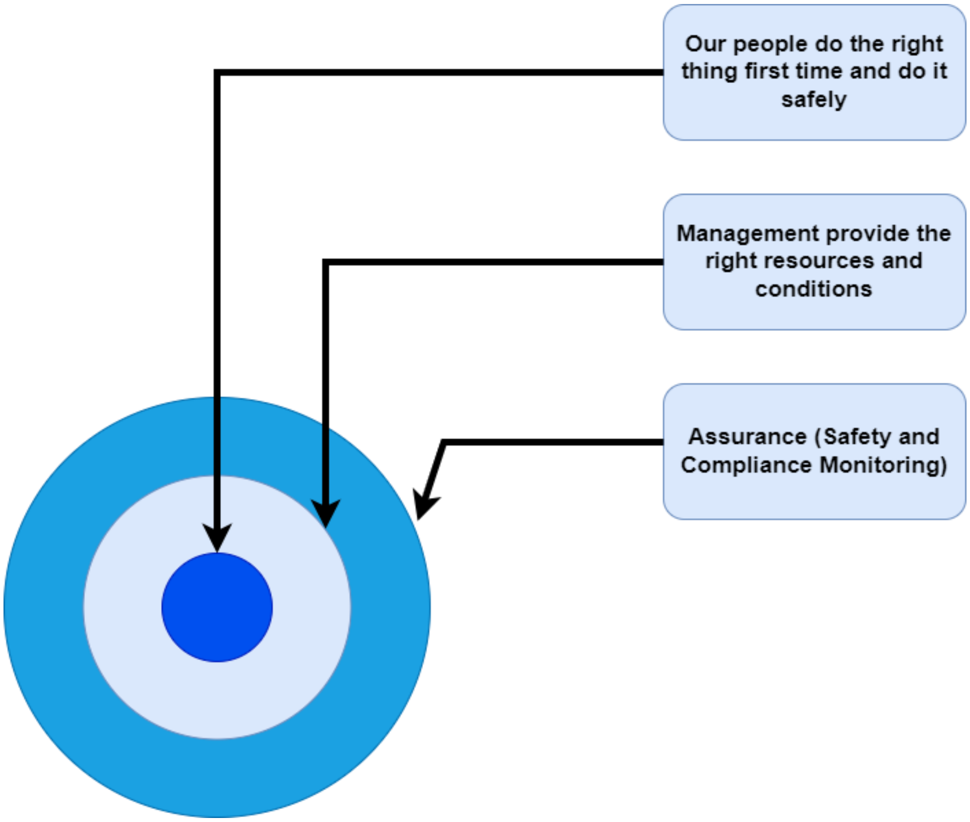

Figure 7-7. Safety assurance

7.5.3 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 aerodrome operator 's SMS.

7.5.4 Safety performance monitoring and measurement

To verify the safety performance and validate 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.

Internal audit

7.5.4.1 Internal audits are performed to assess the effectiveness of the SMS and identify areas for potential improvement. Ensuring compliance with the regulations through the internal audit is a principle aspect of safety assurance.

7.5.4.2 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.

7.5.4.3 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 feedback 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.

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

7.5.4.5 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.

7.5.4.6 Assessing 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

1) Do users understand the process or procedure?
2) Is the purpose of the process or procedure being achieved consistently?

3) Are the results of the process or procedure what the “customer” asked for?
4) Is the process or procedure regularly reviewed?
5) Is a safety risk assessment conducted when there are changes to the process or procedure?
6) Have process or procedure improvements resulted in the expected benefits?

7.5.4.7 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 aerodrome operator 's SRM processes.

7.5.4.8 The results of the internal audit process become one of the various inputs to the SRM and safety assurance functions. Internal audits inform the aerodrome operator '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.

7.5.4.9 ACAAs 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 aerodrome operator to audit their organization and processes. Results of such second- and third-party audits are inputs to the safety assurance function, providing the aerodrome operator with indications of the effectiveness of their internal audit processes and opportunities to improve their SMS.

Safety performance monitoring

7.5.4.10 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.

7.5.4.11 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:

a) **safety objectives**, which should be established first to reflect the strategic achievements or desired outcomes related to safety concerns specific to the organization’s operational context;

b) **SPIs,** which are tactical parameters related to the safety objectives and therefore are the reference for data collection; and

c) **SPTs,** which are also tactical parameters used to monitor progress towards the achievement of the safety objectives.

7.5.4.12 A more complete and realistic picture of the aerodrome operator '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).

7.5.4.13 SPIs are used to measure operational safety performance of the aerodrome operator and the performance of their SMS. SPIs rely on the monitoring of data and information from various sources including the safety reporting system. They should be specific to the individual aerodrome operator and be linked to the safety objectives already established.

7.5.4.14 When establishing SPIs aerodrome operator should consider:

a) **Measuring the right things:** Determine the best SPIs that will show the organization is on track to achieving its 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.

7.5.4.15 Once SPIs have been established the aerodrome operator should consider whether it 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 – that is, individuals and departments becoming 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.

7.5.4.16 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 aerodrome operator '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.

7.5.4.17 The development of SPIs should be linked to the safety objectives and be based on the analysis of data that is available or obtainable. The monitoring and measurement process involves the use of selected safety performance indicators, corresponding SPTs and safety triggers.

7.5.4.18 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.

7.5.4.19 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.

7.5.4.20 During development of SPIs and SPTs, the aerodrome operator should consult with the ACAA.

7.5.4.21 For more information about safety performance management, refer to Chapter 4.

7.5.5 The management of change

7.5.5.1 Aerodrome operator experience change due to a number of factors including, but not limited to:

a) organizational expansion or contraction;

b) 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;

c) changes to the organization's operating environment;

d) changes to the SMS interfaces with external organizations; and

e) external regulatory changes, economic changes and emerging risks.

7.5.5.2 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.

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

a) **Criticality.** How critical is the change? The aerodrome operator 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?

7.5.5.4 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 aerodrome operator experience regular, or even continuous, change.

7.5.5.5 The aerodrome operator should define the trigger for the formal change process. Changes that are likely to trigger formal change management include:

a) introduction of new technology or equipment;

b) changes in the operating environment;

c) changes in key personnel;

d) significant changes in staffing levels;

e) changes in safety regulatory requirements;

f) significant restructuring of the organization; and

g) physical changes (new facility or base, aerodrome layout changes etc.).

7.5.5.6 The aerodrome operator should also consider the impact of the change on personnel. This could affect the way the change is accepted by those affected. Early communication and engagement will normally improve the way the change is perceived and implemented.

7.5.5.7 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. A review of the system description and organizations' interfaces may be needed. This is an opportunity to determine who should be involved in the change. Changes might affect risk controls already in place to mitigate other risks, and therefore change could increase risks in areas that are not immediately obvious;

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) 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.

7.5.6 Continuous improvement of the SMS

7.5.6.1 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.

7.5.6.2 Internal audits involve assessment of the aerodrome operator 's aviation activities that can provide information useful to the organization's decision-making processes. The internal audit function includes evaluation of all of the safety management functions throughout the organization.

7.5.6.3 SMS effectiveness should not be based solely on SPIs; aerodrome operator 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) **Assessments**: includes assessments of safety culture and SMS effectiveness.

c) **Monitoring of occurrences**: monitor the recurrence of safety events including accidents and incidents as well as errors and rule-breaking situations.

d) **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.

e) **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.

f) **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 aerodrome operator data.

g) **Addressing lessons learnt**: from safety reporting systems and aerodrome operator safety investigations.

These should lead to safety improvements being implemented.

7.5.6.4 In summary, the monitoring of the safety performance and internal audit processes contributes to the Aerodrome operator 's ability to continuously improve its safety performance. Ongoing monitoring of the SMS, its related safety risk controls and support systems assures the aerodrome operator that the safety management processes are achieving their desired safety performance objectives.

Figure 7-8 Continuous improvement of the SMS

7.6 Component 4: Safety Promotion

7.6.1 Safety promotion encourages a positive safety culture and helps achieve the aerodrome operator 's safety objectives through the combination of 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.

7.6.2 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.

7.6.3 The aerodrome operator 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.

7.6.4 Training and education

7.6.4.1 Minister Order No. 170/2022 and Minister Order No. 58/2024 require that “the aerodrome operator 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, is an indication of management’s commitment to an effective SMS. The training programme should include initial and recurrent training requirements to maintain competencies. Initial safety training should consider, as a minimum, the following:

a) organizational safety policies and safety objectives;

b) organizational roles and responsibilities related to safety;

c) basic SRM principles;

d) safety reporting systems;

e) the organization’s SMS processes and procedures; and

f) human factors.

7.6.4.2 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.

7.6.4.3 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 may require only a high level overview of the organization’s SMS.

Training needs analysis

7.6.4.4 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 aerodrome operators 's staff will be affected by the implementation of the SMS, but not in the same ways 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. The aerodrome operator should consider whether it is valuable to extend the analysis to staff in external interfacing organizations;

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.

7.6.4.5 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.

7.6.4.6 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.

7.6.4.7 The aerodrome operator 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 support staff, operational personnel, managers and supervisors, senior managers and the accountable executive.

7.6.4.8 There should be specific safety training for the accountable executive and senior managers that includes the following topics:

a) specific awareness training for new accountable executives and post holders on their SMS accountabilities and responsibilities;

b) importance of compliance with national and organizational safety requirements;

c) management commitment;

d) allocation of resources;

e) promotion of the safety policy and the SMS;

f) promotion of a positive safety culture;

g) effective interdepartmental safety communication;

h) safety objective, SPTs and alert levels; and

i) disciplinary policy.

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

7.6.5 Safety communication

7.6.5.1 The aerodrome operator 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, including among aerodrome operators. 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 aerodrome operator 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 aerodrome operator 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; provide feedback to personnel submitting safety reports on what actions have been taken to address any concerns identified.

7.6.5.2 Aerodrome operators should consider whether any of the safety information listed above needs to be communicated to external organizations.

7.6.5.3 Aerodrome operators should assess the effectiveness of their safety communication by checking 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.

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

7.7 Implementation planning

7.7.1 System description

7.7.1.1 A system description helps to identify the organizational processes, including any interfaces, to define the scope of the SMS. This provides an opportunity to identify any gaps related to the aerodrome operator 's SMS components and elements and may serve as a starting point to identify organizational and operational hazards. A system description serves to identify the features of the product, the service or the activity so that SRM and safety assurance can be effective.

7.7.1.2 Most organizations are made up of a complex network of interfaces and interactions involving different internal departments as well as different external organizations that all contribute to the safe operation of the organization. The use of a system description enables the organization to have a clearer picture of its many interactions and interfaces. This will enable better management of safety risk and safety risk controls if they are described, and help in understanding the impact of changes to the SMS processes and procedures.

7.7.1.3 When considering a system description, it is important to understand that a "system" is a set of things working together as parts of an interconnecting network. In an SMS, it is any of an organization's products, people, processes, procedures, facilities, services, and other aspects (including external factors), which are related to, and can affect, the organization's aviation safety activities. Often, a "system" is a collection of systems, which may also be viewed as a system with subsystems. These systems and their interactions with one another make up the sources of hazards and contribute to the control of safety risks. The important systems include both those which could directly impact aviation safety and those which affect the ability or capacity of an organization to perform effective safety management.

7.7.1.4 An overview of the system description and the SMS interfaces should be included in the SMS documentation. A system description may include a bulleted list with references to policies and procedures. A graphic depiction, such as a process flow chart or annotated organization chart, may be enough for some organizations. An organization should use a method and format that works for that organization.

7.7.1.5 Because each organization is unique, there is no "one size fits all" method for SMS implementation. It is expected that each organization will implement an SMS that works for its unique situation. Each organization should define for itself how it intends to go about fulfilling the fundamental requirements. To accomplish this, it is important that each organization prepare a system description that identifies its organizational structures, processes, and business arrangements that it considers important to safety management functions. Based on the system description, the organization should identify or develop policy, processes, and procedures that establish its own safety management requirements.

7.7.1.6 When an organization elects to make a significant or substantive change to the processes identified in the system description, the changes should be viewed as potentially affecting its baseline safety risk assessment. Thus, the system description should be reviewed as part of the management of change processes.

7.7.2 Interface management
Safety risks faced by aerodrome operators are affected by interfaces. Interfaces can be either internal (e.g. between departments) or external (e.g. other aerodrome operators or contracted services,). By identifying and managing these interfaces the aerodrome operators will have more control over any safety risks related to the interfaces. These interfaces should be defined within the system description.

7.7.3 Identification of SMS interfaces
7.7.3.1 Initially aerodrome operator should concentrate on interfaces in relation to its business activities. The identification of these interfaces should be detailed in the system description that sets out the scope of the SMS and should include internal and external interfaces.

7.7.3.2 Once the SMS interfaces have been identified, the aerodrome operator should consider their relative criticality. This enables the aerodrome operator to prioritize the management of the more critical interfaces, and their potential safety risks. Things to consider are:

a) what is being provided;

b) why it is needed;

c) whether the organizations involved has an SMS or another management system in place; and

d) whether the interface involves the sharing of safety data / information.

Assessing safety impact of interfaces

7.7.3.3 The aerodrome operator should then identify any hazards related to the interfaces and carry out a safety risk assessment using its existing hazard identification and safety risk assessment processes.

7.7.3.4 Based on the safety risks identified, the aerodrome operator may consider working with the other organization to determine and define an appropriate safety risk control strategy. By involving the other organization, they may be able to contribute to identifying hazards, assessing the safety risk as well as determining the appropriate safety risk control. This collaborative effort is needed because the perception of safety risks may not be the same for each organization. The risk control could be carried out by either the aerodrome operator or the external organization.

7.7.3.5 It is also important to recognize that each organization involved has the responsibility to identify and manage hazards that affect their own organization. This may mean the critical nature of the interface is different for each organization as they may apply different safety risk classifications and have different safety risk priorities (in term of safety performance, resources, time, etc.).

Managing and monitoring interfaces

7.7.3.6 The aerodrome operator is responsible for managing and monitoring the interfaces to ensure the safe provision of their services and products. This will ensure the interfaces are managed effectively and remain current and relevant. Formal agreements are an effective way to accomplish this as the interfaces and associated responsibilities can be clearly defined. Any changes in the interfaces and associated impacts should be communicated to the relevant organizations.

7.7.3.7 Challenges associated with the aerodrome operator 's ability to manage interface safety risks include:

a) one organization's safety risk controls are not compatible with the other organizations';

b) willingness of both organizations to accept changes to their own processes and procedures;

c) insufficient resources or technical expertise available to manage and monitor the interface; and

d) number and location of interfaces.

7.7.3.8 It is important to recognize the need for coordination between the organizations involved in the interface. Effective coordination should include:

a) clarification of each organization's roles and responsibilities;

b) agreement of decisions on the actions to be taken (e.g. safety risk control actions and timescales);

c) identification of what safety information needs to be shared and communicated;

d) how and when coordination should take place (task force, regular meetings, ad hoc or dedicated meetings); and

e) agreeing on solutions that benefit both organizations but that do not impair the effectiveness of the SMS.

7.7.3.9 All safety issues or safety risks related to the interfaces should be documented and made accessible to each organization for sharing and review. This will allow the sharing of lessons learned and the pooling of safety data that will be valuable for both organizations. Operational safety benefits may be achieved through an enhancement of safety reached by each organization as the result of shared ownership of safety risks and responsibility.

7.7.4 SMS Scalability

7.7.4.1 The organization's SMS, including the policies, processes and procedures, should reflect the size and complexity of the organization and its activities. It should consider:

a) the organizational structure and availability of resources;

b) size and complexity of the organization (including multiple sites and bases); and

c) complexity of the activities and the interfaces with external organizations.

7.7.4.2 The aerodrome operator should carry out an analysis of its activities to determine the right level of resources to manage the SMS. This should include the determination of the organizational structure needed to manage the SMS. This would include considerations of who will be responsible for managing and maintaining the SMS, what safety committees are needed, if any, and the need for specific safety specialists.

Safety risk considerations

9.7.4.3 Regardless of the size of the aerodrome operator, scalability should also be a function of the inherent safety risk of the aerodrome operator 's activities. Even small organizations may be involved in activities that may entail significant aviation safety risks. Therefore, safety management capability should be commensurate with the safety risk to be managed.

Safety data and safety information and its analysis

9.7.4.4 For small organizations, the low volume of data may mean that it is more difficult to identify trends or changes in the safety performance. This may require meetings to raise and discuss safety issues with appropriate experts. This may be more qualitative than quantitative but will help identify hazards and risks for the aerodrome operators. Collaborating with other aerodrome operators or industry associations can be helpful, since these may have data that the aerodrome operator does not have. For example, smaller aerodrome operator can exchange with similar organizations/operations to share safety risk information and identify safety performance trends. Aerodrome operators should adequately analyse and process their internal data even though it may be limited.

7.7.4.5 Aerodrome operator with many interactions and interfaces will need to consider how they gather safety data and safety information from multiple organizations. This may result in large volumes of data being collected to be collated and analysed later. These aerodrome operators should utilize an appropriate method of managing such data. Consideration should also be given to the quality of the data collected and the use of taxonomies to help with the analysis of the data.

7.7.5 Integration of management systems

7.7.5.1 Safety management should be considered as part of a management system (and not in isolation). Therefore, an aerodrome operator may implement an integrated management system that includes the SMS. An integrated management system may be used to capture multiple certificates, authorizations or approvals or to cover other business management systems such as quality, security, occupational health and environmental management systems. This is done to remove duplication and exploit synergies by managing safety risks across multiple activities. For example, where an aerodrome operators holds multiple certificates/approvals it may choose to implement a single management system to cover all of its activities. The aerodrome operator should decide the best means to integrate or segregate its SMS to suit its business or organizational needs.

7.7.5.2 A typical integrated management system may include a:

a) quality management system (QMS);

b) safety management system (SMS);

c) security management system (SeMS);

d) environmental management system (EMS);

e) occupational health and safety management system (OHSMS);

f) financial management system (FMS);

g) documentation management system (DMS); and

h) fatigue risk management system (FRMS).

7.7.5.3 An aerodrome operator may choose to integrate these management systems based on their unique needs. Risk management processes and internal audit processes are essential features of most of these management systems. It should be recognized that the risks and risk controls developed in any of these systems could have an impact on other systems. In addition, there may be other operational systems associated with the business activities that may also be integrated, such as supplier management, facilities management, etc.

7.7.5.4 An aerodrome operator may also consider applying the SMS to other areas that do not have a current regulatory requirement for an SMS. Aerodrome operator should determine the most suitable means to integrate or segregate their management system to suit their business model, operating environment, regulatory, and statutory requirements as well as the expectations of the aviation community. Whichever option is taken, it should still ensure that it meets the SMS requirements.

Benefits and challenges of management system integration

7.7.5.5 Integrating the different areas under a single management system will improve efficiency by:

a) reducing duplication and overlapping of processes and resources;

b) reducing potentially conflicting responsibilities and relationships;

c) considering the wider impacts of risks and opportunities across all activities; and

d) allowing effective monitoring and management of performance across all activities.

7.7.5.6 Possible challenges of management system integration include:

a) existing systems may have different functional managers who resist the integration; this could result in conflict;

b) there may be resistance to change for personnel impacted by the integration as this will require greater cooperation and coordination;

c) impact on the overall safety culture within the organization as there may be different cultures in respect of each system; this could create conflicts;

d) integrating different management systems (such as QMS and SMS) may create additional work to be able to demonstrate that the separate requirements are being met.

7.7.5.7 To maximize the benefits of integration and address the related challenges, senior management commitment and leadership is essential to manage the change effectively. It is important to identify the person who has overall responsibility for the integrated management system.

7.7.6 SMS and QMS integration

7.7.6.1 Some aerodrome operators have both an SMS and QMS. These sometimes are integrated into a single management system. The QMS is generally defined as the organizational structure and associated accountabilities, resources, processes and procedures necessary to establish and promote a system of continuous quality assurance and improvement while delivering a product or service.

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

a) should be planned and managed;

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

c) identify ineffective processes and procedures;

d) strive for continuous improvement; and

e) have the same goal of providing safe and reliable products and services to customers.

7.7.6.3 The SMS focuses on:

a) identification of safety-related hazards facing the organization;

b) assessment of the associated safety risk;

c) implementation of effective safety risk controls to mitigate safety risks;

d) measuring safety performance; and

e) maintaining an appropriate resource allocation to meet safety performance requirements.

7.7.6.4 The QMS focuses on:

a) compliance with regulations and requirements;

b) consistency in the delivery of products and services;

c) meeting the specified performance standards; and

d) delivery of products and services that are “fit for purpose” and free of defects or errors.

7.7.6.5 Monitoring compliance with regulations is necessary to ensure that safety risk controls, applied in the form of regulations, are effectively implemented and monitored by the aerodrome operator. The causes and contributing factors of any non-compliance should also be analysed and addressed.

7.7.6.6 Given the complementary aspects of SMS and QMS, it is possible to integrate both systems without compromising each function. This can be summarized as follows:

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

b) a QMS may identify safety issues or weaknesses in safety risk controls;

c) a QMS may foresee safety issues that exist despite the organization’s compliance with standards and specifications;

d) quality principles, policies and practices should be aligned with the objectives of safety management; and

e) QMS activities should consider identified hazards and safety risk controls for the planning and performance of internal audits.

7.7.6.7 In conclusion, in an integrated management system with unified goals and decision-making that considers the wider impacts across all activities, quality management and safety management processes will be highly complementary and will support the achievement of the overall safety goals.

7.7.7 SMS gap analysis and implementation

7.7.7.1 Before implementing an SMS, the aerodrome operator should carry out a gap analysis. This compares the aerodrome operators existing safety management processes and procedures with the SMS requirements. It is likely that the aerodrome operator 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.

7.7.7.2 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.

7.7.7.3 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.

7.7.7.4 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.

7.8 Runway Safety Team

7.8.1 Introduction

In accordance with Minister Order No. 170/2022, and AMC GM, CS accepted by ED of ACAA AMC1 ADR.OR.D.027 “Safety programmes”, point b) The aerodrome operator should establish, coordinate, and lead local aerodrome safety committees, and a Local Runway Safety Team, dealing with runway safety, apron safety, and the safety of the operations at the aerodrome in general. All relevant organisations operating or providing services at the aerodrome should participate to such aerodrome safety committees and the Local Runway Safety Team.

The local aerodrome safety committees and the Local Runway Safety Team should convene regularly, identify and review local safety issues, and examine possible solutions, and need for action. Minutes of such meetings should be kept. Procedures relevant to the functioning of local aerodrome safety committees and the Local Runway Safety Team should be included in the aerodrome manual.

In accordance with Minister Order No. 58/2024 Appendix A point 20.3 “Aerodromes” consider LRST as a useful group that can be of assistance during the installation process of ARIWS.

7.8.2 Goals and general description of the RST Programme

The primary role of a runway safety team is to advise relevant operators management and operational staff on prevailing local conditions on the runway, taxiways and adjacent areas, other issues of concern and develop mitigating measures and solutions to identified issues.

The RST should implement an action plan for runway safety, advise management as appropriate on potential runway safety issues and recommend strategies for hazard removal and mitigation of the residual risk. These strategies may be developed based on local occurrences or combined with information collected elsewhere.

Although not considered a regulatory authority or intended to replace any required component of a Safety Management System (SMS), the RST is aimed to improve and support runway safety by integrating the safety systems of the participating organizations (stakeholders). RSTs can serve as an excellent tool for managing runways safety related risk identified by the aerodrome operator programs. In addition, the aerodrome operator SMS process should be used to evaluate possible risk posed by operational changes resulting from RST proposed corrective actions.

The RST's meeting schedule depends on the situation and environment of the aerodrome. For example, if major works are proposed, or runway hazards and incidents are increasing, then the RST may need to meet more frequently. However, if operations are stable, with few hazards identified, then the meetings may be less frequent.

The RST is built on the principles of a formal Hazard Identification and Risk Management (HIRM) process, in accordance with MO No. 170/2022, MO No. 58/2024 and ICAO Annex 19 and ICAO Doc 9859— Safety Management Manual (SMM). The RST should be able to capture the HIRM results from its members, as most of them will have their own SMS's with differing HIRM processes.

The RST should cover a wide range of issues related to runway safety, including but not limited to, the following occurrence categories:

- Abnormal runway contact;
- Bird strike;
- Ground collision;
- Ground handling;
- Runway excursion;
- Runway incursion;
- Loss of control on ground;
- Collision with obstacle(s);
- Undershoot / overshoot, aerodrome;
- Use of the wrong runway (runway confusion);
- High Speed Rejected Take-Off;
- Wildlife Event;
- Damage from Foreign Object Debris (FOD).

Refer to ICAO Doc 9870 – Manual on the Prevention of Runway Safety Incursions, for specific guidance on the establishment and objectives of a runway incursion programme.

7.8.3 RST administrative processes

7.8.3.1 Terms of Reference

To facilitate effective decision-making, organizations seeking to establish an RST should agree to a set of procedural rules governing the actions of their representatives. Once formally documented and accepted, these rules will be referred to as the "Terms of Reference" (ToR) of the RST.

Suggested ToRs for the RST include:

- Objectives, scope of oversight, and expected frequency of RST meetings;
- Membership selection processes;
- Roles and responsibilities of individual RST members;
- Processes and formal agreements governing sharing of safety data, safety reports, and safety information as well as the protection of the sources of information shared within the RST (protection from inappropriate use and protection against disclosure);
- Consultation, decision-making and conflict resolution processes;
- Regularly review to ensure its adequacy and compliance with applicable regulation;
- Ensure that the recommendations contained in the ICAO Doc 9870 - Manual on the Prevention of Runway Incursions are implemented;
- Documentation and reporting requirements;
- Monitor runway incidents by type, severity and frequency of occurrence;
- Identify risk factors and local issues, particular locations where risk exist (e.g., hot spots), and problems in daily operations and suggest improvements;
- Solicit assistance by safety experts from within the industry;
- Contribute to active development of solutions to these issues;
- Ensure that the best possible solution is implemented;
- Learn lessons from other incidents and consider the outcome of other investigation reports;
- Disseminate information on developed solutions to stakeholders;
- Initiate a comprehensive safety-awareness campaign to ensure that all stakeholders' staffs are aware of safety issues, such as producing and distributing local hot spot maps or other guidance material.

7.8.3.2 Continuous improvement

All team members will monitor the RST activities for areas in need of improvement and/or failure to achieving the conditions set forth in the ToR. Additionally, the chairperson will schedule the following activities:

a) Internal reviews

At least once every six months, the team will allocate time during a regularly scheduled meeting to discuss each item on the checklistACAA-DAD-GM6-SMS-100. . Their responses will be recorded and maintained as part of the safety library for at least two years.

b) External reviews

At least once per calendar year, the RST documentation should be audited and at least one meeting observed by a member of the regulatory body or an agreed third-party. The results of this appraisal will be recorded and maintained as part of the safety library for a period described in the SMS of the aerodrome operator.

7.8.3.3 RST organizational structure

The organizational setup required for an RST depends on the number of participating members, their interaction and cooperation capabilities and any other local requirements. In any case, the initiator would normally be the aerodrome operator. This section provide basic concepts of leadership and administration sharing in order to assist RST as necessary. It may vary depending on the size and setup of each team.

Irrespective of the final RST set up, the team will require the designation of leadership and administration. These tasks may be carried out by one or more members of the RST; e.g. one Chairperson and one Rapporteur.

7.8.3.4 The RST Chairperson

The Chairperson serves as the coordinator and spokesperson for the team. The nomination and role of the Chairperson can, for example, be organized on a rotational basis amongst all RST members. The roles and responsibilities of the nominated Chairperson may also include a variety of administrative and/or organizational aspects, such as:

a) Meeting planning: The Chairperson schedules the meetings and arranges the venue. He or she gathers input from the members in the weeks prior to the meeting and distributes an agenda one week prior to the meeting date. Guidance on meeting planning is included in Appendix A.

b) Meeting facilitation: The Chairperson ensures the meetings are conducted in a collaborative manner and in accordance with the ToR processes. He or she constantly strives to enhance the programme by regularly engaging in continuous improvement activities.

c) Maintaining the safety library: The Chairperson ensures the actions of the RST are properly documented and maintained in the RST safety library.

d) Coordinating with external agencies: The Chairperson serves as the point of contact with external agencies and ensures all RST activities are properly communicated to applicable agencies/organizations.

7.8.3.5 Role of RST members

a) Meeting planning

RST members will submit items for discussion at the next scheduled meeting as soon as possible, but not later than the date requested by the Chairperson. Each member presenting during the meeting should prepare briefing material and invite subject matter experts as necessary to provide the other members with a clear understanding of the issue they wish to discuss. The members should tour the airport just prior to the meeting to familiarize themselves with the current situation and identify potential safety hazards.

Note.— A tour of the airport during different times of the day and varying environmental conditions should be considered to allow identification of hazards specific to certain light and adverse weather conditions. The tour is for the identification of safety issues only and should not be used by any person external to the RST nor cause disruption to current operations.

b) Meeting participation

RST members will openly share information and strive to achieve consensus during decision-making activities. They will constantly strive to enhance the programme by engaging in continuous improvement activities.

c) Contributing to the safety library

RST members should contribute safety data & analysis, reports, and information from the safety management systems or other safety relevant sources of their participating organizations to the RST.

d) Coordinating with participating organizations

RST members will communicate the findings and decisions of the RST within their respective organizations and ensure the recommendations are properly addressed.

7.8.4 Role of the regulator

The RST is considered an activity of the SMS of the aerodrome operator, which coordinates safety issues from all the users of that aerodrome. Although their participation is not required, ACAA may attend RST meetings to advise on regulatory matters, participate in the information sharing activities, understand the current hazards and risks associated with local operations, and interface with other government agencies (e.g. land use authorities) on behalf of the RST when appropriate.

7.8.5 RST technical processes

7.8.5.1 Meetings

The RST meeting is the most important component of the programme as it is the forum in which hazards are discussed, consequences determined, risks assessed, priorities determined, and recommendations developed. This type of face-to-face interaction leads to improved collaboration, problem-solving and risk management because the team members benefit from information sharing and the perspectives of representatives from other groups.

Given the RSTs operational focus, it should include representatives from the following groups:

a) aerodrome operators;

b) air traffic services;

c) commercial air operators;

d) representatives of flight crew familiar with the aerodrome;

e) members from the general aviation community (if applicable);

f) technical experts of controller associations; and

g) technical experts of pilots associations.

The team may also include:

a) the regulatory authority (ACAA);

b) military operator (if applicable, based on joint use of the airport or other military roles);

c) support services (de-icing, catering, ground handling, etc.);

d) emergency response agencies;

e) subject matter experts (meteorologists, ornithologists, accident investigation authority, etc.) (upon invitation); and

f) consideration may be given to periodically inviting members of other RSTs to enable sharing of information and learning.

In addition to the normal RST members, entities operating at the aerodrome may participate in the RST process to address operational hazards identified by their internal SMS. In this regard, the entities will interface with the RST as needed to address the specify concern.

Note.— Refer to Appendix B for a sample Runway Safety Team meeting agenda.

7.8.5.3 Hazards and associated consequences

Once the team members are identified, the Chairperson selected, and the ToR and schedule are agreed to, the real work of the RST begins with the hazard identification process. It is anticipated that each member will come to the meeting prepared to brief on the hazards related to runway safety, as identified through their respective SMS or other aviation safety relevant systems (arising mostly from safety reporting, investigation and audit activities). Hazards identified through the SMS of other organization operating at the aerodromes who may not be participating in person at the meeting should be presented for evaluation. For guidance on hazard identification refer to in Chapter 2 of this Manual.

In addition to the hazard reporting systems of the member organizations, the RST should also conduct periodic visits to various airport locations (i.e., tower facility, construction areas, taxiway intersections, etc.) and solicit input especially from organizations without formal representation at the meeting. These may include corporate operators, flight schools, industry organizations, ground services and others. By casting a wide net, the RST will develop a deeper understanding of the operational complexity associated with the airport environment and, therefore, be better able to identify hazards and determine operational risks.

As the team discusses the destructive potential of the hazard, it is important to keep in mind that these “consequences” should be framed in realistic operational outcomes, as opposed to extremely remote and unlikely outcomes. A useful technique is to identify the top-level (or generic) hazard, see Figure 7-9, then to list the related specific hazards and associated consequences. For example, a generic hazard category might be “airport construction.” The specific hazards associated with a construction project at the airport might be “the presence of construction equipment” and “the closure of taxiways.” These, in turn, may result in the RST identifying the potential consequences of these specific hazards as “an aircraft colliding with the construction equipment” and “an aircraft taxiing onto a closed taxiway.” By correctly identifying (and documenting) the hazard and defining the associated consequences in operational terms, the RST is able to assess the safety risk.

Hazardous conditions can sometimes combine, resulting in an even greater severity and/or probability of outcome. For example, the hazards associated with airport construction, coupled with the hazards of low visibility and night operations, may result in a greater risk than just the airport construction hazard alone (in this situation, the probability of the risk would likely be increased).

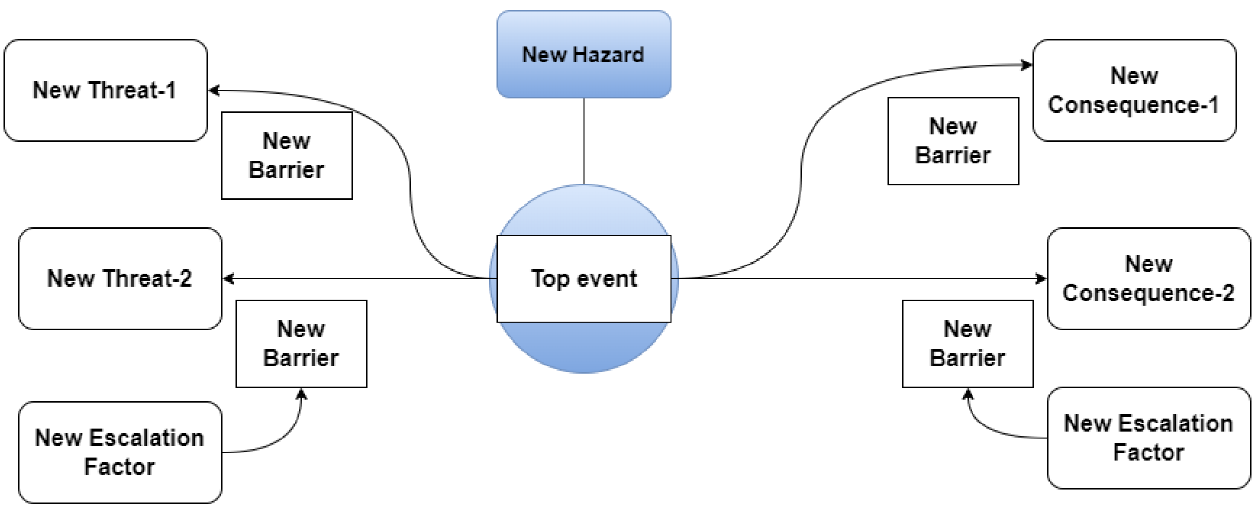

Figure 7-9 Technique for hazard identification

7.8.5.4 Safety risk assessment

The reason for conducting safety risk assessments is to provide the RST with a method for appropriately managing the risks of identified hazards, developing effective risk mitigation strategies, and prioritizing their workflow. Given that time and financial resources are limited, the following process allows the RST to efficiently determine which areas require its immediate attention to reduce the runway safety risk to As Low As Reasonably Practicable (ALARP).

The process of runway safety risk assessment and management is explained in Chapter 2.

One of the advantages of using the RST to conduct the risk assessment is that all stakeholders have been involved in the risk assessment process, thus ensuring that the worst outcome and appropriate probability have been evaluated.

7.8.6 Developing recommendations and action plan

Following the safety risk assessment, the RST should develop specific recommendations to reduce the risk, and an action plan to ensure the recommendations are implemented. In doing so, the following concepts should be considered:

a) Prioritization

The RST should ensure their solutions are prioritized according to the “safety risk tolerability” assessment. For example, if they determine that “the operation may continue” with the assessed level of safety risk, their recommendations should reflect a strategy where improvements are implemented as resources become available. Conversely, if they determine “the operation may continue with mitigation,” their recommendations should reflect a requiring immediate action(s) to address the consequences of the hazard. Thus, time frames for completing the actions must be commensurate with the risk levels involved.

b) Control strategies

Safety risk is controlled by addressing either:

1) the probability of the consequences occurring;
2) the severity level of the consequences; or
3) both simultaneously.

Key approaches to controlling safety risk include:

1) **Avoidance**: The operation or activity is cancelled because the safety risk exceeds the benefit of continuing the operation or activity.
2) **Reduction**: The frequency of the operation or activity is reduced, or action is taken to reduce the severity of the consequences of the risks.
3) **Segregation**: Action is taken to isolate the effects of the consequences of the hazard or build in redundancy to protect against them.

c) Evaluating alternative solutions

During the process, the RST should explore several strategies for controlling safety risks. These strategies should be evaluated against one another to find the most effective and efficient solution using objective and subjective measures. These measures may include criteria such as conducting a cost/benefit analysis, determining the enforceability of the proposal, assessing the acceptability to the affected stakeholder, and others. In all cases, however, the RST must conduct a risk assessment of their proposed solution and evaluate any potential hazards created by their strategy.

However, just because a solution is easy to implement, cost effective and acceptable to all stakeholders, it does not mean that it will reduce the risk level. The effectiveness of the strategy in reducing the risk is measured by the residual or remaining risk once the strategy has been activated. A risk assessment should determine if the remaining (residual) risk is acceptable, or if more solutions and mitigations are required.

d) Notification to Affected Stakeholder

If the RST determines that either a mitigation strategy is required or part of the operation should be modified or suspended, it should make a formal recommendation to the organization responsible for that part of the operation and include the rationale and risk assessment.

A summary of the entire process should include a master register of the hazards identified, current controls and defences, risk analysis and outcome, additional controls and mitigations, action plan for implementation (owner and timelines), and residual risk.

7.8.7 Record keeping – data sharing

Proper and structured record keeping of observed and identified hazards, safety events and corrective actions allow for trend analysis. The RST should identify a gate keeper who is responsible for the maintenance of the data base and can present reports and analysis upon request of the RST members.

Data exchange and sharing amongst RST members enhances the effectiveness of the RST. RSTs from different airports are encouraged to set a protocol in place that could allow for data sharing across various locations and will support the teams in identifying proper mitigation strategies.

APPENDIX A — RST MEETING ORGANIZER TOOL (EXAMPLE)

A.1 Schedule meeting

a) Date

b) Time

c) Location

A.2 Determine invitees:

- aerodrome operators;
- air traffic services;
- commercial air operators;
- representatives of flight crew familiar with the aerodrome;
- members from the general aviation community (if applicable);
- technical experts of controller associations; and
- technical experts of pilots associations.

The team may also include:

- the regulatory authority;
- military operator (if applicable, based on joint use of the airport or other military roles);
- support services (de-icing, catering, ground handling, etc.);
- emergency response agencies;
- subject matter experts (meteorologists, ornithologists, accident investigation authority, etc.) (upon invitation); and
- consideration may be given to periodically inviting members of other RSTs to enable sharing of information and learning.

A.3 Plan Discussion Topics

a) Three weeks prior to the meeting date:

- Notify stakeholders of the meeting date, time, and location.
- Solicit input for agenda items from each of the members.

b) Two weeks prior to the meeting date:

- Schedule airport tours (as required).
- Send tentative agenda to the team.

c) One week prior to the meeting date:

- Consolidate updates and information received from members.
- Distribute the final agenda and supporting documents to the team.

A.4. Meeting Logistics

a) Confirm availability of members

b) Schedule meeting room appropriate for the size and requirements of the RST

c) Coordinate airfield tour with airport management, tower, etc., including vehicle and escort availability.

APPENDIX B — RUNWAY SAFETY TEAM MEETING AGENDA (EXAMPLE)

B.1 Meeting information

a) Date

b) Time

c) Location

B.2 Members and guests in attendance

- aerodrome operators;
- air traffic services;
- commercial air operators;
- representatives of flight crew familiar with the aerodrome;
- members from the general aviation community (if applicable);
- technical experts of controller associations; and
- technical experts of pilots associations.

The team may also include:

- the regulatory authority;
- military operator (if applicable, based on joint use of the airport or other military roles);
- support services (de-icing, catering, ground handling, etc.);
- emergency response agencies;
- subject matter experts (meteorologists, ornithologists, accident investigation authority, etc.) (upon invitation); and
- consideration may be given to periodically inviting members of other RSTs to enable sharing of information and learning.

B.3. Previous business

Review the status of previous action items and update the Action log as appropriate

B.4. New business

Members present new projects, hazards, or events identified within their safety management systems. The team then:

(a) defines the hazards,

(b) conducts safety risk assessments, and

(c) proposes recommendations for managing the safety risk]

B.5 Action log

Document findings and action plan.

B.6 Next meeting

Agree to the date, time, and location for the next meeting.

A.1 Instructions

The following checklist is provided to assist both existing and new RSTs in determining if gaps exist in their programme, or if improvements can be made. Although not intended to be an exhaustive list, the items on the checklist are designed to identify gaps in the system that would hinder the RST from achieving their goal of improving runway safety.

Five main areas are included in the checklist:

1) Terms of Reference;
2) Hazard identification;
3) Safety Risk Management;
4) Communication; and
5) Continuous improvement.

A negative response to any of the associated question indicates an area that should receive attention by all members of the RST (and the organizations they represent) until the gap is filled.

A.2 Checklist

Item	Question	Response	Comments
1. Terms of Reference (ToR)			
1.1	Is there a ToR agreement in place?	YES NO	
1.2	Does the ToR define the scope of work of the RST?	YES NO	
1.3	Does the ToR define the roles for members of the RST?	YES NO	
1.4	Does the ToR define a process for handling data/reports received from the participating organizations?	YES NO	
1.5	Does the ToR describe the decision-making process to be used by the RST?	YES NO	
1.6	Does the ToR define a process for resolving disagreements between RST members?	YES NO	
2. Hazard identification			
2.1	Does the RST have a formal safety data collection and processing system for documenting operational hazards?	YES NO	
2.2	Do all RST members contribute to the formal safety data collection and processing system by sharing identified operational hazards?	YES NO	
2.3	Does the RST define and document specific consequences for the operational hazards?	YES NO	
3. Safety Risk Management			
3.1	Does the RST have a formal process to manage the operational risk?	YES NO	

3.2	As part of the risk management process, are the consequences of the operational hazards assessed in terms of probability and severity?	YES NO	
3.3	Is there a formalized process to determine the level of risk the RST is willing to accept?	YES NO	
3.4	Does the RST develop risk mitigation strategies to control the level of risk within the operational environment?	YES NO	
3.5	Is there a formalized process for the RST to make recommendations to applicable stakeholders?	YES NO	
3.6	Is there a formalized process to document the decisions made by the RST during the risk management process?	YES NO	
3.7	Are the decisions made by the RST periodically reviewed to determine if the desired effect was achieved by their mitigations/recommendations?	YES NO	
4. Communication			
4.1	Does the RST have a formal process to communicate with applicable stakeholders?	YES NO	
4.2	Does the RST periodically provide runway safety material to key frontline employees?	YES NO	
4.3	Does the RST participate in information sharing activities with other RSTs?	YES NO	
4.4	Does the RST solicit safety-related information from all airport users via common links embedded within websites of the RST participating organizations?	YES NO	
5. Continuous improvement			
5.1	Does the RST have a formal process to continuously improve their processes & products?	YES NO	
5.2	Does the RST engage in formal, periodic reviews of their programme to ensure they are improving runway safety?	YES NO	
5.3	Are the results of the continuous improvement programme documented?	YES NO	