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Safety Management Manual (SMM)

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AMENDMENTS

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Contents

ACRONYMS AND ABBREVIATIONS

ADREP	Accident/incident data reporting (ICAO)
AEP	Aerodrome emergency plan
AIRPROX	Aircraft proximity
ALARP	As low as reasonably practicable
ALoSP	Acceptable level of safety performance
AMJ	Advisory material joint
AMO	Approved maintenance organization
AOC	Air operator certificate
ASDE	Airport surface detection equipment
ASR	Air safety report
ATC	Air traffic control
ATCO	Air traffic controller
ATM	Air traffic management
ATS	Air traffic service(s)
CAA	Civil aviation authority
CDA	Constant descent arrivals
CEO	Chief executive officer
CFIT	Controlled flight into terrain
CIP	Commercially important person
Cir	Circular
CMC	Crisis management centre
CRDA	Converging runway display aid
CRM	Crew resource management
CVR	Cockpit voice recorder
DME	Distance measuring equipment
Doc	Document
ERP	Emergency response plan
FDA	Flight data analysis
FDM	Flight data monitoring
FDR	Flight data recorder
FOD	Foreign object (debris) damage
ft	Feet
GPS	Global positioning system
ILS	Instrument landing system
IMC	Instrument meteorological conditions
ISO	International Organization for Standardization
kg	Kilogram(s)
LOFT	Line-oriented flight training
LOSA	Line operations safety audit

m	Metre(s)
MDA	Minimum descent altitude
MEL	Minimum equipment list
MOR	Mandatory occurrence report
MRM	Maintenance resource management
NM	Nautical mile(s)
OJT	On-the-job training
OSHE	Occupational Safety, Health & Environment
OHSMS	Occupational Health & Safety management system
PC	Personal computer
QA	Quality assurance
QC	Quality control
QMS	Quality management system
RVSM	Reduced vertical separation minimum
SA	Safety assurance
SAG	Safety action group
SARPs	Standards and Recommended Practices (ICAO)
SDCPS	Safety data collection and processing systems
SeMS	Security Management System
SHEL	Software/Hardware/Environment/Liveware
SMM	Safety management manual
SMS	Safety management system(s)
SMSM	Safety management systems manual
SOPs	Standard operating procedures
SRB	Safety review board
SRM	Safety risk management
SSP	State safety programme
TLH	Top level hazard
TRM	Team resource management
USOAP	Universal Safety Oversight Audit Programme (ICAO)
VIP	Very important person
VMC	Visual meteorological conditions
VOR	Very high frequency omnidirectional range

OVERVIEW OF THE MANUAL

GENERAL

This third edition of the ICAO *Safety Management Manual (SMM)* (Doc 9859) supersedes the second edition, published in 2009, in its entirety. It also supersedes the ICAO *Accident Prevention Manual* (Doc 9422), which is obsolete.

This manual is intended to provide States with guidance for the development and implementation of a State safety programme (SSP), in accordance with the International Standards and Recommended Practices (SARPs) contained in Annex 1 — *Personnel Licensing*, Annex 6 — *Operation of Aircraft*, Annex 8 — *Airworthiness of Aircraft*, Annex 11 — *Air Traffic Services*, Annex 13 — *Aircraft Accident and Incident Investigation* and Annex 14 — *Aerodromes, Volume I — Aerodrome Design and Operations*. It should be noted that SSP provisions will be incorporated into Annex 19, which is under development at the time this revision was published. This manual also provides guidance material for establishment of Safety Management Systems (SMS) requirements by States as well as for SMS development and implementation by affected product and service providers.

It should be noted this SMM is intended to be used in conjunction with other appropriate guidance materials which can be useful for complementing or enhancing the concepts or guidance within this document.

Note: In the context of safety management, the term "service provider" or "product and service provider" refers to any organization providing aviation products and/ or services. The term thus encompasses approved training organizations that are exposed to safety risks during the provision of their services, aircraft operators, approved maintainance organizations, organizations responsible for type design and/or manufacture of aircraft, air traffic service providers and certified aerodromes.

STRUCTURE

Chapter 1 presents the fundamental safety management concepts and processes. Chapter 2 provides a compilation of the ICAO safety management SARPs contained in Annexes 1, 6, 8, 11, 13 and 14. Finally, Chapters 3 and 4 outline a progressive approach to the development, implementation and maintenance of SSP and SMS. The last two chapters also contain appendices which provide practical guidance and illustrations.

OBJECTIVES

The objective of this manual is to provide States and product and service providers with:

a) an overview of safety management fundamentals;
b) a summary of ICAO Standards and Recommended Practices (SARPs) on safety management contained in Annexes 1, 6, 8, 11, 13 and 14;
c) guidance for States on how to develop and implement an SSP in compliance with the relevant ICAO SARPs; including a harmonized regulatory framework for the oversight of product and service providers' SMS; and
d) guidance for product and service providers on SMS development, implementation and maintenance.

DEFINITIONS

Acceptable Level of Safety Performance (ALoSP)	The minimum level of safety performance of civil aviation in a State, as defined in its State Safety Program, or of a service provider, as defined in its Safety Management System, expressed in terms of safety performance targets and safety performance indicators
Accountable Executive	Single, identifiable person having responsibility for the effective and efficient performance of the State's SSP or of the service provider's SMS
Change Management	A formal process to manage changes within an organization in a systematic manner, so that changes which may impact identified hazards and risk mitigation strategies are accounted for, before the implementation of such changes
Defenses	Specific mitigating actions, preventive controls or recovery measures put in place to prevent the realization or escalation of a hazard 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.
High Consequence Indicators	Safety performance indicators pertaining to the monitoring and measurement of high consequence occurrences, such as accidents or serious incidents. Sometimes known as reactive indicators.
Lower Consequence Indicators	Safety performance indicators pertaining to the monitoring and measurement of lower consequence occurrences, events or activities such as incidents, non conformance findings or deviations. Sometimes known as proactive/ predictive indicators.
Risk Mitigation	The process of incorporating defenses or preventive controls to lower the severity and/ or likelihood of a hazard's projected consequence.
Safety Management System	A systematic approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures.
Safety Performance	A State or a service provider´s safety achievement as defined by its safety performance targets and safety performance indicators.
Safety Performance Indicator	A data-based safety parameter used for monitoring and assessing safety performance.
Safety Risk	The projected likelihood and severity of the consequences or outcomes of a hazard
State Safety Programme	An integrated set of regulations and activities aimed at improving safety.

Note: Above definitions were developed while Annex 19 is being drafted. Upon Annex 19 applicability, if there should be any difference in a definition, the Annex 19 definition shall prevail accordingly.

CHAPTER 1 - SAFETY MANAGEMENT FUNDAMENTALS

This chapter provides an overview of fundamental safety management concepts and practices applicable to implementation of State safety programmes as well as the implementation and oversight of Safety Management Systems by product and service providers. The content of this chapter is provided for introductory purposes with further details on these topics found throughout subsequent chapters of this manual.

1.1 THE CONCEPT OF SAFETY

Within the context of aviation,

Safety is:

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

While the elimination of aircraft accidents and/ or serious incidents remains the ultimate goal, it is recognized that the aviation system cannot be completely free of hazards and associsated risks. Human activities or human-built systems cannot be guaranteed to be absolutely free from operational errors and their consequences. Therefore, safety is a dynamic characteristic of the aviation system, whereby safety risks must be continuously mitigated. It is important to note that the acceptability of safety performance is often influenced by domestic and international norms and culture. As long as safety risks are kept under an appropriate level of control, a system as open and dynamic as aviation can still be managed to maintain the appropriate balance between production and protection.

1.2 THE EVOLUTION OF SAFETY

The history of the progress in aviation safety can be divided into three eras .

Technical era - 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 endeavors was therefore placed on the investigation and improvement of technical factors. 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.

Human Factors era - from the early 1970s until the mid 1990s
In the early 1970s, the frequency of aviation accidents was significantly reduced due to major technological advances and enhancements to safety regulations. Aviation became a safer mode of transportation and the focus of safety endeavors was extended to include human factors issues including the man / machine interface. This led to a search for safety information beyond that which was generated by the earlier accident investigation process. Despite the investment of resources in error mitigation, human performance continued to be cited as a recurring factor in

accidents (Figure 1-2). The application of Human Factors science tended to focus on the individual, without fully considering the operational and organizational context. It was not until the early 1990s that it was first acknowledged that individuals operate in a complex environment, which includes multiple factors having the potential to affect behavior.

Organizational era - from the mid-1990s to the present day
During the organizational era, safety began to be viewed from a systemic perspective, to encompass organizational factors in addition to human and technical factors. As a result, the notion of the "organizational accident" was introduced, considering the impact of organizational culture and policies on the effectiveness of safety risk controls. Additionally, traditional data collection and analysis efforts were limited to the use of data collected through investigation of accidents and serious incidents was supplemented with a new proactive approach to safety. This new approach is based on routine collection and analysis of data using proactive as well as reactive methodologies to monitor known safety risks and detect emerging safety issues. These enhancements formulate the rationale for moving towards a safety management approach.

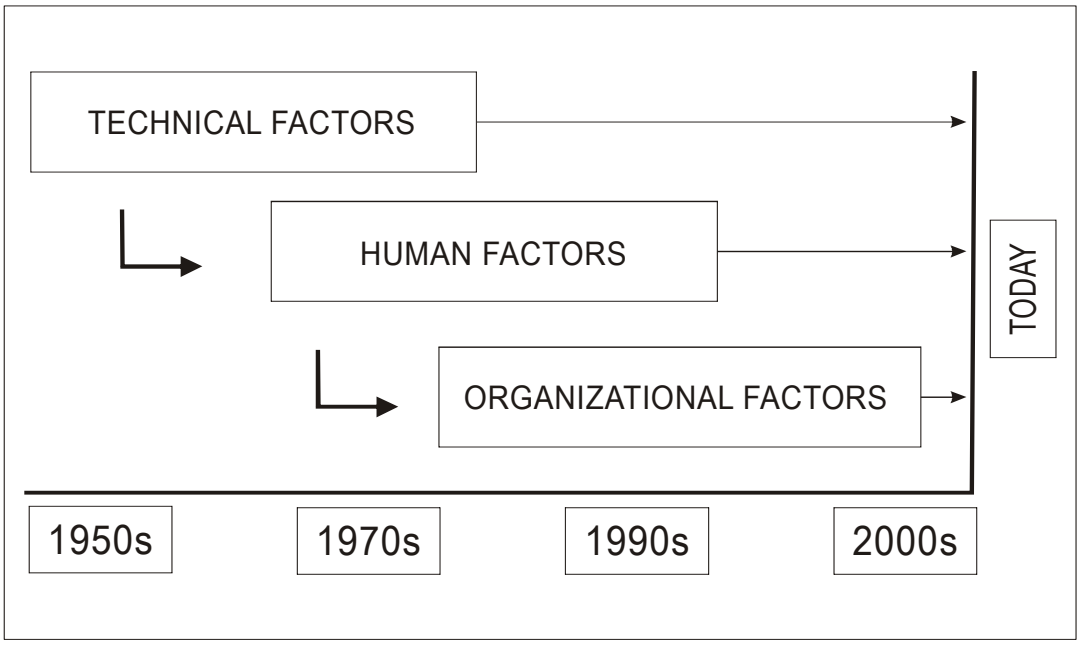


Figure 1-2. The evolution of safety

1.3 ACCIDENT CAUSATION

The Swiss-Cheese Model, developed by Professor James Reason, illustrates that accidents involve successive breaches of multiple system defences. These breaches can be triggered by a number of enabling factors such as equipment failures or operational errors. Since the Swiss-Cheese Model contends that complex systems such as aviation are extremely well defended by layers of defences, single-point failures are rarely consequential in such systems. Breaches in safety defences could be a delayed consequence of decisions made at the highest levels of the system, which could remain dormant until their effects or damaging potential are activated by specific operational circumstances. Under such specific circumstances, human failures or active failures at the operational level act to breach the system's inherent safety defences. The Reason

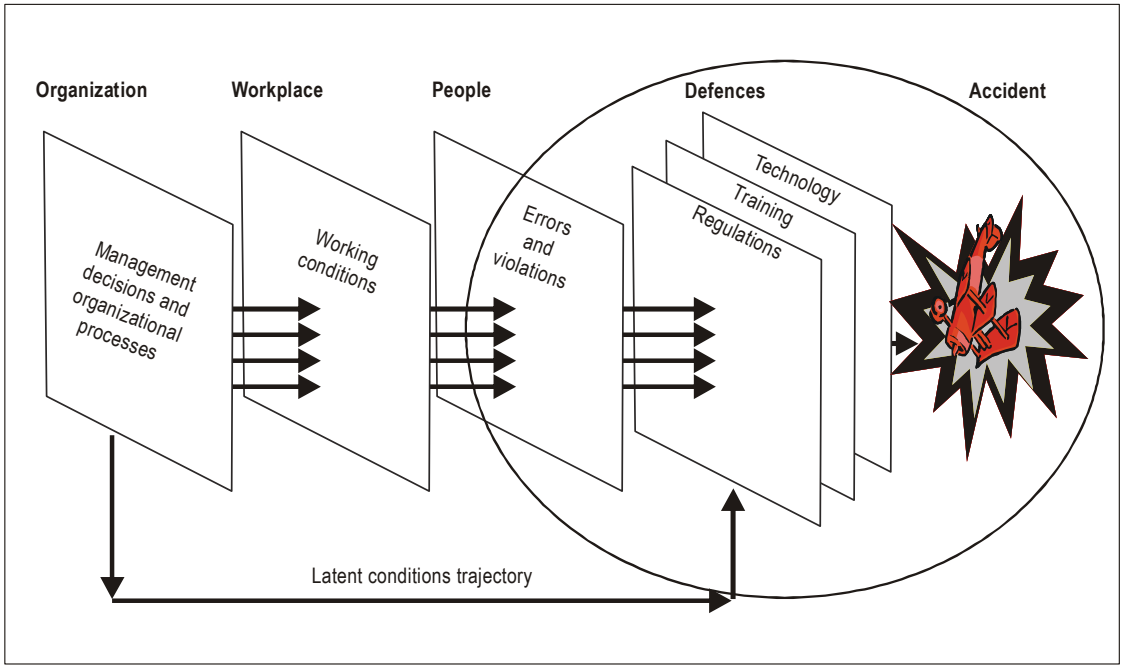
model proposes that all accidents include a combination of both active and latent conditions.

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

Latent conditions are those that exist in the aviation system well before a damaging outcome is experienced. The consequences of latent conditions may remain dormant for a long time. Initially, these latent conditions are not perceived as harmful, but will become evident once the system's defences have been breached. These conditions are generally created by people far removed in time and space from the event. Latent conditions in the system may include those created by a lack of safety culture, poor equipment or procedural design; conflicting organizational goals; defective organizational systems or management decisions. The perspective underlying the organizational accident aims to identify and mitigate these latent conditions on a system-wide basis, rather than through localized efforts to minimize active failures by individuals.

Figure 1.3-1 shows how the Swiss-Cheese Model assists in understanding the interplay of organizational and managerial factors in accident causation. It illustrates that various defences are built into the aviation system to protect against fluctuations in human performance or decisions at all levels of the system. While these defences act to protect against the safety risks, breaches that penetrate all defensive barriers may potentially result in a catastrophic situation. Additionally, Reason's model represents how latent conditions are ever present within the system prior to the accident, and can manifest through local triggering factors.

Figure 1.3-1. A concept of accident causation



1.3.1 The Organizational Accident

The notion of the organizational accident underlying the Reason model can be best understood through a building-block approach, consisting of five blocks (Figure 1.3-2).

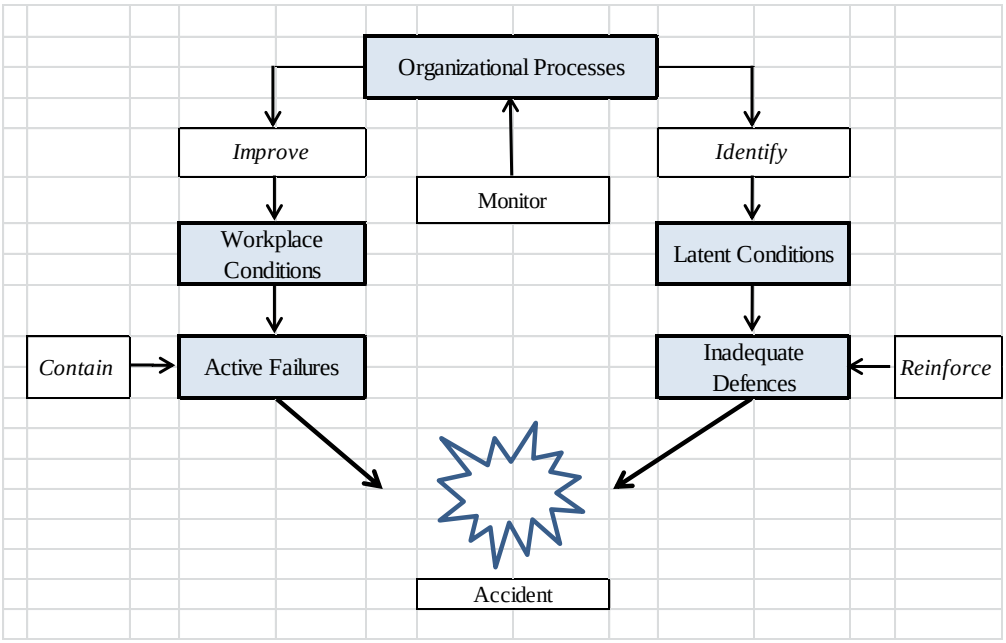


Figure 1.3-2 The organizational accident

The top block represents the organizational processes. These are activities over which any organization has a reasonable degree of direct control. Typical examples include: policy making, planning, communication, allocation of resources, supervision and so forth. Unquestionably, the two fundamental organizational processes as far as safety is concerned are allocation of resources and communication. Downsides or deficiencies in these organizational processes are the breeding grounds for a dual pathway towards failure.

One pathway is the latent conditions pathway. Examples of latent conditions may include: deficiencies in equipment design, incomplete/incorrect standard operating procedures, and training deficiencies. In generic terms, latent conditions can be grouped into two large clusters. One cluster is inadequate hazard identification and safety risk management, whereby the safety risks of the consequences of hazards are not kept under control, but roam freely in the system to eventually become active through operational triggers.

The second cluster is known as normalization of deviance, a notion that, simply put, is indicative of operational contexts where the exception becomes the rule. The allocation of resources in this case is flawed to the extreme. As a consequence of the lack of resources, the only way that operational personnel, who are directly responsible for the actual performance of the production activities, can successfully achieve these activities is by adopting shortcuts that involve constant violation of the rules and procedures.

Latent conditions have all the potential to breach aviation system defences. Typically, defences in aviation can be grouped under three large headings: technology, training and regulations.

Defences are usually the last safety net to contain latent conditions, as well as the consequences of lapses in human performance. Most, if not all, mitigation strategies against the safety risks of the consequences of hazards are based upon the strengthening of existing defences or the development of new ones.

The other pathway originating from organizational processes is the workplace conditions pathway. Workplace conditions are factors that directly influence the efficiency of people in aviation workplaces. Workplace conditions are largely intuitive in that all those with operational experience have experienced them to varying degrees, and include: workforce stability, qualifications and experience, morale, management credibility, and traditional ergonomics factors such as lighting, heating and cooling.

Less-than-optimum workplace conditions foster active failures by operational personnel. Active failures can be considered as either errors or violations. The difference between errors and violations is the motivational component. A person trying to do the best possible to accomplish a task, following the rules and procedures as per the training received, but failing to meet the objective of the task at hand commits an error. A person who willingly deviates from rules, procedures or training received while accomplishing a task commits a violation. Thus, the basic difference between errors and violation is intent.

From the perspective of the organizational accident, safety endeavours should monitor organizational processes in order to identify latent conditions and thus reinforce defences. Safety endeavours should also improve workplace conditions to contain active failures, because it is the combination of all these factors that produces safety breakdowns.

The practical drift

Scott A. Snook's theory of practical drift is used as the basis to understand how, in aviation, the baseline performance of any system “drifts away” from its original design when the organization’s processes and procedures cannot anticipate all situations that may arise in daily operations.

During the early stages of system design (e.g. ATC airspace, introduction of specific equipment, expansion of a flight operation scheme, etc.), operational interactions between people and technology, as well as the operational context, are taken into consideration to identify the expected performance limitations as well as potential hazards. The initial system design is based on three fundamental assumptions: the technology needed to achieve the system production goals is available, the people are trained to properly operate the technology, and the regulations 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 date of operational deployment until the system is decommissioned (Figure 1.3-3).

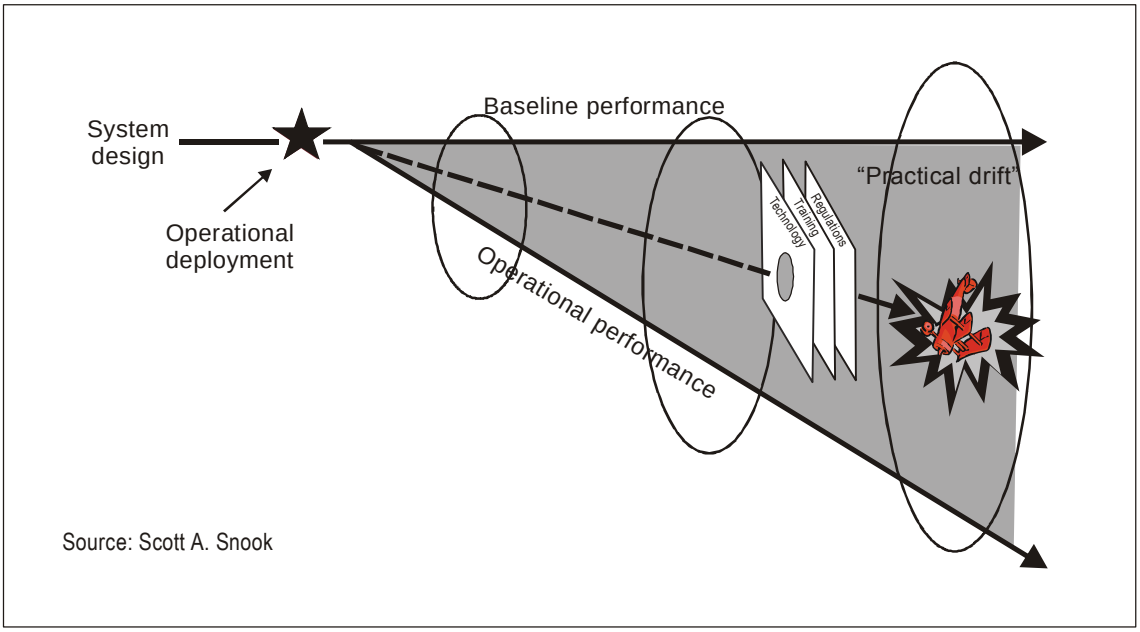
Once operationally deployed, the system performs as designed, following baseline performance most of the time. In reality, however, operational performance is different from baseline performance as a consequence of real-life operations and changes in the operational and regulatory environment. Since 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.

A practical drift from baseline performance to operational performance is foreseeable in any system, no matter how careful and well thought out its design planning may have been. Some of the reasons for the practical drift may include: technology that does not always operate as

predicted; procedures that cannot be executed as planned under certain operational conditions; regulations that are not applicable within certain contextual limitations; introduction of changes to the system, including the addition of new components; the interaction with other systems; and so forth. The fact remains, however, that despite all the system's shortcomings leading to the drift, people operating inside the practical drift make the system work on a daily basis, applying local adaptations (or workarounds) and personal strategies "beyond what the book says".

As explained in Figure 1.3-3, capturing and analysing the information on what takes place within the practical drift holds considerable learning potential about successful safety adaptations and, therefore, for the control and mitigation of safety risks. The closer to the beginning of the practical drift that the information can be systematically captured, the greater the number of hazards and safety risks that can be predicted and addressed, leading to formal interventions for re-design or improvements to the system. However, the unchecked proliferation of local adaptations and personal strategies may lead the practical drift to depart too far from the expected baseline performance, to the extent that an incident or an accident becomes a greater possibility.

Figure 1.3-3 The practical drift



1.4 PEOPLE, CONTEXT AND SAFETY

The aviation system includes product and service providers and State organizations. It is a complex system that requires an assessment of the human contribution to safety and an understanding of how human performance may be affected by its multiple and interrelated components.

The SHELL Model is a conceptual tool used to analyze the interaction of multiple system components. Figure 1-4 provides a basic depiction of the relationship between humans and other workplace components. The SHELL Model contains the following four 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) (humans in the workplace).

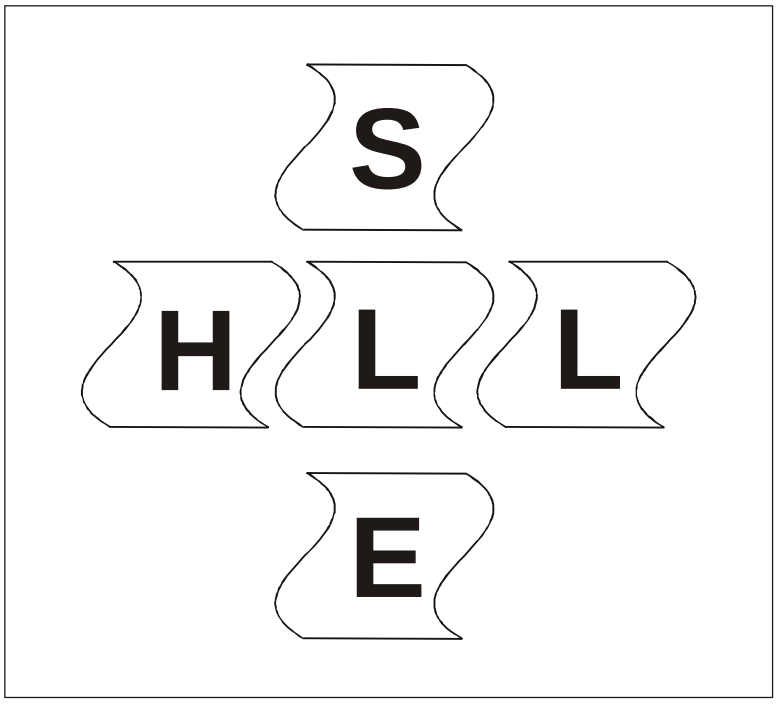


Figure 1-4. The SHELL model – components and interfaces

Liveware. In the centre of the SHEL model are the humans at the front line of operations. 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. Humans do not interface perfectly with the various components of the world in which they work. To avoid tensions that may compromise human performance, the effects of irregularities at the interfaces between the various SHEL blocks and the central Liveware block must be understood. The other components of the system must be carefully matched to humans if stresses in the system are to be avoided.The SHELL model 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. The interface between the human and technology is commonly considered with reference to human performance in the context of aviation operations and there is a natural human tendency to adapt to L-H mismatches. Nonetheless, this tendency has the potential to mask serious deficiencies, which may only become evident after an occurrence.

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, standard operating procedures (SOPs) and computer software. It includes such issues as recency of experience, accuracy, format and presentation, vocabulary, clarity and symbology.

c) ***Liveware-Liveware (L-L).*** The L-L interface is the relationship among persons in the work environment. Since flight crews, air traffic controllers, aircraft maintenance engineers and other operational personnel function in groups, it is important to recognize that communication and inter-personal skills, as well as group dynamics play a role in determining human performance. The advent of crew resource management (CRM) and its extension to air traffic services (ATS) and maintenance operations has created a focus on the management of operational errors across multiple aviation domains. Staff/management relationships as well as overall organizational culture are also within the scope of this interface.

d) ***Liveware-Environment (L-E).*** This interface involves the relationship between the human and both the internal and external environments. The internal workplace environment includes such physical considerations as temperature, ambient light, noise, vibration and air quality. The external environment includes operational aspects such as weather factors, aviation infrastructure and terrain. This interface also involves the relationship between the human internal environment and its external environment. Psychological and physiological forces, including illness, fatigue, financial uncertainties, and relationship and career concerns, can be either induced by the L-E interaction or originate from external secondary sources. The aviation work environment includes disturbances to normal biological rhythms and sleep patterns. Additional environmental aspects may be related to organizational attributes that may affect decision making processes and create pressures to develop “work-arounds” or minor deviations from standard operating procedures.

According to the SHELL Model, a mismatch between the Liveware and other four components contributes to human error. Thus, these interactions must be assessed and considered in all sectors of the aviation system.

1.5 ERRORS AND VIOLATIONS

Effective SMS implmementation by the product or service provider, as well as effective SMS oversight by the State are both dependent upon a clear, mutual understanding of errors and violations and the differentiation between the two. The difference between errors and violations lies in intent. While an error is unintentional, a violation is a deliberate act or omission to deviate from established procedures, protocols, norms or practices.

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

1.5.1. Errors

Error: An action or inaction by an operational person that leads to deviations from organizational or the operational person's intentions or expectations.

In the context of an SMS, both the State and the product or service provider must understand and expect that humans will commit errors regardless of the level of technology used, the level of training, or the existence of regulations, processes and procedures. An important goal then is to set and maintain defences to reduce the likelihood of errors and, just as importantly, reduce the consequences of errors when they do occur. To effectively accomplish this task errors must be identified and reported and analyzed so that appropriate remedial action can be taken. Errors can be divided into the two following categories:

a) **Slips and lapses** *are failures in the execution of the intended action.*
Slips are actions that do not go as planned, while lapses are memory failures. For example, operating the flap lever instead of the (intended) gear lever is a slip. Forgetting a checklist item is a lapse.

b) **Mistakes** *are failures in the plan of action. Even if execution of the plan was correct, it would not be possible to achieve the intended outcome.*

Safety strategies must be put into place to control or eliminate errors.
The strategies to control errors leverage the basic defences within the aviation system. These include:

Reduction strategies provide direct intervention to reduce or eliminate the factors contributing to the error. Examples of reduction strategies include improvement of ergonomic factors and reducing environmental distractions.

Capturing strategies assume the error will be made. The intent is to "capture" the error before any adverse consequences of the error are felt. Capturing strategies are different from reduction strategies in that they utilize checklists and other procedural interventions rather than directly eliminating the error.

Tolerance strategies refer to the ability of a system to accept that an error will be made but without experiencing serious consequences. The incorporation of redundant systems or multiple inspection processes are examples of measures that increase system tolerance to errors.

Since the performance of personnel is generally influenced by organizational, regulatory and environmental factors, safety risk management must include consideration of organizational policies, processes and procedures related to communication, procedures, scheduling of personnel, allocation of resources and budgeting constraints that may contribute to the incidence of errors.

1.5.2. Violations

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

Nonetheless, non-compliance is not necessarily the result of a violation as deviations from regulatory requirements or operating procedures may be a result of an error. To further complicate the issue, while violations are intentional acts, they are not always acts of malicious

intent. Individuals may knowingly deviate from norms, in the belief that the violation facilitates mission achievement without creating adverse consequences. Violations of this nature are errors in judgement and may not automatically result in disciplinary measures depending on the policies in place. Violations of this type can be categorized as follows:

Situational violations are committed in response to factors experienced in a specific context, such as time pressure or high workload.

Routine violations become the normal way of doing business within a work group. Such violations are committed in response to situations in which compliance with established procedures makes task completion difficult. This may be due to practicality/ workability issues, deficiencies in human-technology interface design and others that cause persons to adopt "work-around" procedures, which eventually become routine. These deviations, referred to as "drift," may continue without consequence. But, over time they may become frequent and result in potentially severe consequences. In some cases, routine violations are well grounded and may result in the incorporation of the routine violation as an accepted procedure after a proper safety assessment has been conducted and it shows that safety is not compromised.

Organizationally induced violations may be considered as an extension of routine violations. This type of violation tends to occur when an organization attempts to meet increased output demands by ignoring or stretching its safety defences. Suggest to add reference to **1.7.1 Safety space**, regarding *production* X *safety risk.*

1.6 SAFETY CULTURE

Culture is characterized by the beliefs, values, biases and their resultant behaviour that are shared among members of a society, group or organization. An understanding of these cultural components, and the interactions among them, is important to safety management. Among the most influential cultural components are organizational, professional, and national. A reporting culture is key component of these different cultures. The mix of cultural components may vary greatly among organizations and can negatively influence effective hazard reporting, collaborative root cause analysis, and acceptable risk mitigation. Continous improvement in safety performance is possible when safety becomes a value within an organization as well as a priority at the national or professional level .

Safety culture encompasses the commonly held perceptions and beliefs of an organization's members pertaining to the public's safety and can be a determinant of the members' behaviour. A healthy safety culture relies on a high degree of trust and respect between personnel and management and must therefore be created and supported at the senior management levels.

A healthy safety culture actively seeks improvements, vigilantly remains aware of hazards, and utilizes systems and tools for continuous monitoring, analysis, and investigation. It must exist in State aviation organizations as well as in product and service provider organizations. Other foundations of a healthy safety culture include a shared commitment by personnel and management to personal safety responsibilities, confidence in the safety system, and a documented set of rules and policies. The ultimate responsibility for the establishment and adherence to sound safety practices rests with the management of the organization. A safety culture cannot be effective unless it is embedded within an organization's own culture.

Organizational culture refers to the characteristics and safety perceptions among members interacting within a particular entity. Organizational value systems include prioritisation or balancing

policies covering areas such as productivity vs. quality, safety vs. efficiency, financial vs. technical, professional vs. academic, enforcement vs. corrective action, etc.

The greatest impact for the creation and maintenance of an effective, self sustaining culture for the management of safety is at the organizational level. The organization is a major determinant of the behaviour in which persons will engage while performing management or operational activities during the delivery or oversight of aviation activities. Organizational culture sets the boundaries for accepted executive and operational performance by establishing the norms and limits. Thus, organizational culture provides a cornerstone for managerial and employee decision-making.

Organizational culture has the potential to affect the following:

a) Interactions between senior and junior members of a group;
b) Interactions between industry and regulatory authority personnel;
c) the degree to which information is shared internally and with the regulatory authorities
d) the prevalence of teamwork in the regulatory authority or industry organization;
e) reactions of personnel under demanding operational conditions;
f) acceptance and utilization of particular technologies; and
g) the tendency to take punitive measures in reaction to operational errors within a product or service provider or by the regulatory authorities

Organization culture is also affected by factors such as:

a) business policies and procedures;
b) supervisory behaviour and practices;
c) safety improvement goals as well as minimum tolerance levels;
d) management attitude toward quality or safety issues;
e) employee training and motivation;
f) the relationship between the regulatory authorities and product and service providers and
g) work life balance policies.

The way in which management deals with day-to-day safety issues is also fundamental to improving organizational culture. Collaborative interaction between front-line personnel with their safety and quality counterparts as well as the representatives of the regulatory authority is indicative of a positive organizational culture. This relationship should be characterized by professional courtesy, while maintaining respective roles as necessary to ensure objectivity or accountability.

An effective way to promote safe operations is to ensure that an organization has developed an environment where all staff feel responsible for safety. This becomes evident when staff consider the impact of safety on everything they do, that they report all hazards, errors and threats, and that they support the identification and management of all their associated risks. In addition, management must build an environment in which personnel are aware of safety risks, given sufficient systems to protect themselves, and are assured the protection for their divulgence of safety information through the safety reporting system. An effective safety culture serves as a method to synchronize diverse national and professional cultures within the context of the organization.

Professional culture differentiates the characteristics of particular professional groups (i.e. the characteristic behaviours of pilots vis-à-vis that of air traffic controllers, civil aviation authority personnel or maintenance engineers). Through personnel selection, education ,training, on-the-job experience and peer pressure, etc., professionals tend to adopt the value system and develop

behaviour patterns consistent with their peers or predecessors. An effective professional culture reflects the ability of professional groups to differentiate safety performance issues from contractual or industrial issues. A healthy professional culture may be characterized as the ability for both all professional groups within the organization to collaboratively address safety performance issues.

National culture differentiates the characteristics of particular nations, including the role of the individual within society, the manner in which authority is distributed, its national priorities with respect to resources, accountabilities, morality, objectives and different legal systems. From a safety management perspective, the national culture plays a large part in determining the nature and scope of regulatory enforcement policies including the relationship between regulatory authority personnel and industry personnel, and the extent to which safety-related information is protected.

National culture forms an intrinsic component of personal beliefs that inherently shapes individuals'safety perspectives prior to their membership within an organization. Organizational culture may therefore be significantly affected by the national culture(s) present among the members of its workforce.

Managers should closely assess and consider differences in their personnels' national cultures when applying a safety management program. For instance, safety risk perceptions can greatly differentiate between different national cultures. Safety-related aspects, including communication and leadership styles, as well as the interaction between supervisors and subordinates, may need to be to accommodate a multicultural workforce.

Reporting Culture emerges from personnels' beliefs and attitudes toward the benefits and potential detriments associated with reporting systems and the ultimate effect on the acceptance or utilization of such systems. It is greatly influenced by the organizational, professional, and national cultures, and is one criterion for judging the effectiveness of a safety system. A healthy reporting culture aims to differentiate between intentional and unintentional deviations and determine the best course of action for both the organization as a whole and the individuals directly involved.

The success of a reporting system depends upon the continuous flow of information from front-line personnel. Policies that distinguish wilful acts of misconduct from inadvertent errors, providing for an appropriate punitive or non-punitive response, are essential to assure the effective reporting of systemic safety deficiencies. An "absolute no blame" culture is both unreasonable and unfeasible. While management gains safety information, the system will be ineffective if it interferes with appropriate punitive actions. Conversely, a culture that fails to distinguish unintentional errors/ mistakes from acts of wilfull misconduct will inhibit the reporting process. If personnel avoid reporting for fear of punishment, management does not gain important safety information.

Overall, personnel must believe that they will be supported in any decisions made in the interest of safety but must also understand that intentional breaches of safety policy will not be tolerated. Therefore, a voluntary reporting system should be confidential and operated in accordance with appropriate non-punitive policies. The system should also provide feedback to personnel on safety improvements achieved as a result of the reports received. This objective requires secure and easy access to safety reporting systems, active safety data collection, and management's proactive treatment of the data.

Safety information should be collected solely for the improvement of aviation safety, and information protection is essential in ensuring the information's continued availability. This may be realized through a safety reporting system that is confidential, voluntary, and non-punitive. The

benefits are twofold. Often personnel are the closest to safety hazards, so the reporting system enables them to actively identify these hazards. Simultaneously, management gathers pertinent safety hazard information and builds trust with personnel.

Once data is collected and stored, the information submitted must be processed in order to substantiate the implementation of appropriate actions that should be communicated to front-line personnel in a timely manner.

1.6.1 Safety Culture Promotion & Assessment

The effectviness of a safety culture can indeed be measured and monitored through the use of tangible metrics. In a mature safety culture environment, it can be anticipated that organizations may be in a position to introduce a mechanism for an internal Organization Safety Culture (OSC) Assessment. Such assessments may be further enhanced with a more technically involved or sector specific Organization Risk Profiling (ORP). Concurrently, industry organizations and/or regulators may consider to develop a promotional schemes (eg safety culture award) for product and service providers to participate in a voluntary OSC/ ORP assessment of their organizations. The parameters to be assessed in an OSC/ ORP exercise would include organizational factors and outcomes that are beyond conventional regulatory requirements, but nevertheless pertinent to an organization's safety culture and therefore having an impact on its safety performance. This is the main purpose of such an OSC/ ORP assessment. It serves to supplement traditional regulatory oversight by addressing organizational factors (latent conditions) that are otherwise beyond regulatory purview. An OSC assessment checklist would tend to be more generic in content whilst an ORP checklist would be more customised to the nature of the organization's operations. An illustration of a possible sector specific organization risk profiling assessment checklist is in Appendix 3.

1.7 THE MANAGEMENT DILEMMA

Safety Management processes identify hazards with the potential to adversely affect safety. These processes provide effective and objective mechanisms to assess the risk presented by hazards and implement ways to eliminate these hazards or mitigate the risks associated with them. The result of these processes is to facilitate achievement of an acceptable level of safety while balancing the allocation of resources between production and protection. From a resource allocation perspective the concept of a safety space is especially useful in describing how the balance is achieved.

1.7.1 Safety space

In any organization engaged in the delivery of services, production and safety risks are linked. As production increases, the safety risks may also increase if the necessary resources or process enhancements are not available. An organization must define its production and safety objectives by balancing output with acceptable safety risk. Also, when defining its production objectives, the organization needs to define defences in order to keep safety risks under control. For a product or service provider, the basic safety defences are technology, training, internal process and procedures. For the State, the basic defences are similar i.e. training of personnel, the appropriate use of technology, effective oversight, and the internal processes and procedures supporting oversight. The safety space is the zone where an organization balances desired production whilst maintaining required safety protection through safety risk controls.

For example, a manufacturer or air navigation service provider may wish to support anticipated growth through investment in new technologies These technologies may simultaneously provide the necessary efficiency improvements as well as improved reliability and safety performance. Such decision making should involve an assessment of both value added to the organization's product or service objectives as well as safety risks involved. The allocation of excessive resources to protection or risk controls may result in the product or service becoming unprofitable, thus jeopardizing the viability of the organization.

On the other hand, excess allocation of resources for production at the expense of protection, can have an impact on the safety performance of the product or service and could 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 is developing or exists. Therefore, the safety space boundaries should be defined by the management of the organization and reviewed continually to ensure that it accurately reflects the current situation. Refer Fig 1-7 illustration on safety space.

The need to balance production and protection has become a readily understood and accepted requirement from a product and service provider perspective. This balance is equally applicable to the State's management of its SSP, given the requirement to balance resources required for State protective functions that include certification and surveillance.

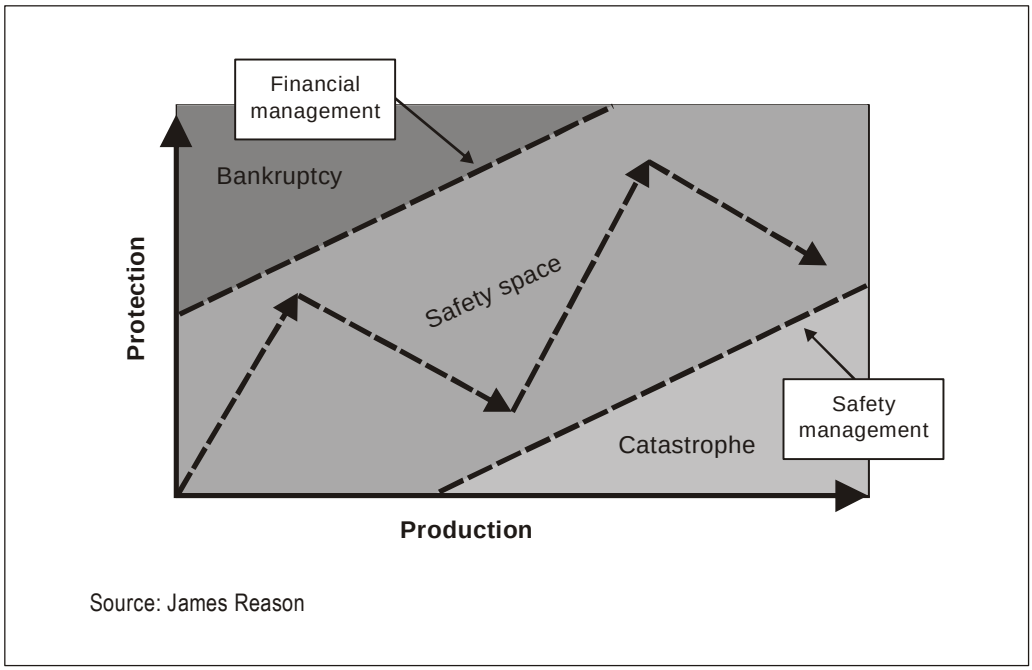


Figure 1-7. The safety space

1.8 CHANGE MANAGEMENT

Aviation organizations, including regulatory authorities, experience change due to expansion and contraction as well as changes to existing systems, equipment, policies, programmes, services and regulations. Hazards may inadvertently be introduced into the aviation system whenever change occurs. Existing baseline safety risk mitigation processes may also be impacted. Safety

management practices require that hazards resulting from change be systematically identified and strategies to manage the consequential safety risks be developed, implemented and subsequently evaluated. Sound management of safety risks associated with change is a critical requirement of the SSP and an SMS.

The management of safety risks resulting from change should take into account the following three considerations:

a) ***Criticality of systems and activities.*** Criticality relates to the potential consequences of safety risk, whether a consideration during the system design process, or during a situation related to systemic change. Changes to equipment and activities associated withrelatively high safety risks should be reviewed to make sure that necessary corrective actions can be taken to control potentially emerging safety risks.

b) ***Stability of systems and operational environments.*** Changes may be planned and under direct control of the organization. Planned changes may be associated with organizational growth or contraction, as well as the introduction of new equipment, products or services. Unplanned changes, including those that are operational, political or economic in nature, may also create risks that require a mitigating response by the organization.. Instances in which frequent systemic or environmental changes occur dictate that managers update key risk assessments and related information more frequently than in more stable situations.

c) ***Past performance.*** Past performance of critical systems may be a reliable indicator of future performance. Trend analyses in the safety assurance process should be employed to track safety performance measures over time and to factor this information into the planning of future activities under situations of change. Moreover, where deficiencies have been found and corrected as a result of past audits, evaluations, data analyses, investigations or reports, it is essential that such information is considered to assure the effectiveness of corrective actions.

1.9 INTEGRATION OF MANAGEMENT SYSTEMS

Aviation organizations vary greatly in terms of overall size and complexity. Each organization has a layered management system that is composed of multiple sub-systems given direction through some type of governance system. The organization should integrate organizational management systems designed to achieve specific organizational goals, i.e., provide products and services to customers. A holistic organizational management system has often been referred to as an integrated Management System or simply the organizational “management system.”
Typical management systems within an aviation organization, may include:

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); and
g) documentation management system (DMS).

Each management system is monitored by an “accountable leader,” Complex product or service provider organizations may have 30-plus management systems that must be integrated into the enterprise. Examples of these systems include:

a) supplier management system;
b) marketing management system;
c) personnel management system;
d) facilities management system;
e) ground equipment management system;
f) production management system;
g) training management system;
h) flight operations management system;
i) cargo operations management system;
j) aircraft maintenance management system; and
k) dispatch management system.
l) fatigue risk management systems (FRMS);

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

a) reduction of duplication and therefore of costs;
b) reduction of overall organizational risks and an increase in profitability;
c) balance of potentially conflicting objectives; and
d) elimination of potentially conflicting responsibilities and relationships;

Each organization will integrate these systems based on its unique production requirements of the organization. Risk management processes are essential features of the SMS, QMS, EMS,FMS, OSHSMS, and SeMS. If the SMS were to operate in isolation of these other management systems, there may be a tendency to focus solely on safety risks without understand the nature of quality, security, or environmental threats to the organization.

While system integration is presently beyond the scope of the harmonized ICAO safety management (SARPs) and of this manual, many civil aviation authorities and product or service providers have realized the benefist of integrating and aligning multiple management systems. For details on SMS and QMS integration please refer to Chapter 4.

1.10 SAFETY REPORTING AND INVESTIGATION

1.10.1 Effective safety reporting

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

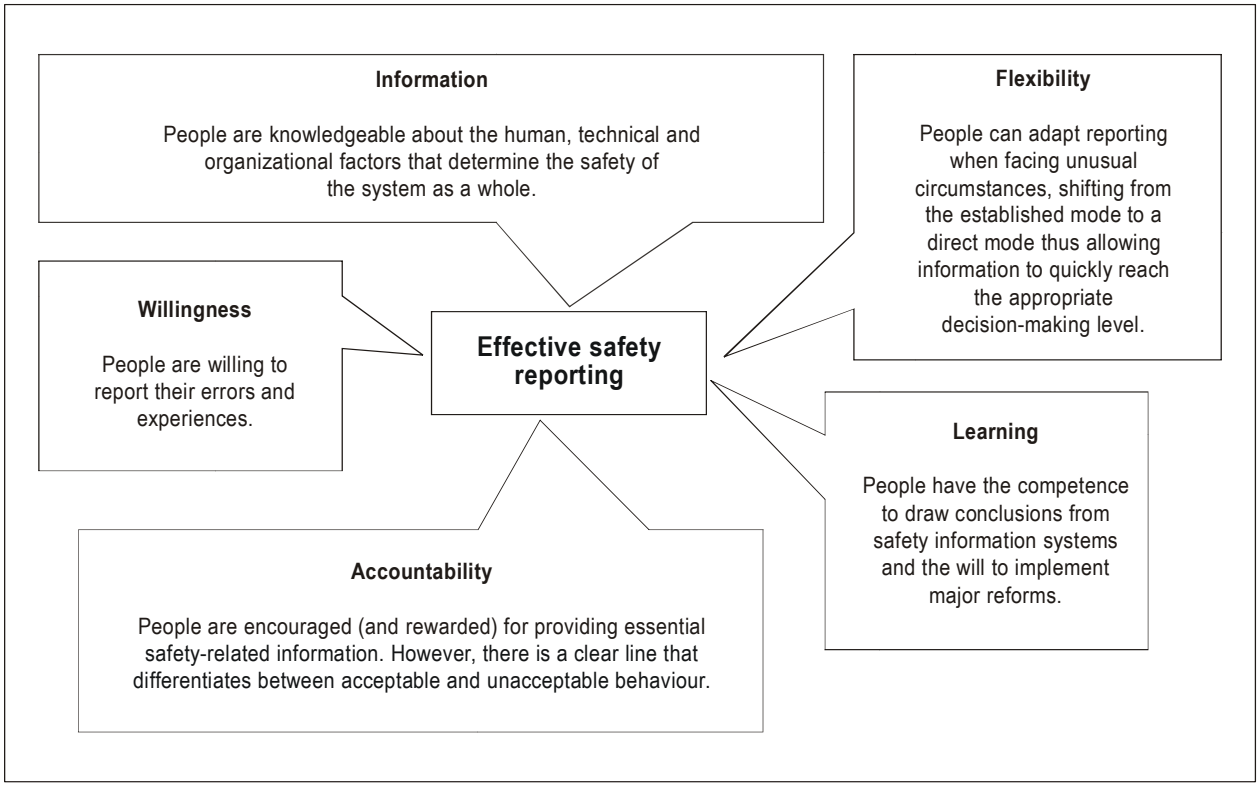
There are five basic characteristics that are universally associated with effective safety reporting systems (See Figure 1-5). Effective hazard reporting is a key component of safety management.

Once reported, data on hazards can be analyzed with other data sources to support the SRM and SA processes

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

For further guidance on State voluntary and mandatory incident reporting systems are in Appendix 11 and 12 of chapter 3 respectively. SMS voluntary reporting system guidance is in Appendix 7 of chapter 4.

Figure 1.5 Effective safety reporting — Five basic characteristics



1.10.2 Investigation of accidents and incidents

When an accident or serious incident occurs, the accident investigation process is set in motion to find out any possible failure within the aviation system and the reasons thereof; and to generate the necessary countermeasures to prevent recurrence. Thus, in a safety management environment, the accident investigation process has a distinct role, being an essential process which deploys when safety defences, barriers, checks and counterbalances in the system have

failed.

Being an important reactive component of the elements contained in the SMS and SSP Frameworks,such investigations contribute to the continuous improvement of the aviation system by providing the root causes of accidents/ incidents and lessons learned from analysis of events. This can support decisions regarding the development of corrective actions and corresponding allocation of resources and may identify necessary improvements to the aviation system, including SMS, SSP as well as the State accident investigation process. While it is common for mandatory State level investigations to be limited to accidents and serious incidents, a mature safety management environment may provide for the investigation of lower consequence events as well.

Apart from establishing findings and root causes to accidents/incidents , most investigation exercises also result in the uncovering of hazards/ threats. An effective and comprehensive investigation process includes the identification and discrimination between an ultimate consequence, an unsafe event and hazards/ threats that contribute to the accident/incident . This may include any systemic, latent or organizational factors within the entire aviation system framework. In today's proactive safety management environment, there is an important and necessary integration between an accident/incident investigation process and an organization's hazard reporting/ identification process. Investigation reporting forms should have a clear provision to document hazards/ threats uncovered during the investigation process that would require separate follow up action by the organization's hazard identification and risk mitigation process. It is common for some investigation reports to limit their "Conclusion" and "Action Taken/ Recommend" to immediate or direct cause(s) only. Thus, any secondary or indirect hazards/ threats could tend to be overlooked , unless this gap can be bridged by linking the accident/incident investigation and hazard identification processes.

1.11 SAFETY DATA COLLECTION AND ANALYSIS

1.11.1. Safety Data Collection and Quality

Data-based decision making is one of the most important facets of any management system. The type of safety data to be collected may include accidents and incidents , events, non conformance or deviations and hazard reports. The quality of the data that is used to enable effective decision making must be considered throughout SSP and SMS development and implementation. Unfortunately, many databases lack the data quality necessary to provide a reliable basis for evaluating safety priorities and the effectiveness of risk mitigation measures. Failure to account for the limitations of data used in support of safety risk management and safety assurance functions will result in flawed analysis results that may lead to faulty decisions and discredit the safety management process.

Given the importance of data quality, organizations must assess the data used to support safety risk management and safety assurance processes using the following criteria:

a) Validity: data collected is acceptable as per established criteria for its intended use.
b) Completeness: no relevant data are missing
c) Consistency: the extent to which measurement of a given parameter is consistent, can be reproduced and avoids error.
d) Accessibility: data are readily available for analysis
e) Timeliness: data are relevant to the time period of interest and available promptly.
f) Security: data are protected from inadvertent or malicious alteration

g) Accuracy: data are error free.

By considering these seven criteria for data quality, safety data analyses will generate the most accurate information possible to be used in support of strategic decision making.

1.11.2 Safety Database

In the context of safety data collection and analysis, the term "safety database" may include the following type of data or information which can be used to support safety data analysis:

- Accident investigation data;
- Mandatory incident investigation data;
- Voluntary reporting data;
- Continuing airworthiness reporting data;
- Operational performance monitoring data;
- Safety risk assessment data;
- Data from audit findings/ reports;
- Data from safety studies/ reviews;
- Safety data from other States, Regional Safety Oversight Organizations or Regional Accident & Incident Investigation Organizations; etc

A safety database may refer to the State's SSP related database(s) or to a service provider's internal SMS related database(s), depending on context. Voluntary Reports may come from Operational Personnel (service providers, pilots etc.), but also from passengers or the general public.

Much of the data in safety databases is in the form of reports related to complex events such as accidents and incidents. The reports in these types of databases typically answer a series of questions: Who was involved in the event? What happened that caused a report to be written? When did the event occur? Where did the event take place? Why did it happen? Other types of databases are related to relatively narrow topics such as flight information, weather and traffic volumes. These reports contain simple facts.

The safety databases are typically housed in various parts of an organization(s). Many Organizations provide access to the databases through an interface that allows safety analysts to efficiently specify and extract reports of interest. Reports can be viewed individually or collectively through aggregation. Analytical tools allow safety analysts to view extracted data in multiple formats. Examples include spreadsheets, maps, and various types of graphs.

To ensure that a database is understood and used appropriately, information related to the database (metadata) must be well documented and made available to users. Types of metadata include field definitions, changes made to the database over time, usage rules, the data collection form, and references to valid values.

A large number of safety databases have been developed independently by many different organizations with very specific areas of responsibility and analysis needs. In order to provide aviation safety analysts with expanded views of safety issues, it is necessary to build safety information integration facilities. These facilities extract information from multiple sources, apply common data standards, consolidate metadata, and load the information onto a common platform housed in centralized data storage architecture.

Once the safety data has been processed, it is made accessible to safety analysts through a common interface and common set of analytical tools. If an analyst requires data from multiple databases, the application of common data standards makes it possible for database technicians to extract data from the required databases and construct an entirely new database. A schematic view of a State safety data system is shown in Fig 1.11.2, indicating the inputs, processes and outputs related to safety data collection, analysis and exchange.

State Safety Data System	
INPUTS (Collection)	• Accident and Incidents reports • Voluntary incident reporting systems • Mandatory incident reporting systems • Operational data collection systems (provided directly from service providers) • Safety oversight data collection systems
PROCESSES (Analysis)	• Data collection tools and data management systems to capture and store data from: – accident and incident reporting systems; – operational data collection systems – Safety oversight data collection systems – recommendations from investigations of accidents and serious incidents • Analysis methods to assess known and emerging risks from all available data sources; • Safety indicators, target and alert levels (individual or aggregated level) to measure safety performance and detect undesirable trends • Development of risk-based safety surveillance processes, including the prioritization of inspections and audits
OUTPUTS (Exchanging)	• Safety recommendations issued by the relevant State authorities based on analysis of all safety data system inputs • Reports on safety indicators, targets and alerts (service provider and State level) generated through analysis of data inputs including: – Comparative “benchmark” analyses – Historical trending analyses – Correlations between proactive indicators and safety outcomes (accidents and serious incidents) • Reviews of State regulations and oversight processes including the prioritization of oversight activities according to areas of greatest risk • Administrative actions required for safety purposes • The exchange of information regarding safety issues among State regulatory authorities and accident investigation authorities • The exchange of information regarding safety issues among service providers, regulatory authorities as well as accident and incident investigation organizations, at the national, regional and international levels.

Fig 1.11.2 State safety data system

1.11.3. Safety Data Analysis

After collecting safety data through various sources, organizations should then perform the necessary analysis to identify hazards and control their potential consequences. Among other purposes, the analysis may be used to:

a) assist in deciding what additional facts are needed;
b) ascertain latent factors underlying safety deficiencies; and
c) assist in reaching valid conclusions.
d) monitor and measure safety trends or performance

Safety analysis is often iterative, requiring multiple cycles. It may be quantitative or qualitative. The absence of quantitative baseline data may force a reliance on more qualitative analysis methods.

Human judgement may be subject to some level of bias based on past experiences, which may influence the interpretation of analysis results or testing of hypotheses. One of the most frequent forms of judgement error is known as “confirmation bias”. This is the tendency to seek and retain information that confirms what one already believes to be true.

1.11.3.1 Analytical Methods and Tools

The following safety analysis methods may be used:

a) ***Statistical analysis.*** These methods can be used to asses the significance of perceived safety trends often depicted in graphical presentations of analysis results. While statistical analysis may yield powerful information regarding the significance of certain trends, data quality and analytic methods must carefully considered to avoid reaching erroneous conclusions.

b) ***Trend analysis.*** By monitoring trends in safety data, predictions may be made about future events. Trends may be indicative of emerging hazards

c) ***Normative comparisons.*** Sufficient data may not be available to provide a factual basis against which to compare the circumstances of potential events. In such cases, it may be necessary to sample real-world experience under similar operating conditions.

d) ***Simulation and testing.*** In some cases, hazards may become evident through simulation; as well as laboratory testingto validate the safety implications of existing or new types of operations, equipment or procedures.

e) ***Expert panel.*** The views of peers and specialists can be useful to evaluate the diverse nature of hazards related to a particular unsafe condition,. A multidisciplinary team formed to evaluate evidence of an unsafe condition can assist in identifying the best course of corrective action.

f) ***Cost-benefit analysis.*** The acceptance of recommended safety risk control measures may be dependent on credible cost-benefit analyses. The costs of implementing the proposed measures are weighed against the expected benefits over time. Cost-benefit analysis may suggest that accepting the consequences of the safety risk is tolerable considering the time, effort and cost necessary to implement corrective action.

1.11.4 Management of Safety Information

Effective safety management is “data driven.” Sound management of the organization’s databases is fundamental to ensure effective and reliable safety analysis of consolidated sources of data.

The establishment and maintenance of a safety database provide an essential tool for personnel monitoring system safety issues. A wide range of relatively inexpensive electronic databases, capable of supporting the organization’s data management requirements, are commercially available .

Depending on the size and complexity of the organization, system requirements may include a range of capabilities to effectively manage safety data. In general, the system should:

a) include a user friendly interface for data entry and query;
b) have the capability of transforming large amounts of safety data into useful information that supports decision making;
c) reduce workload for managers and safety personnel; and
d) operate at a relatively low cost.

To take advantage of the potential benefits of safety databases, a basic understanding of their operation is required. While any information that has been grouped together in an organized manner can be considered to be a database, analysis of paper records maintained in a simple filing system will suffice only for small operations. Storage, recording, recall and retrieval of paper based systems are cumbersome tasks. Safety data should preferably be stored in an electronic database that facilitates the query of records and generation of analysis output in a variety of formats.b

The functional properties and attributes of different database management systems vary, and each should be considered before deciding on the most suitable system. Basic features should enable the user to perform such tasks as:

a) log safety events under various categories;
b) link events to related documents (e.g. reports and photographs);
c) monitor trends;
d) compile analyses, charts and reports;
e) check historical records;
f) share safety data with other organizations;
g) monitor event investigations; and
h) monitor the implementation of corrective actions.

1.11.5 Protection of safety data

Given the potential for misuse of safety data that have been compiled strictly for the purpose of advancing aviation safety, database management must include the protection of the data. Database managers must balance the need for data protection with that of making data accessible to those who can advance aviation safety. Protection considerations include:

a) adequacy of “access to information” regulations vis-à-vis safety management requirements;
b) organizational policies and procedures on the protection of safety data that limit access to those with a “need to know”;
c) de-identification, by removing all details that might lead a third party to infer the identity of individuals (for example, flight numbers, dates/times, locations and aircraft type);
d) security of information systems, data storage and communication networks;
e) prohibitions on unauthorized use of data.

Further information on safety data protection can be found in Appendix 9 of Chapter 3.

1.12 HAZARDS

Hazard identification is a prerequisite to the safety risk management process. Any incorrect differentiation between hazards and safety risks can be a source of confusion. A clear understanding of hazards and their related consequences is essential to the implementation of sound safety risk management.

1.12.1 Understanding Hazards and Consequences

A hazard is generically defined by safety practitioners as a condition or an object with the potential to cause death, injuries to personnel, damage to equipment or structures, loss of material, or reduction of ability to perform a prescribed function. For the purpose of aviation safety risk management, hazard should be focused on those conditions that could cause or contribute to unsafe operation of aircraft or aviation safety related equipment, product and services. (Guidance on distinguishing hazards which are directly pertinent to aviation safety from other general/ industrial hazards is addressed in 1.12.4).

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

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

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

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

Hazards should be differentiated from error, a normal and unavoidable component of human performance, which must be managed.

1.12.2 Hazard Identification and Prioritization

Hazards exist at all levels in the organization and are detectable through use of reporting systems, inspections or audits. Mishaps may occur when hazards interact with certain triggering factors. As a result, hazards should be identified before they lead to accidents, incidents or other safety related occurrences. An important mechanism for proactive hazard identification is a voluntary hazard/ incident reporting system. Additional guidance on voluntary reporting systems can be found in Chapter 3, Appendix 11 and Chapter 4, Appendix 7. Information collected through such reporting systems may be supplemented by observations or findings recorded during routine site inspections or organization audits.

Hazards can also be identified or extracted from review or study of investigation reports, especially those which are deemed to be indirect contributing factors and which may not have been adequately addressed by corrective actions resulting from the investigation process. Thus, a systematic procedure to review accident/ incident investigation reports for outstanding hazards is a good mechanism to enhance an organization's hazard identification system. This is particularly relevant where an organization's safety culture may not have sufficiently matured to support an effective voluntary hazard reporting system yet.

Hazards may be categorized according to their source, or location. Objective prioritization of hazards may require categorizations according to the severity/ likelihood of their projected consequences, which will facilitate the prioritization of risk mitigation strategies, so as to use limited resources in the most effective manner. Refer to Appendix 1 of this Chapter for an example of hazard prioritization procedure.

1.12.3 Hazard Idenification Methodologies

The three methodologies for identifying hazards are:

1. **Reactive** – Through analysis of past outcomes or events. Hazards are identified through investigation of safety occurrences. Incidents and accidents are clear indicators of systems' deficiencies and therefore can be used to determine the hazards that were both contributing to the event or are latent.
2. **Proactive –** Through analysis of existing or real time situations. This is the primary job of the safety assurance function with its audits, evaluations, employee reporting, and the associated analysis and assessment processes. This involves actively seeking hazards in the existing processes.
3. **Predictive** – Through data gathering in order to identify possible negative future outcomes or events. Analyzing system processes and the environment to identify potential future hazards and initiating mitigating actions**.**

1.12.4 Distinguishing Aviation and Occupational Health, Safety & Environment (OSHE) Hazards

Understanding whether a hazard is pertinent to aviation safety or Occupational Safety, Health & Environment (OSHE) would depend on its potential or foreseeable consequence or risk. Any hazard that can have an impact (whether directly or indirectly) on the operational safety of aircraft or aviation safety related equipment, products and services should be deemed to be pertinent to

an aviation SMS. A hazard having purely OSHE consequences only (i.e. without any aviation safety impact), should be separately addressed by the organization's OSHE system / procedures in accordance with its relevant national or organizational OSHE requirements as appropriate. OSHE hazards and consequences with no impact on aviation safety are not pertinent to an aviation SMS.

Safety risks associated with compound hazards that simultaneously impact aviation safety as well as OSHE, may be managed through separate (parallel) risk mitigation processes to address the separate aviation and OSHE consequences respectively. Alternatively, an integrated aviation & OSHE risk mitigation system may be used to address such compounded hazards. An example of a compounded hazard is "lightning strike on an aircraft" (at an airport transit gate). This hazard may be deemed by an OSHE inspector as a "Workplace hazard" (ground personnel/ workplace safety). To an aviation SMS inspector it is also an aviation hazard with risk of damage to aircraft and passenger safety. Since OSHE and aviation safety consequences of such compounded hazards are not the same, due consideration should be taken to manage them separately. The purpose and focus of preventive controls for OSHE and aviation safety consequences would be different.

1.13 SAFETY RISK

Safety risk management is another key component of a safety management system. The term *safety* risk management is meant to differentiate this function from the management of financial risk, legal risk, economic risk and so forth. This section presents the fundamentals of safety risk management and includes the following topics:

a) definition of safety risk;
b) safety risk probability;
c) safety risk severity;
d) safety risk tolerability; and
e) safety risk management.

1.13.1 Safety Risk

Safety risk is the projected likelihood and severity of the consequences or outcomes from an existing hazard or situation. While the outcome may be an accident, an "intermediate unsafe event/ consequence" may be identified as "the most credible outcome." Provision for identification of such layered consequences are usually associated with more sophisticated risk mitigation software. The risk mitigation worksheet illustration in Appendix 2 to this chapter also has this provision.

1.13.2 Safety Risk Probability

The process of controlling safety risks starts by assessing the probability that the consequences of hazards will materialize during aviation activities performed by the organization.

Safety risk probability is defined as the likelihood or frequency that a safety consequence or outcome might occur. The determination of likelihood can be aided by questions such as:

a) Is there a history of occurrences similar to the one under consideration, or is this an isolated occurrence?
b) What other equipment or components of the same type might have similar defects?
c) How many personnel are following, or are subject to, the procedures in question?
d) What percentage of the time is the suspect equipment or the questionable procedure in use?
e) To what extent are there organizational, managerial or regulatory implications that might reflect larger threats to public safety?

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

Figure 1-8 presents a typical safety risk probability table, in this case, a five-point table. The table includes five categories to denote the probability related to an unsafe event or condition, the description of each category, and an assignment of a value to each category.

It must be stressed that this is an example only and that the level of detail and complexity of tables and matrixes should be adapted to be commensurate with the particular needs and complexities of different organizations. Also, it should be noted that organizations may include both qualitative and quantitative criteria that may include up to fifteen values.

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**

Figure 1-8. Safety risk probability table

1.13.3 Safety Risk Severity

Once the probability assessement has been completed, the next step is to assess risk severity, taking into account the potential consequences related to the hazard.

Safety risk severity is defined as the extent of harm that might reasonably occur as a consequence or outcome of the identified hazard.The severity assessment can be based upon :

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

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

The severity assessment should consider all possible consequences related to an unsafe condition or object, taking into account the worst foreseeable situation. Figure 1-9 presents a typical safety risk severity table. It includes five categories to denote the level of severity, the description of each category, and the assignment of a value to each category. As with the safety risk probability table, this table is an example only.

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

Figure 1-9. Safety risk severity table

1.13.4 Safety Risk Tolerability

The safety risk probability and severity assessment process can be used to derive a safety risk index. The index created through the methodology described above consists of an alpha-numeric designator, indicating of the combined results of the probability and severity assessments. The respective severity / probability combinations are presented in the safety risk assessment matrix in Figure 1-10.

The third step in the process is to determine risk tolerability. First, it is necessary to obtain the

indices in the safety risk assessment matrix. For example, consider a situation where a safety risk probability has been assessed as occasional (4) and safety risk severity has been assessed as hazardous (B). The composite of probability and severity (4B) is the safety risk index of the consequence.

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

a) take measures to reduce the organization's exposure to the particular risk ie reduce the likelihood component of the risk index;

b) take measures to reduce the severity of consequences related to the hazard ie reduce the severity component of the risk index; or

c) cancel the operation if mitigation is not possible.

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

Figure 1-10. Safety risk assessment matrix

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

Figure 1-11. Safety risk tolerability matrix

Risk Index Range	Description	Recommended Action
5A, 5B, 5C, 4A, 4B, 3A	HIGH Risk	Cease or cut back operation promptly if necessary. Perform priority risk mitigation to ensure that additional or enhanced preventive controls are put in place to bring down the risk index to the MODERATE or LOW range.
5D, 5E, 4C, 4D, 4E, 3B, 3C, 3D, 2A, 2B, 2C, 1A	MODERATE Risk	Schedule for performance of safety assessment to bring down the risk index to the LOW range if viable.
3E, 2D, 2E, 1B, 1C, 1D, 1E	LOW Risk	Acceptable as is. No further risk mitigation required.

Alternate to Fig 1-11 Safety risk tolerability matrix

1.14 SAFETY RISK MANAGEMENT

Safety risk management encompasses the assessment and mitigation of safety risks. The objective of safety risk management is to assess the risks associated with identified hazards and develop and implement effective and appropriate mitigations. Safety risk management is therefore a key component of the safety management process at both the state and product and service provider level.

Safety risks are conceptually assessed as acceptable, tolerable or intolerable. Risks assessed as initially falling in the intolerable region are unacceptable under any circumstances. The probability and/or severity of the consequences of the hazards are of such a magnitude, and the damaging potential of the hazard poses such a threat to safety, that immediate mitigation action is required.

Safety risks assessed in the tolerable region are acceptable, provided that appropriate mitigation strategies are implemented by the organization. . A safety risk initially assessed as intolerable may be mitigated and subsequently moved into the tolerable region, provided that such risks remain controlled by appropriate mitigation strategies. In both cases, a supplementary cost-benefit analysis may be performed if deemed appropriate. Refer 1.15.3 below for further details.

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

1.14.1 Risk Management Documentation/ Worksheet

Each risk mitigation exercise will need to be documented as necessary. This may be done on a basic spreadsheet or table for risk mitigation involving non complex operations, processes or systems. For hazard identification and risk mitigation involving complex processes, systems or operations, it may be necessary to utilize customized risk mitigation software to facilitate the documentation. Completed risk mitigation documents should be approved by appropriate level of management. For an example of a basic risk mitigation worksheet, refer to Appendix 2.

1.14.2 Human Factors and Risk Management

Given that mature SSPs and SMSs target both human and organizational factors, a specific analysis process is a component of any mature, effective risk management system. In the course of any hazard identification and risk mitigation exercise involving human elements, it is necessary to assure that existing or recommended defences have taken human factors (HF) into consideration. Where necessary, a supplementary HF analysis may be conducted to support that particular risk mitigation exercise/ team. A HF analysis provides an understanding of the human error impact on the situation and ultimately contributes to the development of more comprehensive and effective mitigation/ corrective actions. A human error model is the basis of the analysis process and it defines the relationship between performance and errors and categorizes errors to permit the root hazards to be more readily identified and better understood. This understanding ensures the adequate completion of a root cause analysis. Individual actions and decisions, viewed out of context can appear to be virtually random events, escaping its due attention. Human behavior; is not necessarily random. It usually conforms to some pattern and can be analysed and properly understood. Ultimately, this important HF perspective results in a more comprehensive and in-depth mitigation process. Human factor analysis ensures that the organization's risk mitigation process, when identifying root, contributory or escalation factors, that human factors and their associated circumstantial, supervisory and organizational impacts are duly taken into consideration.

1.14.3 Cost Benefit Analysis (CBA)

Cost-benefit or Cost-effectiveness analysis is normally an independent process from safety risk mitigation or assessment. It is commonly associated with a higher level management protocol, such as in regulatory impact assessment or business expansion projects. However, there may be possible situations where a risk assessment may involve a sufficiently high level or significant financial impact. In such situations, a supplementary CBA or Cost-effectiveness process to support the risk assessment may be warranted. This is to ensure that cost-effectiveness or justification of recommended mitigation actions or preventive controls have taken into consideration their financial implications..

1.15 SAFETY INDICATORS AND PERFORMANCE MONITORING

The output from an organization's safety data collection and analysis system is normally depicted in the form of charts or graphs. Such charts and graphs, normally utilized in conventional quality / reliability management systems, typically show a "snapshot" of data analysis resulting from a one-time query.

Below is an illustration (Fig 1) of such an analysis chart. This particular illustration shows the absolute number of mandatory occurrence report (MOR) incidents of an operator by fleet type for the year 2009. This basic chart does not reflect the number of aircraft for each fleet, nor does it account for the number of flights by each fleet. Thus, there is limited usefulness to be derived from this type of chart. It would not be adequate to serve the purpose of a continuing safety performance indicator.

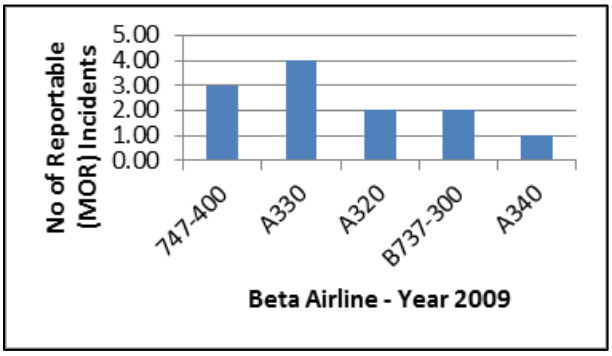


Fig 1 – A basic (screen shot) data analysis chart

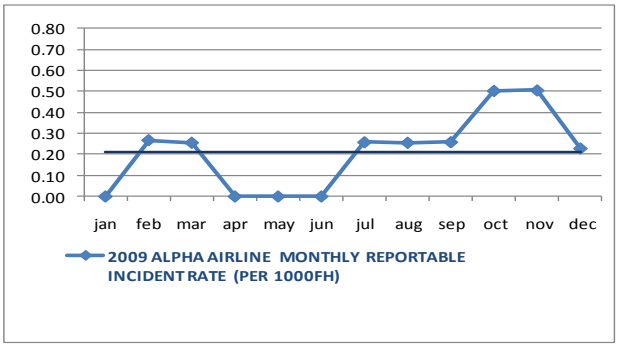


Fig 2 - A continuous monitoring safety indicator chart

Analysis used to continuously monitor safety would be in the form of a periodic data extraction to generate a trending chart or graph, updated on a monthly or quarterly basis. An illustration is shown in Fig 2 above. This data chart provides information on the Monthly Reportable Incident *rate*, taking into consideration the number of accumulated flying hours (FH) for the operator's fleet. A periodic (monthly) incident rate data upload will then allow the chart to serve as a continuous *trend monitoring* indicator. Once such a continuous trend monitoring indicator chart is in place, the next step would be to transform it into a safety performance *measurement* indicator by setting target and alert levels within the chart. This step should preferably be done when there historical data points have already been generated on the chart. These historical data points (historical performance) will be the basis for setting or defining unacceptable alert trending levels as well as any desired targeted improvement level to be achieved within a specified period.

Further details on development of safety performance indicators and their associated target and alert settings are addressed in chapters 3 (SSP) and 4 (SMS) .

1.16 PRESCRIPTIVE AND PERFORMANCE-BASED REQUIREMENTS

1.16.1 UNDERSTANDING PERFORMANCE-BASED REQUIREMENTS

There is a growing belief within the aviation community that effective implementation of State safety programs and safety management systems requires that the existing prescriptive approach to safety be complemented with a performance-based approach. A performance based approach,

supported by the collection and analysis of relevant data can make good business sense while simultaneously providing an equivalent level of safety.

One aim of safety management systems is to introduce supplementary performance-based elements for more effective control of safety risks. In a conventional compliance-based regulatory environment, the approach to safety management is relatively rigid and prescriptive, whereby safety regulations are used as administrative controls. A regulatory framework is supported by inspections and audits to assure regulatory compliance.

In a performance-based enhanced safety environment, certain performance-based elements are introduced within a prescriptive framework. This will allow the "compliance" aspect to a regulation to have room for a more flexible risk-based (and hence more dynamic) performance. As a result, some elements within the SMS and SSP frameworks may be managed on an increasingly performance-based rather than being purely prescriptive approach. These performance-based elements are under the safety assurance and safety risk management components of the respective frameworks.

The performance-based elements within a SMS/ SSP framework include the process for safety performance monitoring and measurement, at the individual product or service provider as well as State levels. This element allows the organization to select its own safety monitoring indicators and the setting of relevant alert and targets that are pertinent to its own context, performance history and expectations. There are no fixed (mandatory) prescribed safety indicators or alert levels or prescribed values under this SMS/ SSP expectation.

1.16.2 PREREQUISITES FOR PERFORMANCE-BASED REQUIREMENTS

SSP and SMS should be in place amongst the State and its product and service providers respectively. An interface needs to be in place for regulatory organizations to agree with individual product and service providers on their SMS related safety performance indicators and associated targets and alert settings. The regulator will also need to have a process for continuous monitoring of individual product and service providers' safety performance. Additional new performance-based processes introduced and duly accepted/ approved by the regulator, should have appropriate performance indicators developed for monitoring such performance-based processes. Such process specific indicators may be viewed as supplementary indicators to the higher level SMS safety performance indicators.

1.16.3 BASELINE AND EQUIVALENT LEVEL OF SAFETY

The safety performance outcome from the introduction of performance-based element(s) within or supplementary to a SMS framework should not be worse off than an existing purely prescriptive regulatory framework. To assess or monitor that such "equivalence" is indeed the case, there should be a safety indicator(s) to monitor the overall events outcome (non conformance occurrences) of the concerned system/ process wherewith the performance-based element will be introduced. As an example, the overall Flight Planning & Fuel Management (FPFM) average incident rate prior to introduction of performance-based provisions should not be worse off than the incident rate after the introduction of performance-based FPFM provisions. By such a comparison process, the pre-implementation "baseline" performance can be verified against post-implementation performance, to see if an "equivalent" level of performance is maintained. If the

latter turns out to be better, then a “better” level of performance is in fact manifested. Where there is a degradation of the system’s performance, the service provider should work in conjunction with the regulator to verify the causal factors and take actions as appropriate. Such actions may include necessary modification of the performance-based requirement itself or where necessary, restoration of basic prescriptive requirements. Details of how system performance can be measured through safety performance indicators are addressed in the next paragraph as well as in chapters 3 and 4 of this SMM.

1.16.4 PERFORMANCE-BASED MONITORING & MEASUREMENT

Monitoring and measurement of a performance-based process should be done through appropriate performance, quality or safety indicators that continuously track the performance of that process. Parameters for such performance tracking may be occurrence outcomes , deviations or any event types that reflect the safety, quality or risk level of the process. A data trending chart should be used to track such outcomes. Outcome occurences should normally be tracked as occurrence rates rather than absolute numbers. In conjunction with such indicators, alert as well as desired improvement target levels should be set for each indicator, where applicable. These will serve as markers to define what is the abnormal/ unacceptable occurrence rate as well as the desired target (improvement) rate for the indicator. The alert level setting will effectively serve as the demarcation line between the acceptable trending region from the unacceptable region for a safety indicator. So long as the occurrence rate for a process does not trend beyond or breach the set alert level criteria, the number of such occurrences is therefore deemed to be acceptable (not abnormal) for that monitoring period. On the other hand, the targeted improvement level serves to aim for a desired improvement level to be achieved within a defined future milestone or monitoring period. With such defined alert and target settings, it becomes apparent that a qualitative/ quantitative performance outcome can be derived at the end of any given monitoring period. This may be done by such as counting the number of alert breaches and/or the number of targets achieved for an individual indicator and/ or a package of safety indicators. Examples of safety performance indicators and target/ alert setting methodology are further addressed under chapters 3 (SSP) and 4 (SMS) respectively.

1.16.5 OVERSIGHT OF PERFORMANCE-BASED REQUIREMENTS

Unlike auditing of prescriptive stand alone requirements, the assessment of a performance-based process would require the assessor to be aware of the context of that process/ element within its overall regulatory framework as well as the complexity of the audited organization. There may be no simple “go” or “no-go” or pass/ fail criteria to apply. Examples would be such as the acceptability of a hazard reporting system or acceptability of proposed target/ alert levels for a performance-based process. It may involve more interaction, monitoring, negotiation and objective judgment for the auditor. The level or degree of compliance or performance for such elements would also vary depending on the complexity of the process or operation audited. An example of element performance or compliance which is subject to organizational or process complexity would be the risk mitigation process. A risk mitigation process may involve the use of a one page worksheet for a simple one-man-operation workshop task. On the other hand, risk mitigation of a complex multi-disciplinary process (eg volcanic airspace operations) may possibly require the use of risk mitigation software to perform a satisfactorily comprehensive safety

assessment.

Appendix 1 - Hazard Prioritization Procedure (Illustration)

<table>
<tr><th></th><th>OPTION 1 (Basic)</th><th>OPTION 2 (Advanced)</th></tr>
<tr><td>Criteria</td><td>Prioritization in relation to the Hazard’s worst possible consequence (incident severity) category.</td><td>Prioritization in relation to the Risk Index (severity & likelihood) category of the Hazard’s worst possible consequence.</td></tr>
<tr><td>Methodology</td><td>a) Project the Hazard’s worst possible consequence

b) Project this consequence’s likely occurrence classification ie it will be deemed to be an accident, serious incident or incident?

c) The Hazard’s prioritization is thus:
<table>
<tr><th>Projected Consequence</th><th>Hazard Level</th></tr>
<tr><td>Accident</td><td>Level 1</td></tr>
<tr><td>Serious Incident</td><td>Level 2</td></tr>
<tr><td>Incident</td><td>Level 3</td></tr>
</table></td><td>a) Project the Risk Index number (based on the Severity & Likelihood matrix) of the hazard’s worst possible consequence (Refer sample matrix in SMM Fig1-11, chpt 1).

b) With reference to the related Tolerability matrix, determine the Risk Index’s Tolerability category ie Intolerable, Tolerable or Acceptable (or equivalent terminology/ categorization)

c) The Hazard’s prioritization is thus:
<table>
<tr><th>Projected Risk Index</th><th>Hazard Level</th></tr>
<tr><td>Intolerable/ High Risk</td><td>Level 1</td></tr>
<tr><td>Tolerable/ Moderate Risk</td><td>Level 2</td></tr>
<tr><td>Acceptable/ Low Risk</td><td>Level 3</td></tr>
</table></td></tr>
<tr><td>Remarks</td><td>This Option 1 takes into consideration the severity the Hazard’s projected Consequence only.</td><td>This Option 2 takes into consideration the severity & likelihood of the Hazard’s projected Consequence – a more comprehensive criteria than Option 1.</td></tr>
</table>

Note:
From a practical viewpoint, Option 1 would be more viable than Option 2 for the purpose of a simpler prioritization system. The purpose of such a system is to facilitate Hazards sorting and prioritization for risk mitigation action.

Once each hazard isprioritized, it would be apparent that they may be sorted as Level 1, 2 and 3 hazards. Priority or attention for risk mitigation may then be assigned according to their level 1/ 2/ 3, as appropriate.

Appendix 2 – Safety Risk Mitigation Worksheet (Illustration)

Table A - Hazard and Consequence:

OPERATION/ PROCESS:	[Describe the process/ operation/ equipment/ system being subject to this HIRM exercise]
HAZARD [H]:	[If there is more than one Hazard to the Operation/ Process, use separate worksheet to address each Hazard]
UNSAFE EVENT [UE]:	[If there is more than one UE to the Hazard, use separate worksheet to address each UE-UC combination]
ULTIMATE CONSEQUENCE [UC]:	[If there is more than one UC to the Hazard, use separate worksheet to address each UC]

Table B - Evaluate Risk Index and Tolerability of Consequence/ UE (See Annex 1):

Table B-1 *Table B-2*

	CURRENT Risk Index & Tolerability (taking into consideration any **existing** PC/ RM/ EC)				**RESULTANT Risk Index & Tolerability** (taking into consideration any **new** PC/ RM/ EC)		
	Severity	Likelihood	Tolerability		Severity	Likelihood	Tolerability
Unsafe Event							
Ultimate Consequence							

Table C - Risk Mitigation:

Hazard [H]	**Preventive Control [PC]**	**Escalation Factor [EF]**	**Escalation Control [EC]**		**Recovery Measure [RM]**	**Escalation Factor [EF]**	**Escalation Control [EC]**	
H	PC1 *(Existing)*	EF *(Existing)*	EC1 *(Existing)*	UNSAFE EVENT [UE]	RM1	EF (to RM1)	EC (to EF)	ULTIMATE CONSEQUENCE [UC]
			EC2 *(New)*					
	PC2 *(Existing)*	EF1 *(New)*	EC *(New)*		RM2	EF (to RM2)	EC (to EF)	
		EF2 *(New)*	EC *(New)*					
	PC3 *(New)*	EF *(New)*	EC *(New)*		RM3	EF (to RM3)	EC (to EF)	

Note: For easier worksheet management, preferable to use separate Worksheet for different Hazard>Unsafe Event>Ultimate Consequence combination

Explanatory Notes to Table A, B & C:

1	*Operation/ Process (Table A)*	Description of the operation or process which is being subjected to this hazard risk mitigation exercise.
2	*Hazard (H)*	Undesirable condition or situation which may lead to unsafe event(s) or occurrence(s). Note: Sometimes (eg TEM) the term “Threat” is used instead of “Hazard”.
3	*Unsafe Event (UE)*	Possible unsafe intermediate event (UE) before any ultimate consequence, accident or most credible outcome. Identification of an unsafe event is applicable only where there is a need to distinguish and establish mitigating actions upstream and downstream of such an intermediate event (before the ultimate Consequence/ Accident) [eg "over temperature event" before an "engine failure"]. If this intermediate UE state is not applicable for a particular operation, then it may be excluded as appropriate.
4	*Ultimate Consequence (UC)*	The most credible outcome, ultimate event or accident.
5	*Preventive Control*	A mitigating action/ mechanism/ defence to block or prevent a hazard/ threat from escalating into an unsafe event or ultimate consequence.
6	*Escalation Factor*	Possible latent condition/ factor which may weaken the effectiveness of a Preventive Control (or Recovery measure). Use where applicable only. Note: Possible that an Escalation Factor may sometimes (eg TEM) be termed as “Threats”.
7	*Escalation Control*	A mitigating action/ mechanism to block or prevent an Escalation Factor from compromising or weakening a Preventive Control (or Recovery Measure). Use where applicable only
8	*Current Risk Index & Tolerability*	Risk Mitigating action (Table C) is applicable whenever an unacceptable *Current Tolerability level of an Unsafe Event or Ultimate Consequence is identified in Table B*. Note that Current Risk Index and Tolerability shall take into consideration existing Preventive Controls, where available.
9	*Resultant Risk Index & Tolerability*	Resultant Risk Index and Tolerability is based on the combined current Prevent Controls (if any) together with the new Preventive Controls/ Escalation Controls/ Recovery Measures put in place as a result of the completed risk management exercise.

Annex 1: Severity, Likelihood, Risk Index & Tolerability Tables *(examples)*

Severity Table (Basic)

Level	***Descriptor***	***Severity Description*** *(customise according to nature of product or service provider's operations)*
1	*Insignificant*	*No significance to aircraft related operational safety.*
2	*Minor*	*Degrade or affect normal aircraft operational procedures or performance.*
3	*Moderate*	*Partial loss of significant/ major aircraft systems or result in abnormal F/Ops procedure application.*
4	*Major*	*Complete failure of significant/ major aircraft systems or result in emergency F/Ops procedure application.*
5	*Catastrophic*	*Loss of aircraft or lives.*

Severity Table (Alternate)

Level	***Descriptor***	***Severity Description*** *(customise according to nature of product or service provider's operations)*					
		Safety of Aircraft	***Physical Injury***	***Damage to Assets***	***Potential Revenue Loss***	***Damage to Environment***	***Damage to Corporate Reputation***
1	*Insignificant*	*No significance to aircraft related operational safety.*	*No injury*	*No Damage*	*No Revenue Loss*	*No Effect*	*No implication*
2	*Minor*	*Degrade or affect normal aircraft operational procedures or performance.*	*Minor injury*	*Minor Damage <$__*	*Minor Loss < $__*	*Minor Effect*	*Limited Localised Implication*
3	*Moderate*	*Partial loss of significant/ major aircraft systems or result in abnormal F/Ops procedure application*	*Serious injury*	*Substantial Damage <$__*	*Substantial Loss <$__*	*Contained Effect*	*Regional Implication*
4	*Major*	*Complete failure of significant/ major aircraft systems or result in emergency F/Ops procedure application*	*Single fatality*	*Major Damage <$__*	*Major Loss <$__*	*Major Effect*	*National Implication*
5	*Catastrophic*	*Aircraft/ Hull Loss*	*Multiple fatality*	*Catastrophic Damage >$__*	*Massive Loss >$__*	*Massive Effect*	*International Implication*

Alternate Severity Table Note: Use highest Severity Level obtained to derive Risk Index in Risk Index Matrix Table.

Likelihood Table

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

Risk Index Matrix *(Severity x Likelihood)*

Likelihood	Severity				
	1. Insignificant	2. Minor	3. Moderate	4. Major	5. Catastrophic
A. (certain/ frequent)	*Moderate (1A)*	*Moderate (2A)*	*High (3A)*	*Extreme (4A)*	*Extreme (5A)*
B. (likely/ occasional)	*Low (1B)*	*Moderate (2B)*	*Moderate (3B)*	*High (4B)*	*Extreme (5B)*
C. (possible/ remote)	*Low (1C)*	*Low (2C)*	*Moderate (3C)*	*Moderate (4C)*	*High (5C)*
D. (unlikely/ improbable)	*Negligible (1D)*	*Low (2D)*	*Low (3D)*	*Moderate (4D)*	*Moderate (5D)*
E. (exceptional)	*Negligible (1E)*	*Negligible (2E)*	*Low (3E)*	*Low (4E)*	*Moderate (5E)*

Risk Acceptability *(Tolerability) Table*

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

Appendix 3 – Organization Safety Culture/ Risk Profile Assessment

(Illustration for air operator)

Note: This organization Safety Culture/ Risk Profile assessment checklist is a conceptual illustration only. The illustrated thirty five parameters are not comprehensive and are applicable for an air operator organization. Customization of parameters for assessment of other service provider types would be necessary. The annotated Result scores are purely illustrative. This OSC/ ORP assessment should be conducted on a voluntary participation basis in view of organization culture/ profile parameters which are beyond normal regulatory purview. Refer to Chapter 1.6.1 for suggested application of such a OSC/ ORP assessment scheme.

ORGANISATION RISK PROFILING (ORP) - Air Operator [Safety Culture Assessment Concept]

Result column: From pull down menu, select "1" (L1), "2" (L2), "3" (L3) or "NA" according to POI/PMI assessment / AOC ORP Mar 12

Organisation Name:		Assessed By / Date:			
	Organisation Risk Parameter	**RISK LEVEL / PROFILE**			**RESULT (Level #)**
		Level 3 (Least Desirable)	**Level 2 (Average)**	**Level 1 (Most Desirable)**	
1	Accountable Manager - ownership of safety/ quality functions.	Safety/ quality functions non existent in Accountable Manager TOR.	Accountable Manager TOR has negligible or indistinct mention of safety/ quality functions	Final accountability for safety & quality matters clearly addressed in Accountable Manager TOR.	3
2	Financial health of the Organisation	TBD	TBD	TBD	2
3	Average Age of Fleet	> 12 years	8 to < 12 years	< 8 years	2
4	SMS performance Score (iaw AW 127)	Year 2011: 65% to 75%	76% to 90%	> 90%	3
5	Active Hazard Identification & Risk Assessment (HIRA) Program	No active HIRA program in place	Have HIRA program in place. Completion or review of 1 to 3 risk assessment projects (per 100 operational employees) within the last 12 mths	Have HIRA program in place for all major operational areas. Completion or review of > 3 risk assessment projects (per 100 operational employees) for all operational areas within the last 12 mths	2
6	Demanding flight crew schedules or timetables (number of FTL incidents?)	TBD	TBD	TBD	2
7	Ratio of internal Safety + Quality Control staff to all Operational staff.	1: > 20	1:15 to 20	1: < 15	3

	Organisation Risk Parameter	RISK LEVEL / PROFILE			RESULT (Level #)
		Level 3 (Least Desirable)	Level 2 (Average)	Level 1 (Most Desirable)	
8	Mixed Fleet Flying [% of pilots involved in MFF - higher % less desirable]	TBD	TBD	TBD	1
	ETOPS Routes (% of ETOPS sectors operated) [higher % less desirable]	TBD	TBD	TBD	2
	ETOPS Duration [higher duration less desirable]	TBD	TBD	TBD	2
9	Company experience (years of operation)	< 5 years	5 to 10 years	> 10 years	3
10	Combined turnover of Accountable Executive, Safety Manager and Quality Manager over last 36 mths	3 or more	2	1 or Nil	2
11	Experience & qualification of Accountable Executive (as of assessment date)	Has <3 years aviation experience AND no technical qualification	Has > 3years aviation experience OR technical qualification.	Has > 3 years aviation experience AND aviation technical qualification	3
12	Experience & qualification of Safety Manager (SM)	Has < 5 years civil aviation safety/ quality experience OR no aviation technical qualification	Has >5 years civil aviation safety/ quality experience AND aviation technical qualification	Has >15 years civil aviation safety/ quality experience AND aviation technical qualifications	2
13	Experience & qualification of Quality Manager (QM Airworthiness/ Engrg)	Has < 5 years civil aviation QC/QA experience OR no civil aviation technical qualifications	Has >5 years civil aviation QC/QA experience AND civil aviation technical qualifications	Has >15 years civil aviation QC/QA experience AND civil aviation technical qualifications	1

	Organisation Risk Parameter	RISK LEVEL / PROFILE			RESULT (Level #)
		Level 3 (Least Desirable)	Level 2 (Average)	Level 1 (Most Desirable)	
14	Multiple portfolio Safety/ Quality management staff (QM/ SM)	SM or QM holds other simultaneous executive position(s) within or without the organisation.	SM or QM TOR includes other non direct safety/ quality functions eg IT, Administration, Training, etc	SM or QM does not hold any other simultaneous executive position(s) within or without the organisation and their TOR do not include other non direct quality/ safety functions.	2
15	Multiplicity of aircraft types	> 4 aircraft types	3 to 4 aircraft types	< 3 aircraft types	1
16	Combined fleet Reportable/ Mandatory Incident rate (per 1000FH) for last 24 mths	TBD	TBD	TBD	2
17	Reserved				
18	Combined fleet Engine IFSD rate per 1000FH	TBD	TBD	TBD	2
19	Average fleet MEL application rate (per 1000 FH)	> 30 MEL applications per 1000 FH	10 to 30 MEL applications per 1000 FH	< 10 MEL applications per 1000 FH	2
20	Internal Technical Concessions application rate	> 3 concession per aircraft per year	> 1 concession per aircraft per year	< 1 concession per aircraft per year	2
21	CAA Technical Concession application rate.	> 1 concession per aircraft per year	> 0.5 concession per aircraft per year	< 0.5 concession per aircraft per year	2

	Organisation Risk Parameter	RISK LEVEL / PROFILE			RESULT (Level #)
		Level 3 (Least Desirable)	Level 2 (Average)	Level 1 (Most Desirable)	
22	Safety Accountability Structure	Safety management function/ office/ manager is accountable or subservient to some operational functions.	Safety management function/ office/ manager is accountable to senior management and is independent of all operational functions.	Safety management function/ office/ manager has direct accountability and reporting to CEO.	3
23	Quality Accountability Structure	Quality management function/ office/ manager is accountable or subservient to non quality/ safety related functions.	Quality management function/ office/ manager is accountable to senior management and is independent of all operational functions.	Quality management function/ office/ manager has direct accountability and reporting to CEO.	3
24	CAA AOC organisation audit findings rate (Level 1 & 2 findings only, observations excluded) for last 24 mths	Any Level 1 finding OR > 5 findings per audit per aircraft	> 1 finding per audit per aircraft	< 1 finding per audit per aircraft	2
25	CAA LSI findings rate (Level 1 & 2 findings only, observations excluded) for last 24 mths	Any Level 1 finding OR > 3 findings per audit per Line Station	> 0.5 finding per audit per Line Station	< 0.5 finding per audit per Line Station	2
26	Component (Rotables/ LRUs) Soft/ CM/ Hard life policy beyond mandatory or MPD requirements	No component life control policy (hard/ soft) beyond mandatory or MPD requirements	Active component hard life control policy and procedures. At least 5-10% of all (MPD/AMS listed) flight & engine control rotables (beyond mandatory and MPD requirements) have been soft or hard lifed.	Active component hard life control policy and procedures. >10 % of all (MPD/AMS listed) flight & engine control rotables (beyond mandatory and MPD requirements) have been soft or hard lifed.	3

	Organisation Risk Parameter	RISK LEVEL / PROFILE			RESULT (Level #)
		Level 3 (Least Desirable)	Level 2 (Average)	Level 1 (Most Desirable)	
27	Scope of QA Investigation and MEDA process.	Internal QA investigation process applied to mandatory incidents only	Internal QA investigation process for all reported incidents.	Internal QA investigation process for all reported incidents + MEDA (or equivalent) process	
28	Availability of Environmental Protection program	Non existent.	Isolated participation/ program in Aviation Environmental Protection.	Routine program & regular engagement & participation in Aviation Environmental Protection program.	3
29	Availability of Special Inspection program based on non mandatory OEM service publications	Special Inspection program for AD related Service Bulletins only.	Special Inspection program for ADs as well as Alert Service Bulletins only.	Special Inspection program for ADs, Alert SBs as well as routine OEM service publications.	2
30	Control of Fleet Technical Management	Fully contracted out to external organisation. (FTM + ITM)	Partially contracted out to external organisation	Internal management by AOC organisation	2
31	Use of Contracted Technical staff	>15 % contracted staff (from another organisation) for internal engineering/ technical functions.	5 to 15 % contracted staff (from another organisation) for internal engineering/ technical functions.	< 5 % contracted staff (from another organisation) for internal engineering/ technical functions.	2
32	Pilot, Technician or AME Transit Inspection certification	Practice Pilot Transit Inspection certification in lieu of qualified engineering Technician/ AME	Practice Technician (limited rating) Transit Inspection certification in lieu of AME	Practice only AME (full type rated) Transit Inspection certification only.	3

	Organisation Risk Parameter	RISK LEVEL / PROFILE			RESULT (Level #)
		Level 3 (Least Desirable)	Level 2 (Average)	Level 1 (Most Desirable)	
33	Hazards reporting system	None in place	Voluntary hazards reporting system in place	Voluntary hazards reporting system in place. Also procedure for identification of hazards in conjunction with incident investigation process.	2
34	Incident reporting, investigation & remedial actions procedure.	No documented incident reporting, investigation or remedial actions procedure	Documented incident reporting, investigation & remedial actions procedure.	Documented incident reporting, investigation & remedial actions procedure and accepted by CAA.	2
35	Technical Records, Technical Stores and Fleet Planning Management	Fully contracted out Technical Records, Technical Stores and Fleet Planning management to external organisation.	Contracts out Technical Records, Technical Stores or Fleet Planning management to external organisation	Internal (in-house) Technical Records, Technical Stores and Fleet Planning management	3

	SUB - TOTAL
LEVEL 3	11
LEVEL 2	21
LEVEL 1	3
NA	0
Total No of Questions	35

ASSESSMENT RESULT	
Total Pts	OPERATOR RISK PROFILE CATEGORY
78	C

ORP Categorization:

Total Score	ORP Category
35-49	A (Desirable)
50-63	B
64-77	C
78-91	D
92-105	E (Least Desirable)

Notes:

1 Risk level criteria descriptions/ figures are illustrative only, subject to customization and validation of actual figures to be used.

2 Checklist will need to be separately customized for AMOs, Aerodrome & ATS SPs.

3 Points to be allocated for each parameter assessed - namely 1, 2 or 3 for Level 1, 2 and 3 respectively.

4 This Checklist assessment may be completed by assigned Inspector/ Surveyor on scheduled basis (such as during organisation audit). He may need to liaise with the service provider to obtain some of the data required.

5 This ORP assessment process may not be mandatory in view of those parameters which are outside of normal regulatory purview eg staff turnover rate, etc. It may be administered as a supplementary/ voluntary participation basis.

6 Total points achieved and its corresponding ORP Category (Cat A to E) to be annotated. Results should be provided to the organization assessed.

7 Results of this ORP assessment may be correlated with other regulatory inspection/ audit program findings to identify areas (organisations) with greater concern or need as per SSP element 3.3 requirements. Otherwise, notification of ORP results to each organization alone may suffice as a mechanism to encourage organizational behavior (safety culture) towards the desirable category where applicable.

8 ORP sample parameters (for CAAs & SPs) listed in original edition of SMM 9859 chpt 10, App1.

CHAPTER 2 - ICAO SAFETY MANAGEMENT SARPs

This chapter provides an overview of the Standards and Recommended Practices (SARPs) relating to safety management, initially adopted in: Annex 1 — *Personnel Licensing*, Annex 6 — *Operation of Aircraft*, Annex 8 — *Airworthiness of Aircraft*, Annex 11 — *Air Traffic Services,* Annex 13 — *Aircraft Accident and Incident Investigation* and Annex 14 — *Aerodromes*. This chapter also includes information on a new Annex (Annex 19) on safety management responsibilities and processes, which consolidates overarching safety management provisions.

2.1 Introduction to ICAO Safety Management SARPs

The ICAO safety management SARPs provide the high-level requirements States must implement to fulfil their safety management responsibilities related to, or in direct support of, the safe operation of aircraft. These provisions are targeted to two audience groups: States and service providers. In the context of safety management, the term “service provider” refers to any organization required to implement a safety management system (SMS) according to the ICAO SMS framework. Therefore, safety providers in this context include:

a) approved training organizations that are exposed to safety risks during the provision of their services;
b) aircraft and helicopter operators authorized to conduct international commercial air transport;
c) approved maintenance organizations providing services to operators of aeroplanes or helicopters engaged in international commercial air transport;
d) organizations responsible for type design and/or manufacture of aircraft;
e) air traffic service providers; and
f) operators of certified aerodromes.

The ICAO safety management SARPs also require an acceptable level of safety to be established by States as defined by their safety performance targets and safety performance indicators. Further details regarding these two topics are provided in Chapters 3 and 4, respectively.

2.2 State safety Management Requirements

State safety management requirements provide specifications for performance, personnel and processes under the direct responsibility of States, necessary for the safety of air transportation. These requirements include the establishment and maintenance of a State safety programme (SSP); the collection, analysis and exchange of safety data; and the protection of safety information.

An SSP requires specific functions performed by States, including the enactment of legislation, regulations, policies and directives to support the safe and efficient delivery of aviation products and services under its authority. For the establishment and maintenance of the SSP, ICAO has developed a framework that comprises, at a minimum, the four following components that contain eleven underlying elements:

a) State safety policy and objectives;

b) State safety risk management;
c) State safety assurance; and
d) State safety promotion.

The following table provides a summary of references to the State safety management requirements and SSP framework as initially adopted in the Annexes to the Convention on International Civil Aviation:

Sources		**Subject(s)**
Annex(es)	**Provision(s)**	
Annex 1 Annex 6, Part I, II and III Annex 8 Annex 11 Annex 13 Annex 14	Definition	State safety programme
Annex 6, Part I	3.3.1 and 8.7.3.1	Establishment of the SSP
Annex 6, Part III	1.3.1	
Annex 8	5.1	
Annex 11	2.27.1	
Annex 13	3.2	
Annex 14	1.5.1	
Annex 6, Part I	3.3.2 and 8.7.3.2	Acceptable level of safety performance concept
Annex 6, Part III	1.3.2	
Annex 8	5.2	
Annex 11	2.27.2	
Annex 14	1.5.2	
Annex 13	5.12	Protection of accident and incident records
Annex 13	8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.9	Safety data collection, analysis and exchange
Annex 1	Attachment C	SSP Framework - Components and Elements
Annex 6, Part I	Attachment I	
Annex 6, Part III	Attachment I	
Annex 8	Attachment to Part II	
Annex 11	Attachment D	
Annex 13	Attachment F	
Annex 14	Attachment C	
Annex 13	Attachment E	Legal guidance for the protection of information from safety data collection and processing systems

Further guidance regarding the SSP requirements, SSP framework and the acceptable level of safety is contained in Chapter 3.

2.3 Service Providers' Safety Management Requirements

ICAO SARPs also include requirements for the implementation of an SMS by service providers and general aviation operators as an element of each State's SSP. The SMS provides the means to identify safety hazards, implementation actions to reduce safety risks, monitor safety performance, and achieve continuous improvement in safety performance.

An SMS framework requires specific activities and processes that must be performed by aviation service providers. The ICAO SMS framework comprises the four following components as well as twelve underlying elements:

a) Safety policy and objectives;
b) Safety risk management;
c) Safety assurance; and
d) Safety promotion.

In the case of international general aviation operators of large or turbojet aeroplanes, as described in Annex 6, Part II, Section III, such operators shall establish and maintain a SMS that is appropriate to the size and complexity of the operation and should as minimum include:

a) a process to identify actual and potential safety hazards and assess the associated risks;
b) a process to develop and implement remedial action necessary to maintain an acceptable level of safety; and
c) provisions for continuous monitoring and regular assessment of the appropriateness and effectiveness of safety management activities.

The following table provides a summary of references to the safety management requirements for service providers and general aviation operators including the SMS frameworks, as initially adopted in the Annexes to the Convention on International Civil Aviation:

Sources		**Subject(s)**
Annex(es)	**Provision(s)**	
Annex 1 Annex 6, Part I, II and III Annex 8 Annex 11 Annex 13 Annex 14	Definition	Safety management system
Annex 1, Appendix 2	4.1 and 4.2	SMS requirements for approved training organizations
Annex 6, Part I	3.3.3, 3.3.4, 8.7.3.3 and 8.7.3.4	SMS requirements for aircraft operators and maintenance organizations

Sources		Subject(s)
Annex(es)	**Provision(s)**	
Annex 6, Part II, Section 3	3.3.2.1 and 3.3.2.2	SMS requirements for aeroplanes engaged in international general aviation
Annex 6, Part III	1.3.3 and 1.3.4	SMS requirements for helicopter operators
Annex 8	5.3 and 5.4	SMS requirements for organizations responsible for the type design and manufacture of aircraft (applicable from 14 November 2013)
Annex 11	2.27.3 and 2.27.4	SMS requirements for air traffic service providers
Annex 14	1.5.3 and 1.5.4	SMS requirements for operators of certified aerodromes
Annex 1	Appendix 4	SMS Framework
Annex 6, Part I	Appendix 7	
Annex 6, Part III	Appendix 4	
Annex 11	Appendix 6	
Annex 14	Appendix 7	

Further guidance regarding the requirements for service providers and SMS framework is contained in Chapter 4.

2.4 New Annex on Safety Management

The need to develop a single Annex dedicated to safety management responsibilities and processes was recommended during the Directors General of Civil Aviation Conference on a Global Strategy for Aviation Safety held in Montréal from 20 to 22 March 2006 (DGCA/06) and the High-level Safety Conference also held in Montréal from 29 March to 1 April 2010 (HLSC/2010).

As mandated by the Conferences, the Air Navigation Commission (ANC) agreed to establish the Safety Management Panel (SMP) to provide recommendations for the development of a new Annex dedicated to safety management responsibilities and processes.

The SMP delivered its recommendation for the content of the new Annex in February 2012, which included safety management provisions —referenced in the charts above— to be transferred to Annex 19 from other Annexes. Most of these requirements have been modified for consistency and clarity while maintaining the original requirement for which they were adopted.

The Annex 19 provisions as proposed by the SMP are intended to harmonize the implementation of safety management practices for States and those organizations involved in aviation activities. Consequently, Annex 19 includes safety management requirements for States, aviation product and service providers, as well as, operators of aeroplanes involved in international general aviation operations. Select sector-specific safety management requirements remain in their individual Annexes applicable to the field or activity of each specific service provider (e.g. requirements for flight data analysis programmes for air operators are maintained in Annex 6, Part I).

Once adopted, Annex 19 impacts numerous ICAO Annexes to the Convention on International Civil Aviation. Therefore, consequential amendments to Annexes 1 — *Personnel Licensing*, 6 — *Operation of Aircraft*, 8 — *Airworthiness of Aircraft*, 11 — Air Traffic Services, 13 — *Aircraft*

Accident and Incident Investigation and 14 — *Aerodromes*, derived from the adoption of Annex 19 are planned to be introduced simultaneously to avoid duplicated requirements.

The applicability date of Annex19 is independent from the applicability dates of existing safety management provisions. Thus, the applicability date of Annex 19 does not affect the existing applicability of safety management SARPs contained in other Annexes.

Chapter 3 STATE SAFETY PROGRAMME (SSP)

3.1 INTRODUCTION TO SSP

3.1.1 This chapter introduces the objectives, framework and implementation approach for a State safety programme (SSP). It also discusses the significance of establishing processes for maintaining and evaluating the effectiveness of the SSP itself.

3.1.2 An SSP is a management system for the regulation and administration of safety by the State. The implementation of an SSP is commensurate with the size and complexity of the State's civil aviation system and requires coordination among multiple authorities responsible for aviation functions of the State, and the objectives of the State Safety Programme are:

- to ensure that a State has the minimum required regulatory framework in place.
- to ensure harmonization amongst the State's regulatory and administrative organizations in their respective safety risk management roles.
- to facilitate monitoring and measurement of the aggregate safety performance of the State's aviation industry.
- to coordinate and continuously improve the State's safety management functions.
- to support effective implementation and interaction with service providers' SMS.

3.1.3 Safety management principles provide a platform for parallel development of the SSP by the State and the SMS by its service providers. In developing the State Safety Legislative Framework, the State promulgates SMS requirements requiring that service providers implement their safety management capabilities allowing for the effective identification of systemic safety deficiencies and the resolution of safety concerns.

3.1.4 The service provider's SMS requires effective regulatory oversight. Additionally, SMS is a largely performance-based system requiring the appropriate exchange of safety information with internal and external stakeholders. The State, through its SSP functions, provides both the oversight functions and facilitates implementation of appropriate data aggregation and information sharing initiatives.

3.2 SSP FRAMEWORK

There are four components that form the fundamentals of an SSP. Each component is subdivided into elements that comprise the processes or activities undertaken by the State to manage safety. The elements combine prescriptive and performance-based approaches and support the implementation of SMS by service providers.

1. State safety policy and objectives

    1.1 State safety legislative framework
    1.2 State safety responsibilities and accountabilities
    1.3 Accident and incident investigation
    1.4 Enforcement policy

2. State safety risk management

2.1 Safety requirements for the service provider's SMS
2.2 Agreement on the service provider's safety performance

3. State safety assurance

3.1 Safety oversight
3.2 Safety data collection, analysis and exchange
3.3 Safety-data-driven targeting of oversight of areas of greater concern or need

4. State safety promotion

4.1 Internal training, communication and dissemination of safety information
4.2 External training, communication and dissemination of safety information.

A brief account of the components & elements :

STATE SAFETY POLICY AND OBJECTIVES

The State safety policy and objectives component defines how the State will manage safety throughout its aviation system. This includes the determination of responsibilities and accountabilities of the different State organizations related to the SSP, as well as of the broad safety objectives to be achieved by the SSP.

The State safety policy and objectives provide management and personnel explicit policies, directions, procedures, management controls, documentation and corrective action processes that keep the safety management efforts of the State's civil aviation authority, and other State organizations on track. This enables the State to provide safety leadership in an increasingly complex and continuously changing air transportation system. Guidance on the development of a State's safety policy statement is provided under Appendix 2 of this Chapter.

1-1 State safety legislative framework

- *SSP Element 1.1 State safety legislative framework - The State has promulgated a national safety legislative framework and specific regulations, in compliance with international and national standards, that define how the State will conduct the management of safety in the State. This includes the participation of State aviation organizations in specific activities related to the management of safety in the State, and the establishment of the roles, responsibilities and relationships of such organizations. The safety legislative framework and specific regulations are periodically reviewed to ensure they remain relevant and appropriate to the State.*

A national aviation legislative framework must be established or amended as necessary. Such a framework covers all aviation sectors and administrative functions applicable to the State and is in accordance to international standards. Such legislation clearly defines the roles and accountabilities of each State organization having an aviation regulatory or administrative function. It is possible that some legislative frameworks may consist of separate legislations for different government ministries that could have been developed independently from each other. For example, legislative frameworks related to the State's responsibility for the direct administration and operation of aerodromes and ATS services may have been developed separately over time. Such legislation may be focussed on these two sectors with a consequent emphasis on operational and technical aspects of providing these services. An operationally biased legislative framework may not have adequately addressed coordination of safety management activities across all relevant State organizations, .

A mechanism for the periodic review of the State's comprehensive aviation legislative framework will assure the continual improvement and correlation between its legislation and operational regulatory requirements. While review of specific

operating requirements are within the purview of the respective regulatory organizations, the necessary integration and cohesion of higher level legislation may need to be addressed at a national level coordination platform, particularly where multiple organizations and ministries are involved.

1-2 State safety responsibilities and accountabilities

- *SSP Element 1.2 State safety responsibilities and accountabilities - the State has identified, defined and documented the requirements, responsibilities and accountabilities regarding the establishment and maintenance of the SSP. This includes the directives to plan, organize, develop, maintain, control and continuously improve the SSP in a manner that meets the State's safety objectives. It also includes a clear statement about the provision of the necessary resources for the implementation of the SSP.*

The State's initial SSP implementation responsibility is to identify the SSP Accountable Executive as well as the State organization that will administrate and coordinate the implementation and operation of the SSP. This entity is also referred to as the SSP placeholder organization in this document.

For States where multiple regulatory and administrative organizations are involved, it may also be necessary to identify an appropriate national committee with representation by these organizations, to serve as the State's on-going SSP coordination platform.

The appointed SSP Accountable Executive and placeholder organization will initiate the SSP implementation process by appointing an SSP implementation team. This implementation team will be responsible to work with the Accountable Executive and the various organizations to initiate the SSP planning and implementation processes.

Implementation and subsequent continuing operation of the SSP will need to be defined and documented. This SSP documentation system includes a top level SSP document that defines/ describes the SSP, together with other records, forms, SOPs, etc associated with the implementation and operation of the SSP.

Concurrent with the definition of safety management responsibilities and accountabilities is the coordinated development of a State Safety Policy (statement) that is applicable across the State's regulatory and administrative framework. Likewise, broad State safety objectives are part of the overall mission statements for all relevant State organizations. High level safety objectives may then be supported by relevant safety indicators to facilitate their assessment or measurement as appropriate.

1-3 Accident and incident investigation

- *The State has established an independent accident and incident investigation process, the sole objective of which is the prevention of accidents and incidents, and not the apportioning of blame or liability. Such investigations are in support of the management of safety in the State. In the operation of the SSP, the State maintains the independence of the accident and incident investigation organization from other State aviation organizations.*

From an SSP perspective, the accident and incident investigation function is focussed on its administration at a State level. There is a fundamental rationale for the independence of this function from those of other organizations as accident causation could be linked to regulatory or SSP related factors. "Independence" in this regard means that an investigation organization or entity be functionally independent from any organization, particularly the civil aviation authority of the State, whose interests could conflict with the tasks entrusted to the investigation authority. Such independence enhances the viability of the accident and incident investigation organization and avoids real or perceived conflicts of interest.

Some States may not have the resources necessary to discharge their investigation responsibilities. For such States,

joining a Regional Accident and Incident Investigation Organization (RAIO) would be a viable solution to achieving the intent of an independent investigation process. To this end, attention is drawn to the ICAO Manual on Regional Accident and Incident Investigation Organization (Doc 9946).

1-4 Enforcement policy

- *SSP Element 1.4 Enforcement policy - The State has promulgated an enforcement policy that establishes the conditions and circumstances under which service providers are allowed to deal with, and resolve, events involving certain safety deviations, internally, within the context of the service provider's safety management system (SMS), and to the satisfaction of the appropriate State authority. The enforcement policy also establishes the conditions and circumstances under which to deal with safety deviations through established enforcement procedures.*

It can be expected that the aviation legislative framework may include a basic provision for enforcement action, just as with any other national legislation. A basic legislative enforcement provision would likely be limited to addressing the scope of penalties for violations only. In an SSP-SMS environment, it is intended for enforcement policies and procedures, whether at individual service provider or State (CAA) level, to incorporate provisions that moderate the nature and scope of enforcement or disciplinary actions according to the actual conditions and circumstances surrounding a violation or act of non–conformance. The intent is to ensure that a necessary distinction is made between a deliberate/ gross violation from unintentional errors/ mistakes.

In order for such an enhancement to take place, the State will need to manifest such intent through its enforcement policy and procedures. At the same time, the State may need to formalize the need for its service providers to have internal disciplinary procedures that incorporate an equivalent enhancement. This would imply that service providers are expected to have an acceptable process in place to manage their own routine safety/ quality deviations through internal disciplinary policies and procedures. The State would indicate that regulatory intervention can be expected under certain conditions and circumstances through which the State (CAA) will take charge of the investigation process with regard to a particular violation or non conformance.

STATE SAFETY RISK MANAGEMENT

The State safety risk management component includes establishment of SMS requirements to ensure that each State's service providers implement necessary hazard identification processes and risk management controls. Part of this requirement includes a mechanism for agreement with individual service providers on acceptable safety performance levels to be achieved through their SMS.

Apart from ensuring that service providers are engaged in effective hazard identification and risk management through SMS requirements, the State may also apply the principles of safety risk management to its own regulatory and SSP activities. Rulemaking, the selection of SSP safety indicators and their associated target and alert settings, surveillance program prioritization, etc are processes which could be enhanced by a data-driven, risk-based approach.

Substantial risks, which are manifest through the analysis of an individual service provider's internally-generated safety data and related safety performance indicators, may require coordination or agreement with the State's aviation regulatory authority respecting appropriate mitigation action, especially where such risks are likely to impact other service providers or stakeholders.

2-1 Safety requirements for the service provider's SMS

- *SSP Element 2.1 Safety requirements for the service provider's SMS - The State has established the controls which govern how service providers will identify hazards and manage safety risks. These include the requirements, specific operating regulations and*

implementation policies for the service provider's SMS. The requirements, specific operating regulations and implementation policies are periodically reviewed to ensure they remain relevant and appropriate to the service providers.

The State establishes the safety requirements for a service provider's SMS through the promulgation of regulations that define the required SMS framework components and elements. Within the SMS framework, the effective implementation of the Safety Risk Management (SRM) component will ensure that service providers identify hazards and manage the related risks. Details of individual service providers' procedures for hazard identification and risk management will be commensurate with the complexity of each organization and reflected accordingly in its SMS documentation. For non regulated organizations such as sub-contractors, it may be necessary for an SMS approved organization to require (contractually) from such sub-contractors hazard identification and risk management processes, where appropriate. Where a sub-contractor has an accepted SMS, the issue of necessary integration need be addressed.

The State's SMS regulatory requirements and SMS guidance materials are to be periodically reviewed, taking into consideration industry feedback as well as current status and applicability of ICAO SMS SARPs and guidance materials.

2-2 Agreement on the service provider's safety performance

- *SSP Element 2.2 Agreement on the service provider's safety performance - The State has agreed with individual service providers on the safety performance of their SMS. The agreed safety performance of an individual service provider's SMS is periodically reviewed to ensure it remains relevant and appropriate to the service providers.*

As part of the SMS acceptance process, the service provider's proposed safety performance indicators (SPIs) and their associated targets and alerts are reviewed and agreed upon by the relevant State regulatory organization. It is also possible for the State to accept an SMS implementation plan allowing for acceptance of a service provider's SPIs at a later phase of their SMS implementation process. In any case full acceptance of an SMS requires that the regulator be satisfied that the proposed SPIs are appropriate and pertinent to the individual service provider's aviation activities.

It is possible that this safety performance agreement process may subsequently include specific safety assessments to be performed or risk mitigation actions to be carried out by the service provider. This may be the result of specific risks manifested from service provider, industry, State or global safety data sources.

There should be a periodic review of each service provider's SPIs and associated targets and alert settings. Such review should take into consideration the performance and effectiveness of each SPI and its associated target and alert settings. Any necessary adjustments to previously agreed SPIs, target or alert settings should be substantiated by appropriate safety data and be documented as appropriate.

STATE SAFETY ASSURANCE

State safety assurance is accomplished through oversight and surveillance activities on service providers as well as the State's internal review of its regulatory and administrative processes. The important role of safety data, its collection, analysis and sharing is also addressed. The State's surveillance programmes should be data-driven so that its resources may be focussed and prioritized according to areas of highest risk or safety concerns.

3-1 Safety oversight

- *SSP Element 3.1 Safety oversight - The State has established mechanisms to ensure effective monitoring of the eight critical elements of the safety oversight function. The State has also established mechanisms to ensure that the identification of hazards and the management of safety risks by service providers follow established regulatory controls (requirements, specific operating regulations and*

implementation policies). These mechanisms include inspections, audits and surveys to ensure that regulatory safety risk controls are appropriately integrated into the service provider's SMS, that they are being practised as designed, and that the regulatory controls have the intended effect on safety risks.

The implementation of ICAO SARPs forms the foundation of a State's aviation safety strategy. This SSP element refers to methods used by the State to effectively monitor the establishment and implementation of its safety oversight system. Details on the critical elements of a State safety oversight system are addressed in Doc 9734, Part A.

The State's safety oversight system includes obligations related to the initial approval and continued surveillance of its aviation service providers to assure compliance with national regulations established in accordance with ICAO SARPs. (Note: the initial approval process includes the State's authorization, certification or designation of service providers, as appropriate).

The State's initial approval, authorization, certification or designation of a service provider includes acceptance of the organization's SMS implementation plan. Certain elements of the service provider's SMS implementation plan will be in place at the time of the organization's initial approval, while other elements will be implemented following the phased approach as described in Chapter 4.

The State's surveillance obligations are carried out through audits and inspections to assure that an adequate level of regulatory compliance is maintained by its service providers and that their respective aviation-related activities are performed safely. The State's surveillance obligations also include the acceptance of an SMS implemented by each of its existing service providers as well as the periodic assessment of SMS performance.

The State's monitoring and review activities, including any related recommended actions, are coordinated for evaluation or resolution at the national SSP coordination platform, where necessary.

3-2 Safety data collection, analysis and exchange

- *SSP Element 3.2 Safety data collection, analysis and exchange - The State has established mechanisms to ensure the capture and storage of data on hazards and safety risks at both an individual and aggregate State level. The State has also established mechanisms to develop information from the stored data, and to actively exchange safety information with service providers and/ or other States as appropriate.*

The State has established a safety data collection and processing system (SDCPS) to ensure the capture, storage and aggregation of data on accidents, incidents and hazards through the State's mandatory and voluntary reports. This system should be supported by State requirements for service providers to report accidents, serious incidents and any other incidents deemed as reportable by the State. An appropriate distinction between accident and incident reports and hazard reports should be made. Likewise, there is a distinction between mandatory (regulatory) reporting systems from voluntary reporting systems, including appropriate confidentiality requirements for voluntary systems. Refer to Appendix 11 for guidance on State voluntary reporting system and Appendix 12 for Mandatory reporting procedure.

The capture of accident and reportable incidents data should include relevant investigation reports. Voluntary reports received may require some form of follow up investigation or evaluation to verify their validity. Validated hazard reports may require follow up risk assessment and mitigation process, at the service provider or CAA level as appropriate. The various types of safety data may be consolidated within a centralized SDCPS or collected and archived within integrated modules of a distributed SDCPS network, as appropriate.

The State has also established procedures to develop and process information from the aggregate stored data, and to actively share safety information with service providers and/or other States as appropriate. The availability of these safety data sources to the State enables the development of SSP safety indicators, such as accident and incident rates. Established safety indicators, together with their respective target and alert settings, will serve as the State's safety

measurement and monitoring mechanism (ALoSP). Further details concerning the development of safety indicators are addressed in section 3.3.4 and Appendix 6 of this chapter.

To assure the continued availability of safety data, especially from voluntary reporting systems, the SDCPS should provide for appropriate safety information protection. Refer to Appendix 9 for guidance on safety information protection.

For States with multiple authorities having responsibility for safety regulation, appropriate coordination, integration and accessibility of their SSP related safety databases should be established. This is also pertinent for States where the accident investigation process is performed by an independent organization from the CAA. Similar consideration may need to be applied for those States where certain safety management functions (involving SSP related data processing) are discharged by a Regional Safety Oversight Organization or a Regional Accident and Incident Investigation Organization on behalf of the State.

The State's SDCPS should include procedures for submission of accident and incident reports to ICAO, which will facilitate global safety information collection and sharing. Guidance on State accident and incident reporting requirements to ICAO (per Annex 13) is provided in Appendix 8 of this chapter.

3-3 Safety-data-driven targeting of oversight of areas of greater concern or need

- *SSP Element 3.3 Safety-data-driven targeting of oversight of areas of greater concern or need - The State has established procedures to prioritize inspections, audits and surveys towards those areas of greater safety concern or need, as identified by the analysis of data on hazards, their consequences in operations, and the assessed safety risks.*

Conventional oversight, surveillance or inspection programmes tend to be consistently and invariably applied to every service provider, with no mechanism for customizing the frequency or scope of surveillance activities. A safety management environment provides for a more dynamic assessment of safety performance. Under the SSP, regulatory oversight surveillance programmes should therefore include a mechanism for calibrating the scope or frequency of surveillance according to actual safety performance. Such a risk-based approach to surveillance prioritization will facilitate the allocation of resources according to areas of greater risk, concern or need. Data to be used for such surveillance calibration may include safety performance indicators related to specific sectors of aviation activity as well as results from previous surveillance reports or audits of individual service providers. Criteria to quantify the outcome (eg % of effective compliance) of each completed audit would be required for this purpose.

A more comprehensive risk-based surveillance concept may involve safety risk data inputs external to the surveillance programme itself. Such additional surveillance frequency/ scope modifier inputs may come from (for example) an organization risk profile (ORP) assessment programme. (Refer to Chapter 1, Appendix 3 for information on the organization risk profile assessment concept). Further input/ concerns may also come from the State's SDCPS or safety indicators. Appropriate interaction with service providers should be conducted before any surveillance modification is implemented. An illustration of an enhanced safety data and risk-based oversight/ surveillance concept is depicted in Fig 3.3-1.

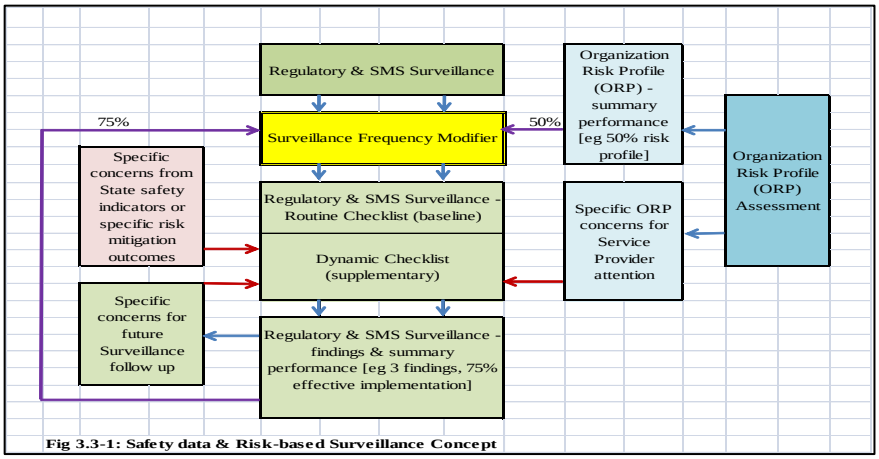


Fig 3.3-1: Safety data & Risk-based Surveillance Concept

STATE SAFETY PROMOTION

Safety promotion involves the establishment of internal as well as external processes by the State to provide or facilitate safety training, communication and dissemination of safety information.

4-1 Internal training, communication and dissemination of safety information

- *SSP Element 4.1 Internal training, communication and dissemination of safety information - The State provides training and fosters awareness and two-way communication of safety-relevant information to support, within the State aviation organizations, the development of an organizational culture that fosters an effective and efficient SSP.*

State regulatory organizations responsible for the different aviation sectors as well as other independent administrative entities such as the accident Investigation organization should have an integrated approach in their respective roles. Therefore, it is important to ensure that there is a specific safety communication channel between them and in particular with the SSP placeholder organization. The SSP Document and its associated State safety and enforcement policies are fundamental to achieve the integration of training, communication and the dissemination of related information. All other subsequent SSP operational strategies, including harmonized SMS requirements and oversight of their respective service providers should be shared, communicated and coordinated amongst the organizations. This will avoid creation of conflicting SMS requirements or oversight/ acceptance criteria for different aviation sectors.

Internal safety training programmes for personnel involved in SSP related duties should be coordinated amongst the various State organizations as appropriate. Priority for SSP and SMS training should be given to personnel involved in implementation or oversight of these programmes, especially for operational or field inspectors who will be involved in determination of SMS acceptance criteria and other safety performance matters. The scope of SSP and SMS training/ familiarization materials will evolve to reflect the actual SSP processes of the State, as they are being fully implemented. Initial SSP and SMS training may be limited to generic SSP/ SMS framework elements and guidance materials, such as contained in ICAO SSP/ SMS training courses.

4-2 External training, communication and dissemination of safety information

- *SSP Element 4.2 External training, communication and dissemination of safety information - The State provides education and promotes awareness of safety risks and two-way communication of safety-relevant information to support, among service providers, the development of an organizational culture that fosters an effective and efficient SMS.*

The State should have an appropriate communication platform or medium to facilitate SMS implementation. This may be an integrated medium for service providers of all its aviation sectors or a dedicated channel from the relevant regulatory organization to service providers specifically under its jurisdiction. The basic content for such external SMS and safety related communication pertains to SMS requirements and guidance material. The State's SSP Document and its related State Safety Policy and Enforcement Policy should also be made available to service providers as appropriate. Such external communication channels can also be enhanced to include other safety related matters as applicable. There should preferable be two way communication, to allow feedback from the industry.

The State should facilitate its service providers' SMS education or training where feasible or appropriate.

3.3 SSP IMPLEMENTATION PLANNING

A State's SSP must be commensurate with the size and complexity of its aviation system, and may require coordination among multiple aviation regulatory organizations responsible for respective sectors. The implementation of an SSP does not alter the respective roles of the State's aviation organizations or their normal interaction with one another. On

the contrary, it enhances their collective regulatory/ administrative functions and capabilities on behalf of the State. Most States already have existing processes that meet the expectation of some SSP elements. The task is to consolidate and enhance those existing processes with additional performance and risk based elements to form an integrated safety management framework. This SSP framework will also facilitate the effective implementation and oversight of SMS by the industry. This section highlights some important considerations for SSP implementation:

3.3.1 Regulatory System Description

A regulatory system review is part of the SSP implementation planning process.
Such a review should include a description of the following:

a) structure of the existing aviation regulatory framework, from the Ministerial level to the various regulatory or administrative organizations;
b) safety management roles and accountabilities of the various regulatory organizations;
c) platform or mechanism for coordination of the SSP amongst the organizations;
d) internal safety/ quality review mechanism at the State level and within each organization

The State's regulatory and administrative organization structure/ chart should be included in the SSP document.

3.3.2 SSP Gap Analysis

Before developing an SSP implementation plan, a gap analysis of existing State structures and processes against the ICAO SSP framework is needed to assess the existence and maturity, of the respective SSP elements. The elements or processes identified as requiring action as a result of the gap analysis form the basis of the SSP implementation plan. Further guidance on the SSP gap analysis process is contained in Appendix 1 to this Chapter.

3.3.3 SSP Implementation Plan

As with any major project implementation exercise, SSP implementation involves many tasks and sub-tasks to be completed within a set timeframe. The number of tasks, as well as the scope of each task is dependent upon the current maturity of the State's safety oversight system. The objective of the implementation process is to achieve progressive enhancement of a State's existing safety management, administration and oversight processes. The appropriate tasks/ sub-tasks are prioritized and documented in an appropriate format for progressive implementation. An SSP implementation plan, together with the development of an SSP top level (exposition) document, provide the foundation for a State to achieve progressive enhancement of its safety management, administrative and oversight processes. These two key documents should be made readily accessible to all relevant personnel within the organizations, in order to facilitate awareness of the SSP and progress related to its implementation. Further guidance on the development of an SSP implementation plan is contained in the Phased Approach section as well as Appendix 1 to this Chapter.

3.3.4 Safety Indicators & Acceptable level of safety performance

3.3.4.1 Acceptable level of safety performance

The acceptable level of safety performance (ALoSP) concept complements the traditional approach to safety oversight that is primarily focused on prescriptive regulatory compliance with a performance based approach that defines actual safety performance levels within a prescribed SSP framework. For purpose of this SMM, ALoSP is the acceptable level of safety performance of a State, as defined by its SSP safety indicators and their associated target and alert levels. A

State's ALoSP should be pertinent to its safety policy and objectives

The State's ALoSP criteria may vary depending on the specific context of each State's aviation system and the maturity of its safety oversight system. The primary focus is to achieve compliance with ICAO requirements and to reduce high consequence events where such issues are evident. The focus will progress to where the State is concerned with a continuous improvement in safety performance. The acceptable level of safety performance for a given SSP, once developed, is a manifestation of what the State considers as appropriate within the context of its own aviation system. A State's ALoSP also expresses the minimum safety objectives acceptable to the oversight authority to be achieved by the aggregate service providers under its authority.

For purpose of an SSP, the acceptable level of safety performance is identified and established by the State's aggregate safety indicators. State safety indicators used for this purpose are those which have objective targets and alert settings incorporated, where applicable. Therefore, acceptable level of safety performance is the overarching concept whilst safety indicators with their corresponding alert and target levels (performance boundary settings) are the actual metrics of the ALoSP. The extent to which such safety indicator objectives are achieved is the performance measurement for those safety indicators. Illustrative examples on development of ALoSP safety indicators are provided in Appendix 6.

A fully developed ALoSP monitoring and measurement process will, on an on-going basis:

- identify all the safety critical sectors and the safety indicators that define the level of safety in these areas;
- identify targets that define the level to be maintained or desired improvement to be achieved for relevant indicators in each sector with a view to achieve continuous improvement throughout the entire aviation system;
- identify alerts that will indicate an actual or developing safety performance problem in a particular safety indicator or sector;
- review SSP safety performance to determine whether modifications or additions to existing indicators, targets or alerts, are needed to achieve continuous improvement.

Establishing acceptable levels of safety indicators, targets and alerts for an SSP does not replace or supersede the need for States to implement all applicable SARPs, nor does it relieve States from their obligations regarding the Convention on International Civil Aviation and its related provisions.

3.3.4.2 Safety Indicators & Alert/ Target Setting

Safety indicators are tactical monitoring and measurement tools of the State's safety performance. During the initial development and implementation of an SSP, the level of safety performance is normally represented by safety indicators related to high consequence outcomes (such as accident and serious incident rates) and high-level system assessment outcomes (such as effective implementation of ICAO SARPs). As the SSP matures, the level of safety performance can be complemented by indicators representing lower consequence system outcomes or deviation events. Safety performance indicators are generally monitored using basic quantitative data trending tools that generate graphs or charts that incorporate alert/ target levels commonly used in technical, quality or reliability control systems.

Targets define long-term SSP safety performance objectives. They are expressed in numerical terms and must be concrete, measurable, acceptable, reliable, and relevant. Targets also need to contain completion dates with milestones if the target is to be achieved in phases or over an extended period of time. Targets provide a measurable way of ensuring and demonstrating the effectiveness of an SSP. Target setting (quantum) should take into consideration factors such as the applicable level of safety risk, the costs and benefits related to improvements to the aviation system, as well as expectations regarding the safety of the State's aviation industry. The setting of desired improvement targets should be determined after considering what is realistically achievable for the associated aviation sector. It should take into consideration recent historical performance of that particular safety indicator, where historical trend data is available.

A corresponding alert level is identified for each safety performance indicator, quantifying the unacceptable performance threshold (abnormal occurrence rate) during a specified monitoring period. The use of objective data-based criteria for setting alert levels is essential to facilitate consistent trending or benchmarking analyses. An alert level setting separates the acceptable from the unacceptable performance regions of a safety indicator chart and is the primary trigger (caution/ alarm bell) for remedial action related to a particular safety indicator. A breach of an alert level warrants follow up investigation as to the cause of the alert and consequent corrective or mitigating actions where necessary. Follow up actions involve coordination with affected service provider(s) to identify root cause, hazards and associated risks as applicable.

As in generic safety metrics practices, the use of Standard Deviation (STDEVP) principle provides a basic objective method for setting alert criteria. This method derives the standard deviation value based on the preceding historical data points of a given safety indicator. This SD value plus the average (mean) value of the historical data-set forms the basic alert value for the next monitoring period. The SD principle (basic MS Excel function) sets the alert level criteria based on actual historical performance of the given indicator (data-set), including its volatility (data points fluctuations). A more volatile historical data-set will result in a higher (more generous) alert level values for the next monitoring period. Guidance on alert level setting using SD criteria is provided in Appendix 6.

A State's basic (initial ALoSP) safety indicators generally consist of high consequence safety indicators such as accident and serious incidents rates for each sector. It is important that such data should normally be expressed in terms of rate instead of absolute incident numbers. Subsequently at a matured ALoSP stage, lower consequence safety indicators may then be developed to supplement the ALoSP package. (Lower consequence indicators are sometimes termed as proactive/ predictive indicators).

Once a State's package of ALoSP safety indicators, targets and alert settings are defined, it is then possible to compile a summary of the performance outcomes of each safety indicator on a regular basis. The target and alert level for each indicator may then be checked for their respective performance (achievement) status. A consolidated summary of the overall target/ alert performance outcome of the complete ALoSP safety indicators package may then be compiled for that particular year or monitoring period. If desired, a quantitative value may be assigned for each "target achieved" and each "alert level not breached" (positive points). This may then provide a numerical/ percentage measurement of the ALoSP performance. The ALoSP performance for a given year or monitoring period may be compared with previous or future performance. States are free to further enhance these basic ALoSP performance measurement criteria with other supplemental factors or processes as deemed necessary.

To ensure that the ALOSP safety indicators remain effective and appropriate over time, they need to be reviewed periodically to determine if any modifications or additions to existing indicators, targets or alerts are needed This periodic ALOSP review and any resulting changes, may be addressed at the SSP coordination platform level where appropriate.

Further information on development of safety indicators, target and alert setting is in Appendix 6 to this chapter as well as parallel guidance on SMS safety performance indicators in chapters 1 and 4.

3.4 SSP IMPLEMENTATION - PHASED APPROACH

SSP implementation is facilitated by identifying the processes associated with each of the four components and related elements of the SSP framework. The progressive or phased implementation of an SSP effectively manages the associated workload and expectations within a realistic time frame. The actual sequencing or prioritization of tasks related to implementation of the various SSP elements will vary among States. The phased approach as described in this Chapter assumes that all 11 SSP elements require some degree of additional implementation. Where certain elements or process are already satisfactorily in place, these may then be integrated or linked to the SSP framework as appropriate

A four phased approach for the implementation of the SSP is provided in this section. This approach involves some reordering of the 11 elements across all four phases. The rationale of this phased framework is to facilitate implementation of the elements and processes in a progressive manner. An overview of the four phases and their included elements is shown in Table A below.

Table A – **Four** Phases of SSP Implementation (An Example)

Phase1 (12 mths)	Phase 2 (12 mths)	Phase 3 (24 mths)	Phase 4 (24 mths)
1. SSP element 1.2(i): a. Identify SSP Place Holder Organization and Accountable Executive b. Establish SSP Implementation Team c. Perform SSP Gap Analysis d. Develop SSP Implementation Plan e. Establish SSP coordination mechanism f. SSP Documentation including the State's SSP framework, its components and elements.	**1. SSP element 1.1:** National aviation legislative framework **2. SSP element 1.2(ii):** a. Safety management responsibilities & accountabilities b. State Safety Policy & Objectives **3. SSP element 1.3:** Accident and serious incident investigation **4. SSP element 1.4(i):** Establish basic enforcement (penalty) legislation **5. SSP element 3.1(i):** State safety oversight and surveillance of its service providers **6. SSP element 2.1(i):** SMS education & promotion for service providers	**1. SSP element 1.4(ii):** Enforcement Policy/ Legislation to include: a. Provision for service providers operating under an SMS, to deal with and resolve safety and quality deviations internally b. Conditions and circumstances under which the State may intervene with safety deviations c. Provision to prevent use or disclosure of safety data for purposes other than safety improvement d. Provision to protect the sources of information obtained from voluntary/ confidential reporting systems. **2. SSP element 2.1(ii):** Harmonized regulations requiring SMS implementation **3. SSP element 3.2(i):** a) Safety data collection & exchange systems b) Establish high consequence State safety performance indicators and target/ alert levels	**1. SSP element 2.2:** Service provider safety performance indicators **2. SSP element 3.1(ii):** Incorporation of service providers' SMS and safety performance indicators as part of routine surveillance program **3. SSP element 3.2(ii):** a. Implement voluntary/ confidential safety reporting systems b. Establish lower consequence safety/ quality indicators with target/ alert level monitoring as appropriate c. Promote safety information exchange with and amongst service providers and other States. **4. SSP element 3.3:** Prioritize inspections and audits based on the analysis of safety risk or quality data where applicable **5. SSP element 3.1(iii)** Establish internal review mechanism covering the SSP to assure continuing effectiveness and improvement
SSP element 4.1, 4.2: Internal SSP & SMS training. Promotion of external SMS training. Internal & external communication and dissemination of safety information are progressively implemented through Phase 1 to 4.			
Note: Phase period (eg 12 months for Phase 1) is an approximate timeframe only. Actual implementation period depends on scope/ complexity of a State's aviation system, actual gaps within each element and organization structure.			

PHASE I

3.4.1 State safety responsibilities and accountabilities - Element 1.2(i)

a) Identify the SSP place holder organization and SSP Accountable executive.
The accountable executive of the State SSP should as minimum, have:

1. authority and accountability, on behalf of the State, for the implementation and maintenance of the SSP across its aviation system, with exception of the State's accident investigation organization;

2. authority on human resources issues related to the SSP place holder organization;

3. authority on major financial issues related to SSP place holder organization;

4. authority on service provider certification and safety oversight by the SSP place holder organization; and

5. responsibility for the coordination of all SSP related issues of the State.

b) Establish the SSP implementation team.

The team should be comprised of representatives from the relevant State aviation regulatory and administrative organizations. The team's role is to drive the SSP implementation from the planning stage to completion. The SSP placeholder organization, together with its department/ office responsible for the administration of the SSP should take over from the SSP implementation team after implementation.

Other functions of the implementation team will include but are not limited to:

1. Coordinating the Gap Analysis process

2. Developing the SSP implementation plan.

3. Ensuring adequate SSP training & technical expertise of the team to establish effective Implementation of the SSP elements and related processes.

4. Monitoring and reporting on the progress of the SSP implementation and providing regular updates and coordination with the SSP Accountable Executive. Ensure that activities within each phase are accomplished as per the defined timeline.

To ensure proper execution of the implementation plan, especially for States with multiple organizations, the Accountable Executive should ensure adequate authority and management support is provided to the implementation team.

c) Perform SSP gap analysis

In order to develop a SSP implementation plan, a gap analysis of the structures and processes existing in the State should be conducted against the ICAO SSP framework. This will allow the State to assess the existence and maturity, within the State, of the elements of an SSP. Once the gap analysis is completed and documented, the components/ elements/ processes identified as missing or deficient will form, together with those already existing, the basis of the SSP implementation plan. An example of a gap analysis for an SSP is included in Appendix 1 to this chapter.

d) Develop SSP Implementation Plan.

The plan will serve as a guide of how the SSP will be developed and integrated into the State safety management activities. The plan should:

1. Clearly establish the activities (elements/ processes) that will be developed or completed under their respective assigned milestones or phases. These activities are based on the outcomes of the gap analysis.

2. Determine a realistic time line, including milestones, for accomplishing each activity or phase.

Depending on the complexity of the State's SSP, an SSP implementation Plan may be compiled as a simple Word/ Excel Table or if necessary, by using a project management tool such as a Gantt chart. A sample format of a basic SSP Implementation Plan is in Appendix 1 to this chapter.

e) Establish State Aviation Safety Coordination Platform

If not already existing, initiate the establishment of an SSP coordination mechanism, with participation from all relevant State aviation regulatory and administrative organizations. This mechanism may be in the form of a board, committee, etc. Its function is to coordinate the implementation and subsequent administration of the SSP amongst the various State aviation regulatory and administrative organizations. This will ensure that the development, periodic review and decision and policy making pertaining to SSP activities such as safety policy, safety indicators, enforcement policy, safety data protection & sharing, SMS regulatory requirements, internal SSP review and findings, etc are carried out in an integrated and coordinated manner. This on-going SSP platform should involve senior management of the various organizations, with the SSP Accountable Executive as the coordinator.

f) Establish SSP documentation

The process to draft the SSP document should commence from the beginning of the SSP implementation exercise. As the SSP components and elements of the SSP are progressively being defined, each element's description and their related processes can then be progressively written up in this top level document. Refer Appendix 10 for an illustrative example of how such a SSP Document and its contents may be structured.

Establish a SSP documentation system (library/ cabinet/ folder) within the SSP placeholder organization that serve as a central repository for the SSP document, related SOPs, forms, minutes of meetings, records, etc associated with the implementation and continuous operation of the SSP. These documents will serve as records and evidence of the actual activities and continuing operation of the individual elements of the SSP. It is possible that some records such as confidential reports, occurrence reports, etc may be maintained in a separate computer system or reside in another regulatory or administrative organization. For such, samples or extracts may be maintained in the library as appropriate. An SSP documentation master index should help to account for all relevant documentation. As with any other system, a consolidated documentation system will facilitate easy traceability, updating, referencing and internal/ external auditing of the system.

PHASE II

3.4.2 State safety legislative framework - Element 1.1

a) Review, develop and promulgate, as necessary, a national safety legislative framework and specific regulations, in compliance with international and national standards, that define how the State will manage and regulate aviation safety throughout its aviation system.

b) Establish a time frame to periodically review the safety legislation and specific operating regulations to ensure they remain relevant and appropriate to the State.

3.4.3 State safety responsibilities and accountabilities - Element 1.2(ii)

a) Define and establish safety management responsibilities and accountabilities of the respective regulatory organizations. A description or illustration of the existing organization structure and integration of the various regulatory and administrative organizations should be addressed within the SSP Document. Cross reference to supporting documentation for the respective organizations' detailed safety responsibilities and accountabilities may be provided there from.

b) Develop and implement a State safety policy and the necessary means to ensure that the policy is understood, implemented and observed at all levels within State aviation organizations.
Guidance on development of a State safety policy is outlined in Appendix 2 of this chapter.

c) Develop or include broad State safety objectives which are congruent to the State safety policy. Such safety objectives may be standalone or be part of the organization's overall organization mission statement, depending on the complexity and roles of the organization. These safety objectives should then be taken into consideration during subsequent development of the State's ALoSP safety indicators. There should be indicators that can serve as metrics to assess the achievement status of those objectives.

3.4.4 Accident and incident investigation - Element 1.3

The State to:

a) Ensure that the national legislative framework do include provision for the establishment of an independent accident and incident investigation process which is administered by an independent organization, bureau, commission or other body.

b) Establish an accident and incident investigation organization, bureau, commission or other body which is independent from all other State aviation organizations. In States where it may not be practical to establish a permanent accident investigation entity, an appropriately competent accident investigation commission or board may be appointed for each accident to be investigated. Alternatively, such States may consider the services of a Regional Accident and Incident Investigation Organization (RAIO, Doc 9946).

c) Establish mechanisms to ensure that the sole objective of the accident and incident investigation process is the prevention of accidents and incidents, in support of the management of safety in the State, and not the apportioning of blame or liability.

3.4.5 Enforcement policy - Element 1.4(i)

a) The State should ensure or establish fundamental legislative provision for regulatory enforcement (penalty) action, including suspension or revocation of certificates.

3.4.6 Safety oversight - Element 3.1(i)

The State should:

a) Ensure or establish a basic safety oversight program to oversee service providers. This should include a surveillance program that assures service providers' regulatory compliance during routine operations including, but not necessarily limited to:

1) site, station or product inspections; and
2) organizational or system audits;

3.4.7 Safety requirements for the service provider's SMS - Element 2.1(i)

a) SMS Implementation - education and promotion phase

Where appropriate, the State should prepare service providers and industry stakeholders for SMS implementation requirements through SMS educational and promotional activities such as SMS Forums, seminars, briefings or workshops.

b) Develop SMS guidance materials pertinent to service providers, in anticipation or in conjunction with the development of SMS regulations.

PHASE III

3.4.8 Enforcement policy - Element 1.4(ii)

The State's regulatory enforcement policy and procedures (in an SSP-SMS environment) should establish:

a) the conditions and circumstances under which service providers are allowed to deal with, and resolve, events involving certain safety deviations, internally, within the context of the service provider's safety management system (SMS), and to the satisfaction of the appropriate State authority.

b) the conditions and circumstances under which safety deviations are dealt with through established enforcement procedures.

c) procedures to ensure that no information obtained from a voluntary/ confidential reporting system or equivalent restricted operational data monitoring systems operating under an SMS will be used for enforcement action.

d) A process to protect the sources of information obtained from voluntary and confidential reporting systems.

A sample Enforcement policy and procedures is outlined in Appendix 3 and Appendix 4 of Chapter 3.

3.4.9 SMS requirements for service providers - Element 2.1(ii)

a) Establish SMS regulation, guidance materials and implementation requirements for all applicable service providers and ensure that the SMS regulatory framework is harmonized across all aviation sectors and is congruent with the ICAO SMS framework. Adoption of ICAO's harmonized SMS framework will facilitate mutual recognition amongst States.

b) Establish a process for acceptance of individual service providers' SMS, to ensure that their SMS framework is congruent with the State's SMS regulatory framework. Such initial review and acceptance may be manifest through an endorsement or acceptance of the organization's SMS manual. Where a phased SMS implementation approach is adopted by the State, such acceptance process may be done on a phased basis where appropriate. Refer Appendix 7 for SMS regulatory assessment/ acceptance example.

   Note: Acceptance or recognition of a foreign organization's SMS (eg foreign AMO) is encouraged, where such SMS has been duly accepted by that organization's local Authority, and the organization's SMS framework is in harmony with the ICAO SMS framework.

3.4.10 Safety data collection, analysis and exchange - Element 3.2(i)

The State should:

a) Set up mechanisms and procedures for collecting and analyzing mandatory/ reportable occurrences at an aggregate State level. This would require the State to :

   1) establish a mandatory or reportable occurrence procedure for certificated/ approved service providers of each aviation sector to report (mandatory basis) accidents and serious incidents. This should include major or mandatory defect reports (MDR) where appropriate. Refer to Appendix 12 for guidance on mandatory reporting procedure.

   2) establish requirements for service providers to have an internal occurrence investigation and resolution process that documents the investigation results and makes the reports available to their respective regulatory organization.

3) ensure that there is an appropriate integration, consolidation and aggregation of data collected from the various aviation sectors at the SSP level. Safety data should not exist as independent or standalone data bases at the individual sector levels only. This integration aspect should also be addressed between the respective safety databases of the CAA and that of the independent accident investigation authority, including those States where certain safety management functions are discharged by a Regional Safety Oversight Organization or a Regional Accident and Incident Investigation Organization on behalf of the State.

b) Establish basic high-consequence safety indicators (initial ALoSP) and their associated target and alert settings. Examples of high consequence safety indicators are accident rates, serious incident rates and monitoring of high risk regulatory non compliance outcomes (eg ICAO audit findings). Safety indicators development and selection should be congruent to the State's safety objectives and safety policy. They should be appropriate and relevant to the scope and complexity of the State's aviation activities. Selection of lower consequence safety indicators may be addressed at a later stage. Periodic monitoring of the safety indicators for any undesirable trends, alert level breaches and target achievement should be performed. Refer Appendix 6 for guidance on safety indicators development and monitoring.

PHASE IV

3.4.11 Agreement on the service provider's safety performance - Element 2.2

The State should establish a procedure for liaison with service providers in their development of a set of realistic safety performance indicators (SPIs), targets and alerts where possible depending on the size and complexity of the organization. The safety indicators, targets and alerts should be:

a) a combination of high and lower consequence SPIs as appropriate;
b) pertinent to the service provider's aviation activities;
c) consistent with other service providers of the same sector/ category;
d) congruent with the State's SSP aggregate safety indicators for the service provider sector/ category.

Once the safety indicators, targets and alerts have been developed, the service provider's action plans in relation to achievement of the targets and their corrective action plans in case an alert level is reached need to be documented. The regulator's process for subsequent periodic review of the service provider's safety performance should be made transparent to the service provider during the development of the performance requirements

3.4.12 Safety Oversight - Element 3.1(ii)

The State should incorporate oversight of service providers' SMS as part of the routine surveillance program that includes:

a) Setting up periodic review of the SMS requirements and related guidance materials with service providers to ensure they remain relevant and appropriate to them.

b) Measuring the safety performance of the individual service provider's SMS through periodic reviews of the agreed safety performance and ensuring that the SPIs, targets and alert settings remain relevant to the service provider.

c) Ensuring that the service provider's hazard identification and safety risk management processes follow established regulatory requirements and that safety risk controls are appropriately integrated into the service provider's SMS,

3.4.13 Safety Oversight - Element 3.1(iii)

a) The State should develop an internal review or assessment mechanism covering the SSP and its Safety Policy to assure continuing conformance and improvement of the SSP. Such internal review should include the State's activities in compliance to the ICAO Universal Safety Oversight Programme (USOAP), Continuous Monitoring Approach (CMA). As with any effective internal review mechanism, there should be an appropriate level of independence in the review process and follow up action accountability.

3.4.14 Safety data collection, analysis and exchange - Element 3.2(ii)

The State should:

a) Establish a State level voluntary reporting system, including provisions for safety information protection (Refer Appendix 9 for guidance on safety information protection). This voluntary reporting system should constitute part of the SSP safety data collection and processing system. The database of this voluntary reporting system should be part of the SSP SDCPS and be accessible to the State's CAA as well as the accident investigation authority. Refer to Appendix 11 for guidance on State's voluntary reporting system.

b) Establish lower consequence safety and/or quality indicators with appropriate target and alert monitoring (mature ALoSP). Safety indicators development and selection should be congruent to the State's safety objectives and safety policy. They should be appropriate and relevant to the scope and complexity of the State's aviation activities. Periodic monitoring of the safety indicators for any undesirable trends, alert level breaches and target achievement should be performed. Refer Appendix 6 for guidance on safety indicators development and monitoring.

c) Promote safety information exchange and sharing amongst the State's regulatory and administrative organizations and service providers, as well as with other States and industry organizations.

3.4.15 Safety data driven targeting of oversight of areas of greater concern or need - Element 3.3

a) The State should review existing surveillance and audit programmes to incorporate provision for calibration of individual service provider surveillance or audit frequency and scope based on pertinent performance outcomes and safety data inputs. Refer to section 3.2, SSP element 3-3 for guidance on safety data based surveillance concept.

3.4.16 Internal training, communication and dissemination of safety information - Element 4.1 (Phase 1-4)

The State should:

a) Develop an internal training policy and procedures.
b) Develop an SSP & SMS training programme for relevant staff. Priority for SSP-SMS implementation personnel and operational/ field Inspectors involved in service providers' SMS.
c) Post SSP-SMS implementation training and education materials should include State specific SSP processes and their relevance to the generic ICAO framework elements.
d) Develop a means to communicate safety related information amongst State regulatory and administrative organizations, including the State SSP documentation, safety/ enforcement policies and procedures; through such mechanisms as newsletters; bulletins and websites.

3.4.17 External training, communication and dissemination of safety information - Element 4.2 (Phase 1-4)

The State should:

a) Establish process to communicate regulatory, SSP and SMS related information to service providers.
b) Develop guidance material on implementation of SMS for service providers.
c) Establish the means to communicate safety-related issues externally including safety policies and procedures through such mechanisms as newsletters; bulletins; or websites.
d) Promote safety information exchange with and amongst service providers and other States.
e) Facilitate SMS training or familiarization for service providers where appropriate

Note

The 2 elements above are progressively developed and implemented through all the phases.

Appendix 1 to Chapter 3

Guidance on SSP Gap Analysis and Implementation Plan

1 Initial Gap Analysis Checklist (Table A)

The initial gap analysis questions checklist (Table A) that follows can be used as a template to conduct the first step of a gap analysis. This format with its overall "Yes/ No/ Partial" response will provide an initial indication of the broad scope of gaps and hence overall workload to be expected. This initial information should be useful to senior management in anticipating the scale of the SSP implementation effort and hence the resources to be provided (This initial checklist would need to be followed up by an appropriate implementation plan per Table B & C).

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

Note: SMM references within [ ] brackets contain guidance materials relevant to the Gap analysis question.

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Table A – Gap Analysis Questions Checklist

	Component 1 — STATE SAFETY POLICIES AND OBJECTIVES		
	Element 1.1 — State safety legislative framework		
	Aspect to be analysed or question to be answered	*Answer*	*Status of implementation*
1.1-1	Has [State] promulgated a national safety legislative framework and specific regulations that define the management of safety in the State? [3.2, 1-1; 3.3.1; 3.4.2]	☐ Yes ☐ No ☐ Partial	
1.1-2	Are the legislative framework and specific regulations periodically reviewed to ensure that they remain relevant to the State? [3.2, 1-1; 3.4.2 (b)]	☐ Yes ☐ No ☐ Partial	
	Element 1.2 — State safety responsibilities and accountabilities		
1.2-1	Has [State] identified a SSP placeholder organization and an Accountable Executive for the implementation, and coordination of the SSP? [3.2,1-2; 3.4.1(a)]	☐ Yes ☐ No ☐ Partial	
1.2-2	Has the [State] established an SSP implementation team? [3.2, 1-2; 3.4.1(b)]	☐ Yes ☐ No ☐ Partial	
1.2-3	Has [State] defined the State requirements, responsibilities and accountabilities regarding the establishment and maintenance of the SSP? [3.2, 1-2; 3.4.1]	☐ Yes ☐ No ☐ Partial	
1.2-4	Does the State have an SSP implementation plan in place, which includes a timeframe for the implementation of actions and gaps as identified through the gap analysis? [3.3; 3.4.1(d)]	☐ Yes ☐ No ☐ Partial	
1.2-5	Is there a documented statement about the provision of the necessary resources for the implementation and maintenance of the SSP? [Chpt 3, App 2, Pt 1(4); 3.2, 1-2]	☐ Yes ☐ No ☐ Partial	

1.2-6	Does the [State] SSP Accountable Executive have control of the necessary resources required for the implementation of the SSP? [3.4.1(a)]	☐ Yes ☐ No ☐ Partial	
1.2-7	Has [State] defined the specific activities and accountabilities related to the management of safety in the State that each aviation regulatory organization under the SSP is accountable for? [3.4.3(a)]	☐ Yes ☐ No ☐ Partial	
1.2-8	Does [State] have a mechanism or platform for the coordination of SSP implementation and subsequent SSP continuous monitoring activities involving all state regulatory organizations? [3.4.1(e)]	☐ Yes ☐ No ☐ Partial	
1.2-9	Does the [State] SSP Accountable Executive coordinate, as appropriate, the activities of the different State aviation organizations under the SSP? [3.4.1(a); 3.2, 1-2]	☐ Yes ☐ No ☐ Partial	
1.2-10	Has [State] established a safety policy? [3.2, 1-2; 3.4.3(b)]	☐ Yes ☐ No ☐ Partial	
1.2-11	Is [State] safety policy signed by the [State] SSP Accountable Executive or an appropriate authority within [State]? [Chpt 3, App 2]	☐ Yes ☐ No ☐ Partial	
1.2-12	Is [State] safety policy reviewed periodically? [3.4.13]	☐ Yes ☐ No ☐ Partial	
1.2-13	Is [State] safety policy communicated to the employees in all [State] aviation organizations with the intent that they are made aware of their individual safety responsibilities? [3.4.3(b)]	☐ Yes ☐ No ☐ Partial	
1.2-14	Has the [State] initiated a unified SSP document as part of the SSP implementation plan to describe its SSP framework components and elements? [3.2, 1-2; 3.4.1(f); App 10]	☐ Yes ☐ No ☐ Partial	
1.2-15	Has the SSP document been completed, approved and signed by the SSP Accountable Executive and the document communicated/ made accessible to all stake holders upon full implementation of the SSP? [3.4.1(f)]	☐ Yes ☐ No ☐ Partial	
1.2-16	Does [State] have a documentation system that ensures appropriate storage, archiving, protection and retrieval of all documents relating to SSP activities? [3.2, 1-2; 3.4.1(f)]	☐ Yes ☐ No ☐ Partial	
1.2-17	Does the [State] have a periodic internal review mechanism for assurance of continuing improvement and effectiveness of its SSP? [3.2, 3-1; 3.4.13(a)]	☐ Yes ☐ No ☐ Partial	
	Element 1.3 — Accident and incident investigation		
1.3-1	Has [State] established an independent accident and incident investigation process the sole objective of which is the prevention of accidents and incidents, and not the apportioning of blame or liability? [3.2, 1-3; 3.4.4]	☐ Yes ☐ No ☐ Partial	
1.3-2	Is the organization/authority for accident investigation functionally independent? (See Manual of Aircraft Accident and Incident Investigation (Doc 9756, Part 1, paragraph 2.1) [3.4.4(b)]	☐ Yes ☐ No ☐ Partial	
	Element 1.4 — Enforcement policy		
1.4-1	Has [State] promulgated an enforcement policy? [3.2, 1-4; 3.4.8; App 3 & 4]	☐ Yes ☐ No ☐ Partial	
1.4-2	Does the State's primary aviation legislation provide for the enforcement of the applicable legislation and regulations?	☐ Yes ☐ No	

	[3.4.5]	☐ Partial	
1.4-3	Does the enforcement policy take into account that service providers are normally allowed to deal with, and resolve routine safety or quality deviations internally within the scope of its approved SMS/ QMS procedures? [3.4.8(a)]	☐ Yes ☐ No ☐ Partial	
1.4-4	Does the enforcement policy establish the conditions and circumstances under which the State may deal with safety deviations directly through its established investigation and enforcement procedures? [3.2, 1-4; 3.4.8(b)]	☐ Yes ☐ No ☐ Partial	
1.4-5	Does the SSP enforcement policy include provision to prevent the use or disclosure of safety data for purposes other than safety improvement? [3.2, 1-4; 3.4.8c]	☐ Yes ☐ No ☐ Partial	
1.4-6	Does the SSP enforcement policy include provision to protect the sources of information obtained from voluntary incident reporting systems? [3.4.8(d); App 3; App 11]	☐ Yes ☐ No ☐ Partial	
	Component 2 — STATE SAFETY RISK MANAGEMENT		
	Element 2.1 — Safety requirements for the service provider's SMS		
2.1-1	Has the State promulgated harmonised regulations to require service providers to implement a SMS? [3.2, 2-1; 3.4.7; App 5]	☐ Yes ☐ No ☐ Partial	
2.1-2	Are these SMS requirements and related guidance materials periodically reviewed to ensure they remain relevant and appropriate to the service providers? [3.2, 1-2; 3.4.12(a)]	☐ Yes ☐ No ☐ Partial	
	Element 2.2 — Agreement on the service provider's safety performance		
2.2-1	Has [State] individually agreed/ accepted service provider's safety performance indicators and their respective alert/ target levels? [3.2, 2-2; 3.4.11]	☐ Yes ☐ No ☐ Partial	
2.2-2	Are the agreed/ accepted safety performance indicators commensurate with the scope/ complexity of the individual service provider's specific operational context? [3.4.11]	☐ Yes ☐ No ☐ Partial	
2.2-3	Are the agreed safety performance indicators periodically reviewed by the [State] to ensure it remains relevant and appropriate to the service provider? [3.4.12(b)]	☐ Yes ☐ No ☐ Partial	
	Continued next page>>>		

	Component 3 — STATE SAFETY ASSURANCE		
	Element 3.1 — Safety oversight		
3.1-1	Has the State established a formal surveillance programme to ensure satisfactory compliance with State safety regulations and requirements by service providers? [3.2, 3-1]	☐ Yes ☐ No ☐ Partial	
3.1-2	Has the State established a process for the initial review and acceptance of individual service providers' SMS? [3.2, 2-2; 3.4.9(b)]	☐ Yes ☐ No ☐ Partial	
3.1-3	Has State established procedures for the review of individual service providers' safety performance indicators and their relevant alert/ target levels? [3.2, 2-2; 3.4.11]	☐ Yes ☐ No ☐ Partial	
3.1-4	Does the State's safety oversight programme include periodic assessment of individual service provider's SMS? [3.2, 3-1; 3.4.12]	☐ Yes ☐ No ☐ Partial	
3.1-5	Does the State's periodic SMS surveillance programme include assessment of service provider's hazard identification and safety risk management processes? [3.4.12c]	☐ Yes ☐ No ☐ Partial	
3.1-6	Does the State's periodic SMS surveillance programme include assessment of service provider's safety performance indicators and their relevant alert/ target levels? [3.4.12(b)]	☐ Yes ☐ No ☐ Partial	
3.1-7	Does the State have a periodic internal review mechanism for assurance of effective compliance of the SSP and its related safety oversight functions? [3.4.13]	☐ Yes ☐ No ☐ Partial	
	Element 3.2 — Safety data collection, analysis and exchange		
3.2-1	Has [State] established mechanisms to ensure the mandatory reporting, evaluation and processing of accidents and serious incident data at the aggregate State level? [3.2, 3-3; 3.4.10]	☐ Yes ☐ No ☐ Partial	
3.2-2	Has the State established a voluntary reporting system to facilitate the collection of data on hazards and associated safety risks that may not be captured by a mandatory incident reporting system? [3.4.14(a)]	☐ Yes ☐ No ☐ Partial	
3.2-3	Has [State] established mechanisms to develop information from the stored data and to promote the exchange of safety information with service providers and/or other States as appropriate? [3.4.14]	☐ Yes ☐ No ☐ Partial	
3.2-4	Has [State] established an acceptable level of safety performance (ALoSP) as defined by selected safety indicators with corresponding target and alert levels as appropriate? [3.4.14(b); 3.4.10(b)]	☐ Yes ☐ No ☐ Partial	
3.2-5	Are the ALoSP safety indicators appropriate and relevant to the scope and complexity of its aviation activities? [3.4.10(b); 3.4.14(b)]	☐ Yes ☐ No ☐ Partial	
3.2-6	Does the State have a mechanism for periodic monitoring of the SSP safety indicators to assure that corrective or follow up actions are taken for any undesirable trends, alert level breaches or non achievement of improvement targets? [3.4.10(b); 3.4.14(b)]	☐ Yes ☐ No ☐ Partial	
	Element 3.3 — Safety-data-driven targeting of oversight of areas of greater concern or need		
3.3-1	Has [State] developed procedures to prioritize inspections, audits and surveys towards those areas of greater safety concern or need? [3.4.15; 3.2, 3-3]	☐ Yes ☐ No ☐ Partial	
3.3-2	Is the prioritization of inspections and audits associated with the analysis of relevant internal/ external safety or quality data?	☐ Yes ☐ No	

	[3.2, 3-3; 3.4.15]	☐ Partial	
	Component 4 — STATE SAFETY PROMOTION		
	Element 4.1 — Internal training, communication and dissemination of safety information		
4.1-1	Is there a process to identify safety management related training requirements , including SSP & SMS training, for relevant personnel of the regulatory/ administrative organizations? [3,4,16]	☐ Yes ☐ No ☐ Partial	
4.1-2	Are there records to show that personnel involved in SSP implementation and its operation have undergone appropriate SSP/ SMS training or familiarisation? [3.4.16; 3.2, 4-1]	☐ Yes ☐ No ☐ Partial	
4.1-3	Does the State maintain a mechanism for the consolidation, communication and sharing of safety information amongst its regulatory and administrative organizations involved in the SSP? [3.4.16(d)]	☐ Yes ☐ No ☐ Partial	
4.1-4	Does the internal safety information/ data sharing include occurrence, investigation and hazard reports from all its aviation sectors? [3.4.14c]	☐ Yes ☐ No ☐ Partial	
	Element 4.2 — External training, communication and dissemination of safety information		
4.2-1	Does the State facilitate the continuing education, communication and sharing of safety information with and amongst its service providers? [3.4.17; 3.2, 4-2]	☐ Yes ☐ No ☐ Partial	
4.2-2	Do the State regulatory organizations participate in regional and global aviation safety information sharing and exchange, and facilitate the participation of their respective service providers in the same? [3.4.17(d)]	☐ Yes ☐ No ☐ Partial	
4.2-3	Is there a formal process for the external dissemination of regulatory documents and information to service providers and a means of assuring the effectiveness of this process? [3.4.17(a)]	☐ Yes ☐ No ☐ Partial	
4.2-4	Is the State's SSP document and its associated safety policy, enforcement policy and aggregate safety indicators included in the State's safety information communication & sharing process? [3.4.17(a)]	☐ Yes ☐ No ☐ Partial	

2 Detailed Gap Analysis & Implementation Tasks (Table B)

The above Table A initial gap analysis checklist will now need to be followed up by a detailed "Required Tasks/ Actions" plan such as per Table B example below. This Table should provide follow up analysis on details of the gaps and translating these into actual required tasks and sub-tasks in the specific context of the State's environment, processes and terminology. Each Task is accordingly assigned to appropriate individuals or groups for action. It is important that correlation of individual element/ task development to their descriptive placeholders in the SSP Document be provided for in this Table. This will trigger progressive updating of the draft SSP Document even as each element is being enhanced or implemented. (Intial element write-ups in SSP documents tend to be anticipatory rather than declaratory).

3 Actions/ Tasks Implementation Schedule (Table C)

Table C may be a separate consolidation of all outstanding Actions/ Tasks or if preferred, be a continuation of Table B in the form of a spread sheet. This Table will show the milestones (Start-End dates) as scheduled for each Task/ Action. For a Phased implementation approach, these Tasks/Actions would need to be sorted according to its related element's Phase allocation. Refer to Phased Approach Section of this chapter as appropriate.

Table B – Gap Analysis & Implementation Tasks Identification (Format Example)

GAQ Ref	Gap Analysis Question	Answer: Yes/ No/ Partial	Description of Gap	Action/ Task Required to fill Gap	Assigned Task Group/ Person	SSP Document Ref/	Action/ task Status (open/ WIP/ closed)
1.1-1	Has [State] promulgated a national safety legislative framework and specific regulations that define the management of safety in the State?	*Partial*	*There is no clear definition or assignment of safety management roles within existing regulatory organizations*	*Task#1 – Legal department to review legislative framework*	*Task group A*	*Chapter 2, Sect 1.*	*WIP*
1.1-2	Are the legislative framework and specific regulations periodically reviewed to ensure that they remain relevant to the State?	*Partial*	*Adhoc or piecemeal review only. No SOP for periodic review process*	*Task#3 – To develop SOP for periodic review of all operating regulations.*	*Task group B*	*Chapter 2, Sect 3.*	*Open*
etc							

Note: All gap analysis questions or only questions with “No/ Partial” answers may be addressed in this Table as appropriate.

Table C – Actions/ Tasks Implementation Plan (Format Example)

Action/ Task Required to fill Gap	GAQ Ref	Assigned Task Group/ Person	Action/ task Status	Schedule/ Timeline (Start – End)												
				1Q 10	2Q 10	3Q 10	4Q 10	1Q 11	2Q 11	3Q 11	4Q 11	1Q 12	2Q 12	3Q 12	4Q 12	etc
Task#1 – Legal department to review legislative framework	*1.1-1*	*Task Group A*	*WIP*													
Task#2 – To define scope of SMS		Group 3														
etc																

Note: This Table C can also be consolidated as a continuation of Table B (spread sheet) if preferred. Where prioritization of tasks implementation is necessary, refer to the Phased Approach Section to this Chapter 3.

Appendix 2 to Chapter 3

Guidance on a State Safety Policy Statement

Part 1

The state safety policy Statement should consider but not necessarily be limited to following commitments:

1) develop and implement strategies and processes to ensure that all aviation activities and operations will achieve the highest level of safety performance;

2) develop and promulgate a national safety legislative framework and applicable operating regulations for the management of safety in the State, which is based on a comprehensive analysis of the State's aviation system, and complies with and, wherever possible, exceeds international safety requirements and standards;

3) consult with relevant segments of the aviation industry on issues regarding regulatory development;

4) allocate the necessary resources to State aviation organizations to ensure personnel are adequately trained and to allow them to discharge their responsibilities;

5) support the management of safety through promotion of voluntary and confidential reporting systems at the service provider as well as State level;

6) conduct data-driven, risk-based and prioritized oversight activities, both performance-based and compliance-oriented, and ensure that these regulatory and administrative oversight activities are conducted according to international standards and best practices as appropriate;

7) promote and educate the aviation industry on safety management concepts and principles and oversee the implementation and operation of SMS in the State's service providers;

8) establish provisions for the protection of safety data collection and processing systems, so that personnel and organizations are encouraged to provide essential safety-related information, and that there is a continuous flow and exchange of safety management data between the State and the service providers;

9) effective interaction with service providers in the resolution of safety concerns;

10) maintain an enforcement policy and procedures that complements the protection of information derived from safety data collection and processing systems;

11) establish a mechanism for the monitoring and measurement of SSP performance through safety indicators and their respective targets and alert level settings;

12) promote the adoption of best practices and positive safety culture within service provider organizations.

The State safety policy Statement should be signed by the SSP Accountable Executive or an appropriate State level office responsible for overseeing the State's regulatory and administrative organizations.

Appendix 2 to Chapter 3

Safety Policy Statement (Illustration)

Part 2

The following is a basic Safety Policy statement illustration:

[State Regulatory organization name]] promotes and regulates the safety of aviation in [State Name]. We are committed to developing and implementing effective strategies, regulatory frameworks and processes to ensure that aviation activities under our oversight achieve the highest practicable level of safety.

To this end we will:

- *Set national standards that are in line with International Civil Aviation Organization standards, recommended practices and procedures;*
- *Adopt a data-driven and performance-based approach in safety regulation and industry oversight activities where appropriate;*
- *Identify safety trends within the aviation industry and adopt a risk-based approach to address areas of greater safety concern or need;*
- *Monitor and measure the safety performance of our aviation system continuously through the State's aggregate safety indicators as well as service providers' safety performance indicators;*
- *Collaborate and consult with the aviation industry to address safety matters and continuously enhance aviation safety;*
- *Promote good safety practices and a positive organization safety culture within the industry based on sound safety management principles;*
- *Encourage safety information collection, analysis and exchange amongst all relevant industry organizations and service providers, with intent that such information is to be used for safety management purposes only;*
- *Allocate sufficient financial and human resources for safety management and oversight; and*
- *Equip staff with proper skills and expertise to discharge their safety oversight and management responsibilities competently.*

_____

Signed by DGCA [SSP Accountable Executive or State level office responsible for civil aviation]

Appendix 3 to Chapter 3

Guidance on State Enforcement Policy

This enforcement policy is promulgated under the statutory authority in [State's applicable civil aviation regulation(s), air navigation order(s) or regulatory standard(s)].

1. Purpose

1.1 The [State's CAA] enforcement policy is aimed at promoting compliance with aviation safety regulations and requirements through enforcement functions in an equitable manner .

1.2 The implementation of safety management systems (SMS) requires the [State's CAA] to have an equitable and discretionary enforcement approach in order to support the SSP-SMS framework.

1.3 To develop enforcement policies and procedures that allow service providers to deal with, and resolve, certain events involving safety deviations, internally, within the context of the service provider's SMS, and to the satisfaction of the authority. Intentional contraventions of the [State's Civil Aviation Act] and the [State's Civil Aviation Regulations] will be investigated and may be subject to conventional enforcement action where appropriate. There should be clear provisions in the enforcement framework for due consideration and segregation between premeditated violations from unintentional errors or deviations.

1.4 The enforcement policy statement and associated enforcement procedures apply to service providers operating in accordance with ICAO Annex 1 — *Personnel Licensing;* Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes*, and Part III — *International Operations — Helicopters;* Annex 8 — *Airworthiness of Aircraft;* Annex 11 — *Air Traffic Services;* and Annex 14 — *Aerodromes*, Volume I — *Aerodrome Design and Operations*.

2. Policy

2.1 [Service provider] will establish, maintain and adhere to an SMS that is commensurate with the size, nature and complexity of the operations authorized to be conducted under its approval/ certificate.

2.2 To maintain this enforcement policy that supports the implementation of SMS, [State's CAA] inspectors will maintain an open communication channel with service providers.

2.3 No information derived from safety data collection and processing systems (established under a SMS) relating to reports classified as confidential, voluntary or equivalent category, shall be used as the basis for enforcement action.

2.4 When a service provider operating under an SMS unintentionally contravenes [Civil Aviation Act or Civil Aviation regulations], specific review procedures will be used. These procedures will allow the [State's CAA] inspector responsible for the oversight of the service provider the opportunity to engage in dialogue with the SMS approved organization. The objective of this dialogue is to agree on proposed corrective measures and an action plan that adequately addresses the deficiencies that led to the contravention and to afford the service provider a reasonable time to implement them. This approach aims to nurture and sustain effective safety reporting, whereby service providers' employees can report safety deficiencies and hazards without fear of punitive action. A service provider can therefore, without apportioning blame, and without fear of enforcement action, analyse the event and the organizational or individual factors that may have led to it, in order to incorporate remedial measures that will best help prevent recurrence.

2.5 [State's CAA], through the inspector responsible for the oversight of the service provider, will evaluate the corrective measures proposed by the service provider, and/or the systems currently in place to address the event underlying the contravention. If the corrective measures (including any appropriate internal disciplinary actions) proposed are considered satisfactory and likely to prevent recurrence and foster future compliance, the review of the violation should then be concluded with no further punitive enforcement action by the regulator.

In cases where either the corrective measures or the systems in place are considered inappropriate, [State's CAA] will continue to interact with the service provider to find a satisfactory resolution that would prevent enforcement action. However, in cases where the service provider refuses to address the event and provide effective corrective measures, [State's CAA] will consider taking enforcement action or other administrative action deemed appropriate.

2.6 Breaches of aviation regulations may occur for many different reasons, from a genuine misunderstanding of the regulations, to disregard for aviation safety. [State's CAA] has a range of enforcement procedures in order to effectively address safety obligations under the [applicable State Act] in light of different circumstances. These procedures may result in a variety of actions such as:

a) counselling;
b) remedial training; or
c) variation, suspension and cancellation of authorizations.

2.7 Enforcement decisions must not be influenced by:

a) personal conflict;
b) personal gain
c) considerations such as gender, race, religion, political views or affiliation; or
d) personal, political or financial power of those involved.

8. PROPORTIONALITY OF RESPONSES

Enforcement decisions must be proportional to the identified breaches and the safety risks they underlie, based on three principles:

a) [State's CAA] will take action against those who consistently and deliberately operate outside Civil Aviation Regulations; and
b) [State's CAA] will seek to educate and promote training or supervision of those who show commitment to resolving safety deficiencies.
c) [State's CAA] will give due and equitable consideration to distinguish between premeditated violations from unintentional errors or deviations.

9. NATURAL JUSTICE AND ACCOUNTABILITY

Enforcement decisions must:

a) be fair and follow due process;
b) be transparent to those involved;
c) take into account the circumstances of the case and the attitude/ actions of the service provider or individual when considering action;
d) be consistent actions/ decisions for like/ similar circumstances; and
e) be subject to appropriate internal and external review.

10. EXCEPTIONS

10.1 This policy is not applicable if there is evidence of a deliberate effort to conceal non-compliance.

10.2 This policy is not applicable if the service provider fails to maintain an acceptable SMS or its agreed safety performance .

10.3 This policy is not applicable if the service provider is deemed by the Authority as a recurrent violator.

In the above circumstances, the Authority may deal with such non compliance or violations according to established enforcement procedures as deemed appropriate.

(Signed) _____

State Accountable Executive

Appendix 4 to Chapter 3

Guidance on State Enforcement Procedures in an SSP-SMS Environment

1. GENERAL

1.1 Under the [State's] State safety programme (SSP), the [State's CAA] is responsible for oversight of certificate holders operating in an SMS environment. Enforcement procedures provide guidance to those responsible for the oversight of service providers operating in an SMS environment on the appropriate response to errors or violations. Enforcement procedures play a supporting function in the process. However, the final decision regarding any SSP enforcement issue is the responsibility of the CAA or SSP Accountable Executive.

2. APPLICABILITY

2.1 These procedures apply to contraventions that may have been committed by persons or service providers conducting activities in an SSP-SMS environment.

2.2 These procedures are effective as of [date].

2.3 These procedures will be used for service providers that have a CAA accepted SMS or are following a "phased SMS implementation approach" with a CAA accepted Implementation Plan.

2.4 Where service providers or individuals have not demonstrated that they are operating in an SMS environment, enforcement actions may be applied without the advantages of the procedures explained in paragraph 3.

3. PROCEDURES

3.1 For the purpose of determining whether an investigation or enforcement evaluation process should be conducted under an SSP-SMS enforcement environment, it will be necessary for the investigation/ enforcement panel to determine the SMS implementation status of the specific service provider. This determination would initially be made through communication between the enforcement panel and the principal inspector who is responsible for oversight and certification of the service provider under investigation. Enforcement deliberation should always be undertaken by a designated or appointed panel of officers rather than an individual officer evaluation and decision process.

3.2 The principal inspector will ascertain if the service provider meets the above-mentioned criteria for SMS enforcement procedures. In order to facilitate initial assessment, [State's CAA] should have a list of service providers' SMS implementation status. Making this list available to aviation investigation/ enforcement personnel will assist the investigators in making a decision regarding the applicability of the investigation/ enforcement evaluation process.

3.3 During the "phased approach" of the service provider's SMS implementation, [State's CAA] may apply the SMS enforcement procedures to service providers that do not have a fully implemented or accepted SMS yet, provided that certain conditions are met.

3.4 [State's CAA] will require, as a minimum, that the three following conditions be met before SMS enforcement procedures may be applied:

a) The service provider has an effective internal hazard reporting and risk mitigation process;

b) The service provider has an effective occurrence investigation and corrective action process

commensurate with the size and complexity of its operations and adequate for determining causal factors and developing corrective measures;

c) Safety data or information pertaining to the event under investigation are made available to investigation/ enforcement panel and full cooperation is provided by the service provider or individual to the investigation/ enforcement panel.

Initial report of violation

3.5 Aviation enforcement personnel should conduct a preliminary analysis in all cases where a contravention is detected or where information about a possible contravention is received. If the reported violation is the outcome or recommendation from an official report, the enforcement panel will need to decide whether that occurrence report is adequate to support enforcement action.

Preliminary evaluation

3.6 The following questions should be considered based on the information received:

a) Are there reasonable grounds to believe that a person or organization conducting activities under an SMS may have committed a contravention?

b) Is the event of such a nature (eg gross/ recurring non conformance, etc) that enforcement action should be considered?

c) Is there any further information or evidence, such as latent conditions, organization/ human factors, etc, that should be secured to facilitate enforcement action decision making?

When the such questions are answered in the affirmative, the principal inspector should be notified for his concurrence to proceed with enforcement action assessment, where applicable.

Assessment and recommendation of enforcement action

3.7 The enforcement panel's process for determining an appropriate, fair and yet effective administrative (or other punitive action) should be based on an objective process that takes into consideration all known underlying, circumstantial, environmental or latent conditions. These should include organizational, human and other escalation factors where applicable. Other factors such as whether the non conformance action is an unintentional error or deliberate action should be taken into consideration as appropriate.

3.8 Once an appropriate enforcement action decision is made, the enforcement panel should then make the necessary recommendation for the Accountable Executive's approval, and thereafter notify the parties concerned.

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Appendix 5 to Chapter 3

State SMS Regulation (Example)

1. STATUTORY BASIS

SMS regulations should be promulgated under the statutory authority of the State's applicable civil aviation authority.

2 Scope of SMS Regulation

2.1 The regulation specifies the requirement for service providers to implement a safety management system (SMS) operating in accordance with Annex 1 — *Personnel Licensing*; Annex 6 — *Operation of Aircraft;* Annex 8 — *Airworthiness of Aircraft;* Annex 11 — *Air Traffic Services;* and Annex 14 — *Aerodromes,* Volume I — *Aerodrome Design and Operation.*

2.2 Within the context of this regulation the term "service provider" would normally refer to approved/ certificated organizations providing aviation services. The term refers to approved training organizations that are exposed to operational safety risks during the provision of their services, aircraft operators, approved maintenance organizations, organizations responsible for type design and/or manufacture of aircraft, air traffic service providers and certified aerodromes, as applicable.

2.1.3 The regulation addresses aviation safety-related processes, procedures and activities of the service provider, rather than occupational safety, environmental protection, or other non aviation related activities.

2.1.5 The regulation establishes the minimum SMS framework requirements. The service provider can establish more stringent internal requirements.

2.2 SMS Regulation/ Requirement Clause (Example)

2.2.1 Effective *[date(s)], [type of service provider]* shall have in place a safety management system (SMS) acceptable to *[CAA name]* and which addresses four high level safety objectives as follows:

2.2.1.1 identifies safety hazards;
2.2.1.2 ensures the implementation of remedial action necessary to maintain agreed safety performance;
2.2.1.3 provides for continuous monitoring and regular assessment of safety performance; and
2.2.1.4 aims at a continuous improvement of the overall performance of the safety management system.

2.2.1 The framework for this SMS shall, as minimum, include the following components and elements:

1. Safety policy and objectives
   - 1.1 Management commitment and responsibility
   - 1.2 Safety accountabilities
   - 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 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.

Note.— A regulation on SMS should address the provision of SMS guidance or advisory materials by the State. Such guidance materials should also include any provision for a phased SMS implementation approach. The CAA's process for acceptance of individual service provider SMS and agreement of their proposed safety performance should also be made known in such requirements or guidance materials as appropriate.

Appendix 6 to Chapter 3

Safety Indicators & ALoSP (Examples)

Table A1-A4: Safety Indicator Examples

These are some illustrative examples of State aggregate safety indicators and their corresponding alert and target level setting criteria. The SMS safety performance indicators on the right hand side of the Table are shown to indicate the necessary correlation between the SSP and SMS safety indicators. Such a summary Table may be compiled by the State and populated accordingly with as many existing or viable safety indicators as possible. SMS SPIs will need to be developed by service providers in relation to the State's SSP safety indicators expectations. In order to ensure congruence between SSP and SMS indicators, the State will need to actively engage service providers in their development of SMS SPIs. It can be expected for SMS SPIs to be more comprehensive that SSP safety indicators. From such a bank of safety indicators, the State may then select an appropriate package of indicators for the purpose of its SSP acceptable level of safety performance monitoring and measurement. It is possible that certain safety/ quality indicators may have been maintained (by State or service providers) for supplementary purposes and hence need not be included for SSP (or SMS) level monitoring and measurement purpose. These would usually be lower level or other process specific indicators within the organization.

Table B: Example of SSP Safety Indicator Chart

This is an example of how a high consequence SSP safety indicator chart can look like. In this case it is the State's aggregate all operators reportable/ mandatory incidents rate. The chart on the left is the preceding year's performance, whilst the right is the current year's progressive data trending. The alert level setting is based on basic safety metrics standard deviation criteria. The Excel spread sheet formula is "=STDEVP". For purpose of manual Standard Deviation calculation, the formula is:

$$\sigma = \sqrt{\frac{\sum X^2}{N} - \mu^2}$$

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

The target setting is a desired percentage improvement (in this case 5%) over the previous year's data points average. It should be noted that actual data point intervals and occurrence rate denominator will need to be determined based on the nature of each data set, in order to ensure viability of the safety indicator. For very low frequency occurrences, the data points' interval may (for example) have to be on a yearly instead of quarterly update basis. Likewise, the occurrence rate denominator may (for example) be per 100,000 air movements instead of 1,000 air movements. This chart is generated by the data sheet as shown in Table C.

Table C: Data Sheet for Sample Safety Indicator Chart

This data sheet is used to generate the safety indicator chart as shown in Table B. The same can be used to generate any other safety indicator chart with the the appropriate data entry and safety indicator descriptor customization. The three alert lines and target line are automatically generated based on their respective settings in this data sheet.

Table D: Example of SSP ALoSP Performance Summary

This is a summary of all the State's SSP safety indicators, with their respective alert and target level outcomes annotated. Such a summary may be compiled at the end of each monitoring period to provide an overview of the SSP ALoSP performance. If a more quantitative performance summary measurement is desired, appropriate points may be assigned to each Yes/No response for each target and alert outcome. Example:

High Consequence Indicators-

Alert level Not Breached	[Yes (4), No (0)]
Target Achieved	[Yes (3), No (0)]

Lower Consequence Indicators-

Alert level Not Breached	[Yes (2), No (0)]
Target Achieved	[Yes (1), No (0)]

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

SSP Safety Indicators (Aggregate State)						**SMS** Safety Performance Indicators (Individual Service Provider)					
High Consequence Indicators (Occurrence/ Outcome-based)			**Lower Consequence** Indicators (Event/ Activity-based)			**High Consequence** Indicators (Occurrence/ Outcome-based)			**Lower Consequence** Indicators (Event/ Activity-based)		
Safety Indicator	Alert level criteria	Target level criteria	**Safety Indicator**	Alert level criteria	Target level criteria	**Safety Performance Indicator**	Alert level criteria	Target level criteria	**Safety Performance Indicator**	Alert level criteria	Target level criteria
Air Operators (Air Operators of the State only)											
CAA aggregate Air Operators monthly/ quarterly accident/ serious incident rate (eg per 1000FH)	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.	CAA aggregate Air Operator annual surveillance Audit LEI% or findings rate (findings per audit)	Consideration	Consideration	Air Operator Individual Fleet monthly serious incident rate (eg per 1000FH)	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.	Operator Combined Fleet monthly Incident rate (eg per 1000FH)	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.
CAA aggregate Air Operators quarterly Engine IFSD incident rate (eg per 1000 FH)	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.	CAA aggregate Air Operator annual Line Station Inspection LEI% or findings rate (findings per inspection)	Consideration	Consideration	Air Operator Combined Fleet monthly serious incident rate (eg per 1000FH)	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.	Operator Internal QMS/ SMS annual audit LEI% or findings rate (findings per audit)	Consideration	Consideration
			CAA annual Foreign Air Operators Ramp surveillance inspection Ave LEI% (for each Foreign Operator).	Consideration	Consideration	Air Operator Engine IFSD incident rate (eg per 1000 FH)	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.	Operator Voluntary Hazard reports rate [eg per 1000 FH]	Consideration	Consideration
			CAA aggregate Operators' DGR incident reports rate [eg per 1000 FH]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.				Operator DGR incident reports rate [eg per 1000 FH]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.
ETC											

Table A-1: Air Operator

SSP Safety Indicators (Aggregate State)						**SMS** Safety Performance Indicators (Individual Service Provider)					
High Consequence Indicators (Occurrence/ Outcome-based)			**Lower Consequence** Indicators (Event/ Activity-based)			**High Consequence** Indicators (Occurrence/ Outcome-based)			**Lower Consequence** Indicators (Event/ Activity-based)		
Safety Indicator	Alert level criteria	Target level criteria	**Safety Indicator**	Alert level criteria	Target level criteria	**Safety Performance Indicator**	Alert level criteria	Target level criteria	**Safety Performance Indicator**	Alert level criteria	Target level criteria
Aerodrome Operators											
CAA aggregate aerodromes monthly/ quarterly ground accident/ serious incidents rate - involving any aircraft [eg per 10,000 ground movements]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.	CAA aggregate Aerodrome Operators annual surveillance Audit LEI% or findings rate (findings per audit)	Consideration	Consideration	Aerodrome Operator quarterly ground accident/ serious incident rate - involving any aircraft [eg per 10,000 ground movements]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.	Aerodrome Operator Internal QMS annual audit LEI% or findings rate (findings per audit)	Consideration	Consideration
CAA aggregate aerodromes monthly/ quarterly Runway Excursion incidents rate - involving any aircraft [eg per 10,000 departures]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.				Aerodromes Operator quarterly Runway Excursion incidents rate - involving any aircraft [eg per 10,000 departures]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.	Aerodrome Operator quarterly Runway Foreign Object Report (FOR) rate [eg per 10,000 ground movements]	Consideration	Consideration
CAA aggregate aerodromes monthly/ quarterly Runway Incursion incidents rate - involving any aircraft [eg per 10,000 departures]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.				Aerodromes Operator quarterly Runway Incursion incidents rate - involving any aircraft [eg per 10,000 departures]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.	Operator Voluntary Hazard reports rate [per operational personnel per quarter]	Consideration	Consideration
									Aerodrome Operator quarterly aircraft ground Foreign Object Damage (FOD) incident report rate - involving damage to aircraft [eg per 10,000 ground movements]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.
ETC											

Table A-2: Aerodrome Operator

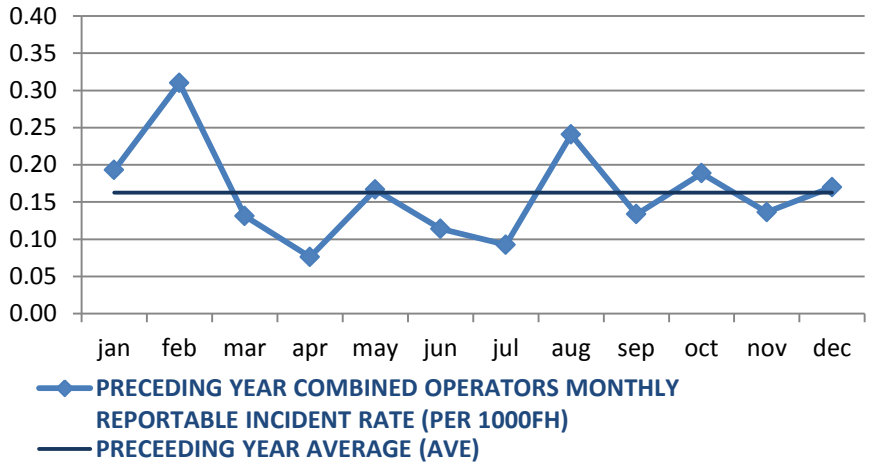
SSP Safety Indicators (Aggregate State)						**SMS** Safety Performance Indicators (Individual Service Provider)					
High Consequence Indicators (Occurrence/ Outcome-based)			**Lower Consequence** Indicators (Event/ Activity-based)			**High Consequence** Indicators (Occurrence/ Outcome-based)			**Lower Consequence** Indicators (Event/ Activity-based)		
Safety Indicator	**Alert level criteria**	**Target level criteria**	**Safety Indicator**	**Alert level criteria**	**Target level criteria**	**Safety Performance Indicator**	**Alert level criteria**	**Target level criteria**	**Safety Performance Indicator**	**Alert level criteria**	**Target level criteria**
ATS Operators											
CAA aggregate ATS quarterly FIR (airspace) serious incidents rate - involving any aircraft [eg per 100,000 flight movements]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.	CAA aggregate ATS quarterly FIR TCAS RA incidents rate - involving any aircraft [eg per 100,000 flight movements]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.	ATS operator quarterly FIR serious incidents rate - involving any aircraft [eg per 100,000 flight movements]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.	ATS Operator quarterly FIR TCAS RA incidents rate - involving any aircraft [eg per 100,000 flight movements]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.
			CAA aggregate ATS quarterly FIR Level Bust (LOS) incident rate - involving any aircraft [eg per 100,000 flight movements]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.	ATS operator quarterly/ annual near miss incident rate [eg per 100,000 flight movements]	Assume historical annual Ave rate is 3, possible Alert rate could be 5.	Assume historical annual Ave rate is 3, possible Target rate could be 2.	ATS Operator quarterly FIR Level Bust (LOS) incident rate - involving any aircraft [eg per 100,000 flight movements]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.
			CAA aggregate ATS Operators annual surveillance Audit LEI% or findings rate (findings per audit)	Consideration	Consideration				ATS Operator Internal QMS annual audit LEI% or findings rate (findings per audit)	Consideration	Consideration
ETC											

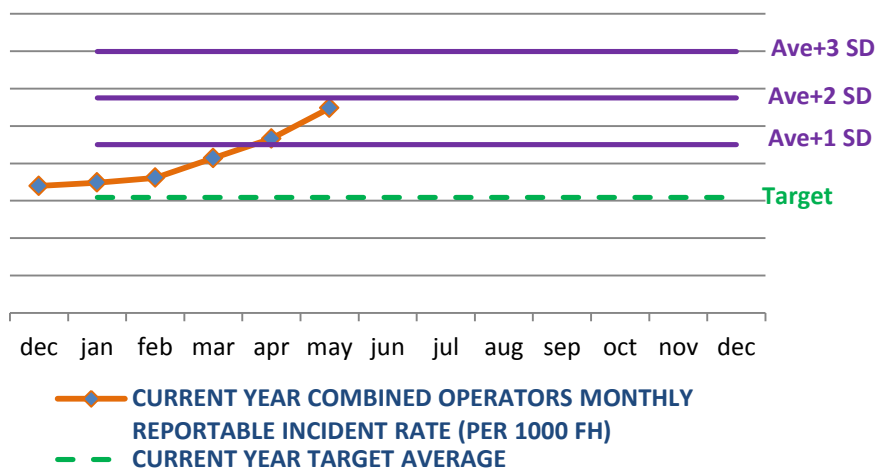
Table A-3: ATS Operator

SSP Safety Indicators (Aggregate State)						**SMS** Safety Performance Indicators (Individual Service Provider)					
High Consequence Indicators (Occurrence/ Outcome-based)			**Lower Consequence** Indicators (Event/ Activity-based)			**High Consequence** Indicators (Occurrence/ Outcome-based)			**Lower Consequence** Indicators (Event/ Activity-based)		
Safety Indicator	**Alert level criteria**	**Target level criteria**	**Safety Indicator**	**Alert level criteria**	**Target level criteria**	**Safety Performance Indicator**	**Alert level criteria**	**Target level criteria**	**Safety Performance Indicator**	**Alert level criteria**	**Target level criteria**
POA/DOA/MRO Organizations											
CAA aggregate MRO quarterly Mandatory Defect Reports (MDR) received	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.	CAA aggregate MRO/ POA/ DOA annual surveillance Audit LEI% or findings rate (findings per audit)	Consideration	Consideration	MRO/ POA quarterly rate of component technical warranty claims.	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.	MRO/ POA/ DOA Internal QMS annual audit LEI% or findings rate (findings per audit).	Consideration	Consideration
CAA aggregate POA/ DOA quarterly rate of operational products which are subject of Airworthiness Directives (ADs) [per product line]	Consideration	Consideration				MRO/ POA quarterly rate of component Mandatory/ Major Defect Reports raised.	Consideration	Consideration	MRO/ POA/ DOA quarterly final inspection/ testing failure/ rejection rate	Consideration	Consideration
									MRO/ POA/ DOA Voluntary Hazard reports rate [per operational personnel per quarter]	Consideration	Consideration
ETC											

Table A-4: POA/ DOA/ MRO

Table B: **Example of SSP Safety Indicator Chart** (with Alert & Target levels setting)





A) Alert Level Setting:

Alert level for a new monitoring period (current year) is based on the preceding period's performance (preceding year), namely its data points Average & Std Deviation. The 3 alert lines are Ave+1SD, Ave+2SD and Ave+3SD

B) Alert Level Trigger:

An Alert (abnormal/ unacceptable trend) is indicated if **ANY** of the conditions below are met for the current monitoring period (current year):

- Any single point is above 3 SD line

- 2 consecutive points are above 2 SD line

- 3 consecutive points are above 1 SD line

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

C) Target Level Setting(Planned Improvement) :

Target setting may be less structured than Alert level setting - eg target the new (current year) monitoring period's Ave rate to be say 5% lower (better) than the preceding period's Ave value.

D) Target Achievement:

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

E) Alert & Target Levels - Validity Period:

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

Table C: Data Sheet for Sample Safety Indicator Chart

SSP High Consequence Safety Indicator Example (with Alert and Target Setting Criteria)

Preceding Year				
Mth	All Operators Total FH	All Operators Incidents	Incident Rate*	Ave
jan	51,837	10.00	0.19	0.16
feb	48,406	15.00	0.31	0.16
mar	53,354	7.00	0.13	0.16
apr	52,513	4.00	0.08	0.16
may	54,037	9.00	0.17	0.16
jun	52,673	6.00	0.11	0.16
jul	54,086	5.00	0.09	0.16
aug	54,043	13.00	0.24	0.16
sep	52,383	7.00	0.13	0.16
oct	53,042	10.00	0.19	0.16
nov	51,353	7.00	0.14	0.16
dec	53,006	9.00	0.17	0.16
		Ave	0.16	
		SD	0.07	

** Rate Calculation:(per 1000 FH)*

Ave+1SD	Ave+2SD	Ave+3SD
0.23	0.29	0.36

Current year							
Mth	All Operators Total FH	All Operators Incidents	Incident Rate*	Preceding Year Ave +1SD	Preceding Year Ave +2SD	Preceding Year Ave +3SD	Current Year Target Average
dec	53006	9.00	0.17	0.23	0.29	0.36	0.16
jan	51635	9.00	0.17	0.23	0.29	0.36	0.15
feb	44295	8	0.18	0.23	0.29	0.36	0.15
mar	48323	10	0.21	0.23	0.29	0.36	0.15
apr	47176	11	0.23	0.23	0.29	0.36	0.15
may	47469	13	0.27	0.23	0.29	0.36	0.15
jun				0.23	0.29	0.36	0.15
jul				0.23	0.29	0.36	0.15
aug				0.23	0.29	0.36	0.15
sep				0.23	0.29	0.36	0.15
oct				0.23	0.29	0.36	0.15
nov				0.23	0.29	0.36	0.15
dec				0.23	0.29	0.36	0.15
		Ave					
		SD					

** Rate Calculation:(per 1000 FH)*

Current Year Alert Level setting criteria is based on Preceding Year [Ave + 1/2/3 SD]

Current Year Target is say 5% Ave rate improvement over the Ave rate for the preceding year, which is:	**0.15**

Table D

Example: State "X" SSP ALoS Performance Summary (say for Year 2010)

High Consequence Safety Indicators					
	Safety Indicator (SI) Description	SI Alert Level/ Criteria (for 2010)	Alert level Not Breached [Yes/ No]	SI Target level/ criteria (for 2010)	Target Achieved [Yes/ No]
1	CAA aggregate Air Operators monthly accident/ serious incident rate [per 1000 FH]	2009 Average Rate + 1/2/3 SD. (annual reset)	Y	5 % improvement of the 2010 Average Rate over the 2009 Average Rate.	N
2	CAA aggregate Aerodromes monthly ground accident/ serious incidents rate - involving any aircraft [per 10,000 ground movements]	2009 Average Rate + 1/2/3 SD. (annual reset)	Y	3 % improvement of the 2010 Average Rate over the 2009 Average Rate.	Y
3	CAA aggregate ATS monthly FIR serious incidents rate - involving any aircraft [per 100,000 air movements]	2009 Average Rate + 1/2/3 SD. (annual reset)	N	4 % improvement of the 2010 Average Rate over the 2009 Average Rate.	N

Lower Consequence Safety Indicators					
	Safety Indicator (SI) Description	SI Alert Level/ Criteria (for 2010)	Alert level Not Breached [Yes/ No]	SI Target level/ criteria (for 2010)	Target Achieved [Yes/ No]
	CAA aggregate Air Operators Organization annual surveillance/ audit outcomes	>25% Average LEI; OR any level 1 finding; OR >5 level 2 findings per audit	Y	<10% Average LEI; AND <1 level 2 finding per audit	N
	CAA annual Air Operator Line Station surveillance inspection Ave LEI% (for each Operator).	>25% Average LEI; OR any level 1 finding; OR >5 level 2 findings per audit	Y	<10% Average LEI	Y
	CAA annual Foreign Air Operators Ramp sampling inspection program.	>25% Average LEI; OR any level 1 finding; OR >5 level 2 findings per audit; OR <25% of Foreign Operators inspected	Y	Not less than 50% of Foreign Operators to be inspected	N
	CAA aggregate Aerodrome Operators Organization annual surveillance/ audit outcomes	>25% Average LEI; OR any level 1 finding; OR >5 level 2 findings per audit	N	<10% Average LEI; AND <1 level 2 finding per audit	N

Lower Consequence Safety Indicators					
	Safety Indicator (SI) Description	SI Alert Level/ Criteria (for 2010)	Alert level Not Breached [Yes/ No]	SI Target level/ criteria (for 2010)	Target Achieved [Yes/ No]
	CAA aggregate ATS Operators Organization annual surveillance/ audit outcomes	>25% Average LEI; OR any level 1 finding; OR >5 level 2 findings per audit	Y	<10% Average LEI; AND <1 level 2 finding per audit	Y
	CAA aggregate ATS quarterly FIR TCAS RA incidents rate - involving any aircraft [per 10,000 flight movements]	2009 Average Rate + 1/2/3 SD. (annual reset)	Y	5 % improvement of the 2010 Average Rate over the 2009 Average Rate.	N
	CAA aggregate D&M/ MRO Organization annual surveillance/ audit outcomes	>25% Average LEI; OR any level 1 finding; OR >5 level 2 findings per audit	Y	<10% Average LEI; AND <1 level 2 finding per audit	Y
	CAA aggregate AMO (MRO) quarterly rate of component warranty claims due to (Major) technical defects.	2009 Average Rate + 1/2/3 SD. (annual reset)	N	5 % improvement of the 2010 Average Rate over the 2009 Average Rate.	N

Note 1: Other Process Indicators - Apart from above SSP level Safety Indicators, there may be other systems level indicators within each operational areas. Examples would include process or system-specific monitoring indicators in AIR, OPS, AGA etc or indicators associated with performance-based programs such as fatigue risk management or fuel management. Such process or system-specific indicators should rightly be administered as part of the system or process concerned. They may be viewed as specific system or process level indicators which undergird the higher level SSP monitoring safety indicators. They should be addressed within the respective system or process manuals/ SOPs as appropriate. Nevertheless, the criteria for setting alert or target levels for such indicators could preferably be aligned with that of the SSP level safety indicators where applicable.

Note 2: Selection of Indicators & Settings - The combination (or package) of High and Lower Consequence Safety Indicators is to be selected by a State according to the scope of their aviation system. For those Indicators where the suggested Alert or Target levels setting criteria is not applicable, the State may consider any alternate criteria as appropriate. General guidance is to set Alerts and Targets that take into consideration recent historical or current performance.

Appendix 7 to Chapter 3

SMS Acceptance/ Assesssment (Example)

Table A SMS ASSESSMENT Checklist - Initial SMS Acceptance

Table A below is a sample (85 questions) regulatory SMS assessment Checklist which can be used for the intial assessment and acceptance of a service provider's SMS. For an initial acceptance process, the assessment questions would need to be comprehensive in order to address all SMS elements of the organization adequately. This will ensure that all elements and their related processes are in place within the organization. The operational aspects of the SMS would be more appropriately addressed during subsequent routine/ annual assessment of the SMS.

The illustrated minimum acceptable performance procedure has provided for a three stage minimum acceptable score criteria. This procedure can facilitate the regulator's progressive assessment of service providers' SMS implementation process, instead of auditing only after a service provider's SMS is fully implemented or matured. Such a progressive assessment protocol will also ensure that the regulator is actively involved in monitoring the industry's SMS implementation from their early phases.

Where phased-elements SMS implementation approach per chapter 4 of this document is adopted, the questions in this Checklist may need to be re-configured and adapted to align with the specific spread of elements across the relevant phases, as may be determined by the State.

An illustrative Corrective Action Notice (CAN) procedure is indicated at the end of the Checklist.

Table B SMS ASSESSMENT Checklist – Routine SMS Assessment

Table B below is a sample (39 questions) regulatory SMS assessment Checklist which can be used for subsequent routine SMS assessment. After an organization's SMS has satisfied the regulator's initial assessment and acceptance process, there will be many assessment questions from the initial assessment Checklist that would no longer be expedient or necessary for routine assessment purpose. A routine SMS assessment Checklist need only to focus on the operational aspects of a SMS and evidence of the satisfactory implementation of its supporting processes.

Routine SMS assessment may be conducted on a standalone basis or incorporated as part of a routine organization/ systems audit. In case of the latter, such SMS routine assessment questions may be accordingly incorporated as a section within the normal organization audit checklist. The auditor performing an integrated QMS-SMS audit will need to be trained for SMS audit as appropriate. The normal Corrective Action Notice (CAN) protocol of the regulator can also be applied to the routine SMS assessment.

Table A SMS ASSESSMENT Checklist - Initial SMS Acceptance

SMS ASSESSMENT Checklist - Initial Acceptance

SMS Audit Chklist_Routine / 18 Aug 2011

INPUT COLUMN: ANNOTATE "Y" for YES," N " for NO, "NA" for NOT APPLICABLE

Organisation Name:	Date of Assessment:		Assessed by POI/ PMI:	REF:

Component / Element	Level 1	Input	Doc Ref/ Remarks	Level 2	Input	Doc Ref/ Remarks	Level 3	Input	Doc Ref/ Remarks
Management commitment & responsibilities [1.1]	SP/L1/1			SP/L3/1			SP/L3/2		
	There is a documented Safety Policy statement.	Y		There is evidence that the Safety Policy is communicated to all employees with intent that they are made aware of their individual safety obligations.	N		There is a periodic review of the Safety Policy by senior management or the Safety Committee	N	
	SP/L1/2			SP/L2/2			AM/L3/1		
	The Safety Policy is relevant to aviation safety.	Y		The Safety Policy is endorsed by the Accountable Manager.	Y		The Accountable Manager's terms of reference indicate his overall responsibility for all safety issues	N	
	SP/L1/3a			SP/L2/3					
	The Safety Policy is relevant to the scope and complexity of the organization's operations.	N		The safety policy do address the provision of necessary human and financial resources for its implementation.	N				
Safety accountabilities [1.2]	AM/L1/1			AM/L2/1a					
	There is a documented safety (SMS) accountability within the organisation that begins with the Accountable Manager	Y		The Accountable Manager's terms of reference does indicate his ultimate responsibility for his organization's SMS	N				
	AM/L1/2			AM/L2/2					
	The Accountable Executive have final authority over all aviation activities of his organization	N		The Accountable Manager's final authority over all operations conducted under his Organization's Certificate(s) is indicated in his terms of reference	N				
	SC/L1/1			SC/L2/1			SC/L3/1		
	There is a Safety Committee (or equivalent mechanism) that reviews the SMS and its safety performance	Y		For a large organisation, there are departmental or section Safety Action Groups that work inconjunction with the Safety Committee	NA		The Safety Committee is chaired by the Accountable Manager or (for very large organisations) by an appropriately assigned deputy, duly substantiated in the SMS manual	Y	

Component / Element		Level 1	Input	Doc Ref/ Remarks	Level 2	Input	Doc Ref/ Remarks	Level 3	Input	Doc Ref/ Remarks
Safety Policy and Objectives		SC/L1/2			SC/L2/2			SC/L3/2		
		The Safety Committee do include relevant operational or departmental Heads as applicable	N		There is an appointed Safety (SMS) coordinator within the Safety Action Group	NA		The Safety Action Groups are chaired by the departmental or section Head where applicable.	NA	
	Appointment of key safety personnel [1.3]	SM/L1/1			SM/L2/1			SM/L3/1		
		There is a Manager who performs the role of administering the SMS	Y		The Manager responsible for administering the SMS does not hold other responsibilities that may conflict or impair his role as SMS manager.	N		The SMS Manager has direct access or reporting to the Accountable Manager concerning the implementation & operation of the SMS	N	
		SM/L1/2						SM/L3/2		
		The Manager performing the SMS role have relevant SMS functions included in his terms of reference	N					The SMS Manager is a senior management position not lower than or subservient to other operational or production positions	N	
	Emergency Response Planning [1.4]	ERP/L1/1			ERP/L2/1			ERP/L3/1		
		There is a documented Emergency Response Plan or equivalent operational contingency procedure.	Y		Does the ERP include procedures for the continuing safe production, delivery or support of its aviation products or services during such emergencies or contingencies?	N		The ERP do address relevant integration with external customer or sub-contractor organizations where applicable	N	
		ERP/L1/2			ERP/L2/2			ERP/L3/2		
		The ERP is appropriate to the size, nature and complexity of the organisation.	Y		There is a plan for drills or exercises with respect to the ERP.	Y		There is a procedure for periodic review of the ERP to ensure its continuing relevance & effectiveness.	N	
		ERP/L1/3			ERP/L2/3					
		Does the Emergency plan address possible or likely emergency/ crisis scenarios relating to the organization's aviation product or service deliveries?	N		ERP drills or exercises are carried out according to plan and result of drills carried out are documented.	N				
		SME/L1/1			SME/L2/1			SME/L3/1		
		There is a SMS Document or exposition.which is approved by the Accountable Manager and accepted by the CAA.	Y		The SMS Document is accepted or endorsed by the organization's national aviation authority	Y		The SMS procedures do reflect appropriate integration with other relevant management systems within the organisation, such as QMS, OSHE, Security, as applicable.	N	

Component / Element		Level 1	Input	Doc Ref/ Remarks	Level 2	Input	Doc Ref/ Remarks	Level 3	Input	Doc Ref/ Remarks
	SMS Documentation [1.5]	SME/L1/2			SME/L2/2			SME/L3/2		
		The SMS Document do provide an overview or exposition of the organization's SMS framework & elements.	Y		The SMS Document exposition of each SMS element do include cross references to supporting or related procedures, manuals or systems as appropriate.	Y		The SMS procedures do reflect relevant coordination or integration with external customer or sub-contractor organizations where applicable.	N	
		SME/L1/3			SME/L2/3			SME/L2/2		
		The SMS Document is a stand alone controlled document or a distinct part/ section of an existing CAA endorsed/ accepted document.	Y		Records pertaining to Safety Committee/ SAG meeting (or equivalent) minutes are made maintained.	Y		There is a process to periodically review the SMS Exposition & supporting documentation to ensure their continuing relevance.	N	
		SR/L1/1			SR/L3/2					
		All components & elements of SMS regulatory requirements are addressed in the SMS Document.	Y		Records pertaining to periodic review of existing Safety/ Risk Assessments or special review in conjunction with relevant changes are available.	N				
		SR/L1/2								
		Records pertaining to Safety Risk Assessments performed are maintained.	Y							
		SR/L1/3								
		Records pertaining to identified or reported hazards/ threats are maintained.	Y							
	rd identification [2.1]	HI/L1/1			HI/L2/1			HI/L3/1		
		There is a procedure for voluntary hazards/ threats reporting by all employees.	Y		In the hazard identification system, there is a clear distinction/ definition between hazards and consequences.	N		There is a procedure to identify hazards/ threats from internal incident/ accident investigation reports for follow up risk mitigation where appropriate.	N	
		HI/L1/2			HI/L2/2			HI/L3/2		
		There is a procedure for incident/ accident reporting by operational or production personnel.	Y		The hazard reporting system is confidential and has provisions to protect the reporter's identity.	N		There is a procedure to review hazards/ threats from relevant industry service or incident/ accident reports for risk mitigation where applicable.	N	

Component / Element		Level 1	Input	Doc Ref/ Remarks	Level 2	Input	Doc Ref/ Remarks	Level 3	Input	Doc Ref/ Remarks
Safety Risk Management	Hazar	HI/L1/3			HI/L2/2			RM/L3/1		
		There is a procedure for investigation of incident/ accidents relating to quality or safety.	Y		The organization's internal investigation & disciplinary procedures do distinguish between premeditated/ deliberate violations from unintentional errors & mistakes.	N		There is a procedure for periodic review of existing risk analysis records.	N	
	Risk assessment and mitigation [2.2]	RM/L1/1			RM/L2/1					
		There is a documented Hazard Identification & Risk Mitigation (HIRM) procedure involving the use of objective risk analysis tools.	Y		Risk assessment reports are approved by departmental managers or higher level where appropriate.	N				
		RM/L1/2			RM/L2/2					
		RM/L1/3			RM/L2/3					
		There is a procedure for identification of operations/ processes/ facilities/ equipment which are deemed (by the organisation) as relevant for HIRM.	N		Recommended mitigation actions which require senior management decision or approval are accounted for and documented.	N				
		RM/L1/4			RM/L2/4			RM/L3/4		
		There is a program for progressive HIRA performance of all aviation safety-related operations/ processes/ facilities/ equipment as identified by the organisation.	N		There is a procedure to prioritise HIRA performance for operations/ processes/ facilities/ equipment with identified or known safety-critical hazards/ risks.	N		There is evidence of progressive compliance and maintenance of the organisation's HIRA performance program.	N	
	Safety performance monitoring & measurement 3.1]	SPALS/L1/1			SPALS/L2/1			SPALS/L3/1		
		There are identified safety performance indicators for measuring & monitoring the organisation's safety performance.	Y		There are lower consequence safety performance indicators (eg non compliance, deviation events)	N		There is a procedure for corrective or follow up action to be taken when targets are not achieved and/or alert levels are breached.	N	
		SPALS/L1/2			SPALS/L2/2			SPALS/L2/2		
		There are high consequence databased safety performance indicators (eg accident & serious incident rates)	Y		There are alert and/ or target level settings within the safety performance indicators where appropriate.	N		Safety performance indicators are reviewed by the safety committee for trending, alert level exceedance and target achievement where applicable.	Y	

Component / Element		Level 1	Input	Doc Ref/ Remarks	Level 2	Input	Doc Ref/ Remarks	Level 3	Input	Doc Ref/ Remarks
Safety Assurance	The Management of Change [3.2]	MC/L1/1			MC/L2/1			MC/L3/1		
		There is a procedure for review of relevant existing aviation safety related facilities and equipment (including any HIRA records) whenever there are pertinent changes to those facilities or equipment .	N		There is a procedure for review of new aviation safety related facilities and equipment for hazards/ risks before they are commissioned.	N		There is a procedure for review of relevant existing facilities, equipment, operations or processes (including any HIRM records) whenever there are pertinent changes external to the organisation such as regulatory/ industry standards, best practices or technology.	N	
		MC/L1/2			MC/L2/2					
		There is a procedure for review of relevant existing aviation operations and processes (including any HIRA records) whenever there are pertinent changes to those operations or processes.	N		There is a procedure for review of new aviation safety related operations and processes for hazards/ risks before they are commissioned.	N				
	Continuous Improvement of the SMS [3.3]	AAP/L1/1			AAP/L2/1			AAP/L3/1		
		There is a procedure for periodic internal audit/ assessment of the SMS	Y		There is a follow up procedure to address audit corrective actions.	Y		SMS audit/ assessment has been carried out according to plan.	N	
		AAP/L1/2			AAP/L2/2			AAP/L3/2		
		There is a current internal SMS audit/ assessment plan.	N					There is a process for SMS audit/ assessment reports to be submitted or highlighted for the Accountable Manager's attention when necessary.	N	
		AAP/L1/3			AAP/L2/3			AAP/L3/3		
		There is a documented internal SMS audit/ assessment procedure.	N		The SMS audit plan do include the sampling of completed safety assessments.	N		The SMS audit plan do cover the SMS roles/ inputs of contractors where applicable.	N	
Safety Promotion	ducation & Communication [4.1, 4.2]	STCP/L1/1			STCP/L2/1			STCP/L3/1		
		There is a documented personnel SMS training/ familiarization policy.	Y		Personnel involved in conducting risk evaluation are provided with appropriate risk management training or familiarisation.	N		There is evidence of organisation wide SMS education or awareness efforts.	N	
		STCP/L1/2			STCP/L2/2			STCP/L3/2		
		The manager responsible for SMS administration has undergone an appropriate SMS training course.	Y		Personnel directly involved in the SMS (Safety Committee/ SAG members) have undergone appropriate SMS training or familiarisation.	N		There is evidence of a Safety (SMS) publication, circular or channel for communicating Safety & SMS matters to employees.	N	

Component / Element		Level 1	Input	Doc Ref/ Remarks	Level 2	Input	Doc Ref/ Remarks	Level 3	Input	Doc Ref/ Remarks
0)	Training, E	STCP/L1/3								
		The Accountable Manager has undergone appropriate SMS familiarisation, briefing or training.	Y							

SUB-	CATEGORY 1
Y	23
N	**11**
NA	0
NO OF QN	
COMPLETED	34

CATEGORY 2
6
21
2
29

CATEGORY 3
2
19
1
22

GRAND TOTAL*	
Y	31
N	51
NA	3
NO. OF QN	0
COMPLETED	85

ASSESSMENT RESULT (% OF YES):

38.7%

Corrective Action Notice (CAN) Procedure

1) MINIMUM OVERALL ACCEPTABLE PERFORMANCE (Phased SMS implementation):

1st year/ phase of assessment (eg 2012) - 45%.
2nd year/ phase of assessment (eg 2013) - 65%.
3rd year/ phase of assessment (eg 2014) and thereafter - 85%.
[Ninety (90) days for corrective action to obtain not less than 45% overall performance]

2) Baseline Performance (Level 1 Questions) [during any year/ phase of assessmment, subsequent to State's SMS requirement applicability date]:

Corrective Action Notice (CAN) to be issued for "No" answers to any Level 1 Questions (during any year/ phase of assessment).
[Sixty (60) days for corrective action to obtain a "Yes" answer to the relevant question(s)]

Table B SMS ASSESSMENT Checklist – Routine SMS Assessment

SMS Element		Assessment Question (39)
Management commitment & responsibilities [1.1]	1	The Safety Policy is relevant to the scope and complexity of the organization's operations.
	2	There is evidence that the Safety Policy is communicated to all employees with intent that they are made aware of their individual safety obligations.
	3	There is a periodic review of the Safety Policy by senior management or the Safety Committee
	4	The Accountable Manager's terms of reference indicate his overall responsibility for all safety issues
Safety accountabilities [1.2]	1	There is a Safety Committee (or equivalent mechanism) that reviews the SMS and its safety performance
	2	The Accountable Manager's final authority over all operations conducted under his Organization's Certificate(s) is indicated in his terms of reference
Appointment of key safety personnel [1.3]	1	The Manager performing the SMS role have relevant SMS functions included in his terms of reference
	2	The Manager responsible for administering the SMS does not hold other responsibilities that may conflict or impair his role as SMS manager.
	3	The SMS Manager has direct access or reporting to the Accountable Manager concerning the implementation & operation of the SMS
	4	The SMS Manager is a senior management position not lower than or subservient to other operational or production positions
Emergency Response Planning [1.4]	1	Does the Emergency plan address possible or likely emergency/ crisis scenarios relating to the organization’s aviation service deliveries?
	2	The ERP do include procedures for the continuing safe production, delivery or support of its aviation products or services during such emergencies or contingencies?
	3	ERP drills or exercises are carried out according to plan and result of drills carried out are documented.
	4	The ERP do address relevant integration with external customer or sub-contractor organizations where applicable
	5	There is evidence of periodic review of the ERP to ensure its continuing relevance & effectiveness.

SMS Element		Assessment Question
SMS Documentation [1.5]	1	The organization's SMS components and elements are adequately manifested in the SMS Document.
	2	The organization's documented SMS components and elements are in line with the aviation authority's SMS requirements.
	3	There is evidence of relevant SMS coordination or integration with external customer or sub-contractor organizations where applicable.
	4	There is evidence of procedure for periodic review of the SMS Document & supporting documentation to ensure their continuing relevance.
	5	Records pertaining to periodic review of existing Safety/ Risk Assessments are available.
Hazard identification [2.1]	1	The number or rate of the organization's registered/ collected hazard reports is commensurate with the size and scope of the organization's operations
	2	The hazard reporting system is confidential and has provisions to protect the reporter's identity.
	3	There is evidence that hazards/ threats uncovered during incident/ accident investigation process are registered with the HIRM system.
	4	There is evidence that registered hazards are systematically processed for risk mitigation where applicable.
Risk assessment and mitigation [2.2]	1	There is evidence that operations/ processes/ facilities/ equipment with aviation safety implications are progressively subjected to the organization's HIRM process.
	2	Completed risk assessment reports are approved by appropriate level of management.
	3	There is a procedure for periodic review of completed risk mitigation records.

SMS Element		Assessment Question
Safety performance monitoring & measurement 3.1]	1	The organization's SMS safety performance indicators have been agreed with the relevant national aviation authority
	2	There are high consequence databased safety performance indicators (eg accident & serious incident rates)
	3	There are lower consequence safety performance indicators (eg non compliance, deviation events)
	4	There are alert and/ or target level settings within the safety performance indicators where appropriate.
	5	The organization's Management of Change procedure do include the requirement for safety risk assessment to be conducted whenever applicable.
	6	There is evidence of corrective or follow up action taken when targets are not achieved and/or alert levels are breached.
The Management of Change [3.2]	1	There is evidence that relevant aviation safety related processes and operations have been subjected to the organization's HIRM process as applicable.
	2	The organization's Management of Change procedure do include the requirement for safety risk assessment to be conducted whenever applicable.
Continuous Improvement of the SMS [3.3]	1	There is evidence that internal SMS audit/ assessment has been planned and carried out.
Training, Education & Communication [4.1, 4.2]	1	There is evidence that all personnel involved in SMS operation has undergone appropriate SMS training or familiarization
	2	Personnel involved in conducting risk evaluation are provided with appropriate risk management training or familiarisation.
	3	There is evidence of a Safety (SMS) publication, circular or channel for communicating Safety & SMS matters to employees.

Appendix 8 to Chapter 3

Accident and Incident Notification and Reporting Guidance

1.0 Introduction

In accordance with Annex 13 — Aircraft Accident and Incident Investigation, States are required to report to ICAO information on all aircraft accidents which involve turbojet-powered aeroplanes or aircraft having a maximum certificated take-off mass of over 2 250 kg. The Organization also gathers information on aircraft incidents considered important for safety and accident prevention. For ease of reference, the term “occurrence” refers to both accidents and incidents.

Throughout the guidance the Annex 13 Standards have been quoted in a blue shaded text box.

2.0 Accidents and Incidents-Notification and Reports

The ICAO Accident and Incident Data Reporting (ADREP) system collects data from States in order to enhance safety through analysis either through validation of known safety issues or identification of emerging safety trends leading to recommendations for accident prevention purposes.

There are four different stages at which information is sent to ICAO after an occurrence. These are:

- Notification;
- Preliminary (ADREP) report;
- Final report; and
- Data (ADREP) report.

Table 1-1 shows a sequential summary of notification and reporting checklist in accordance with Annex 13, Attachment B.

In order to facilitate reporting, States can now use ICAO’s online secure portal site to file notifications and ADREP reports via an e-form or by means of an ADREP compatible format (e.g. ECCAIRS). Further guidance on ICAO’s e-forms is under section 3.0.

2.1 Notification

A notification is used for immediate dissemination of accident/incident information. As per Annex 13, the below information must be sent to ICAO:

Annex 13, 4.1

The State of Occurrence shall forward a notification of an accident or serious incident, with a minimum of delay and by the most suitable and quickest means available, to:
a) the State of Registry;
b) the State of the Operator;
c) the State of Design;
d) the State of Manufacture; and
e) the International Civil Aviation Organization, when the aircraft involved is of a maximum mass of over 2 250 kg or is a turbojet-powered aeroplane.

However, when the State of Occurrence is not aware of a serious incident, the State of Registry or the State of the Operator, as appropriate, shall forward a notification of such an incident to the State of Design, the State of Manufacture and the State of Occurrence.

Annex 13, 4.2

The notification shall be in plain language and contain as much of the following information as is readily available, but its dispatch shall not be delayed due to the lack of complete information:

a) for accidents the identifying abbreviation ACCID, for serious incidents INCID;
b) manufacturer, model, nationality and registration marks, and serial number of the aircraft;
c) name of owner, operator and hirer, if any, of the aircraft;
d) qualification of the pilot-in-command, and nationality of crew and passengers;
e) date and time (local time or UTC) of the accident or serious incident;
f) last point of departure and point of intended landing of the aircraft;
g) position of the aircraft with reference to some easily defined geographical point and latitude and longitude;
h) number of crew and passengers; aboard, killed and seriously injured; others, killed and seriously injured;
i) description of the accident or serious incident and the extent of damage to the aircraft so far as is known;
j) an indication to what extent the investigation will be conducted or is proposed to be delegated by the State of Occurrence;
k) physical characteristics of the accident or serious incident area, as well as an indication of access difficulties or special requirements to reach the site;
l) identification of the originating authority and means to contact the investigator-in-charge and the accident investigation authority of the State of Occurrence at any time; and
m) presence and description of dangerous goods on board the aircraft.

2.2 Preliminary Report

The Preliminary report is an ad-interim report that contains additional information that was missing or not available at the time of sending the notification. Preliminary reports are not compulsory for incidents.

Information needed to be sent for a Preliminary report can also be found at http://www.icao.int/Safety/reporting .

As per Annex 13, 7.1 and 7.2

Accidents to aircraft over 2 250 kg
When the aircraft involved in an accident is of a maximum mass of over 2 250 kg, the State conducting the investigation shall send the Preliminary Report to:

a) the State of Registry or the State of Occurrence, as appropriate;
b) the State of the Operator;
c) the State of Design;
d) the State of Manufacture;
e) any State that provided relevant information, significant facilities or experts; and
f) the International Civil Aviation Organization.

Accidents to aircraft of 2 250 kg or less
When an aircraft, not covered by 7.1, is involved in an accident and when airworthiness or matters considered to be of interest to other States are involved, the State conducting the investigation shall forward the Preliminary Report to:

a) the State of Registry or the State of Occurrence, as appropriate;
b) the State of the Operator;
c) the State of Design;
d) the State of Manufacture; and
e) any State that provided relevant information, significant facilities or experts.

As per Annex 13, 7.4

Dispatch

The Preliminary Report shall be sent by facsimile, e-mail, or airmail within thirty days of the date of the accident unless the Accident/Incident Data Report has been sent by that time. When matters directly affecting safety are involved, it shall be sent as soon as the information is available and by the most suitable and quickest means available.

2.3 Final Report

As per Annex 13, 6.5

In the interest of accident prevention, the State conducting the investigation of an accident or incident shall make the Final Report publicly available as soon as possible and, if possible, within twelve months.

As per Annex 13, 6.6

If the report cannot be made publicly available within twelve months, the State conducting the investigation shall make an interim statement publicly available on each anniversary of the occurrence, detailing the progress of the investigation and any safety issues raised.

As per Annex 13, 6.7

When the State that has conducted an investigation into an accident or an incident involving an aircraft of a maximum mass of over 5700 kg has released a Final Report, the State shall send to the International Civil Aviation Organization a copy of the Final Report.

Detailed guidance on the format, content and submission of the Final Report is contained in the Manual of Aircraft Accident and Incident Investigation, Doc 9756 (Part IV Reporting).

2.4 Data Report

When the investigation has been completed and the Final Report approved, an Accident or Incident Data Report has to be compiled. If an investigation is re-opened, the information previously reported should be amended as appropriate. The purpose of this report is to provide accurate and complete information in a standard format.

Information needed in order to complete a Data report can be found at http://www.icao.int/Safety/reporting.

As per Annex 13, 7.5

Accidents to aircraft over 2 250 kg

When the aircraft involved in an accident is of a maximum mass of over 2 250 kg, the State conducting the Investigation shall send, as soon as practicable after the investigation, the Accident Data Report to the International Civil Aviation Organization.

3.0 General Instructions for Compiling

Occurrences can be reported to ICAO through one of the following options:

- ICAOs Occurrence Report Manager available on iSTARS secure portal at http://www.icao.int/Safety;
- An ADREP compatible database report (eg. ECCAIRS);
- Paper reports sent to ICAO.

3.1 Occurrence Report Manager

The Notification and ADREP Preliminary report forms can now be completed electronically through ICAO's Occurrence Report Manager available on iSTARS secure portal. If you are already an iSTARS member you can access the occurrence report forms by visiting iSTARS and then following the link to occurrence reporting instructions. In case of new registrations to iSTARS secure portal please request access either through iSTARS online or by email at adrep@icao.int.

3.2 Basic Rules

The validity of the safety information which ICAO provides to States depends on the detail and care with which occurrences have been reported. Thus it is in the interest of all States to report accurate and complete data in accordance with Annex 13 and this guidance. Some basic rules to follow when completing the ICAO Online Accident and Incident Reporting form or the ADREP compatible format (eg. ECCAIRS) record of the occurrence:

- Determine the appropriate occurrence classification and categorization. i.e. whether accident, serious incident or incident, based on injury level, aircraft damage and other information available.
- Complete basic data such as date, time, state and location of occurrence, airport, severity, aircraft type, operator, operation type and flight phase.
- Choose the appropriate field units before entering values, e.g. ft, msl or FL for the altitude etc.
- In case more than one aircraft is involved in an occurrence, add the other aircraft information. When entering event types for more than one aircraft ensure to select appropriate aircraft (1 or 2). All events must be in time sequence and care should be taken not to exclude vital events.
- Align events with occurrence categories.
- Use 'Unknown' entries only if it is established after investigating that information was not found.
- Use 'Blank' entries to indicate investigation is ongoing to find information that is currently not available.

3.3 Notifications

In the case of filing a notification by means of iSTARS Occurrence Report Manager, all the information required, as per Annex 13, 4.2 requirements, is contained in the electronic notification forms, now available online and should be completed as per the instructions provided on the form.

Certain fields on the notification forms are key identifiers that will help ICAO identify reports in the database. Therefore in the case of electronic filing these are required fields that must be completed in order to submit an initial notification. The fields are :

- State Reporting;
- State File number;
- Reporting organization;
- Occurrence class and
- Date of occurrence.

When entering basic occurrence data such as injury level and aircraft damage, care should be taken to align these selections with Occurrence class. For instance if the occurrence has been classified as an 'Accident' then either injury level has to be serious, fatal, unknown or aircraft damage, as substantial, destroyed or unknown.

3.4 ADREP Taxonomy

The ADREP taxonomy is developed by ICAO and contains definitions and terminology for aviation accident and incident reporting systems. The taxonomy documents are available at http://www.icao.int/Safety/reporting

These documents should be referenced whenever in doubt of terminology on notification and report forms.

3.5 Dispatch of the reports

When information on the occurrence is available in ADREP compatible format (*e.g. ECCAIRS format)* a copy of the electronic file (e.g. .E4F) should be attached to the notification e-mail and sent to adrep@icao.int.

Online report forms submitted electronically through the Integrated Safety Trend and Reporting System (iSTARS) secure portal are directly received by ICAO.

Reports that are completed on paper forms are to be sent to ICAO at adrep@icao.int or to the following address:

International Civil Aviation Organization
999 University Street, Montreal, Quebec H3C 5H7, Canada
Tel.: + 1 (514) 954-8219; Fax: + 1 (514) 954-6077;

The notification and reports should be in plain language and when possible without causing undue delay, be prepared in one of the working languages of ICAO, taking into account the language(s) of the recipients.

4.0 Special Instructions for Compiling

4.1 Occurrence Category Coding

The ADREP occurrence category taxonomy is part of ICAO's accident and incident reporting system. The occurrence categories are a set of terms used by ICAO to categorize accidents and incidents in order to conduct safety trend analysis. The goal of such analysis is to take pre-emptive action on similar accidents or incidents from occurring in the future.

Most accident and incident sequences involve multiple events. Therefore strictly coding an accident or incident under a single category can be difficult. For instance abrupt manoeuvring (AMAN) may also result in a loss of control in flight (LOC-I), in this case the event is coded under both categories AMAN and LOC-I. ICAO's occurrence category coding philosophy allows the reporter to code multiple categories for a single accident or incident in order for ICAO to consider or study all events that led to the accident or incident.

Detailed definitions of occurrence category and guidance on coding multiple categories can be found at http://www.icao.int/Safety/reporting

4.2 Event Types Coding

In order to determine why an accident or incident happened, it is critical to study factors leading up to, during and after the occurrence. It is therefore vital that all event data known at the time of reporting is accurately included.

To further describe an event 'Descriptive Factors' can be entered for each event. Descriptive factors describe, in detail, what happened during an event by listing all phenomena present. If possible, the descriptive factors should be coded in chronological order below each event type.

To explain an event 'Explanatory Factors' can be entered for each descriptive factor. These factors explain why the event happened and include the human factors aspect/s to the coding of events. They are used to determine what preventive action may be required.

The complete set of event types, descriptive and explanatory factors with their detailed descriptions can be found on the ICAO ADREP taxonomy webpage.

General considerations when reporting events include:

- *Be as specific as possible without speculating on details*: For example: If the nose landing gear did not extend, use the event "Nose/tail landing gear related event" and not "Landing gear related event"

- *Align Occurrence categories with Events:* For example, if SCF-NP, then there must be an event of failure of a non-powerplant component/system.

- *Align Events and Descriptive factors:* Events and Descriptive factors describe what was wrong, what did not work, what was out of the ordinary and what contributed to the occurrence. For example, an event "Central warning related event" for events where this system malfunctioned, and descriptive factor "Central computers" to specify the event.

- *Complete the Sequence of Event in Chronological Order*: An occurrence must be described by the way it is coded. In essence the event coding should provide a similar image of the occurrence sequence as is found in the narrative.

4.3 Narratives

The narrative provides a brief description of the occurrence, including emergency circumstances, significant facts and other relevant information. The narrative shall not exceed 200 words. It is important that events must be described in chronological (time) order, brief and specific.

The study and analysis of the sequence of events that lead to the occurrence can help better understand the nature of the occurrence. Therefore narratives should include a concise summary of all events in order to provide information regarding the events that led to the occurrence. The information provided in a Preliminary Report narrative need not be repeated in a Data report. However, any new information obtained subsequent to the Preliminary Report submission must be included in the Data Report. Seen together, the two narratives should provide the complete history of the flight and conclusions of the investigation made.

When a Preliminary Report has not been submitted (either in the case of an incident or, when an accident investigation has been completed within 30 days) the narrative in the Data Report must provide the history of the flight and the description and analysis of how and why the event occurred, conclusions of the investigation, findings and probable cause. In such cases ideally a total of 400 words may be used when the data report is submitted.

4.4 Safety Recommendations

The reporter should correlate safety recommendations or actions to the relevant findings where applicable. The fields under safety recommendation on the data report should include any corrective action taken or under consideration. If possible, the recommendation should specify how this will resolve the identified safety problem. Include a summary of any preventive action already taken.

Table 1-1 NOTIFICATION AND REPORTING CHECKLIST

Notification of Accidents and Serious Incidents

- International occurrences: *accidents and serious incidents occurring in the territory of a Contracting State to aircraft registered in another Contracting State;*
- Domestic occurrences: *accidents and serious incidents occurring in the territory of the State of Registry;*
- Other occurrences: *accidents and serious incidents occurring in the territory of a non-Contracting State, or outside the territory of any State*

From	Report	To	For	By
State of Occurrence	Notification	State of Registry	International Occurrences: All aircraft	with a minimum of delay
		State of the Operator		
		State of Design		
		State of Manufacturer		
		ICAO	Aircraft over 2 250 kg or turbojet-powered aeroplane	
State of Registry	Notification	State of Operator State of Design State of Manufacturer	Domestic and Other Occurrences	
		ICAO	Aircraft over 2 250 kg or turbojet-powered	

ADREP Preliminary Report

From	Category	Report	To	For	By
State conducting the investigation	Accident	Preliminary	State of Registry	Aircraft over 2 250 kg	30 days*
			State of Occurrence		
			State of the Operator		
			State of Manufacturer		
			State of Design		
			Any State providing information, significant facilities or experts.		
			ICAO		
			Same as above except ICAO	Accidents to aircraft of 2 250 kg or less if airworthiness or matters of interest are involved.	
	Incident	Preliminary	Not required		

* Unless within 30 days, the Accident Data report has been compiled and sent to ICAO no preliminary report is required.

Final Report – Accident and Incidents wherever they occurred

From	Report	To	For	By
State conducting the investigation	Final report	State instituting the investigation	All aircraft	with a minimum of delay
		State of Registry		
		State of the Operator		
		State of Design		
		State of Manufacture		
		State having interest because of fatalities		
		States providing information significant		

		facilities or experts		
		ICAO	Aircraft over 5700kg	

ADREP Data Report

From	Category	Report	To	For	By
State conducting the investigation	Accident	Data	ICAO	Aircraft over 2 250 kg	When investigation has been completed
State conducting the investigation	Incident	Data	ICAO	Aircraft over 5 700 kg	When investigation has been completed

Appendix 9 to Chapter 3

Safety Information Protection

International civil aviation's outstanding safety record is, among others, due to two key factors: a continuous learning process, based on the development and free exchange of safety information. It has long been recognized that endeavours aimed at improving contemporary civil aviation safety must build upon objective data. There are several sources of such data available to civil aviation. In combination, they provide the basis for a solid understanding of the strengths and weaknesses of aviation operations.

Historically, information from accident and incident investigations formed the backbone of activities aimed at improvements in equipment design, maintenance procedures, flight crew training, air traffic control systems, aerodrome design and functions, meteorological services, and other safety-critical aspects of the air transportation system. In recent years, the availability of technological means has led to an accelerated development of safety data collection and processing systems (SDCPS).

SDCPS have allowed civil aviation to gain a deeper understanding of operational errors: why they happen, what can be done to minimize their occurrence, and how to contain their negative impact on safety. It remains undisputed that hazards lead to operational errors in aviation, the vast majority of which are inadvertent. Well-trained, well-intentioned people make errors while maintaining, operating or controlling well-designed equipment. For those rare situations where acts considered, in accordance with the law, to be conduct with intent to cause damage, or conduct with knowledge that damage could result, equivalent to reckless conduct, gross negligence or wilful misconduct, enforcement systems in place ensure that the chain of accountability remains unbroken. This dual approach, combining enhanced understanding of inadvertent operational errors with appropriate enforcement of law by the appropriate authiority, where approprate, has served civil aviation well in terms of safety, while ensuring that there are no harbours for violators.

Recent years, however, have shown a trend in civil aviation when dealing with operational errors leading to occurrences, in that information from SDCPS has been used for disciplinary and enforcement purposes. In some cases it has also been admitted as evidence in judicial proceedings, which has resulted in criminal charges being brought against individuals involved in such occurrences. Laying criminal charges in aviation occurrences resulting from inadvertent operational errors may hinder the effective reporting of such events preventing the development and free exchange of safety information which is essential to improve aviation safety.

A number of initiatives within the international civil aviation community have attempted to address the protection of SDCPS. However, given the sensitivity of the question at hand, a framework that provides unity of purpose and consistency among civil aviation's efforts is essential. Efforts to ensure the protection of safety information must strike a very delicate balance between the need to protect safety information, the need for quality control, the need for safety risk management and the proper administration of justice. A cautious approach should be taken in this regard to avoid making proposals which might be incompatible with laws pertaining to the administration of justice in Contracting States.

To address this topic, ICAO developed Attachment E to Annex 13 which provides legal guidance which aims to assist States to enact national laws and regulations to protect information gathered from SDCPS, while allowing for the proper administration of justice. The objective is to prevent the inappropriate use of information collected solely for the purpose of improving aviation safety. Bearing in mind that States should be allowed the flexibility to draft their laws and regulations in accordance with their national policies and practices, the legal guidance takes the form of a series of principles that can be adapted to meet the particular needs of the State enacting laws and regulations to protect safety information. A brief outline of the guidance follows.

The legal guidance includes general principles stating that:

a) The sole purpose of protecting safety information from inappropriate use is to ensure its continued availability so that proper and timely preventive actions can be taken and aviation safety improved;

b) It is not the purpose of protecting safety information to interfere with the proper administration of justice in States;

c) National laws and regulations protecting safety information should ensure that a balance is struck between the need for the protection of safety information in order to improve aviation safety, and the need for the proper administration of justice;

d) National laws and regulations protecting safety information should prevent its inappropriate use; and

e) Providing protection to qualified safety information under specified conditions is part of a State's safety responsibilities.

The guidance includes principles of protection, as follows:

a) Safety information should qualify for protection from inappropriate use according to specified conditions that should include, but not necessarily be limited to: the collection of information was for explicit safety purposes and the disclosure of the information would inhibit its continued availability;

b) The protection should be specific for each SDCPS, based upon the nature of the safety information it contains;

c) A formal procedure should be established to provide protection to qualified safety information, in accordance with specified conditions;

d) Safety information should not be used in a way different from the purposes for which it was collected; and

e) The use of safety information in disciplinary, civil, administrative and criminal proceedings should be carried out only under suitable safeguards.

The following are recommended circumstances where safety information may not qualify to be covered by protection:

a) there is evidence that the occurrence was caused by an act considered, in accordance with the law, to be conduct with intent to cause damage, or conduct with knowledge that damage would probably result, equivalent to reckless conduct, gross negligence or wilful misconduct;

b) an appropriate authority considers that circumstances reasonably indicate that the occurrence may have been caused by conduct with intent to cause damage, or conduct with knowledge that damage would probably result, equivalent to reckless conduct, gross negligence or wilful misconduct; or

c) a review by an appropriate authority determines that the release of the safety information is necessary for the proper administration of justice, and that its release outweighs the adverse domestic or international impact such release may have on the future availability of safety information.

The guidance also addresses the subject of public disclosure, proposing that, subject to the principles of protection and exception outlined above, any person seeking disclosure of safety information should justify its release. Formal criteria for disclosure of safety information should be established and should include, but not necessarily be limited to, the following:

a) disclosure of the safety information is necessary to correct conditions that compromise safety and/or to change policies and regulations;

b) disclosure of the safety information does not inhibit its future availability in order to improve safety;

c) disclosure of relevant personal information included in the safety information complies with applicable privacy laws; and

d) disclosure of the safety information is made in a de-identified, summarized or aggregate form.

The guidance addresses the responsibility of the custodian of safety information, proposing that each SDCPS should have a designated custodian. It is the responsibility of the custodian of safety information to apply all possible protection regarding the disclosure of the information, unless:

a) the custodian of the safety information has the consent of the originator of the information for disclosure; or

b) the custodian of the safety information is satisfied that the release of the safety information is in accordance with the principles of exception.

Lastly, the guidance introduces the protection of recorded information and, considering that ambient workplace recordings required by legislation, such as cockpit voice recorders (CVRs), may be perceived as constituting an invasion of privacy for operational personnel that other professions are not exposed to, proposes that:

a) subject to the principles of protection and exception above, national laws and regulations should consider ambient workplace recordings required by legislation as privileged protected information, i.e. information deserving enhanced protection; and

b) national laws and regulations should provide specific measures of protection to such recordings as to their confidentiality and access by the public. Such specific measures of protection of workplace recordings required by legislation may include the issuance of orders of non-public disclosure.]

Although guidance for the protection of SDCPS was adopted as an attachment to Annex 13 on 3 March 2006, the aviation community has recommended ICAO to further progress activities regarding the protection of safety data and safety information to ensure their availability for the enhancement of safety. Therefore, during its 37th Session, the Assembly instructed the Council to consider enhancing the provisions on the protection of safety information. On 7 December 2010, the Air Navigation Commission approved the establishment of the Safety Information Protection Task Force (SIP TF), which started activities on 5 May 2011 to provide recommendations for new or enhanced provisions and guidance materials related to the protection of safety information.

Appendix 10 to Chapter 3

SSP Document/ Manual Contents (Example)

NAA SSP Document Content (Example)

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Appendix 11 to Chapter 3

State Voluntary and Confidential Reporting System

[Ref 3-2; 3.4.14(a)]

A State voluntary and confidential reporting system should, as minimum, define:

1) Objective of the reporting system

Example-

The key objective of [State name] voluntary and confidential reporting system is to enhance aviation safety through the collection of reports on actual or potential safety deficiencies that would otherwise not be reported through other channels. Such reports may involve occurrences, hazards or threats relevant to aviation safety. This system does not eliminate the need for mandatory reporting of aircraft accidents and incidents to the relevant authorities under the existing aviation regulations. Reporters are encouraged to make use of their organization's internal SMS voluntary reporting system where applicable, unless they have no access to such systems or the incident or hazard is deemed beyond the scope of their organization's purview.

The [Name of system] is a voluntary, non-punitive confidential reporting system established by the [Name of regulatory/ administrative organization]. It provides a channel for the voluntary reporting of aviation occurrences or hazards while protecting the reporter's identity.

2) Scope of aviation sectors/ areas covered by the system

Example-

The [Name of system] covers areas such as:

a. *Flight Operations:*
    i. *Departure/en route/approach landing*
    ii. *Aircraft cabin operations*
    iii. *Air proximity events*
    iv. *Weight and balance and Performance*
b. *Aerodrome Operations:*
    i. *Aircraft ground operations*
    ii. *Movement on the aerodrome*
    iii. *Fuelling operations*
    iv. *Aerodrome conditions or services*
    v. *Cargo Loading*
c. *Air Traffic Management:*
    i. *ATC operations*
    ii. *ATC equipment and navigation aids*
    iii. *Crew and ATC communications*
d. *Aircraft Maintenance:*
    i. *Aircraft/ engine/ component maintenance & repair activities*
e. *Design & Manufacturing:*
    i. *Aircraft/ engines/ components design or production activities*
f. *Approved Training Organizations:*
    i. *Training activities involving flight operations*
g. *Miscellaneous:*
    i. *Passenger handling operations related to safety*
    ii. *etc*

3) Who can make a voluntary report

Example-

If you belong to any of these groups, you can contribute to aviation safety enhancement through the [Name of system] by reporting on occurrences, hazards or threats in the aviation system.

a) Flight and cabin crew members
b) Air traffic controllers
c) Licensed aircraft engineers, technicians or mechanics
d) Employees of maintenance, design and manufacturing organizations
e) Aerodrome ground handling operators
f) Aerodrome employees
g) General aviation personnel
h) Etc

4) When to make such a report

Example-

You should make a report when:

- *You wish for others to learn and benefit from the occurrence or hazard report, but are concerned about protecting your identity.*
- *There is no other appropriate reporting procedure or channel.*
- *You have tried other reporting procedure or channel without the issue having been addressed.*

5) How are Reports processed

Example-

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

When the Administrator is satisfied that the information obtained is complete and coherent, he will de-identify the information and enter the data into the [Name of system] database. Should there be a need to seek inputs from any third party, only the de-identified data will be used.

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

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

Feedback to the Aviation Community

Relevant de-identified reports and extracts may be shared with the aviation community through periodic publication, so that all can learn from the experiences. Relevant authorities and parties can also review their policy and plan for improvements.

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

6) Contacting the [Name of system] Administrator

Example-

You are welcome to call the [Name of regulatory/ administrative organization] to enquire about the [Name of system] or to request for a preliminary discussion with the [Name of system] Administrator before making a report. The Administrator and Alternate Administrator are contactable during office hours from Monday to Friday at the following telephone numbers:

[Name of system] Administrator	*Alternate Administrator*
Mr ABC	*Mr XYZ*
Tel:xxxxxxxxxxx	*Tel:xxxxxxxxxxxx*

Appendix 12 to Chapter 3

State Mandatory Reporting Procedure

The following is an illustrative example of a State's mandatory reporting procedure, which encompasses mandatory incident reporting systems. This procedure pertains to timely mandatory reporting of accidents, serious incidents, incidents and other reportable occurrences by relevant stakeholders. Such stakeholders can, depending on the State's regulations, encompass certificated/ approved aviation organizations, independent licensed/ authorized personnel (e.g. pilots, cabin crew members, air traffic controllers, maintenance personnel) and members of the public.

Note: If a State prefers, the mandatory reporting of accidents and serious incidents, as well as of defects/ malfunctions/ service difficulties, etc may be covered under separate procedures; otherwise it can be addressed under its mandatory reporting procedure (as is the case in this illustrative example):

Note: Square brackets [ ] italic remarks are administrative guidance for States' consideration in the course of drafting their own Mandatory Reporting Procedure.

1 Mandatory Reporting

1.1 Pursuant to [*regulation reference(s)*], it is mandatory for [*named stakeholders*] to report aviation accidents, serious incidents, incidents and other safety related occurrences (including defects/ malfunctions/ service difficulties) to [*authority / agency name & department*].

1.2 The list of reportable occurrences (apart from accidents) and the reporting timelines are provided in Annex A to this procedure. [*Although Annex A largely consists of examples of serious incidents, States are encouraged to include other occurrences deemed reportable under this mandatory reporting system*]

1.3 The reporting of mandatory occurrences is done using the Mandatory Report (Form XYZ). All mandatory reports are signed by the approved/ certificated organization's authorized signatory where applicable. [*A procedure should also be developed to address notifications received through verbal/ telephone communication*].

1.4 In the case of accidents and serious incidents, immediate coordination with the [*Name of State accident investigation authority*] is to be initiated upon receipt of such notification, to determine whether its independent investigation process is to be activated. [*The actual notification and reporting process to the State's CAA and/ or accident investigation authority will depend on the nature of the State's mandatory reporting requirements and arrangements. Such specific details should then be reflected accordingly in this section of this procedure*]

2 Processing of Mandatory Reports

2.1 Upon receipt of a mandatory report, it shall be validated to ensure that all essential information has been provided by the reporter.

2.2 The report will then be classified into the following categories:

(a) Accident;
(b) Serious Incident;

(c) Incident;
(d) Other occurrence

2.3 After the classification, the report record will be uploaded into the appropriate database with an assigned occurrence reference number.

2.5 The status of each report is categorized and updated as follows:

a) Initial Notification: For evaluation / follow up/ information as annotated
b) Under Investigation: Investigation by [accident investigation authority/ CAA/ service provider] in progress as annotated.
c) Investigation completed: Investigation results/ data received and uploaded.
d) Closed: No further action required

Note:
Notification and submission of accident and serious incident data reports to ICAO is the responsibility of the [*Name of accident investigation authority*].

[*Appropriate coordination and accessibility of the database should be established by States having multiple authorities with safety regulation responsibilities (e.g. CAA, Accident Investigation Authority)]*

3 Accident/ Serious Incident/ Incident classification

3.1 The classification of accident, serious incident and other incident will be based on ICAO Annex 13 definitions.

3.2 Occurrences that are classified as accidents or serious incidents may require independent investigations by the [name of accident investigation authority]. In such cases, the assigned CAA representative tracks the independent investigation process outcomes and provides updates to [*Name of CAA database*] as necessary.

3.3 For incidents and other occurrences (including defects/ malfunctions/ service difficulties) that are not the subject of the State independent investigation process, the assigned CAA representative will liaise with the relevant party for necessary follow up investigation and report submission as applicable.

4 Follow Up / Investigation

4.1 For occurrences that require follow up action or investigation by service provider's internal safety/ quality function, the relevant CAA representative will liaise with the service provider's authorized safety/ quality representative to ensure the timely follow up and closure of the occurrence as appropriate.

4.2 The assigned CAA representative monitors and determines whether CAA intervention before, during or after a service provider's internal safety occurrence investigation and resolution process is necessary.

4.3 On completion and receipt of the follow up / investigation report, the CAA representative enters all relevant information received into the relevant database. In the case of investigation reports issued by [*Name of accident investigation authority*], the CAA representative liaises with that authority for necessary uploading of such data reports into the database.

4.4 Where CAA administrative (enforcement) action following the conclusion of an occurrence investigation report is deemed necessary, such recommendations are forwarded by the relevant Inspector to the DGCA for approval in accordance to CAA enforcement procedure DEF. In the case of investigation reports issued by [*Name of accident investigation authority*] due consideration must be given to the objective of the investigation set forth in Annex 13.

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ANNEX A

Part I Reporting Timelines:

	Notification to CAA and/or Accident Investigation Authority *	Mandatory Report (Form XYZ) submission to CAA and/or accident investigation authority **	Investigation Report*** to CAA
Accident	Immediate/ ASAP	Within 24 hours	90 days
Serious Incident	Immediate/ASAP	Within 48 hours	60 days
Incident	NA	Within 72 hours	30 days (where required)

* Telephone, facsimile or e-mail will in most cases constitute the most suitable and quickest means to send a notification.

** This column does not apply to members of the public

*** This column does not apply to investigation reports from the State's accident investigation authority.

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Part II Examples of Reportable Occurrences

Note: The list below is not exhaustive and does not include accidents.

Air Operator:

- Near collisions requiring an avoidance manoeuvre to avoid a collision or an unsafe situation or when an avoidance action would have been appropriate.
- Controlled flight into terrain only marginally avoided.
- Aborted take-offs on a closed or engaged runway, on a taxiway[1] or unassigned runway.
- Take-offs from a closed or engaged runway, from a taxiway[1] or unassigned runway.
- Landings or attempted landings on a closed or engaged runway, on a taxiway[1] or unassigned runway.
- Gross failures to achieve predicted performance during take-off or initial climb.
- Fires and smoke in the passenger compartment, in cargo compartments or engine fires, even though such fires were extinguished by the use of extinguishing agents.

[1]. Excluding authorized operations by helicopters.

- Events requiring the emergency use of oxygen by the flight crew.
- Aircraft structural failures or engine disintegrations, including uncontained turbine engine failures, not classified as an accident.
- Multiple malfunctions of one or more aircraft systems seriously affecting the operation of the aircraft.
- Flight crew incapacitation in flight.
- Fuel quantity requiring the declaration of an emergency by the pilot.
- Runway incursions classified with severity A. The *Manual on the Prevention of Runway Incursions* (Doc 9870) contains information on the severity classifications.
- Take-off or landing incidents. Incidents such as under-shooting, overrunning or running off the side of runways
- System failures, weather phenomena, operations outside the approved flight envelope or other occurrences which could have caused difficulties controlling the aircraft.
- Failures of more than one system in a redundancy system mandatory for flight guidance and navigation.
- [*Any other incidents or occurrences deemed by the State as reportable under this mandatory reporting system*]

Maintenance Organization:

- Any airframe, engine, propeller, component or system defect/ malfunction/ damage found during scheduled or unscheduled aircraft (airframe/ engines/ components) maintenance activities which could possibly lead to an aircraft operational accident or serious incident (if not promptly rectified).
- [*Any other incidents or occurrences deemed by the State as reportable under this mandatory reporting system*]

Design & Manufacturing Organizations:

- Any design or manufacturing related deficiency/ defect/ malfunction of product or services discovered by or brought to the attention of the Design / Manufacturing organization which is deemed to warrant the possible issue of an Emergency Airworthiness Directive (EAD), Airworthiness Directive (AD) or Alert Service Bulletin (ASB).
- [*Any other incidents or occurrences deemed by the State as reportable under this mandatory reporting system*]

Aerodrome Operator:

- Runway incursion (with no ATC involvement).
- Runway excursion/ overshoot (with no ATC involvement).
- Failure or significant malfunction of airfield lighting.
- Damage to aircraft or engine resulting from contact or ingestion of foreign objects or debris on runway or taxiway.
- Incidents within the aerodrome boundary involving damage to aircraft or with potential impact on aircraft ground movement safety.
- [*Any other incidents or occurrences deemed by the State as reportable under this mandatory reporting system*]

ANS/ CNS Provider:

- Any ANS/ CNS related equipment or system defect/ malfunction/ damage discovered during operation or equipment maintenance which could possibly lead to an aircraft operational accident or serious incident.
- Unauthorised penetration of airspace.
- Aircraft near CFIT.
- Significant level bust incidents.

- Loss of separation incidents.
- Runway incursion (involving ATC communication)
- Runway excursion/ overshoot (involving ATC communication)
- Any other ANS related deficiency/ defect/ malfunction as reported to (and verified by) the ANS/ CNS operator and which is deemed to have impact on safety of air navigation.
- [*Any other incidents or occurrences deemed by the State as reportable under this mandatory reporting system*.

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Note:

Where there are other sector specific or service provider specific mandatory (compulsory) reporting systems existing within a State, such as per Annex 8, Pt II, 4.2.3(f) and 4.2.4 [continuing airworthiness reporting]; necessary correlation or integration with this State-wide SSP related Mandatory Reporting procedure may need to be addressed as appropriate.

CHAPTER 4 - SAFETY MANAGEMENT SYSTEM (SMS)

4.1 INTRODUCTION TO SMS

An SMS is a system to assure the safe operation of aircraft through effective management ofsafety risk. This system is designed to continuously improve safety by identifying hazards, collecting and analyzing data and continuously assessing safety risks. The SMS seeks to proactively contain or mitigate risks before they result in aviation accidents and incidents. It is a system that is commensurate with the organization's regulatory obligations and safety goals.

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

a) the necessary information is available;
b) the appropriate tools are available for the organization's use;
c) the tools are appropriate to the task;
d) the tools are commensurate with the needs and constraints of the organization; and
e) decisions are made based on full consideration of the safety risk;

4.2 SCOPE

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

a) aviation professionals;
b) aviation regulatory and administrative authorities;
c) industry trade associations;
d) professional associations and federations;
e) international aviation organizations;
f) sub-contractors or principals of a service provider; and
g) the flying public.

4.3 SMS FRAMEWORK

This section introduces a framework for SMS implementation by relevant aviation service providers. It should be noted that the implementation of the framework should be commensurate with the size of the organization and the complexity of the products or services provided.

The framework includes four components and twelve elements, representing the minimum requirements for SMS implementation. The four components of an SMS are:

a) safety policy and objectives;
b) safety risk management;
c) safety assurance; and
d) safety promotion.

*S*afety policies and objectives create the frame of reference for the SMS.. The objective of the safety risk management component is to identify hazards, assess the related risks and develop appropriate mitigations in the context related to the delivery of the organization's products or services. Safety assurance is accomplished through on-going processes that monitor compliance with international standards and national regulations. Furthermore, the safety assurance process provides confidence that the SMS is operating as designed and is effective. Safety promotion provides the necessary awareness and training.

The four components, combined with the twelve elements comprise the ICAO SMS framework, are as follows:

1. Safety policy and objectives

    1.1 Management commitment and responsibility
    1.2 Safety accountabilities
    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 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.

The following section provides additional details regarding each of the four components and twelve elements. Each component begins with a high level summary, followed by the text from the SMS framework for each element. Descriptions and general guidance on implementation strategies for each element are then presented.

SAFETY POLICY AND OBJECTIVES

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

4.3.1 MANAGEMENT COMMITMENT AND RESPONSIBILITY

SMS Framework

SMS Element 1.1 Management commitment and responsibility - The service provider shall define the organization's safety policy which shall be in accordance with international and national requirements, and which shall be signed by the accountable executive of the organization. The safety policy shall reflect organizational commitments regarding safety; shall include a clear statement about the provision of the necessary resources for the implementation of the safety policy; and shall be communicated, with visible endorsement, throughout the organization. The safety policy shall include the safety reporting procedures; shall clearly indicate which types of operational behaviours are unacceptable; and shall include the conditions under which disciplinary action would not apply. The safety policy shall be periodically reviewed to ensure it remains relevant and appropriate to the organization.

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

a) Setting the organizational priorities and tasking;
b) Prescribing procedures on how to perform activities or processes;
c) Hiring, training and supervising employees; and
d) Procuring equipment to support the service-delivery activities.
e) Using the skills of its personnel;
f) Allocating the necessary resources;

Management should ensure that:

a) Safety directives and controls are imbedded in Standard Operating Procedures (SOPs);
b) Employees adhere to SOPs and safety directives; and
c) Equipment remains in a serviceable condition.

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

Implementation Strategy

Senior management develops and endorses the safety policy, which is signed by the accountable executive. (see Appendix 8 for discussion of electronic signature of Safety Policy and other SMS related documentation). An example of a safety policy is included in Figure 4.1.

Once the safety policy is developed senior management should:

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

The safety policy must include commitment to:

a) achieve the highest safety standards;
b) comply with all applicable regulatory requirements;
c) comply with international standards;
d) adopt proven best practices appropriate to the activity;
e) provide all the necessary resources;
f) ensure safety is a primary responsibility of all managers;

g) follow the disciplinary policy; and
h) ensure that the safety policy is understood, implemented and maintained at all levels.

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

a) Safety performance indicators;
b) Safety performance targets; and
c) SMS mitigation actions.

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

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

SAFETY POLICY STATEMENT

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

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

Our commitment is to:

- **Support** the management of safety through the provision of all appropriate resources, that will result in an organizational culture that fosters safe practices, encourages effective safety reporting and communication, and actively manages safety with the same attention to results as the attention to the results of the other management systems of the organization;

- **Ensure** the management of safety is a primary responsibility of all managers and employees;

- **Clearly** define for all staff, managers and employees alike, their accountabilities and responsibilities for the delivery of the organization's safety performance and the performance of our safety management system;

[1] Reference - James Reason. (1997)., Managing the Risks of Organizational Accidents and Just Culture: Balancing Safety and Accountability

- **Establish and operate** hazard identification and risk management processes, including a hazard reporting system, in order to eliminate or mitigate the safety risks of the consequences of hazards resulting from our operations or activities to achieve continuous improvement in our safety performance;
- **Ensure** that no action will be taken against any employee who discloses a safety concern through the hazard reporting system, unless such disclosure indicates, beyond any reasonable doubt, gross negligence or a deliberate or wilful disregard of regulations or procedures;
- **Comply** with and, wherever possible, exceed, legislative and regulatory requirements and standards;
- **Ensure** that sufficient skilled and trained human resources are available to implement safety strategies and processes;
- **Ensur**e that all staff are provided with adequate and appropriate aviation safety information and training, are competent in safety matters, and are allocated only tasks commensurate with their skills;
- **Establish and measure** our safety performance against realistic safety performance indicators and safety performance targets;
- **Continually improve** our safety performance through continuous monitoring and measurement, and regular review and adjustment of safety objectives and targets, and diligent achievement of these; and
- **Ensure** externally supplied systems and services to support our operations are delivered meeting our safety performance standards.

(Signed) _____
CEO/Managing Director/or as appropriate

Figure 4-1. Example of a safety policy

4.3.2 SAFETY ACCOUNTABILITY

SMS Framework

SMS Element 1.2 Safety Accountabilities - The service provider shall identify the accountable executive who, irrespective of other functions, shall have ultimate responsibility and accountability, on behalf of the organization, for the implementation and maintenance of the SMS. The organization shall also identify the accountabilities of all members of management, irrespective of other functions, as well as of employees, with respect to the safety performance of the SMS. Safety responsibilities, accountabilities and authorities shall be documented and communicated throughout the organization, and shall include a definition of the levels of management with authority to make decisions regarding safety risk tolerability.

In the SMS context accountability means being responsible for taking corrective actions, either due to the reporting of hazards and errors, as well as in response to accidents and incidents. The Accountable Executive is also responsible for the organization's ability to learn from the analysis of data collected through its safety reporting system.

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

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

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

Implementation Strategy

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

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

a) full authority for human resources issues;
b) authority for major financial issues;
c) direct responsibility for the conduct of the organization's affairs;
d) final authority over operations under its certificate/ approval;
e) establishment and promotion of the safety policy;
f) establishment of the organization's safety objectives and safety targets;
g) acting as the organization's safety champion; and
h) having final responsibility for the resolution of all safety issues.

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

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

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

All aviation safety-related positions, responsibilities, and authorities should be defined, documented and communicated throughout the organization. The safety accountabilities of each senior manager (departmental head or person responsible for a functional unit) are integral components of their job descriptions. Given that the management of safety is a core business function, every senior manager has a degree of involvement in the operation of the SMS. This involvement is certainly deeper for those managers directly responsible for functional units that deliver the organization's products or

services (operations, manufacturing, maintenance, engineering, training and dispatch, hereafter referred to by the generic term “line managers”) than for those responsible for support functions (human resources, administration, legal and financial).

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

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

The SMS related accountabilities, authorities and responsibilities of all appropriate senior managers must be described in the organization’s safety management system documentation. Mandatory safety functions performed by the safety manager, safety office, safety action groups, etc may be embedded into existing job descriptions, processes and procedures.

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

4.3.3 APPOINTMENT OF KEY SAFETY PERSONNEL

SMS Framework

SMS Element 1.3 Appointment of key safety personnel - The service provider shall identify a safety manager to be the responsible individual and focal point for the implementation and maintenance of an effective SMS.

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

Implementation Strategy

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

a) managing the SMS implementation plan on behalf of the Accountable Executive;

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

c) monitoring corrective actions and evaluating their results;

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

e) maintaining records and safety documentation;

f) planning and facilitating staff safety training;

g) providing independent advice on safety matters;

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

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

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

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

a) safety/ quality management experience;

b) operational management experience;

b) technical background to understand the systems that support operations;

c) people skills;

d) analytical and problem-solving skills;

e) project management skills; and

f) oral and written communications skills.

Note.— A sample job description for a safety manager is contained in Appendix 1 to this chapter. For small organizations, it may be viable to combine safety and quality management functions within the same office.

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

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

Additionally, a formal process is required to assess the effectiveness and efficiency of any mitigation strategies used to achieve the agreed safety performance targets of the organization. One potential process includes the creation of a Safety Review Committee (SRC). The SRC provides the platform to achieve the objectives of resource allocation and to

assess the effectiveness and efficiency of risk mitigation strategies. The SRC is a very high-level committee, chaired by the Accountable Executive and composed of senior managers, including line managers responsible for functional areas as well as those from relevant administrative departments. The safety manager participates in the SRC in an advisory capacity only. The SRC may meet infrequently, unless exceptional circumstances dictate otherwise. The SRC:

a) monitors the effectiveness of the SMS ;

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

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

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

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

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

The SRC is strategic and deals with high-level issues related to policies, resource allocation and organizational performance monitoring. Once a strategic direction has been developed by the SRC, implementation of safety strategies must be coordinated throughout the organization. This can be accomplished by creating a Safety Action Group (SAG). SAGs are composed of line managers and front-line personnel. SAGs are normally chaired by a designated line manager. SAGs are tactical entities that deal with specific implementation issues per the direction of the SRC. The SAG:

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

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

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

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

e) reviews the effectiveness of previous safety recommendations; and

f) oversees safety promotion activities as necessary to increase awareness of safety issues among relevant employees, to ensure that employess are provided appropriate opportunities to participate in safety management activities.

4.3.4 COORDINATION OF EMERGENCY RESPONSE PLANNING

SMS Framework

SMS Element 1.4 Coordination of emergency planning - The service provider shall ensure that an emergency response plan that provides for the orderly and efficient transition from normal to emergency operations and the return to normal operations is properly coordinated with the emergency response plans of those organizations it must interface with during the provision of its services.

Implementation Strategy

An emergency response plan (ERP) documents actions to be taken by all responsible personnel during aviation related emergencies. The purpose of an ERP is to ensure that there is an orderly and efficient transition from normal to emergency operations, including assignment of emergency responsibilities and delegation of authority. Authorization for action by key personnel is also contained in the plan, as well as the means to coordinate efforts necessary to cope with the emergency. The overall objective is to save lives, the safe continuation of operations and the return to normal operations as soon as possible..

The applicability of emergency response planning extends to providers of aviation products that may be attributable to, or affected by, an aviation safety occurrence. The product provider's processes are generally called "contingency product support" and include emergency airworthiness action, alert services, aircraft accident on-site support etc. The product provider need not change the name of these product support processes to ERP processes; however, they must be noted appropriately in the organization's SMS documentation. Refer to Appendix 4 for further guidance on ERP.

4.3.5 SMS DOCUMENTATION

SMS Framework

SMS Element 1.5 SMS Documentation - The service provider shall develop an SMS implementation plan, endorsed by senior management of the organization that defines the organization's approach to the management of safety in a manner that meets the organization's safety objectives. The organization shall develop and maintain SMS documentation describing the safety policy and objectives, the SMS requirements, the SMS processes and procedures, the accountabilities, responsibilities and authorities for processes and procedures, and the SMS outputs. Also as part of the SMS documentation, the organization shall develop and maintain a safety management system manual (SMSM), to communicate its approach to the management of safety throughout the organization.

The SMS documentation should include a top level description (exposition) document, which describes the organization's SMS according to its components and elements. Such a document facilitates the organization's internal administration, communication and maintenance of the SMS. At the same time, it serves as the organization's SMS communication (declaration) to the relevant authority (CAA) for the purpose of regulatory acceptance, assessment and subsequent oversight of the SMS. This top level SMS document may be a standalone document or it can be a distinct "SMS Section/ Chapter" within an existing organization/ CAA approved document. Where details of the organization's SMS processes are already addressed in existing documents, appropriate cross referencing to such documents is sufficient. This SMS document will need to be kept up to date and where significant amendments are intended or made, may require CAA concurrence where necessary. Guidance for the compilation of an SMS document is in Appendix 3.

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

Implementation Strategy

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

1) A consolidated description of the SMS components and elements such as -

   a) document and records management ;
   b) regulatory SMS requirements ;
   c) framework, scope and integration;
   d) safety policy and safety objectives ;
   e) safety accountabilities and key personnel ;
   f) voluntary hazard reporting system;
   g) incident reporting and investigation procedures;
   h) hazard identification and risk assessment processes;
   i) safety performance indicators;
   j) safety training and communication;
   k) continuous improvement and SMS audit ;
   l) management of change; and
   m) emergency or operations contingency planning;

2) A compilation of current SMS related records and documents such as-

   a) hazards report register and samples of actual reports;
   b) safety performance indicators and related charts;
   c) record of completed or in-progress safety assessments;
   d) SMS internal review or audit records;
   e) safety promotion records;
   f) personnel SMS/ safety training records;
   g) SMS/ Safety committee meeting minutes;
   h) SMS implementation plan (during implementation process); etc

SAFETY RISK MANAGEMENT

Service providers should ensure that the safety risks encountered in aviation activities are controlled in order to achieve their safety performance targets. This process is known as safety risk management and includes hazard identification, safety risk assessment and the implementation of appropriate remediation measures. The safety risk management process is illustrated in figure 4.3.

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

Understanding the system, and its operating environment are also essential for achievement of high safety performance. Hazards may be discovered during the operational life cycle, through employee reports or incident investigations. Analysis of these hazards should be conducted in the context of the system. This context is key to avoid attribution of events to "human error," where defects in the system may be neglected, remaining latent for future and potentially more serious events to occur. Guidance on hazard identification and risk assessment procedures and format are addressed in following two elements as well as in chapter 1.14 and 1.15 respectively.

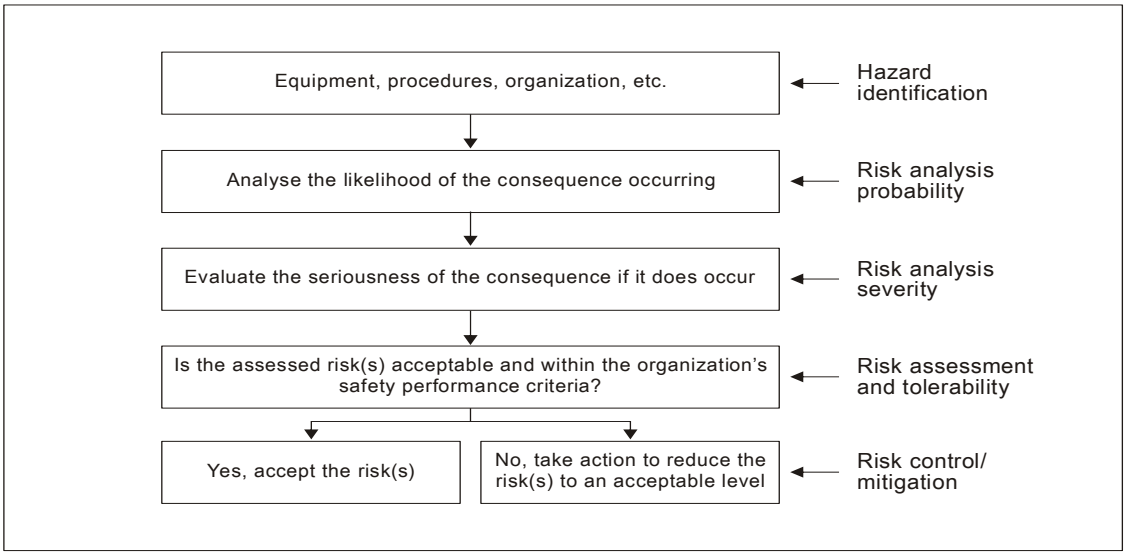


Figure 4-3. The process of safety risk management

4.3.6 HAZARD IDENTIFICATION

SMS Framework

SMS Element 2.1 Hazard identification - The service provider shall develop and maintain a formal process that ensures that hazards in operations are identified. Hazard identification shall be based on a combination of reactive, proactive and predictive methods of safety data collection.

Safety risk management requires the service provider to develop and maintain a formal process to identify hazards that may contribute to aviation safety-related occurrences. Hazards may exist in ongoing aviation activities or be inadvertently introduced into an operation whenever changes are introduced to the aviation system. In this case, hazard identification is an integral part of the change management processes as described in SMS framework element 3.2 – *The management of change*.

Hazard identification is based on a combination of reactive, proactive and predictive safety data collection methods as discussed in Chapter 1. Hazard identification is the first step in the SRM process. The corresponding safety risks are then assessed within the context of the potentially damaging consequences related to the hazard. Where the safety risks are assessed to be unacceptable, additional safety risk controls must be built into the system.

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

a) instances where the organization experiences an unexplained increase in aviation safety-related events or regulatory non-compliance;
b) significant operational changes, including anticpated changes to key personnel or other major systems components; and
c) significant organizational change, including anticipated growth and contraction, corporate mergers, or

acquisitions.

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

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

Figure 4-4 illustrates the hazard documentation and follow-up risk management process. Hazards are constantly identified through various data sources. The service provider is expected to identify hazards, eliminate these hazards or to mitigate the associated risks. In the case of hazards identified in products or services delivered through sub-contractors, a mitigation could be the service provider's requirement for such organizations to have an SMS or an equivalent process for hazard identification and risk management.

The safety management information system becomes a source of safety knowledge to be used as reference in organizational safety decision making processes. This safety knowledge provides material for safety trend analyses, as well as for safety education Guidance on voluntary and confidential hazard reporting system is in Appendix 7.

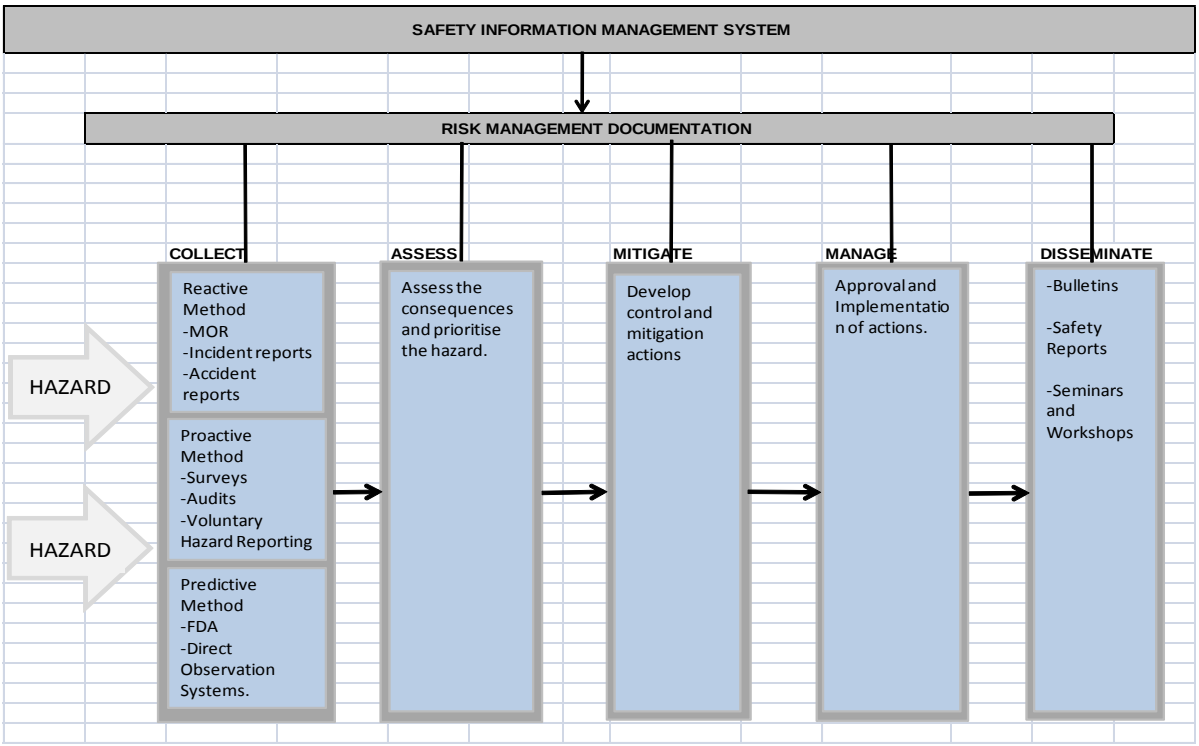


Figure 4-4. Documentation of hazards and risk management

Implementation Strategy

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

a) design factors, including equipment and task design;
b) human performance limitations (e.g. physiological, psychological and cognitive);
c) procedures and operating practices, including their documentation and checklists, and their validation under actual operating conditions;
d) communication factors, including media, terminology and language;
e) organizational factors, such as those related to the recruitment, training and retention of personnel, the compatibility of production and safety goals, the allocation of resources, operating pressures and the corporate safety culture;
f) factors related to the operational environment of the aviation system (e.g. ambient noise and vibration, temperature, lighting and the availability of protective equipment and clothing);
g) regulatory oversight factors, including the applicability and enforceability of regulations; the certification of equipment, personnel and procedures;
h) performance monitoring systems that can detect practical drift or operational deviations; and
i) human-machine interface factors.

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

a) normal operations monitoring schemes (e.g. flight data analysis for aircraft operators);
b) voluntary and mandatory reporting systems;
c) safety surveys;
d) safety audits;
e) feedback from training; and
g) investigation and follow-up reports on accidents/ incidents.

Examples of external data sources for hazard identification include:

a) industry accident reports;
b) State mandatory incident reporting system;
c) State voluntary incident reporting system;
d) State oversight audits; and
e) information exchange systems.

The type of technologies used in the hazard identification process will depend upon the size and complexity of the service provider and its aviation activities. In all cases the service provider's hazard identification process is clearly described in the organization's SMS/ safety documentation. The hazard identification process considers all possible hazards that may exist within the scope of the service provider's aviation activities including interfaces with other systems, both within and external to the organization. Once hazards are identified, their consequences (i.e. any specific events or outcomes) should be determined. Refer to Appendix 7 for guidance on an organization's voluntary and confidential reporting system.

4.3.7 RISK ASSESSMENT AND MITIGATION

SMS Framework

SMS Element 2.2 Risk assessment and mitigation - The service provider shall develop and maintain a formal process that ensures analysis, assessment and control of the safety risks in _ operations.

Figure 4.7 presents the safety risk management process in its entirety. The process starts with the identification of hazards and their potential consequences. The safety risks are then assessed in terms of probability and severity, to define the level of safety risk (safety risk index). If the assessed safety risks are deemed to be tolerable, appropriate action is taken and the operation continues. The completed hazard identification and safety risk assessment and mitigation process is documented and approved as appropriate and forms part of the safety information management system.

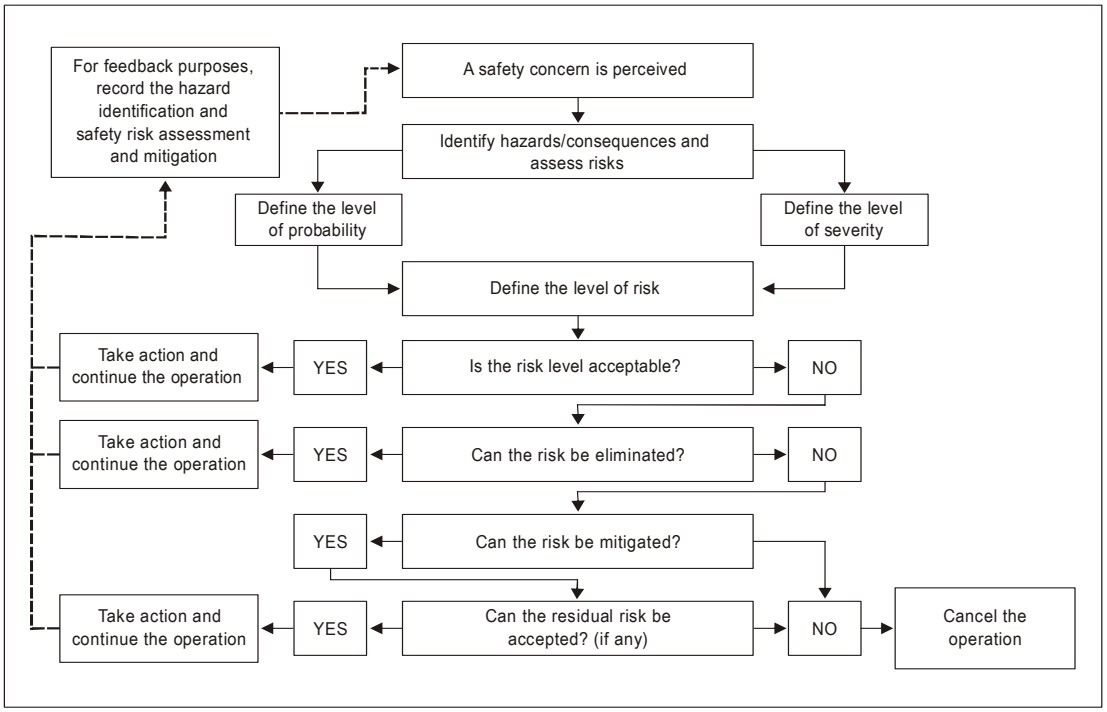


Fig 4.7 The safety risk management process

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

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

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

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

Safety risk assessment involves an analysis of identified hazards that includes two components — the severity of a

safety outcome as well as the probability that it will occur. Guidance on how safety information should be analyzed in complex, large organizations is provided in Chapter 1. Once risk have been assessed, the service provider will engage in a decision making process to determine the need to implement risk mitigation measures.

This decision making process involves the use of a risk categorization tool that may be in the form of a assessment matrix. An example of a safety risk (index) assessment matrix is provided in Figure 4-6.

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

Figure 4-6. Example of a safety risk (index) assessment matrix

Using this matrix, risks can be categorized according to an assessment of their potential severity and probability. While an assessment matrix methodology is recommended, other equivalent methods of depicting risk tolerance are available. The risk assessment matrix may be customized to reflect the context of each service provider's organizational structure, its aviation activities and may be subject to agreement by its regulatory authority. Based on this matrix example, risks reflected as being unacceptable (Red and yellow categories) must be mitigated so as to reduce their severity and / or probability. The service provider should consider suspension of any activities that continue to expose the organization to intolerable safety risks in the absence of mitigating actions that reduce the risks to an acceptable level. Additional information regarding probably, severity and risk tolerability matrix is located in Chapter 1 of this document.

After safety risks have been assessed, appropriate mitigations can be implemented. Mitigation measures may include a number of alternatives including, but not limited to, modifications to existing operating procedures, training programmes, or equipment used in the delivery of aviation products or services. Additional alternatives may include the introduction of new operating procedures, training programmes, technologies or supervisory controls. Almost invariably these alternatives will involve deployment or re-deployment of the three traditional aviation safety defences - technology, training and regulations. A determination of any unintended consequences, particularly the introduction of new hazards, should be made prior to the implementation of any risk mitigation measures .

The three generic safety risk mitigation approaches include :

a) ***Avoidance.*** The activity is suspended, either because the associated safety risks are intolerable or deemed unacceptable vis-à-vis the associated benefits.

b) ***Reduction.*** Some safety risk exposure is accepted, although the severity or probability associated with the risks are lessened, possibly by measures that mitigate the related consequences.

c) ***Segregation of exposure.*** Action is taken to isolate the potential consequences related to the hazard or to establish multiple layers of defences to protect against them.

A 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 can be taken. 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 outweigh the costs.
c) ***Practicality.*** The extent to which the mitigation is implementable and appropriate in terms of available technology, financial and administrative resources, legislation and regulations, political will, etc.
d) ***Acceptability.*** The extent to which the alternative is consistent with stakeholder paradigms.
f) ***Enforceability.*** The extent to which compliance with new rules, regulations or operating procedures can be monitored?
g) ***Durability.*** The extent to which the mitigation will be sustainable and effective.
h) ***Residual safety risks.*** The degree of safety risk that remains subsequent ot the implementation of the initial mitigation, and which may necessitate additional risk control measures.
i) ***Unintended consequences.*** The introduction of new hazards and related safety risks associated with the implementation of any mitigation alternative.

Once the mitigation has been approved and implemented, any associated impact on safety performance provides feedback to the service provider's safety assurance process. This is necessary to ensure integrity, efficiency and effectiveness of the defenses under the new operational conditions.

Risk Management Documentation/ Worksheet

Each risk mitigation exercise is to be documented progressively. This may be accomplished using a variety of applications ranging from basic spreadsheets or tables to customized commercial risk mitigation software. Completed risk mitigation documents should be approved by appropriate level of management. For an example of a basic hazard risk mitigation worksheet, refer to Appendix 2 of Chapter 1.

SAFETY ASSURANCE

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

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

monitors the effectiveness of safety risk controls .

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

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

4.3.8 SAFETY PERFORMANCE MONITORING AND MEASUREMENT

SMS Framework

SMS Element 3.1 Safety performance monitoring and measurement - The service provider shall develop and maintain the means to verify the safety performance of the organization and to validate the effectiveness of safety risk controls. The safety performance of the organization shall be verified in reference to the safety performance indicators and safety performance targets of the SMS.

Implementation Strategy

Information used to measure the organization's safety performance is generated through its safety reporting systems. Safety Performance Indicators are discussed in detail in section 4.4.5 and Appendix 6 of this chapter.

Reporting Systems

There are two types of reporting systems:

a) mandatory incident reporting systems; and
b) voluntary incident reporting systems.

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

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

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

future trending analyses to track the effectiveness of risk mitigations and to identify emerging hazards.

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

Guidance on voluntary and confidential reporting systems is in Appendix 7 to this chapter.

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

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

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

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

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

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

Safety Performance Indicators

The final output of a safety performance monitoring and measurement process is the development of safety performance indicators based on analysis of data collected through the sources referenced above. The monitoring and measurement process involves the use of selected safety performance indicators, corresponding safety performance targets and alert levels. Guidance on the development of safety performance indicators and their target and alert settings are addressed in Section 4.4.5 and Appendix 6.

4.3.9 THE MANAGEMENT OF CHANGE

SMS Framework

SMS Element 3.2 Management of change - The service provider shall develop and maintain a formal process to identify changes within the organization which may affect established processes and services; to describe the arrangements to ensure safety performance before implementing changes; and to eliminate or modify safety risk controls that are no longer needed or effective due to changes in the operational environment.

Implementation Strategy

Aviation service providers experience change due to a number of factors including, but not limited to: organizational expansion or contraction; changes to internal systems, processes or procedures that support delivery of the products and services; and changes to the organization's operating environment. Change may affect the appropriateness or effectiveness of existing safety risk mitigation strategies. In addition, new hazards, and related safety risks may be inadvertently introduced into an operation whenever change occurs. Such hazards should be identified so as to enable the assessment and control of any related safety risks. Safety reviews, as discussed in the discussion on safety performance monitoring and measurement, can be valuable sources of information to support decision making processes and manage change effectively.

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

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

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

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

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

4.3.10 CONTINUOUS IMPROVEMENT OF THE SMS

SMS Framework

SMS Element 3.3 Continuous improvement of the SMS - The service provider shall develop and maintain a formal process to identify the causes of substandard performance of the SMS, determine the implications of substandard performance of the SMS in operations, and eliminate or mitigate such causes.

Implementation Strategy

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

Internal evaluations involve assessment of the service provider's aviation activities that can provide information useful to the organization's decision making processes. It is here where the key activity of SMS – hazards identification and risks mitigation (HIRM) takes place. Evaluations conducted for the purpose of this requirement must be conducted by persons or organizations that are functionally independent of the technical processes being evaluated. The internal evaluation function includes evaluation of safety management functions, policymaking, safety risk management, safety assurance and safety promotion throughout the organization.

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

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

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

SAFETY PROMOTION

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

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

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

4.3.11 TRAINING AND EDUCATION

SMS Framework

SMS Element 4.1 Training and education - The service provider shall develop and maintain a safety training programme that ensures that personnel are trained and competent to perform the SMS duties. The scope of the safety training shall be appropriate to each individual's involvement in the SMS.

Implementation Strategy

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

a) Organizational safety policies, goals & objectives ;
b) Organizational safety roles and responsibilites related to safety;
c) Basic safety risk management principles;
d) Safety reporting systems;
e) Safety management support (including evaluation and audit programmes);
f) Lines of communication for dissemination of safety information;
g) A validation process that measures the effectiveness of training;
h) Documented intial indoctrination and recurrent training requirements;

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

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

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

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

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

4.3.12 SAFETY COMMUNICATION

SMS Framework

SMS Element 4.2 Safety communication - The service provider shall develop and maintain formal means for safety communication that ensures that all personnel are fully aware of the SMS, conveys safety-critical information, and explains why particular safety actions are taken and why safety procedures are introduced or changed.

Implementation Strategy

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

a) ensure that staff are fully aware of the SMS;
b) convey safety-critical information;
c) raise awareness of corrective actions; and
d) provide information regarding new or amended safety procedures.

Examples of organizational communication initiatives include:

a) safety management systems manual disemination;
b) safety processes and procedures;
c) safety newsletters, notices and bulletins; and
d) websites or email.

4.4 SMS IMPLEMENTATION PLANNING

4.4.1 SYSTEM DESCRIPTION

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

4.4.2 INTEGRATION OF MANAGEMENT SYSTEMS

Depending upon the organizational, operational and regulatory contexts, a service provider may implement an integrated SMS. Integration has the potential to provide synergies by managing safety risks across multiple areas of aviation activities. For example, a service provider may implement a single SMS for its design organization, production organization, and business aviation flight department. Alternatively, there may be situations where an individual SMS for each type of aviation activity is appropriate. The organization may define the best means to integrate or segregate its SMS as suits its business or organizational model, subject to satisfying the State that its SMS duties in all service provider roles are being properly discharged. The service provider's SMS may also be integrated with security,

occupational health and environmental management systems.

SMS AND QMS integration

Aviation service providers typically implement enterprise-wide management systems. Organizational safety performance is dependent on the effective integration of these systems to support the delivery of products and services. In the context of SMS, the most significant aspect of integration is with the service provider's Quality Management System (QMS). QMS is generally defined as the organizational structure and associated accountabilities, resources, processes, and procedures necessary to establish and promote a system of continuous quality assurance and improvement while delivering a product or service. QMS is an existing aviation regulatory requirement for most service providers including production approval (Annex 8), maintenance organizations (Annex 6 Part I) and meteorological and aeronautical data service providers (Annexes 3 and 15, respectively).

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

a) must be planned and managed;
b) depend upon measurement and monitoring of performance indicators;
c) involve all organizational functions related to the delivery of aviation products and service ; and
d) strive for continuous improvement.

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

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

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

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

a) an SMS is supported by QMS processes such as auditing, inspection, investigation, root cause analysis, process design, statistical analysis, and preventive measures;
b) a QMS may anticipate safety issues that exist despite the organization's compliance with standards and specifications; and
c) quality principles, policies and practices are linked to the objectives of safety management.

The relationship between SMS and QMS leads to the complementary contributions of each system to the attainment of the organization's safety and quality goals. A summary comparison may be reflected as follows:

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

4.4.3 GAP ANALYSIS

A gap analysis compares the service provider's existing safety management processes and procedures with requirements contained in the SMS framework. Aviation service providers will have typically implemented various SMS functions due to their compliance with national regulations or adoption of industry best practices. The development of an SMS should build upon existing organizational structures and control systems. The gap analysis facilitates development of an SMS implementation plan by identifying the gaps that must be addressed to fully implement an SMS. Once the gap analysis is complete and fully documented, the resources and processes that have been identified as missing or inadequate will form the basis of the SMS implementation plan.

Appendix 2 to this chapter provides a listing of gap analysis questions to facilitate service providers in systematically assessing their existing processes. From an objective response to each gap analysis question, it will then be apparent as to what enhancements or actions are required.

4.4.4 SMS IMPLEMENTATION PLAN

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

The service provider's implementation plan may be documented in different forms, varying from a simple spreadsheet or specialized project management software. The implementation plan should address gaps, through completion of specific actions and completion of milestones according to the stated timeline. Assignment of each task assures accountability throughout the implementation process. The plan should be reviewed regularly and updated as necessary. A format example of an SMS implementation plan/ schedule is in Appendix 2 to this chapter.

Full implementation of all components and elements of the SMS framework may take up to five years, depending on an organization's maturity and complexity. SMS implementation, including guidance for a phased approach, is discussed in the next section of this chapter.

4.4.5 SAFETY PERFORMANCE INDICATORS

An SMS defines measurable performance outcomes to determine whether the system is truly operating in accordance

with design expectations and not simply meeting regulatory requirements. The safety performance indicators are used to monitor known safety risks, detect emerging safety risks and to determine any necessary corrective actions.

These safety performance indicators also provide objective evidence for the regulator to assess the effectiveness of the service providers' SMS and to monitor achievement of its safety objectives. The service provider's safety performance indicators consider factors such as the organization's safety risk tolerance, the cost/ benefits of implementing improvements to the system, regulatory requirements and public expectations. Safety performance indicators should be selected and developed in consultation with the service provider's regulatory authority. This process is necessary to facilitate the regulator's aggregation and harmonization of service providers' safety performance indicators for the same aviation sector.

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

In practice, the safety performance of an SMS is expressed by safety performance indicators and their corresponding alert and target values. The service provider should monitor current indicators' performance in the context of historical trends to identify any abnormal changes in safety performance. Likewise, target and alert settings should take into consideration recent historical performance for a given indicator. Desired improvement targets should be realistic and achievable for the service provider and the associated aviation sector.

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

A range of high consequence as well as lower consequence safety performance indicators provide a more comprehensive insight into the service provider's safety performance. This will ensure that high consequence outcomes (eg accidents and serious incidents) as well as lower consequence events (eg incidents, non conformance reports, deviations), are addressed. Safety performance indicators are essentially data trending charts that track occurrences in terms of event rates (eg number of incidents per 1000 flying hours). High consequence indicators should be addressed first whilst lower consequence indicators may be developed at the more matured phase of SMS implementation.

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

Examples and details on development of safety indicators, target and alert setting is in Appendix 6 to this chapter.

4.5 PHASED IMPLEMENTATION APPROACH

The objective of this section is to introduce an example of SMS implementation phases. The implementation of an SMS

is a systematic process. Nevertheless, this process may be quite a challenging task depending on factors, such as the availability of guidance material and resources required for implementation, as well as the service providers' pre-existing knowledge of SMS processes and procedures,

The reasons for a phased approach to SMS implementation include:

a) the provision of a manageable series of steps to follow in implementing an SMS, including allocation of resources;
b) the need to allow implementation of SMS framework elements in various sequences, depending upon the results of each service provider's gap analysis;
c) the initial availability of data and analytic processes to support reactive, proactive and predictive safety management practices; and
d) the need for a methodical process to ensure effective and sustainable SMS implementation.

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

Four implementation phases are proposed for an SMS. Each phase is associated with various elements (or sub-elements) as per the ICAO SMS framework. It is apparent that the particular configuration of elements in this guidance material is not meant to be absolute. States and service providers may choose to make adjustments as may be deemed appropriate for the circumstances.

A summary of the four phases of SMS implementation and their corresponding elements is shown in below Table A.

Table A - Four Phases of SMS implementation

Phase I (12 mths*)	Phase II (12 mths)	Phase III (18 mths)	Phase IV (18 mths)
1. SMS element 1.1(i): a. Identify SMS Accountable Executive b. Establish SMS Implementation Team c. Define scope of the SMS d. Perform SMS Gap Analysis **2. SMS element 1.5(i):** a. Develop SMS Implementation Plan **3. SMS element 1.3:** a. Establish a key person/ office responsible for the administration and maintenance of the SMS. **4. SMS element 4.1(i):** a. Establish SMS training program for personnel, with priority for SMS implementation team. **5. SMS element 4.2(i):** a. Initiate SMS/ Safety communication channels	**1. SMS element 1.1(ii):** a. Establish Safety Policy & Objectives **2. SMS element 1.2:** a. Define safety management responsibilities & accountabilities across relevant departments of the organization b. Establish SMS/ Safety coordination mechanism/ committee. c. Establish departmental/ divisional SAGs where applicable **3. SMS element 1.4:** a. Establish Emergency Response Plan **4. SMS element 1.5(ii):** a. Initiate progressive development of an SMS Document/ Manual & other supporting documentation	**1. SMS element 2.1(i):** a. Establish voluntary hazards reporting procedure **2. SMS element 2.2:** a. Establish safety risk management procedure **3. SMS element 3.1(i):** a. Establish occurrence reporting & investigation procedure b. Establish safety data collection & processing system for high consequence outcomes c. Develop high consequence SPIs & associated targets & alert settings **4. SMS element 3.2:** a. Establish Management of Change procedure that includes safety risk assessment **5. SMS element 3.3(i):** a. Establish internal quality audit programme b. Establish external quality audit programme	**1. SMS element 1.1(iii):** a. Enhance existing disciplinary procedure/ policy with due consideration of unintentional errors/ mistakes from deliberate/ gross violations **2. SMS element 2.1(ii):** a. Integrate hazards identification from occurrence investigation reports with the voluntary hazard reporting system b. Integrate hazard identification & risk management procedures with sub-contractor or customer SMS where applicable **3. SMS element 3.1(ii):** a. Enhance safety data collection & processing system to include lower consequence events b. Develop lower consequence SPIs & associated targets/ alert settings **4. SMS element 3.3(ii):** a. Establish or integrate SMS audit into existing internal & external audit programs b. Establish other operational SMS review/ survey programs where appropriate **5. SMS element 4.1(ii):** a. Ensure SMS training program for all relevant personnel is completed **6. SMS element 4.2(ii):** a. Promote safety information sharing & exchange internally and externally.
SMS element 1.5: SMS Documentation (Phase I toIV) >>>>>>>>>>>>>>>>>>> >>>>>>>>>>>>>>>>>>>>>>>>>>>>			
SMS element 4.1, 4.2: SMS Training, education & communication (Phase I & thereafter) >>>>>>>>>>>>>>>>>>>>>>>>>>>>			
Notes: 1) Implementation period indicated is an approximation. Actual Implementation period is dependent on scope of actions required for each element allocated and the size/ complexity of the organization. 2) SMS element numbers indicated corresponds to the ICAO SMS element numbers. Suffix such as "(a)", etc indicates that the element has been sub-divided to facilitate the phased implementation approach.			

4.5.1 PHASE I

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

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

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

Management Commitment and Responsibility - Element 1.1(i)

a. Identify the Accountable Executive and the safety accountabilities of managers. This activity is based on Elements 1.1 and 1.2 of the ICAO SMS framework.

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

i) Responsible for developing the SMS implementation plan.
ii) Ensuring adequate SMS training & technical expertise of the team to establish effective Implementation of the SMS elements and related processes.
iii) Monitor and report on the progress of the SMS implementation and providing regular updates and coordination with the SMS Accountable Executive

c. Describe the organization's scope of activities (departments/ divisions) which the SMS will be applicable to. This definition of the organization's SMS applicability will subsequently need to be described in the SMS Document as appropriate. This activity is based on Element 1.5 of the ICAO SMS framework. Guidance on a system description is provided in paragraph 4.4.1 of this Chapter.

d. Conduct a gap analysis of the organization's current systems and processes in relation to ICAO SMS framework requirements (or the relevant SMS regulatory requirements). Guidance on an SMS gap analysis for a service provider is provided in Appendix 2 to this Chapter.

SMS Implementation Plan - Element 1.5(i)

a. Develop an SMS implementation plan on how the organization will implement the SMS on the basis of the identified system and process gaps resulting from the gap analysis. An example of a basic SMS implementation plan is in Appendix 2 to this Chapter.

Appointment of Key Safety Personnel - Element 1.3

a) Identify the key SMS person (safety/ quality function) within the organization that will be responsible for administering the SMS on behalf of the Accountable Executive.
b) Establish the safety services office.

Training and Education - Element 4.1(i)

a) conduct training needs analysis;
b) Organize and set up schedules for appropriate training for all staff according to their individual responsibilities and involvement in the SMS;
c) Develop safety training considering;
   i. initial (general safety) job-specific training, and
   ii. recurrent training;
d) Identify the costs associated with training;
e) Develop a validation process that measures the effectiveness of training; and
f) establish safety training record system.

Safety Communication - Element 4.2(i)

a) Initiate a mechanism or medium for safety communication.
b) Establish a means to convey safety information through any of :
   - Safety newsletters, notices and bulletins;
   - Websites;
   - Email.

4.5.2 PHASE II

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

Management Commitment and Responsibility - Element 1.1(ii)

a) Develop a safety policy.
b) Have the Accountable Executive sign the safety policy.
c) Communicate the safety policy through the organization.
d) Establish a review schedule for the safety policy to ensure it remains relevant and appropriate to the organization.
e) Establish safety objectives for the SMS, by developing safety performance standards in terms of:
   — safety performance indicators;
   — safety performance targets and alert levels ; and
   — action plans.
f) Establish the SMS requirements for subcontractors:
   — establish a procedure to write SMS requirements into the contracting process; and
   — establish the SMS requirements in the bidding documentation.

Safety Accountabilities - Element 1.2

a) Define safety accountabilities and communicate those through the organization.
b) Establish the Safety Action Group (SAG)

c) Establish Safety/SMS coordination committee.
d) Define clear functions of the Safety Action Group (SAG) and the Safety/SMS coordination committee
e) Establish lines of communication between the safety services office, the Accountable Executive, the Safety Action Group (SAG) and the Safety/SMS coordination committee
f) Appoint the Accountable Executive as the chair person of the Safety/SMS coordination committee
g) Develop a schedule of meetings for the safety services office to meet with the Safety/SMS coordination committee and SAG as needed.

Coordination of the Emergency Response Plan - ERP Element 1.4

a) Review the outline of the ERP related to the delegation of authority and assignment of emergency responsibilities.
b) Establish coordination procedures for action by key personnel during the emergency and of return to normal operations.
c) Identify external entities that will interact with the organization during emergency situations.
d) Assess their respective ERPs.
e) Establish coordination between the different ERPs.
f) Incorporate the coordination among different ERPs in the organization's safety management systems documentation.

Refer to Appendix 4 for further guidance on ERP

SMS documentation - Element 1.5(ii)

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

a) develop a SMS Document - stand alone manual or distinct section within an existing controlled organization manual. (Refer to Appendix 3 for guidance on SMS manual compilation)
b) establish a SMS filing system to collect and maintain current records relating to the organization's on-going SMS processes;
c) records to provide a historical reference as well as current status of all SMS processes such as: hazards register; index of completed safety assessments, SMS/ safety training records; current SPIs and associated safety objectives, internal SMS audit reports, SMS/ Safety Committee meeting minutes, SMS implementation plan, etc.
d) records that will serve as evidence of the SMS operation and activities during internal or external assessment or audit of the SMS.

4.5.3 PHASE III

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

Hazard identification - Element 2.1(i)

a) Establish a voluntary reporting procedure. Refer to Appendix 7 for guidance.
b) Establish program/ schedule for systematic HIRM performance/ review on all applicable aviation safety-related processes/ equipment.
c) Establish process for prioritizarion and assignment of identified hazards for risk mitigation

Safety Risk Assessment and Mitigation - Element 2.2

a) Establish safety risk management procedure, including their approval and periodic review process.
b) Develop and adopt safety risk matrices relevant to the organization's operational or production processes.
c) Adopted safety risk matrices and associated instructions should be included in the organization's SMS or Risk management training materials.

Safety Performance Monitoring and Measurement - Element 3.1(i)

a) Establish internal occurrence reporting and investigation procedure. This may include mandatory or major defect reports (MDR) where applicable.
b) Establish safety data collection, processing and analysis for high consequence outcomes.
c) Establish high-consequence safety indicators (initial ALoSP) and their associated target and alert settings. Examples of high consequence safety indicators are such as accident rates, serious incident rates and monitoring of high risk non compliance outcomes. Refer Appendix 6 for safety indicators guidance.
d) Agreement reached with the State oversight authority on safety performance indicators and safety performance targets.

The Management of Change - Element 3.2

a) Establish a formal process for the management of change that considers:
    - Vulnerability of systems and activities;
    - Stability of systems and operational environments;
    - Past performance.
    - Regulatory, industry and technological changes
b) Ensure management of change procedures do address impact on existing safety performance and risk mitigation records before implementing new changes.
c) Establish procedures to ensure that safety assessment of new aviation safety related operations, processes and equipment are conducted (or accounted for) as applicable, before they are commissioned.

Continuous Improvement of the SMS - Element 3.3(i)

a) Develop forms for internal evaluations.
b) Define an internal audit process.
c) Define an external audit process.
d) Define a schedule for evaluation of facilities, equipment, documentation and procedures, to be completed through audits and surveys.
e) Develop documentation relevant to operational safety assurance.

4.5.4 PHASE IV

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

Management Commitment and Responsibility - Element 1.1(iii)

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

Hazard Identification - Element 2.1(ii)

a) Integrate the hazards identified from occurrence investigation reports with the voluntary reporting system.
b) Integrate hazard identification & risk management procedures with sub-contractor or customer SMS where applicable
c) If necessary, develop process for prioritizing collected hazards for risk mitigation based on areas of greater need or concern. Refer Appendix 1 of chapter 1 for guidance.

Safety Performance Monitoring and Measurement - Element 3.1(ii)

a) Enhance safety data collection & processing system to include lower consequence events;
b) Establish lower consequence safety/ quality indicators with target/ alert levels monitoring as appropriate (mature ALoSP); and
c) Agreement reached with the State oversight authority on lower consequence safety performance indicators and safety performance target/ alert levels.

Continuous Improvement of the SMS - Element 3.3(ii)

a) Establish or integrate SMS audit into existing internal & external audit programs
b) Establish other operational SMS review/ survey programs where appropriate

Training and Education - Element 4.1(ii)

a) Completed SMS training program for all relevant personnel.

Safety Communication - Element 4.2(ii)

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

Note:
Within the phased approach implementation, there are 2 key elements that are progressively implemented through all the phases. These include SMS documentation and State safety promotion through training and communication as follows:

SMS documentation - Element 1.5

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

SMS Training, education and Safety communication - Element 4.1 and 4.2

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

Appendix 1 - SAMPLE JOB DESCRIPTION FOR A SAFETY MANAGER

1. OVERALL PURPOSE

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

2. KEY ROLES

Safety advocate

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

Leader

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

Communicator

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

- Provides and articulates information regarding safety issues within the organization.

Developer

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

Relationship builder

- Builds and maintains an excellent working relationship with the organization's Safety Action Group (SAG) and within the safety services office (SSO).

Ambassador

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

Analyst

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

Process management

- Effectively utilizes applicable processes and procedures to fulfil roles and responsibilities.

- Investigates opportunities to increase the efficiency of processes.

- Measures the effectiveness and seeks to continually improve the quality of processes.

3. RESPONSIBILITIES

The safety manager is responsible for amongst other duties :

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

4. NATURE AND SCOPE

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

5. QUALIFICATIONS

To qualify as a safety manager the person should have:

- Full-time experience in aviation safety in the capacity of an aviation safety investigator, safety/ quality manager or safety risk manager;
- Sound knowledge of the organization's operations, procedures and activities;
- Broad aviation technical knowledge
- Extensive knowledge of Safety Management Systems (SMS) and have completed appropriate SMS training
- An understanding of Risk Management principles and techniques to support the SMS
- Experience implementing and/or managing Safety Management Systems (SMS)
- Experience and qualifications in aviation accident/ incident investigation and human factors
- Experience and qualifications in conducting safety/ quality audits and inspections
- Sound knowledge of aviation regulatory frameworks, including ICAO Standards and Recommended Practices (SARPS) and relevant Civil Aviation Regulations
- Ability to communicate at all levels both inside and outside the company
- Ability to be firm in conviction, promote a "just and fair culture" and yet advance an open and non-punitive atmosphere for reporting
- Ability and confidence to communicate directly to the accountable executive as his advisor and confidante
- Well developed communication skills and demonstrated interpersonal skills of a high order, with the ability to liaise with a variety of individuals and organizational representatives, including those from differing cultural backgrounds
- Computer literacy and superior analytical skills

6. AUTHORITY

6.1 Regarding safety matters, the safety manager has direct access to the Accountable Executive and appropriate senior and middle management.

6.2 The safety manager is authorized under the direction of the Accountable Executive to conduct safety audits, surveys and inspections of any aspect of the operation in accordance with the procedures specified in the safety management system documentation

6.3 The safety manager is authorized under the direction of the Accountable Executive to conduct investigations of internal safety events in accordance with the procedures specified in the organization's safety management system documentation.

6.4 The safety manager should not hold other positions or responsibilities that may conflict or impair his role as a SMS/ Safety manager. This should be a senior management position not lower than or subservient to production or operational functions of the organization.

Appendix 2 - GUIDANCE ON SMS GAP ANALYSIS AND IMPLEMENTATION PLAN

1 Initial Gap Analysis Checklist (Table 1)

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

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

Note: SMM references within [ ] brackets contain guidance materials relevant to the Gap analysis question.

Table 1

No.	*Aspect to be analysed or question to be answered*	*Answer*	*Status of implementation*
Component 1 — SAFETY POLICY AND OBJECTIVES			
Element 1.1 — Management commitment and responsibility			
1	Is there a safety policy in place? [4.3.1; 4.5.2(a)]	☐ Yes ☐ No ☐ Partial	
2	Does the safety policy reflect senior management commitments regarding safety management? [4.3.1]	☐ Yes ☐ No ☐ Partial	
3	The Safety Policy is appropriate to the size, nature and complexity of the organization. [4.3.1]	☐ Yes ☐ No ☐ Partial	
4	The Safety Policy is relevant to aviation safety. [4.3.1]	☐ Yes ☐ No ☐ Partial	
5	Is the safety policy signed by the Accountable Executive? [4.3.1; 4.5.2]	☐ Yes ☐ No ☐ Partial	
6	Is the safety policy communicated, with visible endorsement, throughout the [organization]? [4.5.2]	☐ Yes ☐ No ☐ Partial	
7	Is the safety policy periodically reviewed to ensure it remains relevant and appropriate to the [organization]? [4.5.2]	☐ Yes ☐ No ☐ Partial	
Element 1.2 — Safety accountabilities			
1	Has the [organization] identified an Accountable Executive who, irrespective of other functions, shall have ultimate responsibility and accountability, on behalf of the [organization], for the implementation and maintenance of the	☐ Yes ☐ No ☐ Partial	

No.	*Aspect to be analysed or question to be answered*	*Answer*	*Status of implementation*
	SMS? [4.5.1; 4.3.2]		
2	Does the Accountable Executive have full control of the financial and human resources required for the operations authorized to be conducted under the operations certificate? [4.3.2]	☐ Yes ☐ No ☐ Partial	
3	Does the Accountable Executive have final authority over all aviation activities of his organization? [4.3.2]	☐ Yes ☐ No ☐ Partial	
4	Has the organization identified and documented the safety accountabilities of management as well as operational personnel, with respect to the SMS? [4.3.2]	☐ Yes ☐ No ☐ Partial	
5	Is there a Safety Committee or Review board for the purpose of reviewing SMS and safety performance? [4.3.3 and App 3]	☐ Yes ☐ No ☐ Partial	
6	Is the Safety Committee chaired by the Accountable Executive or by an appropriately assigned deputy, duly substantiated in the SMS manual? [4.3.3 and App 3]	☐ Yes ☐ No ☐ Partial	
7	Does the Safety Committee include relevant operational or departmental Heads as applicable? [4.3.3 and App 3]	☐ Yes ☐ No ☐ Partial	
8	Are there Safety Action Groups that work in conjunction with the Safety Committee? (large/ complex organizations as appropriate) [4.3.3 and App 3]	☐ Yes ☐ No ☐ Partial	
Element 1.3 — Appointment of key safety personnel			
1	Has the organization appointed a qualified person to manage and oversee the day-to-day operation of the SMS? [4.5.1; 4.3.3; App 1]	☐ Yes ☐ No ☐ Partial	
2	Does the qualified person have direct access or reporting to the Accountable Executive concerning the implementation & operation of the SMS? [4.3.3; App 1, 6.1]	☐ Yes ☐ No ☐ Partial	
3	The Manager responsible for administering the SMS does not hold other responsibilities that may conflict or impair his role as SMS manager. [App 1, 6.4]	☐ Yes ☐ No ☐ Partial	
4	The SMS Manager is a senior management position not lower than or subservient to other operational or production positions [App1, 6.4]	☐ Yes ☐ No ☐ Partial	
Element 1.4 — Coordination of emergency response planning			
1	Does the [organization] have an emergency response/contingency plan appropriate to the size, nature and complexity of the organization? [App 4]	☐ Yes ☐ No ☐ Partial	
2	Does the Emergency/ Contingency plan address all possible or likely emergency/ crisis scenarios relating to the organization's aviation product or service deliveries? [App 4, 4(f)]	☐ Yes ☐ No ☐ Partial	
3	Does the ERP include procedures for the continuing safe production, delivery or support of its aviation products or services during such emergencies or contingencies? [App 4, 4(e)]	☐ Yes ☐ No ☐ Partial	
4	Is there a plan and record for drills or exercises with respect to the ERP? [App 4, 5c]	☐ Yes ☐ No ☐ Partial	
5	Does the ERP address necessary coordination of its emergency response/contingency procedures with the emergency/response contingency	☐ Yes ☐ No	

No.	*Aspect to be analysed or question to be answered*	*Answer*	*Status of implementation*
	procedures of other organizations where applicable? [App 4, 4(d)]	☐ Partial	
6	Does the [organization] have a process to distribute and communicate the ERP to all relevant personnel, including relevant external organizations? [App 4, 5(a)]	☐ Yes ☐ No ☐ Partial	
7	Is there a procedure for periodic review of the ERP to ensure its continuing relevance & effectiveness? [App 4, 5(d)]	☐ Yes ☐ No ☐ Partial	
Element 1.5 — SMS documentation			
1	There is a top level SMS summary or exposition Document which is approved by the Accountable Manager and accepted by the CAA. [4.3.5]	☐ Yes ☐ No ☐ Partial	
2	Does the SMS Documentation address the organization's SMS and its associated components and elements? [4.3.5; 4.4.1; App 3]	☐ Yes ☐ No ☐ Partial	
3	Is the organization's SMS framework in alignment to the regulatory SMS framework? [4.3.5; 4.4.1; App 3]	☐ Yes ☐ No ☐ Partial	
4	Does the organization maintain a record of relevant supporting documentation pertinent to the implementation and operation of the SMS? [4.3.5; 4.5.4]	☐ Yes ☐ No ☐ Partial	
5	Does the organization have a SMS implementation plan to establish its SMS implementation process, including specific tasks and their relevant implementation milestones? [4.4.4]	☐ Yes ☐ No ☐ Partial	
6	Does the SMS implementation plan address the coordination between the service provider's SMS and the SMS of external organizations where applicable? [4.4.4]	☐ Yes ☐ No ☐ Partial	
7	Is the SMS implementation plan endorsed by the Accountable Executive? [4.5.1; 4.4.4]	☐ Yes ☐ No ☐ Partial	
Component 2 — SAFETY RISK MANAGEMENT			
Element 2.1 — Hazard identification			
1	There is a process for voluntary hazards/ threats reporting by all employees. [4.5.3(a); 4.3.6]	☐ Yes ☐ No ☐ Partial	
2	Is the voluntary hazard/ threats reporting simple, available to all personnel involved in safety-related duties and commensurate with the size of the service provider? 4.3.6]	☐ Yes ☐ No ☐ Partial	
3	Does the [organization's] SDCPS include procedures for incident/ accident reporting by operational or production personnel? [4.3.8; 4.5.3; Xref chpt 3, App 12]	☐ Yes ☐ No ☐ Partial	
4	Is incident/ accident reporting simple, accessible to all personnel involved in safety-related duties and commensurate with the size of the service provider? [4.5.3; 4.3.8]	☐ Yes ☐ No ☐ Partial	
5	Does the [organization] have procedures for investigation of all reported incident/ accidents?. [4.5.3; 4.3.8]	☐ Yes ☐ No ☐ Partial	
6	Are there procedures to ensure that hazards/ threats identified or uncovered during incident/ accident investigation processes are appropriately accounted for and integrated into the organization's hazard collection and risk mitigation procedure? [1.12.2; 1.12.3; 4.3.6]	☐ Yes ☐ No ☐ Partial	

No.	*Aspect to be analysed or question to be answered*	*Answer*	*Status of implementation*
7	Are there procedures to review hazards/ threats from relevant industry reports for follow up actions or risk evaluation where applicable? [1.12.2; 1.12.3]	☐ Yes ☐ No ☐ Partial	

No.	*Aspect to be analysed or question to be answered*	*Answer*	*Status of implementation*
Element 2.2 — Safety risk assessment and mitigation			
1	Is there a documented Hazard Identification and Risk Mitigation (HIRM) procedure involving the use of objective risk analysis tools. [1.12; 1.14; 4.3.7]	☐ Yes ☐ No ☐ Partial	
2	Is the risk assessment reports approved by departmental managers or higher level where appropriate? [4.3.7; 1.15.1]	☐ Yes ☐ No ☐ Partial	
3	Is there a procedure for periodic review of existing risk mitigation records? [4.5.3]	☐ Yes ☐ No ☐ Partial	
4	Is there a procedure to account for mitigation actions whenever unacceptable risk levels are identified? [4.5.3]	☐ Yes ☐ No ☐ Partial	
5	Is there a procedure to prioritise identified hazards for risk mitigation actions? [4.5.3]	☐ Yes ☐ No ☐ Partial	
6	Is there a program for systematic and progressive HIRM performance of all aviation safety-related operations/ processes/ facilities/ equipment as identified by the organization? [4.5.3]	☐ Yes ☐ No ☐ Partial	
Component 3 — SAFETY ASSURANCE			
Element 3.1 — Safety performance monitoring and measurement			
1	Are there identified safety performance indicators for measuring & monitoring safety performance of the organization's aviation activities? [4.5.3; 4.3.8; App 6]	☐ Yes ☐ No ☐ Partial	
2	Are safety performance indicators relevant to the organization’s safety policy as well as management’s high level safety objectives/ goals? [4.5.3; 4.3.8; App 6]	☐ Yes ☐ No ☐ Partial	
3	Do the safety performance indicators include alert/ target settings to define unacceptable performance regions and planned improvement goals? [4.5.3; 4.3.8; App 6]	☐ Yes ☐ No ☐ Partial	
4	Is the setting of alert levels or out of control criteria based on objective safety metrics principles? [4.3.8; App 6]	☐ Yes ☐ No ☐ Partial	
5	Do the safety performance indicators include quantitative monitoring of high consequence safety outcomes (eg accident & serious incident rates) as well as lower consequence events (eg rate of non compliance, deviations)? [4.3.8; App 6]	☐ Yes ☐ No ☐ Partial	
6	Are safety performance indicators and their associated performance settings developed in consultation with, and subject to the Aviation Authority’s agreement? [4.5.3; 4.3.8]	☐ Yes ☐ No ☐ Partial	
7	Is there a procedure for corrective or follow up action to be taken when targets are not achieved and alert levels are exceeded/ breached? [4.4.5]	☐ Yes ☐ No ☐ Partial	
8	Are the safety performance indicators periodically reviewed? [4.4.5; App 6]	☐ Yes ☐ No ☐ Partial	
Element 3.2 — The management of change			
1	Is there a procedure for review of relevant existing aviation safety related facilities and equipment (including any HIRM records) whenever there are pertinent changes to those facilities or equipment? [4.3.9; 4.5.3]	☐ Yes ☐ No ☐ Partial	

No.	*Aspect to be analysed or question to be answered*	*Answer*	*Status of implementation*
2	Is there a procedure for review of relevant existing aviation safety related operations and processes (including any HIRM records) whenever there are pertinent changes to those operations or processes? [4.3.9; 4.5.3]	☐ Yes ☐ No ☐ Partial	
3	Is there a procedure for review of new aviation safety related operations and processes for hazards/ risks before they are commissioned? [4.5.3]	☐ Yes ☐ No ☐ Partial	
4	Is there a procedure for review of relevant existing facilities, equipment, operations or processes (including any HIRM records) whenever there are pertinent changes external to the organization such as regulatory/ industry standards, best practices or technology? [4.5.3]	☐ Yes ☐ No ☐ Partial	
Element 3.3 — Continuous improvement of the SMS			
1	Is there a procedure for periodic internal audit/ assessment of the SMS? [4.3.10; 4.5.3; 4.5.4]	☐ Yes ☐ No ☐ Partial	
2	Is there a current internal SMS audit/ assessment plan? [4.3.10; 4.5.3; 4.5.4]	☐ Yes ☐ No ☐ Partial	
3	Does the SMS audit plan include the sampling of completed/ existing safety risk assessments? [4.5.4]	☐ Yes ☐ No ☐ Partial	
4	Does the SMS audit plan include the sampling of safety performance indicators for data currency and their target/ alert settings performance? [4.5.4]	☐ Yes ☐ No ☐ Partial	
5	Does the SMS audit plan cover the SMS interface with sub-contractors or customers where applicable? [4.5.4]	☐ Yes ☐ No ☐ Partial	
6	There is a process for SMS audit/ assessment reports to be submitted or highlighted for the Accountable Manager's attention where appropriate. [4.5.4]	☐ Yes ☐ No ☐ Partial	
Component 4 — SAFETY PROMOTION			
Element 4.1 — Training and education			
1	Is there a program to provide SMS training/ familiarization to personnel involved in the implementation or operation of the SMS? [4.3.11; 4.5.4]	☐ Yes ☐ No ☐ Partial	
2	Has the Accountable Executive undergone appropriate SMS familiarisation, briefing or training? [4.3.11; 4.5.4]	☐ Yes ☐ No ☐ Partial	
3	Are personnel involved in conducting risk mitigation provided with appropriate risk management training or familiarisation? [4.3.11; 4.5.4]	☐ Yes ☐ No ☐ Partial	
4	Is there evidence of organization wide SMS education or awareness efforts? [4.3.11; 4.5.4]	☐ Yes ☐ No ☐ Partial	
Element 4.2 — Safety communication			
1	Does the organization participate in safety information sharing with relevant external industry product and service providers or organizations, including the relevant aviation regulatory organizations? [4.3.12; 4.5.4]	☐ Yes ☐ No ☐ Partial	
2	There is evidence of a Safety (SMS) publication, circular or channel for communicating Safety (SMS) matters to employees. [4.3.12; 4.5.4]	☐ Yes ☐ No ☐ Partial	

No.	*Aspect to be analysed or question to be answered*	*Answer*	*Status of implementation*
3	Are the organization's SMS manual and related guidance materials accessible or disseminated to all relevant personnel? [4.3.12; 4.5.4]	☐ Yes ☐ No ☐ Partial	

2 Detailed SMS Gap Analysis & Implementation Tasks (Table 2)

The above Table 1 initial gap analysis checklist will now need to be followed up by a detailed "Required Tasks/ Actions" plan such as per Table 2 example below. This Table 2 will provide follow up analysis on details of the gaps and translating these into actual required tasks and sub-tasks in the specific context of the organization's processes and procedures. Each Task is accordingly assigned to appropriate individuals or groups for action. It is important that correlation of individual element/ task development to their descriptive placeholders in the SMS Document be provided for in this Table 2. This will trigger progressive updating of the draft SMS Document even as each element is being enhanced or implemented. (Initial element write-ups in SMS documents tend to be anticipatory rather than declaratory).

3 Actions/ Tasks Implementation Schedule (Table 3)

Table 3 may be a separate consolidation of all outstanding Actions/ Tasks or if preferred, be a continuation of Table 2 in the form of a spread sheet. This Table will show the milestones (Start-End dates) as scheduled for each Task/ Action. For a Phased implementation approach, these Tasks/Actions would need to be sorted according to its related element's Phase allocation. Refer to Phased Approach Section of this chapter for the phased prioritization of SMS elements as appropriate. Where it is anticipated that the actual number of Tasks/ Actions and their milestones are sufficiently voluminous and complex as to require utilising a project management software to management them, this may be done by using such as MS project/ Gantt chart as appropriate. Table 4 is an illustration of such a Gantt chart.

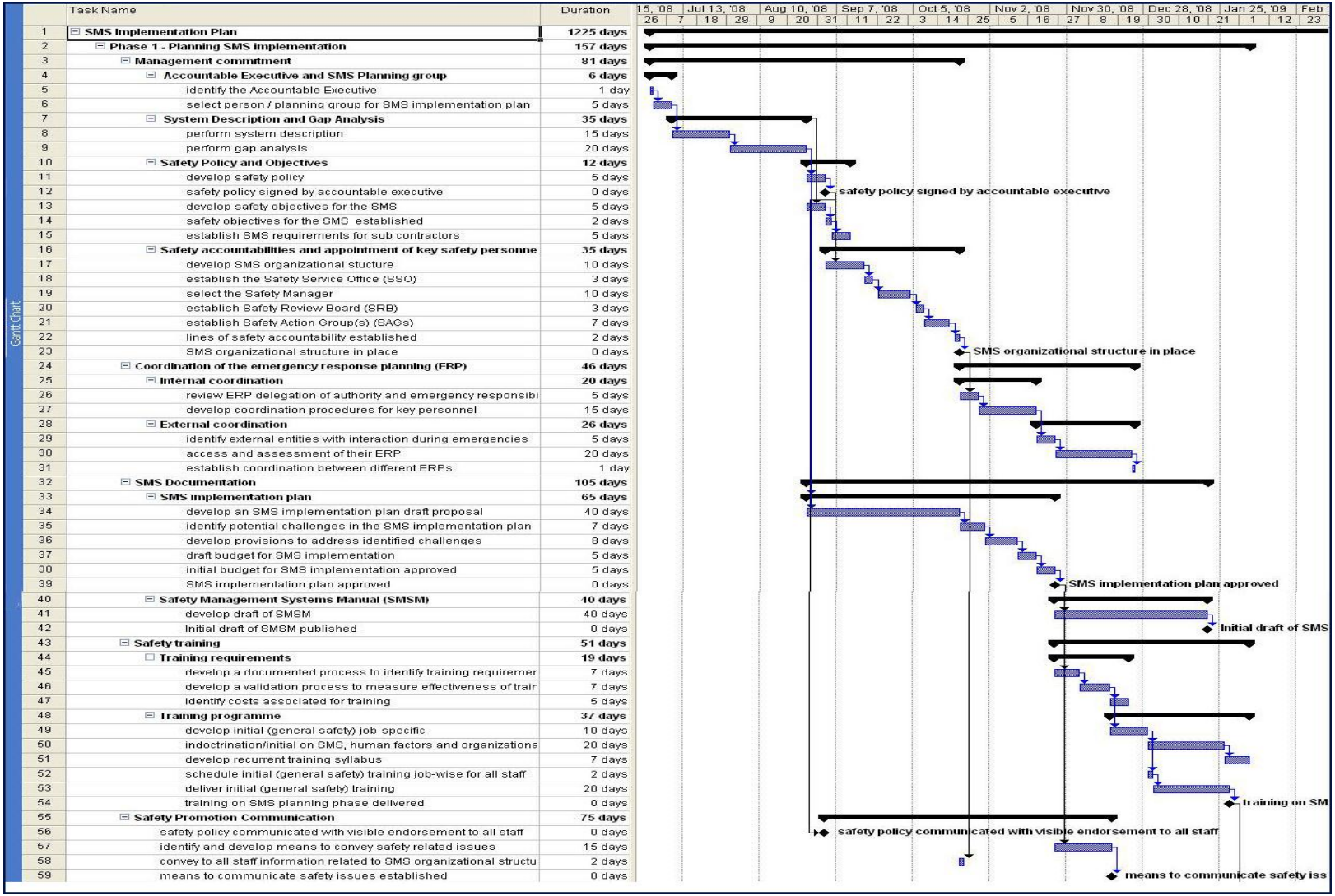
Table 2 – SMS Gap Analysis & Implementation Tasks Identification (Format Example)

GAQ Ref	Gap Analysis Question	Answer: Yes/ No/ Partial	Description of Gap	Action/ Task Required to fill Gap	Assigned Task Group/ Person	SMS Document Ref/	Action/ task Status (Open/ WIP/ Closed)
1.1-1	*Is there a safety policy in place?*	*Partial*	*Existing safety policy addresses OSHE only.*	*a) To enhance existing safety policy to include aviation SMS objectives and policies OR develop a separate aviation safety policy* *b) Safety policy to be approved and signed by Accountable Executive.*	*Task Group 1*	*Chapter 1, Section 1.3.*	*Open*
Etc							

Table 3 – SMS Implementation Schedule (Format Example)

Action/ Task Required to fill Gap	SMS Doc Ref/	Assigned Task Group/ Person	Action/ task Status	Schedule/ Timeline												
				1Q 10	2Q 10	3Q 10	4Q 10	1Q 11	2Q 11	3Q 11	4Q 11	1Q 12	2Q 12	3Q 12	4Q 12	etc
1.1-1a) To enhance existing safety policy to include aviation SMS objectives and policies OR develop a separate aviation safety policy	*Chpt 1, Sect 1.3.*	*Task Group 1*	*Open*													
1.1-1b) Safety policy to be approved and signed by Accountable Executive.																
Etc																

Table 4 – SMS Implementation Schedule (Format Example – Gantt chart)



Appendix 3 - GUIDANCE FOR THE DEVELOPMENT OF A SMS MANUAL

This appendix serves to guide organizations in their compilation of a top level SMS Manual or Document to define their SMS framework and its associated elements. This Document can be a stand-alone SMS Manual or be integrated as a consolidated SMS Section/ Chapter within an appropriate approved manual of the organization (eg Organization Exposition Manual, Company Manual, etc). The actual configuration may depend on regulatory expectation.

The suggested format and Content items in this Appendix is one way in which an organization can develop its top level SMS Document. The actual Content items would depend on the specific SMS framework and elements of the organization. The description under each element would be commensurate with the scope and complexity of the organization's SMS processes.

This Document will serve to communicate the organization's SMS framework internally as well as with relevant external organizations. This Document may be subject to endorsement or approval by the CAA as evidence of the acceptance of the SMS.

Note: A distinction is to be made between a SMS Manual / Document from its operational supporting records and documents. Latter refers to historical and current records and documents generated during implementation and operation of the various SMS processes. These are documentary evidence of the on-going SMS activities of the organization.

This SMS Document/ Manual guide is formatted in the following manner:

a) Section heading
b) Objective
c) Criteria
d) Cross Reference Documents

Below each numbered section heading is a description of the "Objective" for that section, followed by its "Criteria" and "Cross Reference Documents". The "Objective" is what the organization intends to achieve by doing what is described in the section. The "Criteria' defines the scope of what should be considered when writing the section. The "Cross Reference Document" links the information to other relevant manuals or SOPs of the organization which contain details of the element or process as applicable.

The manual contents include:

1. Document control ;
2. SMS regulatory requirements ;
3. Scope and integration of the safety management system ;
4. Safety policy ;
5. Safety objectives ;
6. Safety accountabilities and key personnel ;
7. Safety reporting and remedial actions ;
8. Hazard identification and risk assessment ;
9. Safety performance monitoring and measurement ;
10. Safety-related investigations and remedial actions ;
11. Safety training and communication ;
12. Continuous improvement and SMS audit ;
13. SMS records management ;
14. Management of change ; and
15. Emergency/ contingency response plan.

1. Document Control

Objective
Describe how the manual(s) kept up to date and ensure that all personnel involved in safety-related duties have the most current version.

Criteria
a) Hard copy or controlled electronic media and distribution list.
b) Correlation of this SMS manual with other existing manuals such as a Maintenance Control (MCM), Operations Manual, should be explained.
c) Process for periodic review of the manual and its related forms/ documents to ensure their continuing suitability, adequacy and effectiveness.
d) Manual administration, approval and regulatory acceptance process.

Cross Reference Documents: *Quality manual; Engineering manual; etc*

2. SMS Regulatory Requirements

Objective
Address current SMS regulations and guidance materials for necessary reference and awareness by all concerned.

Criteria
a) Spell out current SMS regulations/standards. Include compliance timeframe and advisory material references as applicable.
b) Where, appropriate, elaborate or explain the significance and implications of those regulations to the organization.
c) Correlate to other safety related requirements or standards where appropriate.

Cross Reference Documents: *SMS regulation/ requirement reference; SMS Guidance document ref; etc*

3. Scope and Integration of the Safety Management System

Objective
Describe scope and extent of the organization's aviation-related operations and facilities within which the SMS will apply. The scope of Hazard Identification and Risk Management (HIRM) eligible processes, equipment and operations should also be addressed.

Criteria
a) Spell out nature of the organization's aviation business and its position or role within the industry as a whole.
b) Identify major areas, departments, workshops and facilities of the organization within which the SMS will apply.
c) Identify major processes, operations and equipment which are deemed to be eligible for the organization's HIRM program; especially those which are pertinent to aviation safety. If the scope of HIRM eligible processes, operations and equipment is too detailed or extensive, it may be controlled under a supplementary document as appropriate.
d) Where the SMS is expected to be operated or administered across a group of interlinked organizations or contractors, such integration and associated accountabilities should be defined and documented as applicable.
e) Where there are other related control/ management systems within the organization such as QMS, OSHE, SeMS etc, their relevant integration (where applicable) within the aviation SMS should be identified.

Cross Reference Documents: *Quality Manual, Engineering Manual, etc*

4. Safety Policy

Objective
Describe the organization's intentions, management principles, and commitment to improving aviation safety in the

product or service provider. A safety policy should be a short description similar to a mission statement.

Criteria

a) The safety policy should be appropriate to the size and complexity of the organization.
b) The safety policy states the organization's intentions, management principles and commitment to continuous improvement in aviation safety.
c) The safety policy is approved by the Accountable Executive.
d) The safety policy is promoted by the Accountable Executive and all other managers.
e) The safety policy is reviewed periodically.
f) Personnel at all levels are involved in the establishment and maintenance of the safety management system.
g) The safety policy is communicated to all employees with the intent that they are made aware of their individual safety obligations.
h) The safety policy should be signed by the Accountable Executive.

Cross Reference Documents: *OSHE safety policy, etc*

5. Safety Objectives

Objective

Describe the safety objectives of the organization. The safety objectives would be a short statement that describes in broad terms what you hope to achieve.

Criteria

a) Safety objectives have been established
b) Safety objectives are expressed as a top-level statement describing the organization's commitment to achieving safety.
c) There is a formal process to develop a coherent set of safety objectives.
d) Safety objectives are publicized and distributed.
e) Resources have been allocated for achieving the objectives.
f) Safety objectives are linked to safety indicators to facilitate monitoring and measurement where appropriate.

Cross Reference Documents: *safety performance indicators document, etc*

6. Roles and Responsibilities

Objective

Describe the safety authorities, responsibilities and accountabilities for personnel involved in the SMS.

Criteria

a) The Accountable Executive is responsible for ensuring that the safety management system is properly implemented and performing to requirements in all areas of the organization.
b) Appropriate Safety Manager (office), Safety Committee or Safety Action Groups have been appointed as appropriate.
c) Safety authorities, responsibilities and accountabilities of personnel at all levels of the organization are defined and documented.
d) All personnel understand their authorities, responsibilities and accountabilities in regards to all safety management processes, decision and actions.
e) An SMS organizational accountabilities diagram is available.

Cross Reference Documents: *Company exposition manual, SOP manual, Administration manual, etc*

7. Safety Reporting

Objective

A reporting system should include both reactive (accident/incident reports etc) and proactive/ predictive (hazard reports). Describe the respective reporting systems. Factors to consider include: report format, confidentiality, addressees,

investigation/ evaluation procedures, corrective/ preventive actions and report dissemination.

Criteria

a) The organization has a procedure that provides for the capture of internal occurrences including accidents, incidents, and other occurrences relevant to SMS.
b) A distinction is to be made between mandatory reports (accidents, serious incidents, major defects, etc) which are required to be notified to the CAA and other routine occurrence reports which remain within the organization.
c) There is also a voluntary and confidential hazard/ occurrence reporting system, incorporating appropriate identity/ data protection as applicable.
d) The respective reporting processes are simple, accessible and commensurate with the size of the organization.
e) High consequence reports and associated recommendations are addressed to and reviewed by appropriate level of management.
f) Reports are collected in an appropriate database to facilitate necessary analysis.

Cross Reference Documents

8. Hazard Identification and Risk Assessment

Objective

Describe the hazard identification system and how such data are collated. Describe the process for any categorization of hazards/risks and their subsequent prioritization for a documented safety assessment. Describe how the safety assessment process is conducted and how preventive action plans are implemented.

Criteria

a) Identified hazards are evaluated/ prioritized/ processed for risk assessment as appropriate.
b) There is a structured process for risk assessment, involving the evaluation of severity, likelihood, tolerability and preventive controls.
c) Hazard identification and risk assessment procedures do focus on aviation safety as its fundamental context.
d) The risk assessment process utilizes worksheets/ forms or software which is appropriate to the complexity of the organization and operations involved.
e) Completed safety assessments are approved by appropriate level of management.
f) There is a process for evaluating effectiveness of corrective, preventive and recovery measures that have been developed.
g) There is a process for periodic review of completed safety assessments and documenting their outcomes.

Cross Reference Documents

9. Safety Performance Monitoring and Measurement

Objective

Describe the safety performance monitoring and measurement component of the SMS. This includes the organization's SMS safety performance indicators (SPIs).

Criteria

a) There is a formal process to develop and maintain a set of safety performance indicators and their associated performance targets.
b) Correlation of the SPIs to the organization's safety objectives where applicable and the process of regulatory acceptance of the SPIs where required.
c) The process of monitoring the performance of these SPIs including remedial action procedure whenever unacceptable or abnormal trends are triggered.
d) Any other supplementary SMS or safety performance monitoring and measurement criteria or process.

Cross Reference Documents

10. Safety-related Investigations and Remedial Actions

Objective

Describe how accidents/incidents/ occurrences are investigated and processed within the organization, including its correlation with the organization's SMS hazard identification and risk management system.

Criteria

a) Procedure to ensure that reported accidents and incidents are investigated internally.
b) Dissemination of completed investigation reports internally as well as to the CAA as applicable.
c) Process for ensuring that corrective actions taken or recommended are carried out and evaluation of their outcomes/ effectiveness.
d) Procedure on disciplinary inquiry and actions associated with investigation report outcomes.
e) Conditions under which punitive disciplinary action would be considered (e.g. illegal activity, recklessness, gross negligence or wilful misconduct) are clearly defined.
f) Process to ensure that investigations include identification of active failures as well as contributing factors and hazards.
g) Investigation procedure and format provides for findings on contributing factors or hazards to be processed for follow-up action by the organization's hazard identification and risk management system where appropriate.

Cross Reference Documents

11. Safety Training and Communication

Objective

Describe the type of SMS and other safety related training that staff receives and the process for assuring the effectiveness of the training. Describe how such training procedures are documented. Describe the safety communication processes/ channels within the organization.

Criteria

a) Training syllabus, eligibility and requirements are documented.
b) There is a validation process that measures the effectiveness of training.
c) The training includes initial, recurrent and update training, where applicable.
d) The organization's SMS training is part of the organization's overall training program.
e) SMS awareness is incorporated into the employment or indoctrination program
f) Safety communication processes/ channels within the organization

Cross Reference Documents

12. Continuous Improvement and SMS Audit

Objective

Describe the process for continuous improvement and review of the SMS.

Criteria

a) Process for regular internal audit/ review of the organization's SMS to ensure its continuing suitability, adequacy and effectiveness.
b) Describe any other programs contributing to continuous improvement of the organization's SMS and safety performance eg MEDA, safety surveys, ISO systems, etc.

Cross Reference Documents

13. SMS Records Management

Objective

Describe the method of storing all SMS related records and documents.

Criteria

a) The organization has a SMS records or archiving system that ensures the retention of all records generated in conjunction with the implementation and operation of the SMS.
b) Records to be kept include hazard reports, risk assessments reports, Safety Action Group/Safety meeting notes, safety performance indicator charts, SMS audit reports, SMS training records, etc
c) Records should be traceable for all elements of the SMS and be accessible for routine administration of the SMS as well as internal and external audits purposes.

Cross Reference Documents

15. Management of Change

Objective

Describe the organization's process for managing changes that may have an impact on safety risks and how such processes are integrated with the SMS.

Criteria

a) Procedure to ensure that substantial organizational or operational changes do take into consideration any impact which they may have on existing safety risks.
b) Procedure to ensure that appropriate safety assessment is performed prior to introduction of new equipment or processes which have safety risks implications.
c) Procedure for review of existing safety assessments whenever there are changes to the associated process or equipment

Cross Reference Documents: *Company SOP relating to management of change, etc*

16 Emergency/ Contingency Response Plan

Objective

Describe the organization's intentions and commitment to dealing with emergency situations and their corresponding recovery controls. Outline the roles and responsibilities of key personnel. The Emergency Response Plan can be a separate document or it can be part of the SMS manual.

Criteria (as applicable to the organization)

a) The organization has an emergency plan that outlines roles and responsibilities in the event of a major incident, crisis or accident
b) There is a notification process that includes an emergency call list and an internal mobilization process
c) The organization has arrangements with other agencies for aid and the provision of emergency services as applicable.
d) The organization has procedures for emergency mode operations where applicable.
e) There is a procedure for overseeing the welfare of all affected individuals and for notifying next of kin.
f) The organization has established procedures for handling media and insurance related issues.
g) There are defined accident investigation responsibilities within the organization.
h) The requirement for preservation of evidence, securing affected area and mandatory/ governmental reporting is clearly stated.
i) There is emergency preparedness and response training for affected personnel
j) A disabled aircraft or equipment evacuation plan is developed by the organization in consultation with aircraft/ equipment owners, aerodrome operators or other agencies as applicable.
k) A procedure exists for recording activities during an emergency response.

Cross Reference Documents: *ERP manual, etc*

Appendix 4 - EMERGENCY RESPONSE PLANNING

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

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

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

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

a) delegation of emergency authority;
b) assignment of emergency responsibilities;
c) documentation of emergency procedures and processes;
d) coordination of emergency efforts internally and with external parties;
e) safe continuation of essential operations, while the crisis is being managed;
f) proactive identification of all possible emergency events/ scenarios and their corresponding mitigation actions; etc

5 To be effective, an ERP should:

a) be appropriate to the size, nature and complexity of the organization;
b) be readily accessible to all relevant personnel and other organizations where applicable;
b) include checklists and procedures relevant to different or specific emergency situations;
c) have quick reference contact details of relevant personnel;
c) be regularly tested through exercises;
d) periodically reviewed and updated when details change, etc

6 ERP Contents

An emergency response plan (ERP) would normally be documented in the format of a manual. It should set out the responsibilities and roles and actions for the various agencies and personnel involved in dealing with specific emergencies. An ERP should take account of such considerations as:

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

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

1) designating who will lead and who will be assigned to the response teams;
2) defining the roles and responsibilities for personnel assigned to the response teams;
3) clarifying the reporting lines of authority;
4) setting up aemergency management centre (EMC);
5) establishing procedures for receiving a large number of requests for information, especially during the first few days after a major accident;
6) designating the corporate spokesperson for dealing with the media;
7) defining what resources will be available, including financial authorities for immediate activities;
8) designating the company representative to any formal investigations undertaken by State officials;
9) defining a call-out plan for key personnel, etc.

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

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

1) management;
2) State authorities (search and rescue, regulatory authority, accident investigation board, etc.);
3) local emergency response services (aerodrome authorities, fire fighters, police, ambulances, medical agencies, etc.);
4) relatives of victims (a sensitive issue that, in many States, is handled by the police);
5) company personnel;
6) media; and
7) legal, accounting, insurers, etc.

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

1) Who should lead the initial response team?
2) Who should be included on the initial response team?
3) Who should speak for the organization at the accident site?
4) What would be required by way of special equipment, clothing, documentation, transportation, accommodation, etc.?

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

1) acting as passengers or customers in exercises;
2) handling survivors or external parties;
3) dealing with next of kin, authorities, etc.

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

1) staffing (perhaps for 24 hours a day, 7 days per week, during the initial response period);
2) communications equipment (telephones, fax, Internet, etc.);
3) documentation requirements, maintenance of emergency activity logs;
4) impounding related company records;
5) office furnishings and supplies; and
6) reference documents (such as emergency response checklists and procedures, company manuals, aerodrome emergency plans and telephone lists).

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

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

1) all relevant records about the concerned product or service;
2) lists of points of contact and any personnel associated with the occurrence;
3) notes of any interviews (and statements) with anyone associated with the event;
4) any photographic or other evidence.

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

1) nominating a senior company representative at the accident site if:
   — at home base;
   — away from home base;
   — offshore or in a foreign State.
2) management of surviving victims;
3) needs of relatives of victims;
4) security of wreckage;
5) handling of human remains and personal property of the deceased;
6) preservation of evidence;
7) provision of assistance (as required) to the investigation authorities;
8) removal and disposal of wreckage; etc.

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

1) what information is protected by statute (FDR data, CVR and ATC recordings, witness statements etc.);
2) who may speak on behalf of the parent organization at head office and at the accident site (public relations manager, chief executive officer or other senior executive, manager, owner);
3) direction regarding a prepared statement for immediate response to media queries;
4) what information may be released (what should be avoided);
5) the timing and content of the company's initial statement;
6) provisions for regular updates to the media.

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

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

1) State requirements for the provision of assistance services;
2) travel and accommodation arrangements to visit the crisis site;
3) programme coordinator and point(s) of contact for victims/ customers;
4) provision of up-to-date information;
5) temporary assistance to victims or customers;

ICAO Circular 285, Guidance on Assistance to Aircraft Accident Victims and Their Families, provides further guidance on this subject.

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

7. CHECKLISTS

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

a) reviewed and updated (for example, currency of call-out lists and contact details); and
b) tested through realistic exercises.

8. TRAINING AND EXERCISES

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

Appendix 5 - RELATED ICAO GUIDANCE MATERIAL

MANUALS

Advanced Surface Movement Guidance and Control Systems (A-SMGCS) Manual (Doc 9830)
Airport Services Manual (Doc 9137)
- *Part 1 – Rescue and Fire Fighting*
- *Part 5 – Disabled Aircraft Removal*
- *Part 7 – Airport Emergency Planning*

Airworthiness Manual (Doc 9760)
Global Air Navigation Plan (Doc 9750)
Global Air Traffic Management Operational Concept (Doc 9854)
Human Factors Guidelines for Aircraft Maintenance Manual (Doc 9824)
Human Factors Guidelines for Air Traffic Management (ATM) Systems (Doc 9758)
Human Factors Guidelines for Safety Audits Manual (Doc 9806)
Human Factors Training Manual (Doc 9683)
Line Operations Safety Audit (LOSA) (Doc 9803)
Manual Concerning Interception of Civil Aircraft (Doc 9433)
Manual Concerning Safety Measures Relating to Military Activities Potentially Hazardous to Civil Aircraft Operations (Doc 9554)
Manual of Aircraft Accident and Incident Investigation (Doc 9756)
- Part I — *Organization and Planning*
- Part II — *Procedures and Checklists*
- Part III — *Investigation*
- Part IV — *Reporting*

Manual of Aircraft Ground De-icing/Anti-icing Operations (Doc 9640)
Manual of All-Weather Operations (Doc 9365)
Manual of Civil Aviation Medicine (Doc 8984)
*Manual of Procedures for Operations Inspection, Certification and Continued Surveillance (*Doc 8335)
Manual of Radiotelephony (Doc 9432)
Manual on Airspace Planning Methodology for the Determination of Separation Minima (Doc 9689)
Manual on Air Traffic Management System Requirements (Doc 9882)
Manual on Certification of Aerodromes (Doc 9774)
Manual on Global Performance of the Air Navigation System (Doc 9883)
Manual on ICAO Bird Strike Information Systems (IBIS) (Doc 9332)
Manual on Implementation of a 300 m (1 000 ft) Reduced Vertical Separation Minimum Between FL 290 and FL 410 Inclusive (Doc 9574)
Manual on Regional Accident & Incident Investigation (Doc 9946)
Manual on Required Communication Performance (RCP) (Doc 9869)
Manual on Simultaneous Operations on Parallel or Near-Parallel Instrument Runways (SOIR) (Doc 9643)
Manual of Surface Movement Guidance and Control Systems (SMGCS) (Doc 9476)
Manual on the Quality Management System for the provision of Meteorological Service to International Air Navigation (Doc 9855)
Normal Operations Safety Survey (NOSS) (Doc 9910)
Performance-based Navigation Manual (Doc 9613)
Preparation of an Operations Manual (Doc 9376)
Safety Oversight Audit Manual (Doc 9735)
Safety Oversight Manual (Doc 9734)

CIRCULARS

Assessment of ADS-B to Support Air Traffic Services and Guidelines for Implementation (Cir 311)
A Unified Framework for Collision Risk Modelling in Support of the Manual on Airspace Planning Methodology *with further applications* (Cir 319)[1]
Guidance on Assistance to Aircraft Accident Victims and Their Families (Cir 285)
Hazards at Aircraft Accident Sites (Cir 315)
Human Factors Digest No 15 — Human Factors in Cabin Safety (Cir 300)
Human Factors Digest No. 16 — Cross-cultural Factors in Aviation Safety (Cir 302)
Human Factors Digest No. 17 — Threat and Error Management (TEM) in Air Traffic Control (Cir 314)
Operation of New Larger Aeroplanes at Existing Aerodromes (Cir 305)
Training Guidelines for Aircraft Accident Investigators (Cir 298)

Table A1-A4: Safety Performance Indicator (SPI) Examples

Examples of SMS safety performance indicators (SPIs) are reflected on right hand side of this Table A. The corresponding alert and target level criteria for each indicator are to be accounted for as shown. The SSP safety performance indicators on the left hand side of the Table are shown to indicate the necessary correlation between the SMS and SSP safety indicators. SMS SPIs should be developed by product and service providers in consultation with their respective State regulatory organizations. Their proposed SPIs will need to be congruent with the State's SSP safety indicators, hence necessary agreement/ acceptance should be obtained.

Table B: Example of SMS Safety Performance Indicator Chart

This is an example of how a high consequence SMS safety performance indicator chart can look like. In this case it is an airline operator's reportable/ mandatory incidents rate. The chart on the left is the preceding year's performance, whilst the right is the current year's on-going data updates. The alert level setting is based on basic safety metrics standard deviation criteria. The Excel spread sheet formula is "=STDEVP". For purpose of manual Standard Deviation calculation, the formula is:

$$\sigma = \sqrt{\frac{\sum X^2}{N} - \mu^2}$$

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

The target setting is a desired percentage improvement (in this case 5%) over the previous year's data points average. This chart is generated by the data sheet as shown in Table C.

Table C: Data Sheet for Sample Safety Performance Indicator Chart

This data sheet is used to generate the safety performance indicator chart as shown in Table B. The same can be used to generate any other safety performance indicator with the appropriate data entry and safety performance indicator descriptor amendment.

Table D: Example of SMS Performance Summary

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

High Consequence Indicators-
Alert level Not Breached [Yes (4), No (0)]
Target Achieved [Yes (3), No (0)]

Lower Consequence Indicators-
Alert level Not Breached [Yes (2), No (0)]
Target Achieved [Yes (1), No (0)]

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

TABLE A-1: Safety Performance Indicator Examples (Air Operators)

SSP Safety Indicators (Aggregate State)						**SMS** Safety Performance Indicators (Individual Service Provider)					
High Consequence Indicators (Occurrence/ Outcome-based)			**Lower Consequence** Indicators (Event/ Activity-based)			**High Consequence** Indicators (Occurrence/ Outcome-based)			**Lower Consequence** Indicators (Event/ Activity-based)		
Safety Indicator	Alert level criteria	Target level criteria	**Safety Indicator**	Alert level criteria	Target level criteria	**Safety Performance Indicator**	Alert level criteria	Target level criteria	**Safety Performance Indicator**	Alert level criteria	Target level criteria
Air Operators (Air Operators of the State only)											
CAA aggregate Air Operators monthly/ quarterly accident/ serious incident rate (eg per 1000FH)	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.	CAA aggregate Air Operator annual surveillance Audit LEI% or findings rate (findings per audit)	Consideration	Consideration	Air Operator Individual Fleet monthly serious incident rate (eg per 1000FH)	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.	Operator Combined Fleet monthly Incident rate (eg per 1000FH)	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.
CAA aggregate Air Operators quarterly Engine IFSD incident rate (eg per 1000 FH)	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.	CAA aggregate Air Operator annual Line Station Inspection LEI% or findings rate (findings per inspection)	Consideration	Consideration	Air Operator Combined Fleet monthly serious incident rate (eg per 1000FH)	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.	Operator Internal QMS/ SMS annual audit LEI% or findings rate (findings per audit)	Consideration	Consideration
			CAA annual Foreign Air Operators Ramp surveillance inspection Ave LEI% (for each Foreign Operator).	Consideration	Consideration	Air Operator Engine IFSD incident rate (eg per 1000 FH)	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.	Operator Voluntary Hazard reports rate [eg per 1000 FH]	Consideration	Consideration
			CAA aggregate Operators' DGR incident reports rate [eg per 1000 FH]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.				Operator DGR incident reports rate [eg per 1000 FH]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.
ETC											

TABLE A-2: Safety Performance Indicator Examples (Aerodrome Operators)

SSP Safety Indicators (Aggregate State)						**SMS** Safety Performance Indicators (Individual Service Provider)					
High Consequence Indicators (Occurrence/ Outcome-based)			**Lower Consequence** Indicators (Event/ Activity-based)			**High Consequence** Indicators (Occurrence/ Outcome-based)			**Lower Consequence** Indicators (Event/ Activity-based)		
Safety Indicator	Alert level criteria	Target level criteria	**Safety Indicator**	Alert level criteria	Target level criteria	**Safety Performance Indicator**	Alert level criteria	Target level criteria	**Safety Performance Indicator**	Alert level criteria	Target level criteria
Aerodrome Operators											
CAA aggregate aerodromes monthly/ quarterly ground accident/ serious incidents rate - involving any aircraft [eg per 10,000 ground movements]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.	CAA aggregate Aerodrome Operators annual surveillance Audit LEI% or findings rate (findings per audit)	Consideration	Consideration	Aerodrome Operator quarterly ground accident/ serious incident rate - involving any aircraft [eg per 10,000 ground movements]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.	Aerodrome Operator Internal QMS annual audit LEI% or findings rate (findings per audit)	Consideration	Consideration
CAA aggregate aerodromes monthly/ quarterly Runway Excursion incidents rate - involving any aircraft [eg per 10,000 departures]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.				Aerodromes Operator quarterly Runway Excursion incidents rate - involving any aircraft [eg per 10,000 departures]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.	Aerodrome Operator quarterly Runway Foreign Object Report (FOR) rate [eg per 10,000 ground movements]	Consideration	Consideration
CAA aggregate aerodromes monthly/ quarterly Runway Incursion incidents rate - involving any aircraft [eg per 10,000 departures]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.				Aerodromes Operator quarterly Runway Incursion incidents rate - involving any aircraft [eg per 10,000 departures]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.	Operator Voluntary Hazard reports rate [per operational personnel per quarter]	Consideration	Consideration
									Aerodrome Operator quarterly aircraft ground Foreign Object Damage (FOD) incident report rate - involving damage to aircraft [eg per 10,000 ground movements]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.
ETC											

TABLE A-3: Safety Performance Indicator Examples (ATS Operators)

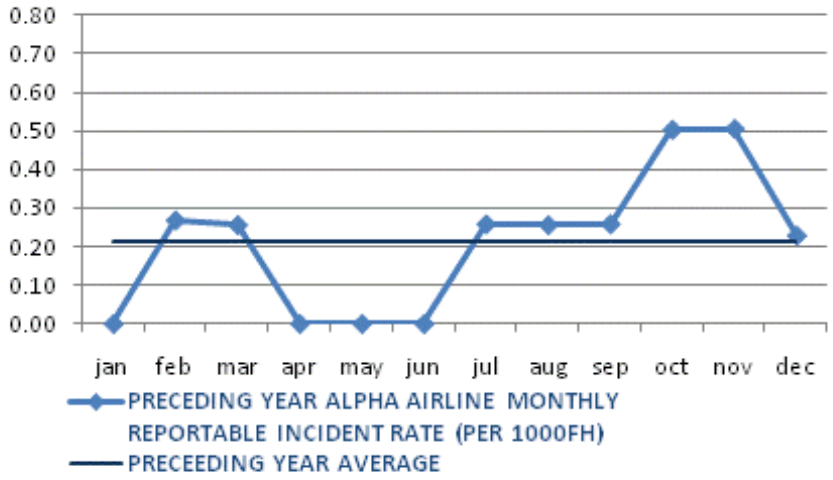
SSP Safety Indicators (Aggregate State)						**SMS** Safety Performance Indicators (Individual Service Provider)					
High Consequence Indicators (Occurrence/ Outcome-based)			**Lower Consequence** Indicators (Event/ Activity-based)			**High Consequence** Indicators (Occurrence/ Outcome-based)			**Lower Consequence** Indicators (Event/ Activity-based)		
Safety Indicator	**Alert level criteria**	**Target level criteria**	**Safety Indicator**	**Alert level criteria**	**Target level criteria**	**Safety Performance Indicator**	**Alert level criteria**	**Target level criteria**	**Safety Performance Indicator**	**Alert level criteria**	**Target level criteria**
ATS Operators											
CAA aggregate ATS quarterly FIR (airspace) serious incidents rate - involving any aircraft [eg per 100,000 flight movements]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.	CAA aggregate ATS quarterly FIR TCAS RA incidents rate - involving any aircraft [eg per 100,000 flight movements]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.	ATS operator quarterly FIR serious incidents rate - involving any aircraft [eg per 100,000 flight movements]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.	ATS Operator quarterly FIR TCAS RA incidents rate - involving any aircraft [eg per 100,000 flight movements]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.
			CAA aggregate ATS quarterly FIR Level Bust (LOS) incident rate - involving any aircraft [eg per 100,000 flight movements]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.	ATS operator quarterly/ annual near miss incident rate [eg per 100,000 flight movements]	Assume historical annual Ave rate is 3, possible Alert rate could be 5.	Assume historical annual Ave rate is 3, possible Target rate could be 2.	ATS Operator quarterly FIR Level Bust (LOS) incident rate - involving any aircraft [eg per 100,000 flight movements]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.
			CAA aggregate ATS Operators annual surveillance Audit LEI% or findings rate (findings per audit)	Consideration	Consideration				ATS Operator Internal QMS annual audit LEI% or findings rate (findings per audit)	Consideration	Consideration
ETC											

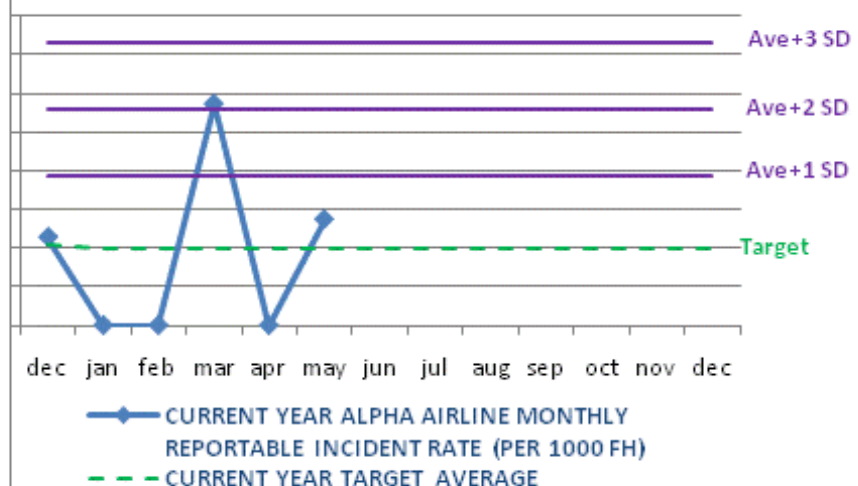
TABLE A-4: Safety Performance Indicator Examples (Maintenance/ Production/ Design Organizations)

SSP Safety Indicators (Aggregate State)						**SMS** Safety Performance Indicators (Individual Service Provider)					
High Consequence Indicators (Occurrence/ Outcome-based)			**Lower Consequence** Indicators (Event/ Activity-based)			**High Consequence** Indicators (Occurrence/ Outcome-based)			**Lower Consequence** Indicators (Event/ Activity-based)		
Safety Indicator	Alert level criteria	Target level criteria	**Safety Indicator**	Alert level criteria	Target level criteria	**Safety Performance Indicator**	Alert level criteria	Target level criteria	**Safety Performance Indicator**	Alert level criteria	Target level criteria
POA/DOA/MRO Organizations											
CAA aggregate MRO quarterly Mandatory Defect Reports (MDR) received	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.	CAA aggregate MRO/ POA/ DOA annual surveillance Audit LEI% or findings rate (findings per audit)	Consideration	Consideration	MRO/ POA quarterly rate of component technical warranty claims.	Ave + 1/2/3 SD. (annual or 2 yearly reset)	__% (eg 5%) improvement between each annual Mean Rate.	MRO/ POA/ DOA Internal QMS annual audit LEI% or findings rate (findings per audit).	Consideration	Consideration
CAA aggregate POA/ DOA quarterly rate of operational products which are subject of Airworthiness Directives (ADs) [per product line]	Consideration	Consideration				MRO/ POA quarterly rate of component Mandatory/ Major Defect Reports raised.	Consideration	Consideration	MRO/ POA/ DOA quarterly final inspection/ testing failure/ rejection rate	Consideration	Consideration
									MRO/ POA/ DOA Voluntary Hazard reports rate [per operational personnel per quarter]	Consideration	Consideration
ETC											

TABLE B: Example of SMS Safety Performance Indicator Chart (Air Operator)

SMS High Consequence Safety Indicator Example (with Alert and Target Setting Criteria)





A) **Alert Level Setting:**

Alert level for a new monitoring period (current year) is based on the preceding period's performance (preceding year), namely its data points Average & Std Deviation. The 3 alert lines are Ave+1SD, Ave+2SD and Ave+3SD

B) **Alert Level Trigger:**

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

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

C) **Target Level Setting (Planned Improvement):**

Target setting may be less structured than Alert level setting - eg target the new (current year) monitoring period's Ave rate to be say 5% lower (better) than the preceding period's Ave value.

D) **Target Achievement:**

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

E) **Alert & Target Levels - Validity Period:**

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

TABLE C: Data Sheet for Sample Safety Performance Indicator Chart (Air Operator)

SMS High Consequence Safety Indicator Example (with Alert and Target Setting Criteria)

Preceding Year				
Mth	Alpha Airline Total FH	No of reportable/ MOR Incidents	Incident Rate*	Ave
jan	3,992	-	0.00	0.21
feb	3,727	1.00	0.27	0.21
mar	3,900	1.00	0.26	0.21
apr	3,870	-	0.00	0.21
may	3,976	-	0.00	0.21
jun	3,809	-	0.00	0.21
jul	3,870	1.00	0.26	0.21
aug	3,904	1.00	0.26	0.21
sep	3,864	1.00	0.26	0.21
oct	3,973	2.00	0.50	0.21
nov	3,955	2.00	0.51	0.21
dec	4,369	1.00	0.23	0.21
		Ave	0.21	
		SD	0.18	

** Rate Calculation:(per 1000 FH)*

Ave+1SD	Ave+2SD	Ave+3SD
0.39	0.57	0.76

Current year							
Mth	Alpha Airline Total FH	No of reportable/ MOR Incidents	Incident Rate*	Preceding Year Ave +1SD	Preceding Year Ave +2SD	Preceding Year Ave +3SD	Current Year Target Average
dec	4369	1.00	0.23	0.39	0.57	0.76	0.21
jan	4090	0.00	0.00	0.39	0.57	0.76	0.20
feb	3316	0	0.00	0.39	0.57	0.76	0.20
mar	3482	2	0.57	0.39	0.57	0.76	0.20
apr	3549	0	0.00	0.39	0.57	0.76	0.20
may	3633	1	0.28	0.39	0.57	0.76	0.20
jun				0.39	0.57	0.76	0.20
jul				0.39	0.57	0.76	0.20
aug				0.39	0.57	0.76	0.20
sep				0.39	0.57	0.76	0.20
oct				0.39	0.57	0.76	0.20
nov				0.39	0.57	0.76	0.20
dec				0.39	0.57	0.76	0.20
		Ave					
		SD					

** Rate Calculation:(per 1000 FH)*

Current Year Alert Level setting criteria is based on Preceding Year [Ave + 1/2/3 SD]

Current Year Target is say 5% Ave rate improvement over the Ave rate for the preceding year, which is: **0.20**

TABLE D

Example: Alpha Airline SMS Safety Performance Measurement (say for Year 2010)

High Consequence Safety Performance Indicators					
	Safety Performance Indicator (SI) Description	SPI Alert Level/ Criteria (for 2010)	Alert level Not Breached [Yes/ No]	SPI Target level/ criteria (for 2010)	Target Achieved [Yes/ No]
1	Alpha Airline A320 Fleet monthly serious incident rate (eg per 1000FH)	Ave + 1/2/3 SD. (annual or 2 yearly reset)	Y	5 % improvement of the 2010 Average Rate over the 2009 Average Rate.	N
2	Alpha Airline A320 Fleet Engine IFSD incident rate (eg per 1000 FH)	Ave + 1/2/3 SD. (annual or 2 yearly reset)	Y	3 % improvement of the 2010 Average Rate over the 2009 Average Rate.	Y
3	ETC				

Lower Consequence Safety Indicators					
	Safety Indicator (SI) Description	SI Alert Level/ Criteria (for 2010)	Alert level Not Breached [Yes/ No]	SI Target level/ criteria (for 2010)	Target Achieved [Yes/ No]
1	Operator Combined Fleet monthly Incident rate (eg per 1000FH)	Ave + 1/2/3 SD. (annual or 2 yearly reset)	Y	5 % improvement of the 2010 Average Rate over the 2009 Average Rate.	N
2	Operator Internal QMS annual audit LEI% or findings rate (findings per audit)	>25% Average LEI; OR any level 1 finding; OR >5 level2 findings per audit	Y	5 % improvement of the 2010 Average Rate over the 2009 Average Rate.	Y
3	Operator Voluntary Hazard reports rate [eg per 1000 FH]	TBD		TBD	
4	Operator DGR incident reports rate [eg per 1000 FH]	Ave + 1/2/3 SD. (annual or 2 yearly reset)	N	5 % improvement of the 2010 Average Rate over the 2009 Average Rate.	Y
	ETC				

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

Note 2: Selection of Indicators & Settings - The combination (or package) of High and Lower Consequence Safety Indicators is to be selected by an organization according to the scope of their organization system. For those Indicators where the suggested Alert or Target levels setting criteria is not applicable, the organization may consider alternate criteria as appropriate. General guidance is to set Alerts and Targets that take into consideration recent historical or current performance.

Appendix 7 - VOLUNTARY & CONFIDENTIAL REPORTING SYSTEM

Below guidance is based on the example of an integrated air operator and maintenance organization. For other service provider organization types, this guidance material may be customised as necessary.

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

1) Objective of the reporting system

Example-

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

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

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

2) Scope of aviation sectors/ areas covered by the system

Example-

The [Name of system] covers areas such as:

h. Flight Operations
i. Hangar Aircraft Maintenance:
j. Workshop Component Maintenance
k. Technical Fleet Management
l. Inventory Technical Management
m. Engineering Planning
n. Technical Services
o. Technical Records
p. Line Maintenance
q. etc

3) Who can make a voluntary report

Example-

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

i) Flight and cabin crew members
j) Air traffic controllers
k) Licensed aircraft engineers, technicians or mechanics
l) Employees of maintenance, design and manufacturing organizations
m) Airport ground handling operators
n) Aerodrome employees
o) General aviation personnel
p) Etc

4) When to make such a report

Example-

You should make a report when:

- *You wish for others to learn and benefit from the incident or hazard but are concerned about protecting your identity.*
- *There is no other appropriate reporting procedure or channel.*
- *You have tried other reporting procedure or channel without the issue having been addressed.*

5) How are Reports processed

Example-

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

When the Manager is satisfied that the information obtained is complete and coherent, he will de-identify the information and enter the data into the [Name of system] database. Should there be a need to seek inputs from any third party, only the de-identified data will be used.

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

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

<u>Safety Information Sharing within the Company and the Aviation Community</u>

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

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

6) Contacting the [Name of system] Manager

Example-

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

[Name of system] Manager	*Alternate Manager*
Mr ABC	*Mr XYZ*
Tel:xxxxxxxxxxx	*Tel:xxxxxxxxxxxx*

Appendix 8 - ELECTRONIC SIGNATURE

NOTE: Appendix 8 consists of extracts from Federal Aviation Administration (FAA) Advisory Circular AC No: 120-78 "Acceptance and Use of Electronic Signatures, Electronic Recordkeeping Systems, and Electronic Manuals", dated 10/29/02.[3]

It should be understood that the information below is merely illustrative, and is not intended to be restrictive in any way. This Appendix is not intended to be taken or used as the sole set of information needed for the use of electronic signatures. Nothing in this Appendix shall affect the right of Contracting States to develop and/or use their own material on electronic signatures.

1. What is the purpose of this advisory circular (AC)?

a. This AC is not mandatory and does not constitute a regulation. This AC provides guidance on the acceptance and use of electronic signatures to satisfy certain operational and maintenance requirements. This AC also provides guidance on the acceptability of electronic recordkeeping systems and electronic maintenance manuals, including inspection procedures manuals, quality assurance, operations manuals, and training manuals required by Title 14 of the Code of Federal Regulations (14 CFR)…

b. This AC describes an acceptable means, but not the only means, of complying with the FAA's operational and maintenance requirements. Specifically, handwritten signatures, records and mechanic's stamps continue to be acceptable. However, if you use the electronic means described in the AC, you must conform to it in all important respects.

2. Who does this AC apply to?

- Air carriers under 14 CFR parts 121, 129, or 135
- Operators under 14 CFR parts 91, 125, 133, or 137
- Persons performing airmen certification under 14 CFR parts 61, 63, 65, 141, and 142
- Individuals performing maintenance or preventive maintenance under 14 CFR part 43
- Repair stations under 14 CFR part 145
- Aviation maintenance technical schools under 14 CFR part 147

3. Definitions

d. Digital Signature. Cryptographically generated data that identifies a document's signatory (signer) and certifies that the document has not been altered. Digital signature technology is the foundation of a variety of security, electronic business, and electronic commerce products. This technology is based on public/private key cryptography, digital signature technology used in secure messaging, public key infrastructure (PKI), virtual private network (VPN), web standards for secure transactions, and electronic digital signatures.

e. Electronic Signature. The online equivalent of a handwritten signature. It is an electronic sound, symbol, or process attached to or logically associated with a contract or other record and executed or adopted by an individual. It electronically identifies and authenticates an individual entering, verifying, or auditing computer-based records. An electronic signature combines cryptographic functions of digital signatures with the image of an individual's handwritten signature or some other visible mark considered acceptable in a traditional signing process. It authenticates data with a hash algorithm and provides permanent, secure user-authentication.

5. What is an acceptable electronic signature?

[3] Full text of the FAA AC No: 120-78 can be found on FAA website:
http://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/23224

a. General. Before recent changes to permit the use of electronic signatures, handwritten signatures were used on any required record, record entry, or document. The electronic signature's purpose is identical to that of a handwritten signature or any other form of signature currently accepted by the FAA. The handwritten signature is universally accepted because it has certain qualities and attributes (e.g., subparagraph c(4)(d) below concerning employee termination) that should be preserved in any electronic signature. Therefore, an electronic signature should possess those qualities and attributes that guarantee a handwritten signature's authenticity.

b. Forms of Electronic Signatures.

(1) An electronic signature may be in the following forms.

- A digital signature
- A digitized image of a paper signature
- A typed notation
- An electronic code
- Any other unique form of individual identification that can be used as a means of authenticating a record, record entry, or document

(2) Not all identifying information found in an electronic system may constitute a signature. For example, the entry of an individual's name in an electronic system may not constitute an electronic signature. Other guarantees equal to those of a handwritten signature should be provided.

c. Attributes of an Acceptable Electronic Signature. First and foremost, an electronic signature must be part of a well-designed program. This program should, at a minimum, consider the following.

(1) Uniqueness. An electronic signature should retain those qualities of a handwritten signature that guarantee its uniqueness. A signature should identify a specific individual and be difficult to duplicate. A unique signature provides evidence that an individual agrees with a statement. An electronic system cannot provide a unique identification with reasonable certainty unless the identification is difficult for an unauthorized individual to duplicate….

(2) Significance. An individual using an electronic signature should take deliberate and recognizable action to affix his or her signature. Acceptable, deliberate actions for creating a digital electronic signature include, but are not limited to, the following:

- Badge swipes
- Signing an electronic document with a stylus
- Typing specific keystrokes
- Using a digital signature

(3) Scope. The scope of information being affirmed with an electronic signature should be clear to the signatory and to subsequent readers of the record, record entry, or document. Handwritten documents place the signature close to the information to identify those items attested to by a signature. However, electronic documents may not position a signature in the same way. It is therefore important to clearly identify the specific sections of a record or document that are affirmed by a signature from those sections that are not. Acceptable methods of marking the affected areas include, but are not limited to, highlighting, contrast inversion, or the use of borders or flashing characters. Additionally, the system should notify the signatory that the signature has been affixed…

(4) Signature Security. The security of an individual's handwritten signature is maintained by ensuring that it is difficult for another individual to duplicate or alter it. An electronic signature should maintain an equivalent level of security. An electronic system that produces signatures should restrict other individuals from affixing another individual's signature to a record, record entry, or document…

(5) Non-repudiation. An electronic signature should prevent a signatory from denying that he or she affixed a signature to a specific record, record entry, or document. The more difficult it is to duplicate a signature, the likelier the signature was created by the signatory. The system's security features that make it difficult for others to duplicate signatures or alter signed documents usually ensure that a signature was indeed made by the signatory….

(6) Traceability. An electronic signature should provide positive traceability to the individual who signed a record, record entry, or any other document.

d. Other Acceptable Forms of Signature/Identification. Although this AC specifically addresses electronic signatures, other types of signatures, such as a mechanic's stamp, may also be acceptable to the FAA. If identification other than a handwritten signature is used, access to that identification should be limited to the named individual only...

e. Compliance with Other Regulatory Requirements. Although the FAA now permits the use of electronic signatures to meet certain FAA operational and maintenance requirements, any computer hardware used to generate the required documents and records must continue to meet current regulatory requirements. A proper signature affixed to an improperly created document still results in a document that does not meet regulatory requirements. Methods and procedures used to generate an electronic signature must therefore meet all regulatory requirements for a recordkeeping system to be used by owners, operators, or maintenance personnel. In addition, electronic signatures should only be used to satisfy the maintenance and operational requirements relating to this AC. Electronic signatures may not be considered acceptable in other areas covered by 14 CFR having more specific applicability (i.e., legal depositions and various other applications). Although the acceptance of electronic signatures will foster the use of electronic recordkeeping systems, the FAA continues to accept paper documents to satisfy current regulatory requirements.