Doc 9859
AN/474

Safety Management Manual (SMM)

Approved by the Secretary General and published under his authority

Third Edition — 2013

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Published in separate English, Arabic, Chinese, French, Russian
and Spanish editions by the
INTERNATIONAL CIVIL AVIATION ORGANIZATION
999 University Street, Montréal, Quebec, Canada H3C 5H7

For ordering information and for a complete listing of sales agents
and booksellers, please go to the ICAO website at www.icao.int.

First edition 2006
Second edition 2009
Third edition 2013

Doc 9859, *Safety Management Manual (SMM)*
Order Number: 9859
ISBN 978-92-9249-214-4

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AMENDMENTS

Amendments are announced in the supplements to the *Catalogue of ICAO Publications;* the Catalogue and its supplements are available on the ICAO website at www.icao.int. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS		
No.	Date	Entered by

CORRIGENDA		
No.	Date	Entered by

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GLOSSARY

ACRONYMS AND ABBREVIATIONS

AD	Airworthiness directive
ADREP	Accident/incident data reporting (ICAO)
AIB	Accident investigation board
AIR	Airworthiness
ALoSP	Acceptable level of safety performance
AMAN	Abrupt manoeuvring
AME	Aircraft maintenance engineer
AMO	Approved maintenance organization`
AMS	Aircraft maintenance schedule
ANS	Air navigation service
AOC	Air operator certificate
AOG	Aircraft on ground
ASB	Alert service bulletin
ATC	Air traffic control
ATM	Air traffic management
ATS	Air traffic service(s)
CAA	Civil aviation authority
CAN	Corrective action notice
CBA	Cost-benefit analysis
CEO	Chief executive officer
CFIT	Controlled flight into terrain
Cir	Circular
CM	Condition monitoring
CMA	Continuous monitoring approach
CMC	Crisis management centre
CNS	Communications, navigation and surveillance
CP	Command post
CRM	Crew resource management
CVR	Cockpit voice recorder
D&M	Design and manufacturing
DGR	Dangerous goods regulation
DMS	Document management system
DOA	Design organization approval
Doc	Document
EAD	Emergency airworthiness directive
EC	Escalation control
ECCAIRS	European Coordination Centre for Accident and Incident Reporting Systems
EDTO	Extended diversion time operation
EF	Escalation factor
EMC	Emergency management centre

EMS	Environmental management system
ERP	Emergency response plan
FDR	Flight data recorder
FH	Flying hours
FIR	Flight information region
FL	Flight level
FMS	Financial management system
FRMS	Fatigue risk management systems
FTL	Flight time limitation
FTM	Fleet technical management
GAQ	Gap analysis questionnaire
H	Hazard
HF	Human factors
HIRA	Hazard identification and risk assessment
HIRM	Hazard identification and risk mitigation
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IFSD	In-flight shutdown
ILS	Instrument landing system
IMC	Instrument meteorological conditions
ISO	International Organization for Standardization
iSTARS	Integrated Safety Trend and Reporting System
ITM	Inventory technical management
kg	Kilogram(s)
LEI	Lack of effective implementation
LOC-I	Loss of control in flight
LOFT	Line-oriented flight training
LOS	Loss of separation
LOSA	Line operations safety audit
LRU	Line replaceable unit
LSI	Line station inspection
MCM	Maintenance control manual
MDR	Mandatory defect report
MEDA	Maintenance error decision aid
MEL	Minimum equipment list
MFF	Mixed fleet flying
MOR	Mandatory occurrence report
MPD	Maintenance planning document
MRM	Maintenance resource management
MRO	Maintenance repair organization
MSL	Mean sea level
N/A	Not applicable

OEM	Original equipment manufacturer
OHSMS	Occupational health and safety management system
OPS	Operations
ORP	Organization risk profile
OSC	Organization safety culture
OSHE	Occupational safety, health and environment
PC	Preventive control
PMI	Principal maintenance inspector
POA	Production organization approval
POI	Principal operations inspector
QA	Quality assurance
QC	Quality control
QM	Quality management
QMS	Quality management system
RAIO	Regional accident and incident investigation organization
RM	Recovery measure
RSOO	Regional safety oversight organization
SA	Safety assurance
SAG	Safety action group
SARPs	Standards and Recommended Practices (ICAO)
SB	Service bulletin
SCF-NP	System component failure — non-powerplant
SD	Standard deviation
SDCPS	Safety data collection and processing system
SeMS	Security management system
SHEL	Software/hardware/environment/liveware
SM	Safety management
SMM	Safety management manual
SMP	Safety Management Panel
SMS	Safety management system(s)
SOPs	Standard operating procedures
SPI	Safety performance indicator
SRB	Safety review board
SRC	Safety review committee
SRM	Safety risk management
SSO	Safety services office
SSP	State safety programme
STDEVP	Population standard deviation
TBD	To be determined
TOR	Terms of reference
UC	Ultimate consequence
UE	Unsafe event
USOAP	Universal Safety Oversight Audit Programme (ICAO)
WIP	Work in progress

DEFINITIONS

Note.— The following definitions were developed while new Annex 19 — Safety Management *was being drafted. Once Annex 19 becomes applicable in November 2013, if there should be any differences in the definitions, the Annex 19 definitions shall prevail.*

Acceptable level of safety performance (ALoSP). The minimum level of safety performance of civil aviation in a State, as defined in its State safety programme, 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. A 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.

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

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

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

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

Risk mitigation. The process of incorporating defences 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's or 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 predicted probability and severity of the consequences or outcomes of a hazard.

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

Chapter 1

OVERVIEW OF THE MANUAL

1.1 GENERAL

1.1.1 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.

1.1.2 This manual is intended to provide States with guidance on 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 — *Safety Management*, which was still under development at the time this third edition was published. This manual also provides guidance material for the establishment of safety management system (SMS) requirements by States as well as for SMS development and implementation by affected product and service providers.

1.1.3 It should be noted that this manual is intended to be used in conjunction with other appropriate guidance material which can be used to complement or enhance the concepts or guidance in 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 maintenance organizations, organizations responsible for type design and/or manufacture of aircraft, air traffic service providers and certified aerodromes.

1.2 OBJECTIVE

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 safety management SARPs contained in Annexes 1, 6, 8, 11, 13 and 14;

c) guidance 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 on SMS development, implementation and maintenance.

1.3 STRUCTURE

Chapter 1 presents an overview of the manual while Chapter 2 discusses the fundamental safety management concepts and processes. Chapter 3 provides a compilation of the ICAO safety management SARPs contained in Annexes 1, 6, 8, 11, 13 and 14. Finally, Chapters 4 and 5 outline a progressive approach to the development, implementation and maintenance of an SSP and an SMS. The last two chapters also contain appendices which provide practical guidance and illustrations. The Attachment to the manual provides a list of related ICAO guidance material.

Note.— In this manual, the use of the male gender should be understood to include both male and female persons.

Chapter 2

SAFETY MANAGEMENT FUNDAMENTALS

Note.— 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.

2.1 THE CONCEPT OF SAFETY

2.1.1 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."

2.1.2 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 associated 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.

2.2 THE EVOLUTION OF SAFETY

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

a) *The 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 endeavours 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.

b) *The 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 endeavours 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 2-1). 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 behaviour.

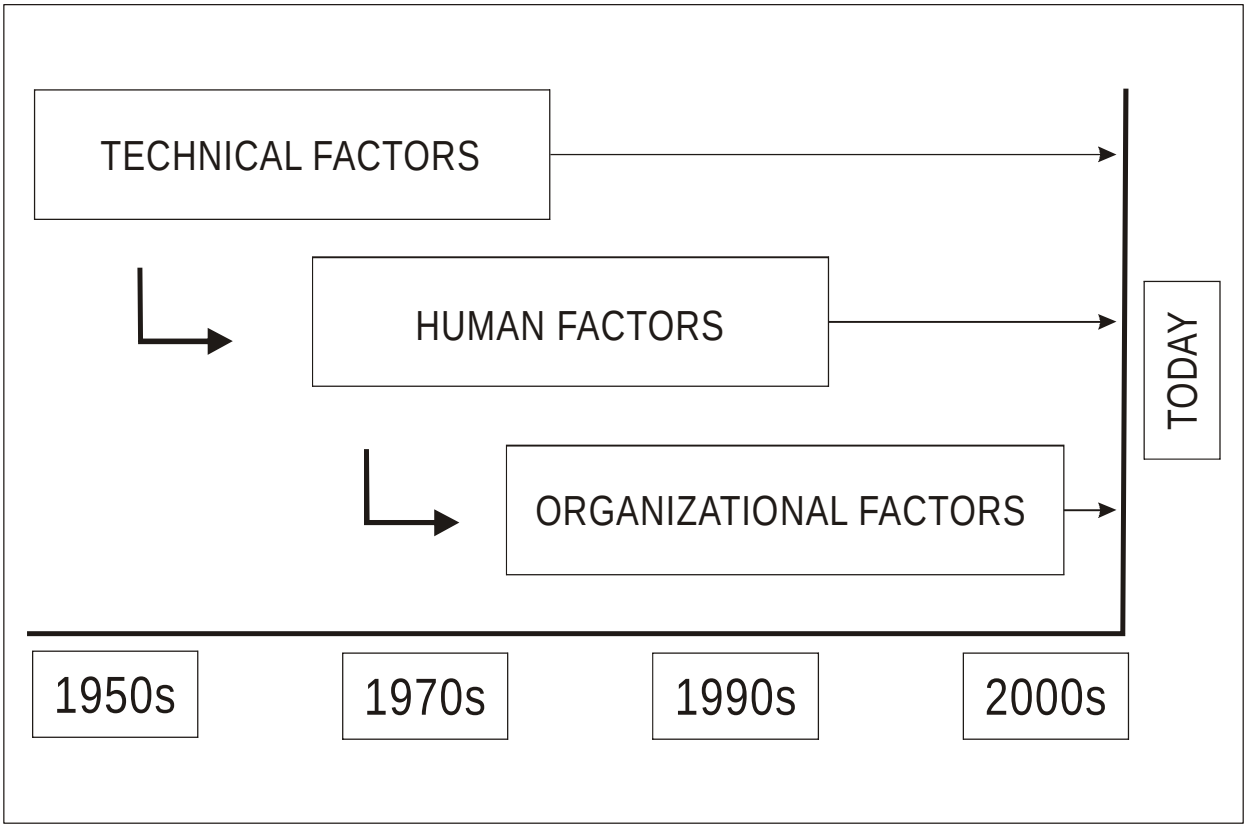


Figure 2-1. The evolution of safety

c) *The organizational era — from the mid-1990s to the present day.* During the organizational era safety began to be viewed from a systemic perspective, which was 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, which had been limited to the use of data collected through investigation of accidents and serious incidents, were 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 formulated the rationale for moving towards a safety management approach.

2.3 ACCIDENT CAUSATION

2.3.1 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 can be a delayed consequence of decisions made at the highest levels of the system, which may 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.

2.3.2 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.

2.3.3 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.

2.3.4 Figure 2-2 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.

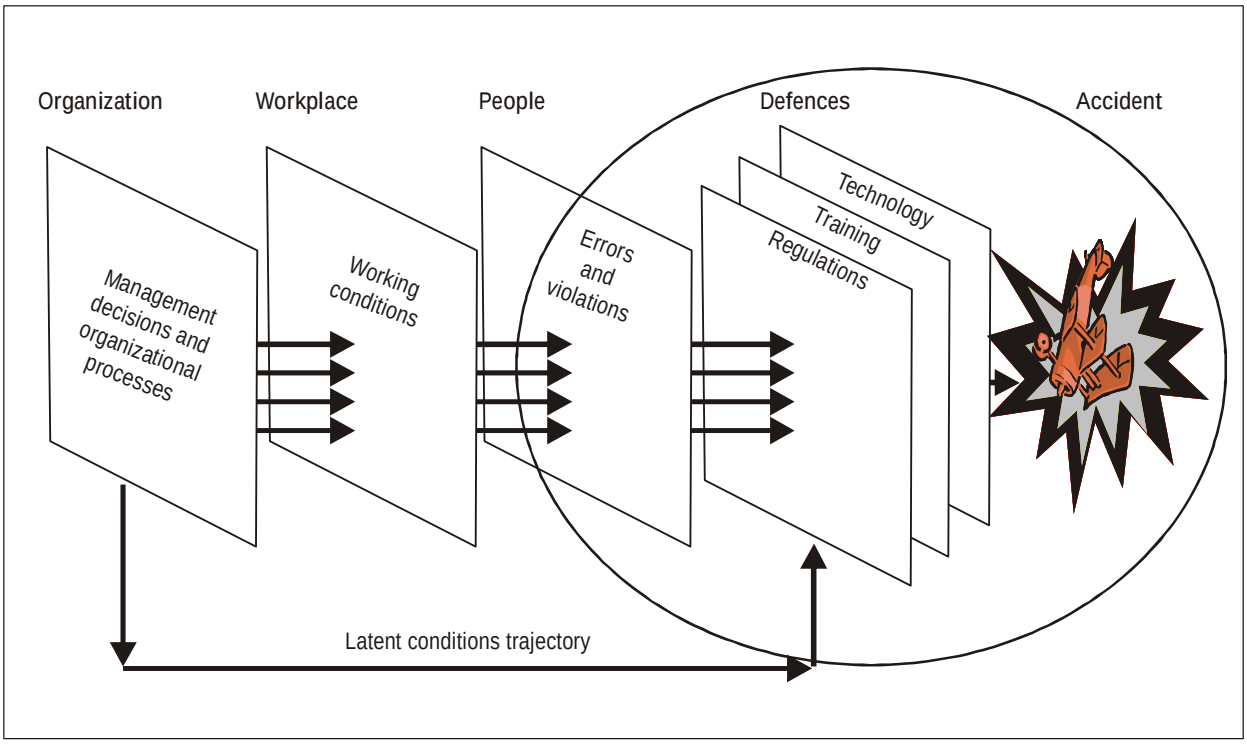


Figure 2-2. The concept of accident causation

The organizational accident

2.3.5 The notion of the organizational accident underlying Reason's Model can be best understood through a building-block approach, consisting of five blocks (Figure 2-3). 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, and supervision. 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.

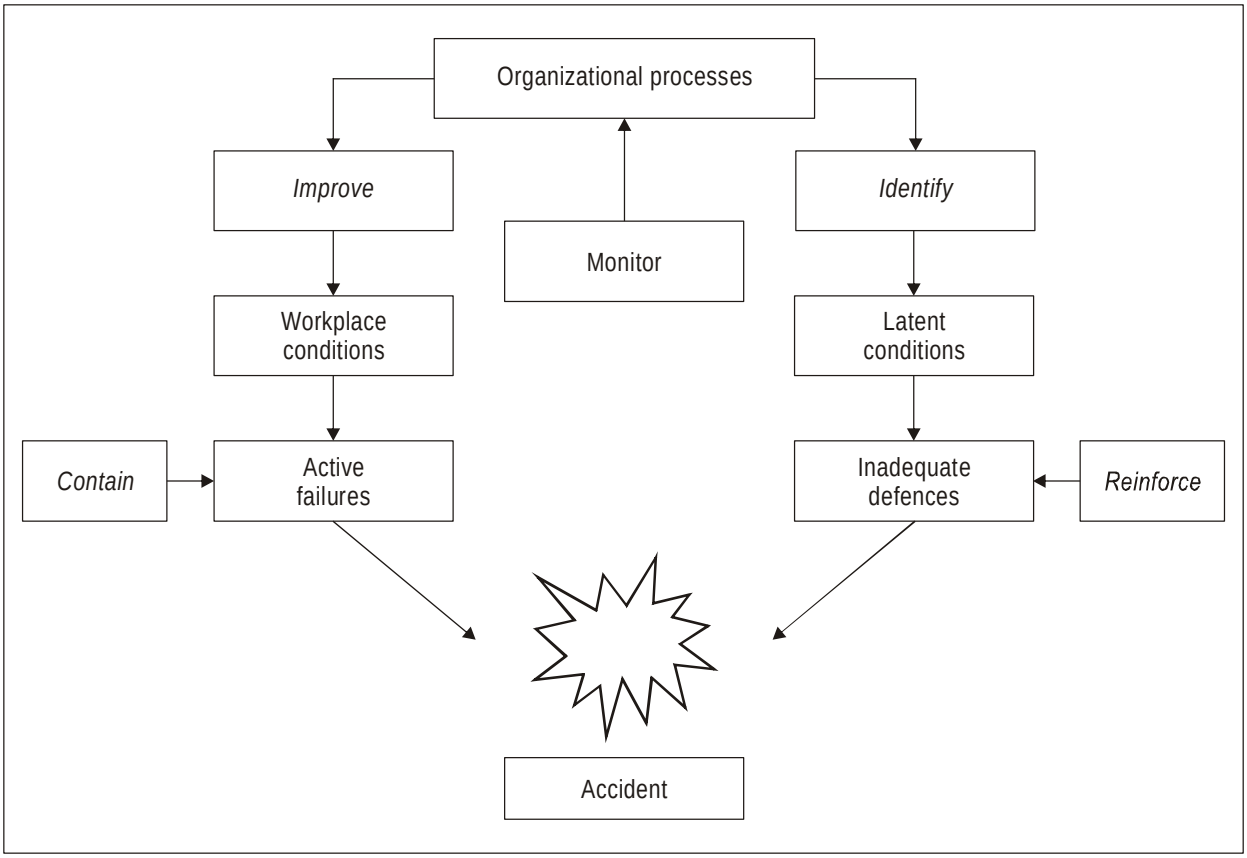


Figure 2-3 The organizational accident

2.3.6 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.

2.3.7 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.

2.3.8 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.

2.3.9 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.

2.3.10 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, while accomplishing a task, willingly deviates from rules, procedures or training received commits a violation. Thus, the basic difference between errors and violation is intent.

2.3.11 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

2.3.12 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.

2.3.13 During the early stages of system design (e.g. ATC airspace, introduction of specific equipment, expansion of a flight operation scheme), 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 2-4).

2.3.14 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.

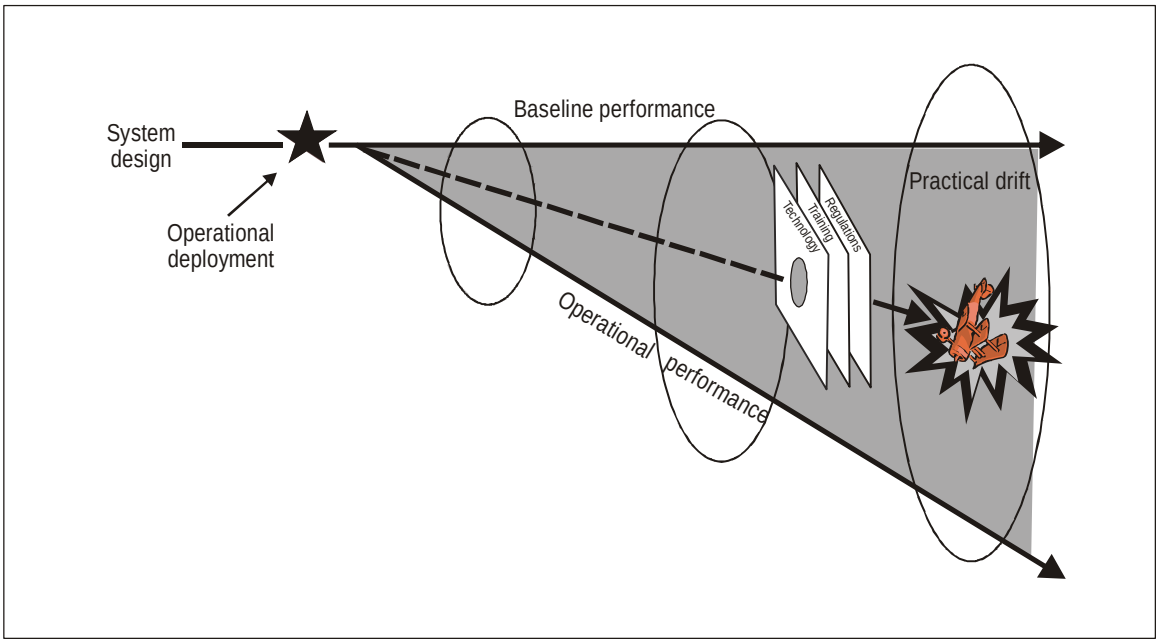


Figure 2-4. The practical drift

2.3.15 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".

2.3.16 As explained in Figure 2-4, 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 of 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.

2.4 PEOPLE, CONTEXT AND SAFETY

2.4.1 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.

2.4.2 The SHELL Model is a conceptual tool used to analyse the interaction of multiple system components. Figure 2-5 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.

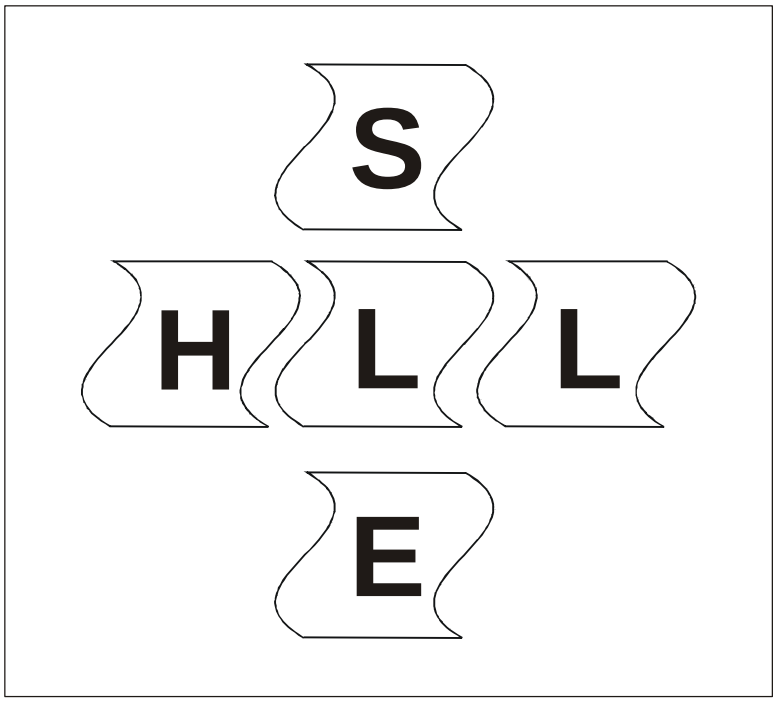


Figure 2-5. The SHELL model — components and interfaces

2.4.3 *Liveware.* In the centre of the SHELL 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 SHELL 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 become evident only 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 interpersonal 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 “workarounds” or minor deviations from standard operating procedures.

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

2.5 ERRORS AND VIOLATIONS

2.5.1 Effective SMS implementation 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.

2.5.2 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 wilful misconduct or gross negligence.

Errors

2.5.3 As indicated previously, an error is defined as "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, reported and analysed 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 were correct, it would not have been possible to achieve the intended outcome.

2.5.4 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 the following:

a) *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 reduction of environmental distractions.

b) *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.

c) *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.

2.5.5 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, scheduling of personnel, allocation of resources and budgeting constraints that may contribute to the incidence of errors.

Violations

2.5.6 A violation is defined as **"**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 because deviations from regulatory requirements or operating procedures may be the 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:

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

b) *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 other issues that cause persons to adopt “workaround” 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 is shown that safety is not compromised.

c) *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.

2.6 SAFETY CULTURE

2.6.1 Culture is characterized by the beliefs, values, biases and their resultant behaviour that are shared by members of a society, group or organization. An understanding of these cultural components, and the interaction between them, is important to safety management. The three most influential cultural components are organizational, professional and national cultures. A reporting culture is a 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. Continuous 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.

2.6.2 A 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 behaviour of the members. 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 level.

2.6.3 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 characteristics 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.

2.6.4 *Organizational culture* refers to the characteristics and safety perceptions among members interacting within a particular entity. Organizational value systems include prioritization or balancing policies covering areas such as productivity versus quality, safety versus efficiency, financial versus technical, professional versus academic, and enforcement versus corrective action.

2.6.5 The greatest potential 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.

2.6.6 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) the 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.

2.6.7 Organizational 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's 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) policies on work/life balance.

2.6.8 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 and 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.

2.6.9 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 on safety in everything they do, report all hazards, errors and threats and support the identification and management of all their associated risks. In addition, management must create an environment in which personnel are aware of safety risks, are given sufficient systems to protect themselves and are assured protection when they divulge 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.

2.6.10 *Professional culture* differentiates the characteristics of particular professional groups (i.e. the characteristic behaviour 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 between safety performance issues and contractual or industrial issues. A healthy professional culture may be characterized as the ability for all professional groups within the organization to collaboratively address safety performance issues.

2.6.11 *National culture* differentiates the characteristics of particular nations, including the role of the individual within society, the manner in which authority is distributed, and national priorities with respect to resources, accountabilities, morality, objectives and different legal systems. From a safety management perspective, 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.

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

2.6.13 When applying a safety management programme, managers should closely assess and consider the differences in the national cultures of their personnel. For instance, safety risk perceptions can differ greatly between different national cultures. Safety-related aspects, including communication and leadership styles as well as the interaction between supervisors and subordinates, may need to accommodate a multicultural workforce.

2.6.14 *Reporting culture* emerges from personnel beliefs about and attitudes toward the benefits and potential detriments associated with reporting systems and the ultimate effect on their acceptance or utilization of such systems. It is greatly influenced by 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.

2.6.15 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. Not only is an “absolute no blame” culture unreasonable, it is not even feasible. 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 wilful misconduct will inhibit the reporting process. If personnel avoid reporting for fear of punishment, management does not gain important safety information.

2.6.16 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.

2.6.17 Safety information should be collected solely for the improvement of aviation safety, and information protection is essential in ensuring the continued availability of information. 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. At the same time, management is able to gather pertinent safety hazard information and also build trust with personnel.

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

Promotion and assessment of a safety culture

2.6.19 The effectiveness 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 to conduct an internal organization safety culture (OSC) assessment. Such an assessment may be further enhanced using the more technically involved and sector-specific organization risk profile (ORP) assessment. Concurrently, industry organizations and/or regulators may consider developing promotional schemes (e.g. a safety culture award) to encourage product and service providers to participate in a voluntary OSC/ORP assessment of their organizations. The parameters to be assessed in an OSC/ORP assessment should include organizational factors and outcomes that are beyond conventional regulatory requirements, but which are nevertheless pertinent to an organization's safety culture, and therefore have an impact on its safety performance. This is the main purpose of 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 while an ORP checklist would be more customized to the nature of the organization's operations. An illustration of a possible sector-specific OSC/ORP assessment checklist is provided in Appendix 1.

2.7 THE MANAGEMENT DILEMMA

2.7.1 Safety management processes identify hazards with the potential to adversely affect safety. These processes also 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 this balance is achieved.

Safety space

2.7.2 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 risks. 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 and internal processes 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 while 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 the value added to the organization's product or service objectives as well as the 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.

2.7.3 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 can ultimately lead to an accident. It is therefore essential that a safety boundary be defined that provides early warning that an unbalanced allocation of resources exists or is developing. Therefore, the safety space boundaries should be defined by the management of the organization and reviewed continually to ensure that they accurately reflect the current situation. Refer to Figure 2-6 for an illustration of the boundaries of an organization's safety space.

2.7.4 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.

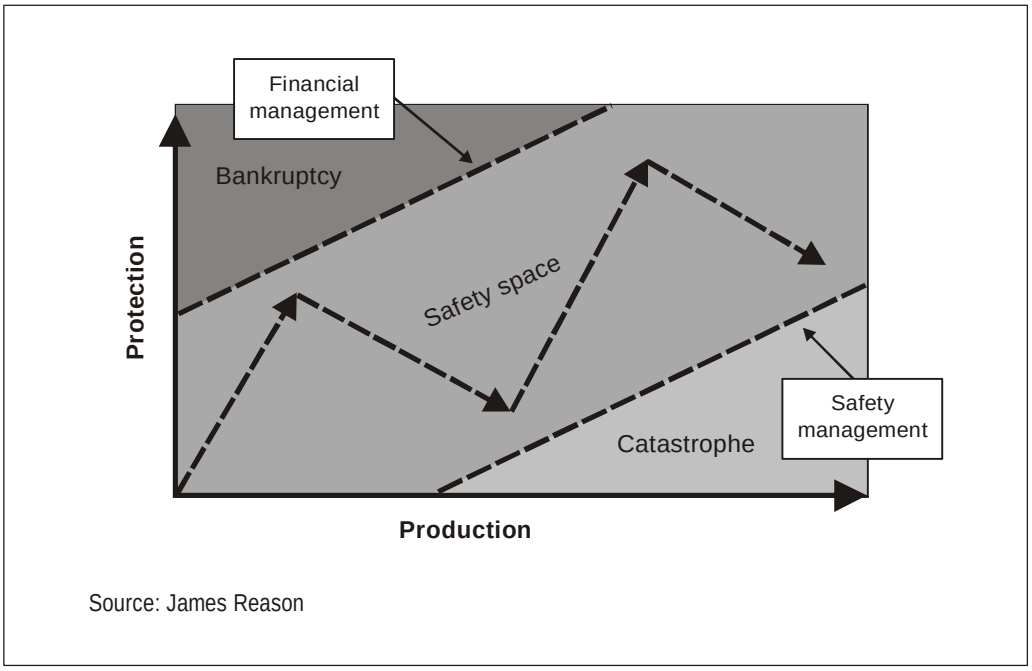


Figure 2-6. The safety space

2.8 CHANGE MANAGEMENT

2.8.1 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 SMS.

2.8.2 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 with relatively 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 the 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 be considered to assure the effectiveness of corrective actions.

2.9 INTEGRATION OF MANAGEMENT SYSTEMS

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

2.9.2 Typical management systems within an aviation organization may include:

a) a quality management system (QMS);

b) a safety management system (SMS);

c) a security management system (SeMS);

d) an environmental management system (EMS);

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

f) a financial management system (FMS); and

g) a documentation management system (DMS).

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

a) a supplier management system;

b) a marketing management system;

c) a personnel management system;

d) a facilities management system;

e) a ground equipment management system;

f) a production management system;

g) a training management system;

h) a flight operations management system;

i) a cargo operations management system;

j) an aircraft maintenance management system;

k) a dispatch management system; and

l) a fatigue risk management system (FRMS).

2.9.4 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.

2.9.5 Each organization will integrate these systems based on its unique production requirements. 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 understanding the nature of quality, security or environmental threats to the organization.

2.9.6 While system integration is presently beyond the scope of the harmonized ICAO safety management SARPs and this manual, many civil aviation authorities and product or service providers have realized the benefits of integrating and aligning multiple management systems. For details on SMS and QMS integration, please refer to Chapter 5.

2.10 SAFETY REPORTING AND INVESTIGATION

Effective safety reporting

2.10.1 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.

2.10.2 There are five basic characteristics that are universally associated with effective safety reporting systems (see Figure 2-7). Effective hazard reporting is a key component of safety management. Once reported, data on hazards can be analysed with other data sources to support the SRM and SA processes.

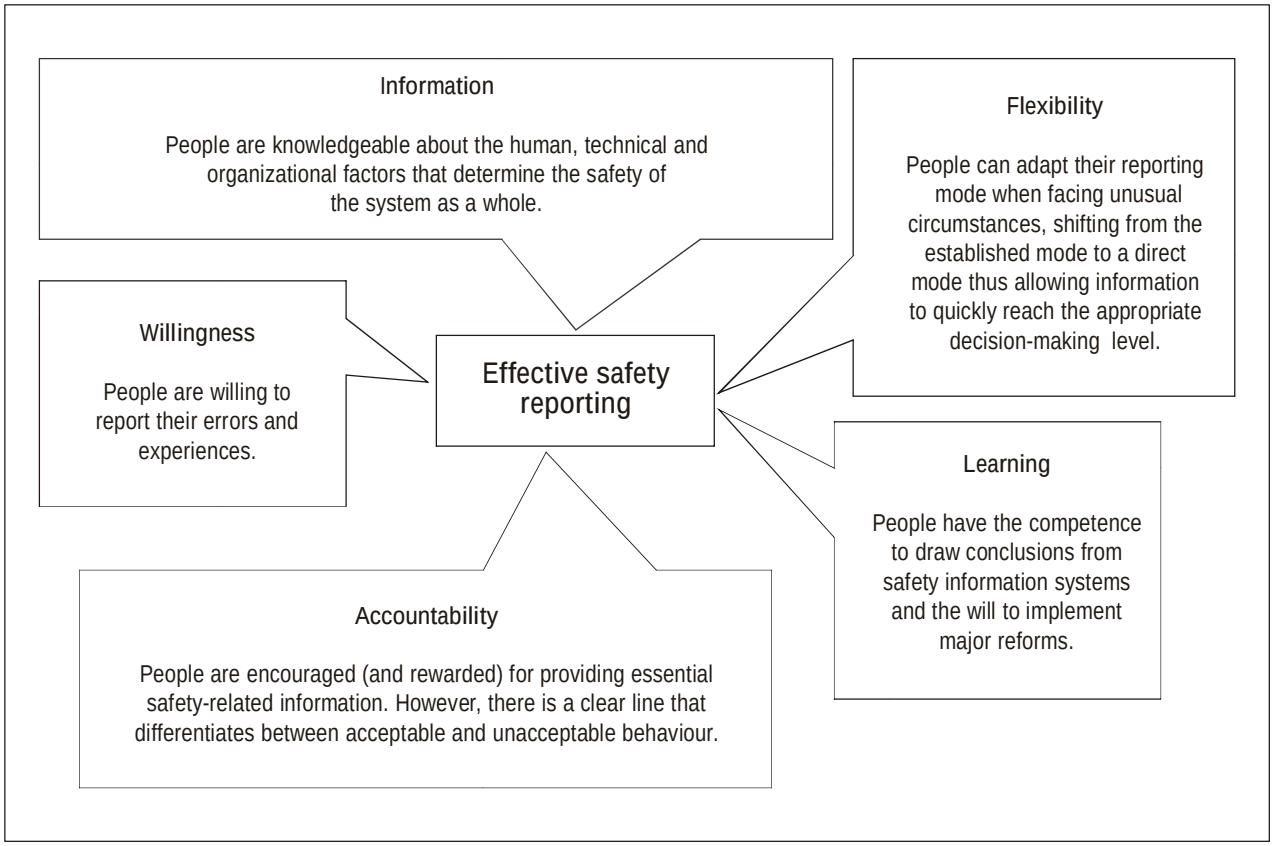


Figure 2-7. Effective safety reporting — five basic characteristics

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

2.10.4 Further guidance on State voluntary and mandatory incident reporting systems is provided in Appendices 2 and 3, respectively, to Chapter 4. Guidance on SMS voluntary reporting systems is provided in Appendix 5 to Chapter 5.

Investigation of accidents and incidents

2.10.5 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, the reasons therefor 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 that deploys when safety defences, barriers, checks and counterbalances in the system have failed.

2.10.6 Being an important reactive component of the elements contained in the SMS and SSP frameworks, accident 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.

2.10.7 Apart from establishing findings and the root causes of accidents/incidents, most investigation exercises also uncover hazards/threats. An effective and comprehensive investigation process includes the identification of 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 that hazards/threats uncovered during the investigation process, which would require separate follow-up action by the organization's hazard identification and risk mitigation process, must be documented. It is common for some investigation reports to limit their "conclusion" and "action taken/recommended" to immediate or direct causes only. Thus, any secondary or indirect hazards/threats tend to be overlooked, unless this gap can be bridged by linking the accident/incident investigation and hazard identification processes.

2.11 SAFETY DATA COLLECTION AND ANALYSIS

Safety data collection and quality

2.11.1 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 are 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.

2.11.2 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 are acceptable as per established criteria for their 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.

Safety database

2.11.3 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:

a) accident investigation data;

b) mandatory incident investigation data;

c) voluntary reporting data;

d) continuing airworthiness reporting data;

e) operational performance monitoring data;

f) safety risk assessment data;

g) data from audit findings/reports;

h) data from safety studies/reviews; and

i) safety data from other States, regional safety oversight organizations (RSOOs) or regional accident and incident investigation organizations (RAIOs), etc.

2.11.4 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 the context. Voluntary reports may come from operational personnel (service providers, pilots, etc.), but also from passengers or the general public.

2.11.5 Much of the data in safety databases are 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.

2.11.6 The safety databases are typically housed in various parts of an organization. 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.

2.11.7 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.

2.11.8 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 that can 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.

2.11.9 Once the safety data have been processed, they are 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's safety data system is shown in Figure 2-8, indicating the inputs, processes and outputs related to safety data collection, analysis and exchange.

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 aggregate level) to measure safety performance and detect undesirable trends; • development of risk-based safety surveillance processes, including the prioritization of inspections and audits.
Outputs (Exchange)	• 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 trend 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.

Figure 2-8. Schematic view of a State's safety data system

Safety data analysis

2.11.10 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;

c) assist in reaching valid conclusions; and

d) monitor and measure safety trends or performance.

2.11.11 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.

2.11.12 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.

Analytical methods and tools

2.11.13 The following safety analysis methods may be used:

a) *Statistical analysis.* This method can be used to assess 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 analytical methods must be 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 testing to 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 in evaluating 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 analysis. The cost 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.

Management of safety information

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

2.11.15 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.

2.11.16 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 to transform large amounts of safety data into useful information that supports decision making;

c) reduce the workload for managers and safety personnel; and

d) operate at a relatively low cost.

2.11.17 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 using 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.

2.11.18 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.

Protection of safety data

2.11.19 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 that 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 5 to Chapter 4.

2.12 SAFETY INDICATORS AND PERFORMANCE MONITORING

2.12.1 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 the data analysis resulting from a one-time query.

2.12.2 Figure 2-9 is a basic (screen shot) data analysis chart and 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 for the purpose of a continuing safety performance indicator.

2.12.3 Analysis used to continuously monitor safety should be in the form of a periodic data extraction to generate a trend chart or graph, updated on a monthly or quarterly basis, as shown in Figure 2-10. 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) upload of the incident rate data 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 is 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 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 trend 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 Chapter 4 (SSP) and Chapter 5 (SMS).

2.13 HAZARDS

2.13.1 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.

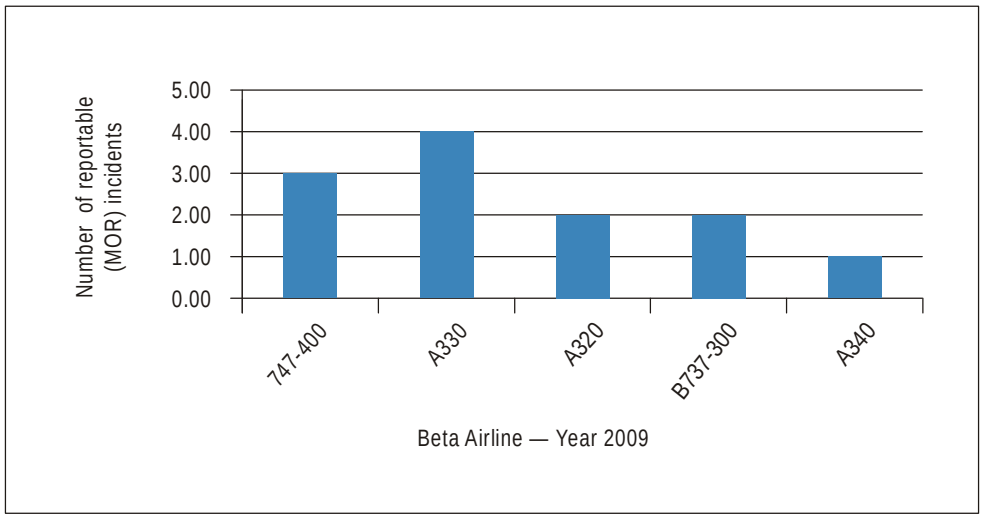


Figure 2-9. A basic (screen shot) data analysis chart

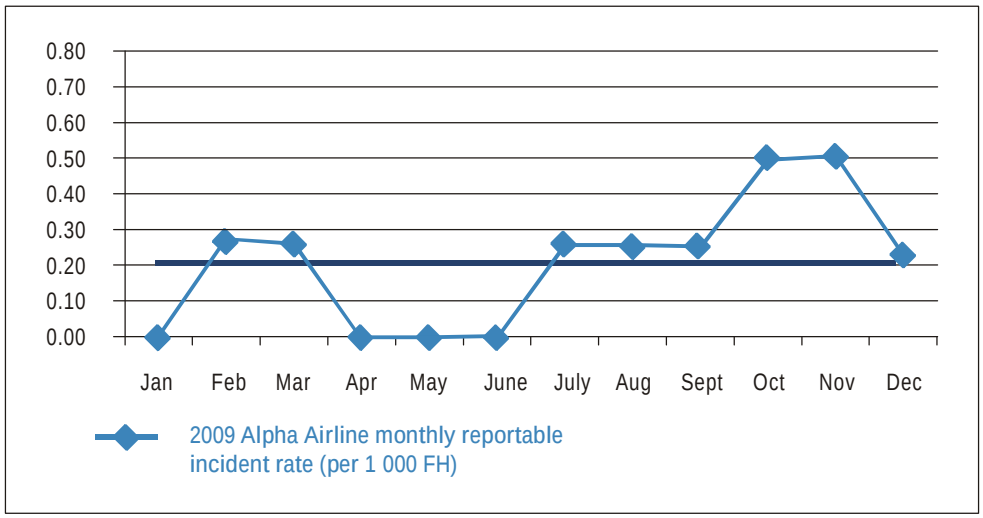


Figure 2-10. A continuous monitoring safety indicator chart

Understanding hazards and consequences

2.13.2 A hazard is generically defined by safety practitioners as a condition or an object with the potential to cause death, injuries to personnel, damage to equipment or structures, loss of material, or reduction of the ability to perform a prescribed function. For the purpose of aviation safety risk management, the term hazard should be focused on those conditions which could cause or contribute to unsafe operation of aircraft or aviation safety-related equipment, products and services. (Guidance on distinguishing hazards that are directly pertinent to aviation safety from other general/industrial hazards is addressed in 2.13.12 and 2.13.13).

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

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

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

2.13.6 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.

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

Hazard identification and prioritization

2.13.8 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 4, Appendix 2, and Chapter 5, Appendix 5. Information collected through such reporting systems may be supplemented by observations or findings recorded during routine site inspections or organization audits.

2.13.9 Hazards can also be identified from the review or study of investigation reports, especially those hazards 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 is not sufficiently mature to support an effective voluntary hazard reporting system.

2.13.10 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 This will facilitate the prioritization of risk mitigation strategies so as to use limited resources in the most effective manner. Refer to Appendix 3 to this chapter for an example of a hazard prioritization procedure.

Hazard identification methodologies

2.13.11 The three methodologies for identifying hazards are:

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

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

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

Distinguishing between aviation hazards and occupational safety, health and environment (OSHE) hazards

2.13.12 Understanding whether a hazard is pertinent to aviation safety or OSHE depends 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 pertinent to an aviation SMS. A hazard having purely OSHE consequences (i.e. without any impact on aviation safety) should be addressed separately 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.

2.13.13 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 and OSHE risk mitigation system may be used to address such compound hazards. An example of a compound hazard is a lightning strike on an aircraft at an airport transit gate. This hazard may be deemed by an OSHE inspector to be a "workplace hazard" (ground personnel/ workplace safety). To an aviation safety inspector it is also an aviation hazard with risk of damage to the aircraft and a risk to passenger safety. Since OSHE and aviation safety consequences of such compound 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.

2.14 SAFETY RISK

2.14.1 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 and includes the following topics:

a) a definition of safety risk;

b) safety risk probability;

c) safety risk severity;

d) safety risk tolerability; and

e) safety risk management.

Definition of safety risk

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

Safety risk probability

2.14.3 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?

2.14.4 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.

2.14.5 Figure 2-11 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.

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

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 2-11. Safety risk probability table

Safety risk severity

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

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

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

2.14.8 The severity assessment should consider all possible consequences related to an unsafe condition or object, taking into account the worst foreseeable situation. Figure 2-12 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.

Safety risk tolerability

2.14.9 The safety risk probability and severity assessment process can be used to derive a safety risk index. The index created through the methodology described above consists of an alphanumeric designator, indicating the combined results of the probability and severity assessments. The respective severity/probability combinations are presented in the safety risk assessment matrix in Figure 2-13.

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

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 an increase in workload or as a result of conditions impairing their efficiency — Serious incident — Injury to persons	C
Minor	— Nuisance — Operating limitations — Use of emergency procedures — Minor incident	D
Negligible	— Few consequences	E

Figure 2-12. Safety risk severity table

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 2-13. Safety risk assessment matrix

2.14.11 The index obtained from the safety risk assessment matrix must then be exported to a safety risk tolerability matrix (see Figure 2-14) that describes the tolerability criteria for the particular organization. Using the example above, the criterion for safety risk assessed as 4B falls in the “unacceptable under the existing circumstances” category. In this case, the safety risk index of the consequence is unacceptable. The organization must therefore:

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

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

c) cancel the operation if mitigation is not possible.

Note.— The inverted pyramid in Figure 2-14 reflects a constant effort to drive the risk index towards the bottom APEX of the pyramid. Figure 2-15 provides an example of an alternate safety risk tolerability matrix.

2.15 SAFETY RISK MANAGEMENT

2.15.1 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/service provider level.

2.15.2 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.

2.15.3 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 to 2.15.7 for further details.

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

Risk management documentation/worksheet

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

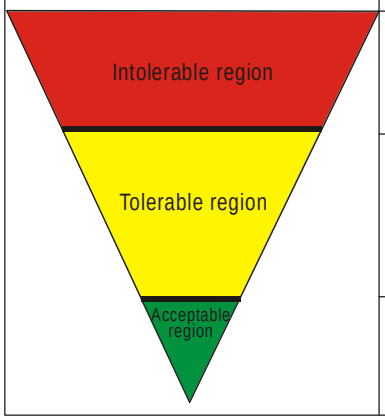
Tolerability description	Assessed risk index	Suggested criteria
	**5A, 5B, 5C, 4A, 4B, 3A**	Unacceptable under the existing circumstances
	5D, 5E, 4C, 4D, 4E, 3B, 3C, 3D, 2A, 2B, 2C, 1A	Acceptable based on risk mitigation. It may require management decision.
	3E, 2D, 2E, 1B, 1C, 1D, 1E	Acceptable

Figure 2-14. 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 performance of a safety assessment to bring down the risk index to the low range if viable.
3E, 2D, 2E, 1B, 1C, 1D, 1E	Low risk	Acceptable as is. No further risk mitigation required.

Figure 2-15 An alternate safety risk tolerability matrix

Human factors and risk management

2.15.6 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. An HF analysis provides an understanding of the impact of human error 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 their due attention. Human behaviour 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. An HF analysis ensures that during the organization's risk mitigation process, when identifying root, contributory or escalation factors, human factors and their associated circumstantial, supervisory and organizational impacts are duly taken into consideration.

Cost-benefit analysis (CBA)

2.15.7 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 a regulatory impact assessment or business expansion project. However, there may be situations where a risk assessment may be at a sufficiently high level or have a 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 the cost-effectiveness analysis or justification of recommended mitigation actions or preventive controls has taken into consideration the associated financial implications.

2.16 PRESCRIPTIVE AND PERFORMANCE-BASED REQUIREMENTS

Understanding performance-based requirements

2.16.1 There is a growing belief within the aviation community that effective implementation of a State safety programme (SSP) and safety management system (SMS) 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, makes good business sense while simultaneously providing an equivalent level of safety.

2.16.2 One aim of an SMS 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.

2.16.3 In a performance-based, enhanced safety environment, certain performance-based elements are introduced within a prescriptive framework. This will allow the "compliance" aspect of 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.

2.16.4 The performance-based elements within an SMS/SSP framework include the process for safety performance monitoring and measurement at the individual product or service provider level as well as at the State level. This element allows the organization to select its own safety monitoring indicators and the setting of relevant alerts 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.

Prerequisites for performance-based requirements

2.16.5 The State and its product and service providers respectively should have an SSP and an SMS in place. 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 the individual product and service provider's 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.

Baseline and equivalent level of safety

2.16.6 The safety performance outcome from the introduction of performance-based elements within or supplementary to an SMS framework should not be worse than that of an existing, purely prescriptive regulatory framework. To assess or monitor that such "equivalence" is indeed the case, there should be safety indicators to monitor the overall outcome of events (non-conformance occurrences) of the system/process concerned for which the performance-based element will be introduced. As an example, the overall flight planning and fuel management (FPFM) average incident rate after introduction of performance-based provisions should not be worse than the incident rate prior to 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 has been maintained. If the post-implementation performance turns out to be better, then a "better" level of performance has in fact been 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, which may include 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 2.16.7 as well as in Chapters 4 and 5 of this manual.

Performance-based monitoring and measurement

2.16.7 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 occurrences 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 and 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 deemed to be acceptable (not abnormal) for that monitoring period. On the other hand, the aim of a targeted improvement level is to achieve the desired improvement level 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 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 methodologies are further addressed in Chapters 4 and 5 respectively.

Oversight of performance-based requirements

2.16.8 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 within the complexity of the audited organization. There may be no simple “go”/no-go” or pass/fail criteria to apply. An example would be the acceptability of a hazard reporting system or the acceptability of proposed target/alert levels for a performance-based process, which may involve more interaction, monitoring, negotiation and objective judgement for the auditor. The level or degree of compliance or performance of 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 is the risk mitigation process. A risk mitigation process may involve the use of a one-page worksheet for a workshop task of a simple one-man operation. On the other hand, risk mitigation of a complex, multi-disciplinary process (e.g. operations in airspace affected by volcanic eruptions) may require the use of risk mitigation software in order to perform a satisfactorily comprehensive safety assessment.

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Appendix 1 to Chapter 2

ORGANIZATION SAFETY CULTURE (OSC)/ORGANIZATON RISK PROFILE (ORP) ASSESSMENT CHECKLIST — AIR OPERATORS

Note.— This OSC/ORP assessment checklist is a conceptual illustration only. The illustrated thirty-seven parameters are not comprehensive and are applicable for an air operator organization. Customization of these 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 basis in view of organization culture/profile parameters which are beyond normal regulatory purview. Refer to Chapter 2, 2.6.19, for a suggested application of such an OSC/ORP assessment scheme.

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

Organization name:	Assessed by/date:

	Organization 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’s TOR	Accountable manager’s TOR have negligible or indistinct mention of safety/quality functions	Final accountability for safety and quality matters clearly addressed in the accountable manager’s TOR.	3
2	Financial state of the organization	TBD	TBD	TBD	2
3	Average age of fleet	More than 12 years	8 to less than 12 years	Less than 8 years	2
4	SMS performance score	Year 2011: 65% to 75%	76% to 90%	More than 90%	3
5	Active hazard identification and risk assessment (HIRA) programme	No active HIRA programme in place	HIRA programme in place. Completion or review of 1 to 3 risk assessment projects (per 100 operational employees) within the last 12 months.	Have HIRA programme in place for all major operational areas. Completion or review of more than 3 risk assessment projects (per 100 operational employees) for all operational areas within the last 12 months.	2
6	Demanding flight crew schedules or timetables (number of flight time limitation incidents?)	TBD	TBD	TBD	2
7	Ratio of internal safety plus quality control staff to all operational staff	1: more than 20	1:15 to 20	1: less than 15	3
8	Mixed fleet flying (MFF) (percentage of pilots involved in MFF — higher percentage is less desirable)	TBD	TBD	TBD	1

	Organization risk parameter	*Risk level/profile*			*Result (Level #)*
		Level 3 (least desirable)	*Level 2 (average)*	*Level 1 (most desirable)*	
9	EDTO routes (percentage of EDTO sectors operated) (higher percentage is less desirable)	TBD	TBD	TBD	2
10	EDTO duration (higher duration is less desirable)	TBD	TBD	TBD	2
11	Company experience (years of operation)	Less than 5 years	5 to 10 years	More than 10 years	3
12	Combined turnover of the accountable executive, the safety manager and the quality manager over the last 36 months	3 or more	2	1 or nil	2
13	Experience and qualifications of the accountable executive (as of the assessment date)	Has less than 3 years of aviation experience and no technical qualification	Has more than 3 years of aviation experience or technical qualifications	Has more than 3 years of aviation experience and aviation technical qualifications	3
14	Experience and qualification of the safety manager (SM)	Has less than 5 years of civil aviation safety/quality experience or no aviation technical qualification	Has more than 5 years of civil aviation safety/quality experience and aviation technical qualifications	Has more than 15 years of civil aviation safety/quality experience and aviation technical qualifications	2
15	Experience and qualifications of the quality manager	Has less than 5 years of civil aviation QC/QA experience or no civil aviation technical qualifications	Has more than 5 years of civil aviation QC/QA experience and civil aviation technical qualifications	Has more than 15 years of civil aviation QC/QA experience and civil aviation technical qualifications	1
16	Multiple portfolio safety/quality management staff (QM/SM)	SM or QM holds other simultaneous executive positions within or outside of the organization	SM or QM TOR include other non-direct safety/quality functions, e.g. IT, administration, training	SM or QM does not hold any other simultaneous executive positions within or outside of the organization and their TOR do not include other non-direct quality/safety functions	2
17	Multiplicity of aircraft types	More than 4 aircraft types	3 to 4 aircraft types	Less than 3 aircraft types	1
18	Combined fleet reportable/ mandatory incident rate (per 1 000 FH) for the last 24 months	TBD	TBD	TBD	2
19	Reserved				
20	Combined fleet engine IFSD rate per 1 000 FH	TBD	TBD	TBD	2
21	Average fleet MEL application rate (per 1 000 FH)	More than 30 MEL applications per 1 000 FH	10 to 30 MEL applications per 1 000 FH	Less than 10 MEL applications per 1 000 FH	2
22	Internal technical concession application rate	3 concessions per aircraft per year	More than 1 concession per aircraft per year	Less than 1 concession per aircraft per year	2
23	CAA technical concession application rate.	More than 1 concession per aircraft per year	More than 0.5 concessions per aircraft per year	Less than 0.5 concessions per aircraft per year	2

	Organization risk parameter	Risk level/profile			Result (Level #)
		Level 3 (least desirable)	*Level 2 (average)*	*Level 1 (most desirable)*	
24	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 the CEO	3
25	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 the CEO	3
26	CAA AOC organization audit findings rate (Levels 1 and 2 findings only, observations excluded) for the last 24 months	Any Level 1 finding or more than 5 findings per audit per aircraft	More than 1 finding per audit per aircraft	Less than 1 finding per audit per aircraft	2
27	CAA LSI findings rate (Levels 1 and 2 findings only, observations excluded) for the last 24 months	Any Level 1 finding or more than 3 per audit per line station	More than 0.5 findings per audit per line station	Less than 0.5 findings per audit per line station	2
28	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 to 10% of all (MPD/AMS listed) flight and engine control rotables (beyond mandatory and MPD requirements) have been soft or hard lifed.	Active component hard life control policy and procedures. More than 10% of all (MPD/AMS listed) flight and engine control rotables (beyond mandatory and MPD requirements) have been soft or hard lifed.	3
29	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	
30	Availability of environmental protection programme	Non-existent	Isolated participation in an aviation environmental protection programme	Routine programme and regular engagement and participation in an aviation environmental protection programme	3
31	Availability of special inspection programme based on non-mandatory OEM service publications	Special inspection programme for AD-related SBs only	Special inspection programme for ADs as well as alert SBs only	Special inspection programme for ADs, alert SBs as well as routine OEM service publications	2
32	Control of fleet technical management	Fully contracts out to an external organization (FTM + ITM)	Partially contracts out to an external organization	Internal management by AOC organization	2
33	Use of contracted technical staff	More than 15% contracted staff (from another organization) for internal engineering/technical functions	5 to 15% contracted staff (from another organization) for internal engineering/technical functions	Less than 5% contracted staff (from another organization) for internal engineering/technical functions	2

	Organization risk parameter	*Risk level/profile*			*Result (Level #)*
		Level 3 (least desirable)	*Level 2 (average)*	*Level 1 (most desirable)*	
34	Pilot, technician or AME transit inspection certification	Practises pilot transit inspection certification in lieu of qualified engineering technician/AME	Practises technician (limited rating) transit inspection certification in lieu of AME	Practises only AME (fully type-rated) transit inspection certification only	3
35	Hazard reporting system	None in place	Voluntary hazard reporting system in place	Voluntary hazard reporting system in place. Also procedure for identification of hazards in conjunction with incident investigation process.	2
36	Incident reporting, investigation and remedial action procedures	No documented incident reporting, investigation or remedial action procedures	Documented incident reporting, investigation and remedial action procedures	Documented incident reporting, investigation and remedial action procedures and accepted by the CAA	2
37	Technical records, technical stores and fleet planning management	Fully contracts out technical records, technical stores and fleet planning management to external organization	Contracts out technical records, technical stores or fleet planning management to external organization	Internal (in-house) technical records, technical stores and fleet planning management	3

	Subtotal
Level 3	11
Level 2	21
Level 1	3
N/A	0
Total number of questions	37

Assessment result	
Total points	ORP category
78	D

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 customized for AMOs, aerodrome and ATS service providers.

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

4. This OSC/ORP checklist assessment may be completed by the assigned inspector/surveyor on a scheduled basis (such as during an organization audit). He may need to liaise with the service provider to obtain some of the data required.

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

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

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

Appendix 2 to Chapter 2

Example of a Safety Risk Mitigation Worksheet

Note.— For easier worksheet management, it is preferable to use a separate worksheet for each different Hazard>Unsafe event>Ultimate consequence combination.

Table 2-A2-1. Hazard and consequence

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

Table 2-A2-2. Risk index and tolerability of consequence/UE (see Attachment 1)

	Current risk tolerability (taking into consideration any existing PC/RM/EC)				*Resultant risk index and tolerability (taking into consideration any new PC/RM/EC)*		
	Severity	Likelihood	Tolerability		Severity	Likelihood	Tolerability
Unsafe event							
Ultimate consequence							

Table 2-A2-3. Risk mitigation

Hazard (H)	*PC*	*EF*	*EC*		*RM*	*EF*	*EC*	
H	PC1 (Existing)	EF (Existing)	EC1 (Existing)	UE	RM1	EF (to RM1)	EC (to EF)	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)	

Explanatory notes.—

1. *Operation/process (Table 2-A2-1).* Description of the operation or process which is being subjected to this hazard/risk mitigation exercise.

2. *Hazard (H).* An undesirable condition or situation which may lead to unsafe event(s) or occurrence(s). Sometimes the term “threat” (e.g. TEM) is used instead of “hazard”.

3. *Unsafe event (UE).* A possible intermediate unsafe event before any ultimate consequence, accident or most credible outcome. Identification of an unsafe event is applicable only where there is a need to distinguish and establish mitigating actions upstream and downstream of such an intermediate event (before the ultimate consequence/accident) (e.g. “over temperature event” before an “engine failure”). If this intermediate UE state is not applicable for a particular operation, then it may be excluded as appropriate.

4. *Ultimate consequence (UC).* The most credible outcome, ultimate event or accident.

5. *Preventive control (PC).* A mitigating action/mechanism/defence to block or prevent a hazard/threat from escalating into an unsafe event or ultimate consequence.

6. *Escalation factor (EF).* A possible latent condition/factor which may weaken the effectiveness of a preventive control (or recovery measure). Use where applicable only. It is possible that an escalation factor may sometimes be referred to as a “threat”.

7. *Escalation control (EC).* A mitigating action/mechanism to block or prevent an escalation factor from compromising or weakening a preventive control (or recovery measure). Use where applicable only.

8. *Current risk index and tolerability.* Risk mitigating action (Table 2-A2-3) is applicable whenever an unacceptable current tolerability level of an unsafe event or ultimate consequence is identified in Table 2-A2-2. Current risk index and tolerability shall take into consideration existing preventive controls, where available.

9. *Resultant risk index and tolerability.* Resultant risk index and tolerability are based on the combined current preventive controls (if any) together with the new preventive controls/escalation controls/recovery measures put in place as a result of the completed risk mitigation exercise.

Attachment to Appendix 2. Example Severity, Likelihood, Risk Index and Tolerability Tables

Table Att-1. Severity table (basic)

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

Table Att-2. Severity table (alternate)

Level	*Descriptor*	*Severity description (customize according to the nature of the 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	Degrades or affects normal aircraft operational procedures or performance	Minor injury	Minor damage Less than $__	Minor loss Less than $__	Minor effect	Limited localized implication
3	Moderate	Partial loss of significant/major aircraft systems or results in abnormal flight operations procedure application	Serious injury	Substantial damage Less than $__	Substantial loss Less than $__	Contained effect	Regional Implication
4	Major	Complete failure of significant/major aircraft systems or results in emergency application of flight operations procedures	Single fatality	Major damage Less than $__	Major loss Less than $__	Major effect	National Implication
5	Catastrophic	Aircraft/hull loss	Multiple fatality	Catastrophic damage More than $__	Massive loss More than $__	Massive effect	International implication

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

Table Att-3. Likelihood table

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

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

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

Table Att-5. Risk acceptability (tolerability) table

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

Appendix 3 to Chapter 2

ILLUSTRATION OF A HAZARD PRIORITIZATION PROCEDURE

<table>
<tr><th></th><th>Option 1 (Basic)</th><th>Option 2 (Advanced)</th></tr>
<tr><td>Criteria</td><td>Prioritize in relation to the hazard's worst possible consequence (incident severity) category.</td><td>Prioritize in relation to the risk index (severity and 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 the likely occurrence classification of this consequence (i.e. will it be deemed to be an accident, serious incident or incident?);

c) conclude that the hazard's prioritization is thus:
<table>
<tr><th>Projected consequence</th><th>Hazard level</th></tr>
<tr><td>Accident
Serious incident
Incident</td><td>Level 1
Level 2
Level 3</td></tr>
</table></td><td>a) project the risk index number (based on the relevant severity and likelihood matrix) of the hazard's worst possible consequence (refer to Figure 2-13 of this chapter);

b) with reference to the related tolerability matrix, determine the risk index's tolerability category (i.e. intolerable, tolerable or acceptable) or equivalent terminology/ categorization;

c) conclude that the hazard's prioritization is thus:
<table>
<tr><th>Projected risk index</th><th>Hazard level</th></tr>
<tr><td>Intolerable/High risk
Tolerable/Moderate risk
Acceptable/Low risk</td><td>Level 1
Level 2
Level 3</td></tr>
</table></td></tr>
<tr><td>Remarks</td><td>Option 1 takes into consideration the severity of the hazard's projected consequence only.</td><td>Option 2 takes into consideration the severity and likelihood of the hazard's projected consequence — a more comprehensive criteria than Option 1.</td></tr>
</table>

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

Once each hazard has been prioritized, it will 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 or 3), as appropriate.

Chapter 3

ICAO SAFETY MANAGEMENT SARPS

3.1 INTRODUCTION

3.1.1 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 new Annex 19 — *Safety Management* that deals with safety management responsibilities and processes and consolidates overarching safety management provisions.

3.1.2 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.

3.1.3 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 4 and 5, respectively.

3.2 STATE SAFETY MANAGEMENT REQUIREMENTS

3.2.1 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.

3.2.2 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.

Table 3-1 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. Further guidance regarding the SSP requirements, SSP framework and the acceptable level of safety is contained in Chapter 4.

3.3 SERVICE PROVIDERS' SAFETY MANAGEMENT REQUIREMENTS

3.3.1 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, implement actions to reduce safety risks, monitor safety performance and achieve continuous improvement in safety performance.

3.3.2 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.

3.3.3 International general aviation operators of large or turbojet aeroplanes, as described in Annex 6, Part II, Section III, shall establish and maintain an SMS that is appropriate to the size and complexity of the operation and should, as a 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.

3.3.4 Table 3-2 provides a summary of references to the safety management requirements for service providers and general aviation operators, including the SMS framework, as initially adopted in the Annexes to the Convention on International Civil Aviation. Further guidance regarding the requirements for service providers and the SMS framework is contained in Chapter 5.

Table 3-1. Summary of references to the State safety management requirements and SSP framework as initially adopted in the Annexes to the Convention

Source		*Subject*
Annex	*Provision*	
1 6, Parts I, II and III 8 11 13 14, Volume I	Definitions	State safety programme
6, Part I	3.3.1 and 8.7.3.1	Establishment of the SSP
6, Part III	1.3.1	
8	5.1	
11	2.27.1	
13	3.2	
14, Volume I	1.5.1	
6, Part I	3.3.2 and 8.7.3.2	Acceptable level of safety performance concept
6, Part III	1.3.2	
8	5.2	
11	2.27.2	
14, Volume I	1.5.2	
13	5.12	Protection of accident and incident records
13	8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.9	Safety data collection, analysis and exchange
1	Attachment C	SSP framework — components and elements
6, Part I	Attachment I	
6, Part III	Attachment I	
8	Attachment to Part II	
11	Attachment D	
13	Attachment F	
14	Attachment C	
13	Attachment E	Legal guidance for the protection of information gathered from safety data collection and processing systems

Table 3-2. Summary of references to the safety management requirements for service providers and general aviation operators, including the SMS framework, as initially adopted in the Annexes to the Convention

Source		*Subject*
Annex	*Provision*	
1 6, Parts I, II and III 8 11 13 14, Volume I	Definitions	Safety management system
1	Appendix 2, 4.1 and 4.2	SMS requirements for approved training organizations
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
6, Part II	Section 3, 3.3.2.1 and 3.3.2.2	SMS requirements for aeroplanes engaged in international general aviation
6, Part III	1.3.3 and 1.3.4	SMS requirements for helicopter operators
8	5.3 and 5.4	SMS requirements for organizations responsible for the type design and manufacture of aircraft (applicable from 14 November 2013)
11	2.27.3 and 2.27.4	SMS requirements for air traffic service providers
14, Volume I	1.5.3 and 1.5.4	SMS requirements for operators of certified aerodromes
1	Appendix 4	SMS framework
6, Part I	Appendix 7	
6, Part III	Appendix 4	
11	Appendix 6	
14, Volume I	Appendix 7	

3.4 NEW ANNEX 19 — *SAFETY MANAGEMENT*

3.4.1 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).

3.4.2 As mandated by the Conferences, the Air Navigation Commission 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.

3.4.3 In February 2012 the SMP recommended the transfer of the safety management provisions in Annexes 1; 6, Parts I, II and III; 8; 11; 13 and 14, Volume I (see Tables 3-1 and 3-2) to new Annex 19. Most of these requirements were modified for consistency and clarity while maintaining the original requirement for which they were adopted.

3.4.4 The Annex 19 provisions as proposed by the SMP are intended to harmonize the implementation of safety management practices for States and 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 the Annex applicable to the field or activity of each specific service provider (e.g. requirements for flight data analysis programmes for air operators are retained in Annex 6, Part I).

3.4.5 Once adopted, Annex 19 will have an impact on a number of ICAO Annexes to the Convention on International Civil Aviation. Therefore, consequential amendments to Annexes 1, 6, 8, 11, 13 and 14 stemming from the adoption of Annex 19 will be introduced simultaneously to avoid duplicate requirements.

3.4.6 The applicability date of Annex 19 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 the other Annexes.

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Chapter 4

STATE SAFETY PROGRAMME (SSP)

4.1 INTRODUCTION

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

4.1.2 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 the aviation functions of the State. The objectives of the SSP are to:

a) ensure that a State has the minimum required regulatory framework in place;

b) ensure harmonization amongst the State's regulatory and administrative organizations in their respective safety risk management roles;

c) facilitate monitoring and measurement of the aggregate safety performance of the State's aviation industry;

d) coordinate and continuously improve the State's safety management functions; and

e) support effective implementation and interaction with the service provider's SMS.

4.1.3 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 service providers to implement their safety management capabilities allowing for the effective identification of systemic safety deficiencies and the resolution of safety concerns.

4.1.4 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, both provides the oversight functions and facilitates implementation of appropriate data aggregation and information-sharing initiatives.

4.2 SSP FRAMEWORK

4.2.1 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. These eleven elements combine prescriptive and performance-based approaches and support the implementation of SMS by service providers. The four components and eleven elements of an SSP framework are:

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.

4.2.2 A brief account of the components and elements of an SSP framework follows.

SSP Component 1. State Safety Policy and Objectives

4.2.3 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 the broad safety objectives to be achieved by the SSP.

4.2.4 The State safety policy and objectives provide management and personnel with 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 safety policy statement is provided in Appendix 1 to this chapter.

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.

4.2.5 A national safety 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 with 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 legislation for different government ministries that may have been developed independently of each other. For example, the legislative framework 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 focused on these two sectors with a consequent emphasis on the operational and technical aspects of providing these services. An operationally biased legislative framework may not adequately address coordination of safety management activities across all relevant State organizations.

4.2.6 A mechanism for the periodic review of a State's comprehensive aviation legislative framework will assure the continual improvement of and correlation between its legislation and operational regulatory requirements. While review of specific operating requirements is within the purview of the respective regulatory organizations, the necessary integration and cohesion of higher level legislation may need to be addressed by a coordination platform at the national level, particularly where multiple organizations and ministries are involved.

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.

4.2.7 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. In this document this entity is also referred to as the SSP placeholder organization.

4.2.8 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 ongoing SSP coordination platform.

4.2.9 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 for working with the accountable executive and the various organizations to initiate the SSP planning and implementation processes.

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

4.2.11 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 of all relevant State organizations. High-level safety objectives may then be supported by relevant safety indicators to facilitate their assessment or measurement as appropriate.

SSP Element 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.

4.2.12 From an SSP perspective, the accident and incident investigation function is focused on its administration at a State level. An investigation organization or entity must be functionally independent from any other organization, particularly the civil aviation authority of the State, whose interests could conflict with the tasks entrusted to the investigation authority. The fundamental rationale for the independence of this function from those of other organizations is that accident causation can be linked to regulatory or SSP-related factors. Also, such independence enhances the viability of the accident and incident investigation organization and avoids real or perceived conflicts of interest.

4.2.13 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).

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.

4.2.14 Just as with any other national legislation, it can be expected that the aviation legislative framework may include a basic provision for enforcement action. 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 that enforcement policies and procedures, whether at the individual service provider or State (CAA) level, should be enhanced 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 of such an enhancement is to ensure that a necessary distinction is made between a deliberate/gross violation and an unintentional error/mistake.

4.2.15 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.

SSP Component 2. State Safety Risk Management

4.2.16 The State safety risk management component includes the establishment of SMS requirements to ensure that each State's service providers implement the 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.

4.2.17 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, and surveillance programme prioritization, among others, are processes which could be enhanced by a data-driven, risk-based approach.

4.2.18 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.

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.

4.2.19 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 provider's 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 subcontractors, it may be necessary for an SMS-approved organization to require (contractually), from such subcontractors, hazard identification and risk management processes, where appropriate. Where a subcontractor has an accepted SMS, the issue of necessary integration needs to be addressed.

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

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.

4.2.21 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 its 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.

4.2.22 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 sources such as the service provider, industry, the State or global safety data.

4.2.23 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.

SSP Component 3. State Safety Assurance

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

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.

4.2.25 The implementation of ICAO SARPs forms the foundation of a State's aviation safety strategy. SSP Element 3.1 refers to the 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.

4.2.26 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.

4.2.27 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 described in Chapter 5.

4.2.28 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.

4.2.29 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.

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.

4.2.30 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 obtained 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 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 and voluntary reporting systems, including appropriate confidentiality requirements for voluntary systems. Refer to Appendix 2 for guidance on a State's voluntary reporting system and Appendix 3 for an example of a State's mandatory reporting procedure.

4.2.31 The capture of data on accidents and reportable incidents 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 a 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.

4.2.32 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 4.3.5.1 to 4.3.5.12 and Appendix 4 to this chapter.

4.2.33 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 5 for guidance on safety information protection.

4.2.34 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 organization independent from the CAA. Similar consideration may need to be given to those States where certain safety management functions (involving SSP-related data processing) are discharged by an RSOO or an RAIO on behalf of the State.

4.2.35 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 accident and incident notification and reporting, as per the requirements of ICAO Annex 13, is provided in Appendix 6 to this chapter.

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.

4.2.36 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 (e.g. percentage of effective compliance) of each completed audit would be required for this purpose.

4.2.37 A more comprehensive risk-based surveillance concept may involve safety risk data input external to the surveillance programme itself. Such additional surveillance frequency/scope modifier input may come from (for example) an ORP assessment programme. (Refer to Chapter 2, Appendix 1, for information on the ORP 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 Figure 4-1.

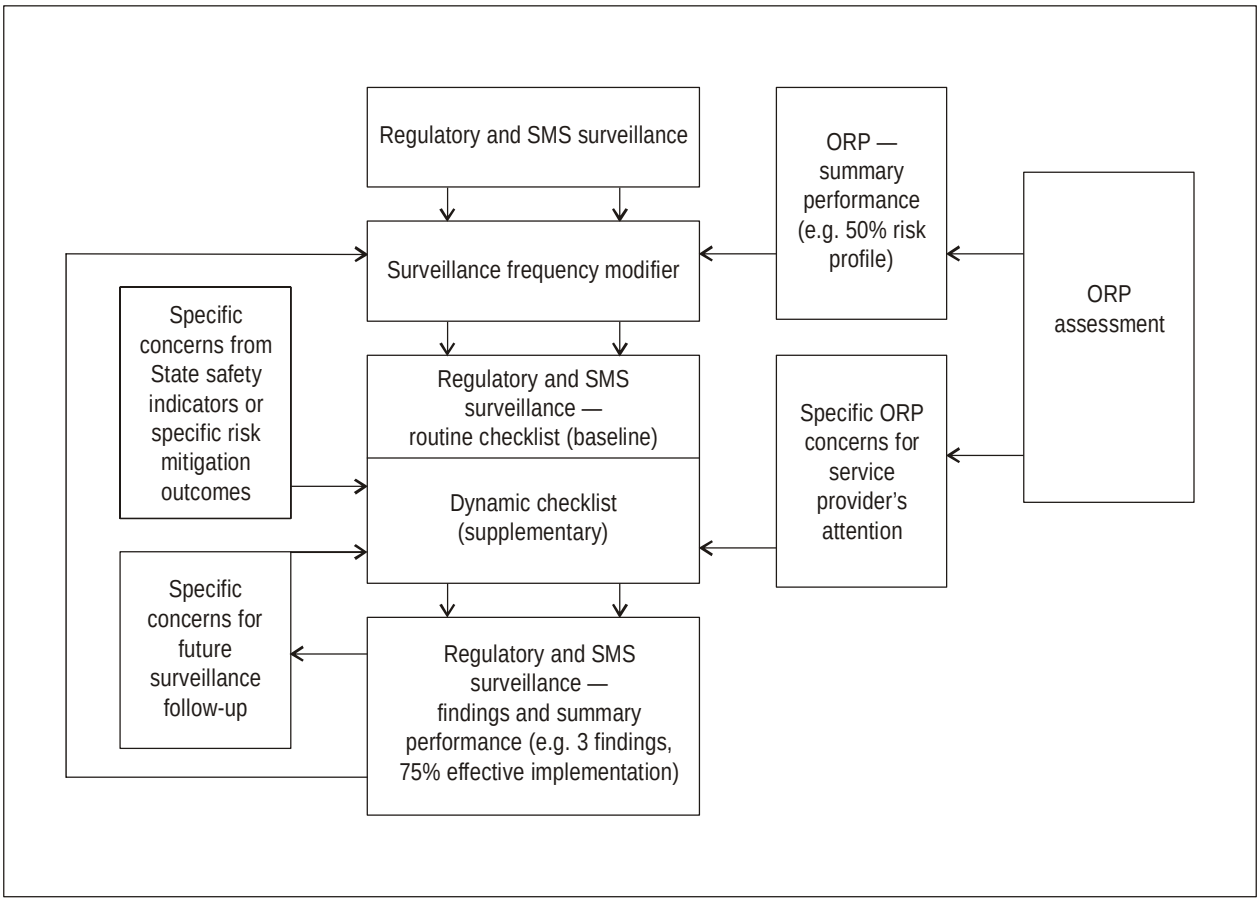


Figure 4-1. Safety data and risk-based surveillance concept

SSP Component 4. State Safety Promotion

4.2.38 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.

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.

4.2.39 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 to their respective roles. Therefore, it is important to ensure that there is a dedicated 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 achieving the integration of training, communication and the dissemination of related information. All other subsequent SSP operational strategies, including harmonized SMS requirements and oversight of the 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.

4.2.40 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 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 material 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 material such as that contained in ICAO SSP/SMS training courses.

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.

4.2.41 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 preferably be two-way communication to allow feedback from the industry.

4.2.42 The State should also facilitate the SMS education or training of its service providers where feasible or appropriate.

4.3 SSP IMPLEMENTATION PLANNING

4.3.1 General

A State's SSP must be commensurate with the size and complexity of its aviation system, which may require coordination among multiple aviation regulatory organizations responsible for the 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 expectations of some SSP

elements. The task is to consolidate and enhance these 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 industry. This section highlights some important considerations for SSP implementation.

4.3.2 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) the 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; and

d) an 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.

4.3.3 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 will form the basis of the SSP implementation plan. Further guidance on the SSP gap analysis process is contained in Appendix 7 to this Chapter.

4.3.4 SSP implementation plan

As with any major project implementation exercise, SSP implementation involves many tasks and subtasks to be completed within a set time frame. 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/subtasks 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, provides 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 organization 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 the Section 4.4 as well as Appendix 7 to this chapter.

4.3.5 Safety indicators

Acceptable level of safety performance

4.3.5.1 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 the purpose of this manual, 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.

4.3.5.2 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 ALoSP 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.

4.3.5.3 For the purpose of an SSP, the ALoSP 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, ALoSP is the overarching concept while safety indicators with their corresponding alert and target levels (performance boundary settings) are the actual metrics of the ALoSP. The extent to which safety indicator objectives are achieved is the performance measurement for those safety indicators. Illustrative examples on the development of ALoSP safety indicators are provided in Appendix 4.

4.3.5.4 A fully developed ALoSP monitoring and measurement process will, on an ongoing basis:

a) identify all the safety-critical sectors and the safety indicators that define the level of safety in these areas;

b) 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 achieving continuous improvement throughout the entire aviation system;

c) identify alerts that will indicate an actual or developing safety performance problem in a particular safety indicator or sector; and

d) review SSP safety performance to determine whether modifications or additions to existing indicators, targets or alerts are needed to achieve continuous improvement.

4.3.5.5 Establishing ALoSP 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.

Alert/target setting

4.3.5.6 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.

4.3.5.7 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 are available.

4.3.5.8 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 providers to identify root causes, hazards and associated risks as applicable.

4.3.5.9 As in generic safety metrics practices, the use of the population standard deviation (STDEVP) provides a basic objective method for setting alert criteria. This method derives the standard deviation (SD) 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 (a basic MS Excel function) sets the alert level criteria based on actual historical performance of the given indicator (data set), including its volatility (data point fluctuations). A more volatile historical data set will result in higher (more generous) alert level values for the next monitoring period. Guidance on alert level setting using SD criteria is provided in Appendix 4.

4.3.5.10 A State's basic (initial ALoSP) safety indicators generally consist of high-consequence safety indicators such as accident and serious incident 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 mature ALoSP stage, lower-consequence safety indicators may then be developed to supplement the ALoSP package. (Lower-consequence indicators are sometimes termed "proactive/predictive" indicators.)

4.3.5.11 Once a State's package of ALoSP safety indicators, targets and alert settings has been 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 or 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.

4.3.5.12 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 the development of safety indicators and target and alert setting criteria is provided in Appendix 4 to this chapter. Parallel guidance on SMS safety performance indicators can be found in Chapters 2 and 5.

4.4 SSP IMPLEMENTATION — PHASED APPROACH

4.4.1 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 eleven SSP elements will require some degree of additional implementation. Where certain elements or processes are already satisfactorily in place, these may then be integrated or linked to the SSP framework as appropriate.

4.4.2 A four-phased approach for the implementation of the SSP is provided in this section. This approach involves some reordering of the eleven SSP elements across all four phases. The rationale for 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 4-1.

Phase 1

4.4.3 State safety responsibilities and accountabilities — Element 1.2 (i)

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

1) authority and accountability, on behalf of the State, for the implementation and maintenance of the SSP across its aviation system, with the 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 the 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 the 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 should include but not be limited to:

1) coordinating the gap analysis process;

2) developing the SSP implementation plan;

3) ensuring adequate SSP training and technical expertise of the team in order to establish effective implementation of the SSP elements and related processes;

4) monitoring of and reporting on the progress of SSP implementation, providing regular updates, coordinating with the SSP accountable executive and ensuring 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 that adequate authority and management support is provided to the implementation team.

Table 4-1. An example of four phases of SSP implementation

Phase 1 (12 months)	*Phase 2 (12 months)*	*Phase 3 (24 months)*	*Phase 4 (24 months)*
1. SSP Element 1.2 (i): a) identify the SSP place holder organization and the accountable executive; b) establish the SSP implementation team; c) perform an SSP gap analysis; d) develop an SSP implementation plan; e) establish an SSP coordination mechanism; f) develop the required SSP documentation including the State's SSP framework, its components and elements.	1. SSP Element 1.1: Establish a national safety legislative framework. 2. SSP Element 1.2 (ii): a) identify, define and document the safety management responsibilities and accountabilities; b) define and document the State safety policy and objectives. 3. SSP Element 1.3: Establish an accident and serious incident investigation process. 4. SSP Element 1.4 (i): Establish basic enforcement (penalty) legislation. 5. SSP Element 3.1 (i): Provide for effective State safety oversight and surveillance of its service providers. 6. SSP Element 2.1 (i): Facilitate and promote SMS education for service providers.	1. SSP Element 1.4 (ii): Promulgate enforcement policy/legislation that includes: a) provisions 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) provisions to prevent use or disclosure of safety data for purposes other than safety improvement; d) provisions to protect the sources of information obtained from voluntary/ confidential reporting systems. 2. SSP Element 2.1 (ii): Develop harmonized regulations requiring SMS implementation. 3. SSP Element 3.2 (i): a) establish safety data collection and exchange systems; b) establish high-consequence State safety performance indicators and target/alert levels.	1. SSP Element 2.2: Review and agree upon the service provider's safety performance indicators. 2. SSP Element 3.1 (ii): Incorporate the service provider's SMS and safety performance indicators into the routine surveillance programme. 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 an internal review mechanism covering the SSP to assure continuing effectiveness and improvement.

Note 1.— SSP Elements 4.1 and 4.2 (Internal SSP and SMS training; promotion of external SMS training; and internal and external communication and dissemination of safety information) are progressively implemented through Phases 1 to 4.

Note 2.— The time frame for each phase (e.g. 12 months for Phase 1) is an approximation only. The actual implementation period will depend on the scope/complexity of a State's aviation system, the actual gaps within each element and the organizational structure.

c) Perform an SSP gap analysis. In order to develop an 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 of the elements of its SSP. Once the gap analysis has been completed and documented, the components/elements/processes identified as missing or deficient, together with those already existing, will form the basis of the SSP implementation plan. An example of an SSP gap analysis checklist is included in Appendix 7 to this chapter.

d) Develop an SSP implementation plan. The plan will serve as a guide to 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; and

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 for a basic SSP implementation plan is in Appendix 7 to this chapter.

e) Establish a 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 or committee. 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 and sharing, SMS regulatory requirements, and internal SSP review and findings, are carried out in an integrated and coordinated manner. This ongoing 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 an SSP document should commence from the beginning of the SSP implementation exercise. As the SSP components and elements of the SSP are progressively defined, each element's description and its related processes can then be progressively written up in this top-level document. Refer to Appendix 8 for an illustrative example of how such an SSP document and its contents may be structured. Establish an SSP documentation system (library/cabinet/folder) within the SSP placeholder organization that serves as a central repository for such things as the SSP document, related SOPs, forms, minutes of meetings, and records 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 and occurrence reports may be maintained in a separate computer system or reside in another regulatory or administrative organization. In such cases, samples or extracts may be maintained in the library as appropriate. An SSP documentation master index should help to account for all relevant documentation. A consolidated documentation system will facilitate easy traceability, updating, referencing and internal/external auditing of the system.

Phase 2

4.4.4 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.

4.4.5 State safety responsibilities and accountabilities — Element 1.2 (ii)

a) Define and establish the safety management responsibilities and accountabilities of the respective regulatory organizations. A description or illustration of the existing organizational structure and integration of the various regulatory and administrative organizations should be addressed within the SSP document. Cross-reference to supporting documentation in terms of the detailed safety responsibilities and accountabilities of the respective organizations may be provided therefrom.

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 the aviation organizations of the State. Guidance on development of a State safety policy is outlined in Appendix 1 to this chapter.

c) Develop or include broad State safety objectives which are congruent with the State safety policy. Such safety objectives may be stand-alone or part of the organization's overall 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 the safety objectives.

4.4.6 Accident and incident investigation — Element 1.3

The State should:

a) ensure that the national legislative framework includes provisions 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, a competent accident investigation commission or board may be appointed for each accident to be investigated. Alternatively, such States may consider the services of an RAIO (see 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.

4.4.7 Enforcement policy — Element 1.4 (i)

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

4.4.8 Safety oversight — Element 3.1 (i)

The State should ensure or establish a basic safety oversight programme to oversee service providers. This should include a surveillance programme that assures the regulatory compliance of service providers during routine operations including, but not necessarily limited to:

a) site, station or product inspections; and

b) organizational or system audits.

4.4.9 Safety requirements for the service provider's SMS — Element 2.1 (i)

a) Where appropriate during the education and promotion phase of SMS implementation, 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 material, pertinent to service providers, in anticipation of or in conjunction with the development of SMS regulations. See Appendix 9 to this chapter for an example of a State SMS regulation.

Phase 3

4.4.10 Enforcement policy — Element 1.4 (ii)

In an SSP-SMS environment, the State's regulatory enforcement policy and procedures 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 voluntary/confidential reporting systems 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 State enforcement policy is outlined in Appendix 10 and sample State enforcement procedures are outlined in Appendix 11 to this chapter.

4.4.11 SMS requirements for service providers — Element 2.1 (ii)

a) Establish SMS regulations, guidance material 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 the acceptance of an individual service provider's SMS to ensure that its 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 an acceptance process may be done on a phased basis where appropriate. Refer to Appendix 12 for an example of an SMS regulatory assessment/acceptance checklist.

Note.— Acceptance or recognition of a foreign organization's SMS (e.g. foreign AMO) is encouraged where such an 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.

4.4.12 Safety data collection, analysis and exchange — Element 3.2 (i)

The State should:

a) set up mechanisms and procedures for collecting and analysing mandatory/reportable occurrences at the 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 3 for an example of a State's 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 stand-alone databases at the individual sector level only. This integration aspect should also be addressed for 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 an RSOO or an RAIO 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 (e.g. ICAO audit findings). Development and selection of safety indicators should be congruent with 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 to Appendix 4 for guidance on developing and monitoring safety indicators.

Phase 4

4.4.13 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.

4.4.14 Safety oversight — Element 3.1 (ii)

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

a) setting up with service providers periodic review of the SMS requirements and related guidance material 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.

4.4.15 Safety oversight — Element 3.1 (iii)

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. As with any effective internal review mechanism, there should be an appropriate level of independence in the review process and accountability for follow-up action.

4.4.16 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 to Appendix 5 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 2 for guidance on a State's voluntary reporting system;

b) establish lower-consequence safety and/or quality indicators with appropriate target and alert monitoring (mature ALoSP). Selection and development of safety indicators should be congruent with the State's safety objectives and safety policy and 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 to Appendix 4 for guidance on developing and monitoring safety indicators;

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.

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

The State should review existing surveillance and audit programmes to incorporate provisions for calibration of individual service provider's surveillance or audit frequency and scope based on pertinent performance outcomes and safety data inputs. Refer to Section 4.2, SSP Element 3.3, 4.2.36 and 4.2.37 for guidance on the safety-data-based surveillance concept.

4.4.18 Internal training, communication and dissemination of safety information — Element 4.1 (Phases 1 to 4)

The State should:

a) develop an internal training policy and procedures;

b) develop an SSP and SMS training programme for relevant staff. Priority should be given to SSP-SMS implementation personnel and operational/field inspectors involved in a service provider's SMS;

c) include State-specific SSP processes and their relevance to the generic ICAO framework elements in post-SSP and SMS implementation training and education material;

d) develop a means to communicate safety-related information, including the State SSP documentation and safety/enforcement policies and procedures, to State regulatory and administrative organizations through such mechanisms as newsletters, bulletins and websites.

4.4.19 External training, communication and dissemination of safety information — Element 4.2 (Phases 1 to 4)

The State should:

a) establish a process to communicate regulatory, SSP- and SMS-related information to service providers;

b) develop, for service providers, guidance material on implementation of SMS;

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 the exchange of safety information with and amongst service providers and other States;

e) facilitate SMS training or familiarization for service providers where appropriate.

Note.— The elements in 4.4.18 and 4.4.19 are progressively developed and implemented through all of the implementation phases.

Appendix 1 to Chapter 4

GUIDANCE ON THE DEVELOPMENT OF A STATE SAFETY POLICY STATEMENT

1. GENERAL

1.1 The State safety policy statement should consider, but not necessarily be limited to, the following commitments:

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

b) 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;

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

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

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

f) 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;

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

h) 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;

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

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

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

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

1.2 The State safety policy statement should be signed by the SSP accountable executive or an official from the appropriate State level office responsible for overseeing the State's regulatory and administrative organizations.

2. ILLUSTRATION OF A BASIC SAFETY POLICY STATEMENT

The following is an illustration of a basic safety policy statement:

[Name of the State regulatory organization] promotes and regulates the safety of aviation in [Name of State]. 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:

1) set national standards that are in line with the Standards, Recommended Practices and Procedures of the International Civil Aviation Organization;

2) adopt a data-driven and performance-based approach to safety regulation and industry oversight activities where appropriate;

3) identify safety trends within the aviation industry and adopt a risk-based approach to address areas of greater safety concern or need;

4) 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;

5) collaborate and consult with the aviation industry to address safety matters and continuously enhance aviation safety;

6) promote good safety practices and a positive organization safety culture within the industry based on sound safety management principles;

7) encourage safety information collection, analysis and exchange amongst all relevant industry organizations and service providers, with the intent that such information is to be used for safety management purposes only;

8) allocate sufficient financial and human resources for safety management and oversight; and

9) equip staff with the proper skills and expertise to discharge their safety oversight and management responsibilities competently.

(Signed) _____

DGCA [SSP accountable executive or an official from the State-level office responsible for civil aviation]

_____

Appendix 2 to Chapter 4

GUIDANCE ON A STATE'S VOLUNTARY AND CONFIDENTIAL REPORTING SYSTEM

(Refer to SSP Element 3.2; and Chapter 4, 4.4.16 a))

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

a) the 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 a system 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.

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

> Example:
>
> The [Name of system] covers areas such as:
>
> a) Flight operations:
>
> i) departure/en route/approach and 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 and repair activities.

e) Design and 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.

c) 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.

d) when to make such a report;

Example:

You should make a report when:

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

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

c) you have tried another reporting procedure or channel without the issue having been addressed.

e) how reports are processed;

Example:

The [Name of system] pays particular attention to the need to protect the reporter's identity when processing all reports. Every report will be read and validated by the 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 ten (10) working days if additional information is not needed. In cases where the administrator 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.

f) how to contact 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 a preliminary discussion with the [Name of system] administrator before making a report. The administrator and alternate administrator can be contacted during office hours from Monday to Friday at the following telephone numbers:

[Name of system] administrator	Alternate administrator
Mr. ABC	Mr. XYZ
Tel.:	Tel.:

_____

Appendix 3 to Chapter 4

EXAMPLE OF A STATE'S 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 1.— 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 2.— In some cases a "Remark" has been provided in square brackets [ ]. This is 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 and department].

1.2 The list of reportable occurrences (apart from accidents) and the reporting timelines are provided in Annex A to this procedure. [*Remark:* 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. [*Remark:* A procedure should also be developed to address notifications received through verbal/telephone communications.]

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. [*Remark:* 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 classification, the report record will be uploaded into the appropriate database with an assigned occurrence reference number.

2.4 The status of each report will be 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].

[*Remark:* 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's 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 the 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 the 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 with CAA enforcement procedure Reference xxx. 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.

ANNEX A

PART I. REPORTING TIMELINES (EXAMPLE)

	*Notification to the CAA and/or the accident investigation authority**	*Mandatory Report (Form XYZ) submission to the CAA and/or the accident investigation authority***	*Investigation Report to the CAA****
Accident	Immediate/ASAP	Within 24 hours	90 days
Serious incident	Immediate/ASAP	Within 48 hours	60 days
Incident	N/A	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.

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;

1. Excluding authorized operations by helicopters.

- 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 failure to achieve predicted performance during take-off or initial climb;
- fires and smoke in the passenger compartment or cargo compartments or engine fires, even though such fires were extinguished by the use of extinguishing agents;
- 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 severity classifications;
- take-off or landing 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;
- [*Remark:* Include 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);
- [*Remark:* Include any other incidents or occurrences deemed by the State as reportable under this mandatory reporting system.]

Design and 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);

1. Excluding authorized operations by helicopters.

- [*Remark:* Include 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 the 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;
- [*Remark*: Include 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;
- unauthorized 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 an impact on the safety of air navigation;
- [*Remark:* Include any other incidents or occurrences deemed by the State as reportable under this mandatory reporting system.]

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

Appendix 4 to Chapter 4

SSP SAFETY PEFORMANCE INDICATORS

1. Tables 4-A4-1 to 4-A4-4 (safety indicator examples) provide illustrative examples of State aggregate safety performance indicators (SPIs) and their corresponding alert and target level setting criteria. The SMS SPIs on the right-hand side of the tables 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 expectations of the State's SSP safety indicators. In order to ensure congruence between SSP and SMS indicators, the State will need to actively engage service providers in its development of SMS SPIs. It can be expected for SMS SPIs to be more comprehensive than 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 ALoSP monitoring and measurement. It is possible that certain safety/quality indicators may have been maintained (by the State or service providers) for supplementary purposes and hence need not be included for SSP (or SMS) level monitoring and measurement purposes. These would usually be lower level or other process-specific indicators within the organization.

2. Table 4-A4-5 (example of an SSP safety indicator chart) is an example of what a high-consequence SSP safety performance indicator chart looks like. In this case it is the State's aggregate of all operators' reportable/mandatory incident rates. The chart on the left is the preceding year's performance, while the chart on 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 spreadsheet formula is "=STDEVP". For the purpose of manual standard deviation calculation, the formula is:

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

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

3. The target setting is a desired percentage improvement (in this case 5%) over the previous year's data point average. It should be noted that the actual data point interval and occurrence rate denominator will need to be determined based on the nature of each data set, in order to ensure the viability of the safety indicator. For very low frequency occurrences, the data point 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 shown in Table 4-A4-6.

4. The data sheet in Table 4-A6 (data sheet for a sample safety indicator chart) is used to generate the safety indicator chart shown in Table 4-A4-5. The same can be used to generate any other safety indicator chart with 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.

5. Table 4-A4-7 (example of an SSP ALoSP performance summary) 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. For 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 performance of the ALoSP safety indicators at the end of any given monitoring period.

Table 4-A4-1. Safety performance indicators for 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 operator monthly/quarterly accident/serious incident rate (e.g. per 1 000 FH)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 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 (e.g. per 1 000 FH)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate	Operator combined fleet monthly incident rate (e.g. per 1 000 FH)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate
CAA aggregate air operator quarterly engine IFSD incident rate (e.g. per 1 000 FH)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 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 (e.g. per 1 000 FH)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate	Operator internal QMS/SMS annual audit LEI % or findings rate (findings per audit)	Consideration	Consideration
			CAA annual foreign air operator ramp surveillance inspection average LEI % (for each foreign operator)	Consideration	Consideration	Air operator engine IFSD incident rate (e.g. per 1 000 FH)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate	Operator voluntary hazard report rate (e.g. per 1 000 FH)	Consideration	Consideration
			CAA aggregate operator DGR incident report rate (e.g. per 1 000 FH)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate				Operator DGR incident report rate (e.g. per 1 000 FH)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate
etc.											

Table 4-A4-2. Safety performance indicators for aerodrome operators

SSP safety performance 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 aerodrome monthly/quarterly ground accident/serious incident rate — involving any aircraft (e.g. per 10 000 ground movements)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate	CAA aggregate aerodrome operator annual surveillance audit LEI % or findings rate (findings per audit)	Consideration	Consideration	Aerodrome operator quarterly ground accident/serious incident rate — involving any aircraft (e.g. per 10 000 ground movements)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate	Aerodrome operator internal QMS/SMS annual audit LEI % or findings rate (findings per audit)	Consideration	Consideration
CAA aggregate aerodrome monthly/quarterly runway excursion incident rate — involving any aircraft (e.g. per 10 000 departures)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate				Aerodrome operator quarterly runway excursion incident rate — involving any aircraft (e.g. per 10 000 departures)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate	Aerodrome operator quarterly runway foreign object/debris hazard report rate (e.g. per 10 000 ground movements)	Consideration	Consideration
CAA aggregate aerodrome monthly/quarterly runway incursion incident rate — involving any aircraft (e.g. per 10 000 departures)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate				Aerodrome operator quarterly runway incursion incident rate — involving any aircraft (e.g. per 10 000 departures)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate	Operator voluntary hazard report rate (per operational personnel per quarter)	Consideration	Consideration
									Aerodrome operator quarterly aircraft ground foreign object damage incident report rate — involving damage to aircraft (e.g. per 10 000 ground movements)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate
etc.											

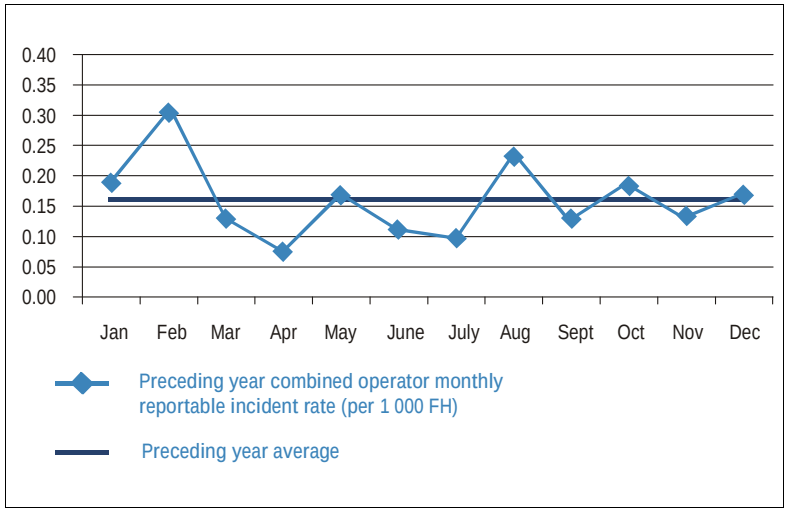
Table 4-A4-3. Safety performance indicators for ATS operators

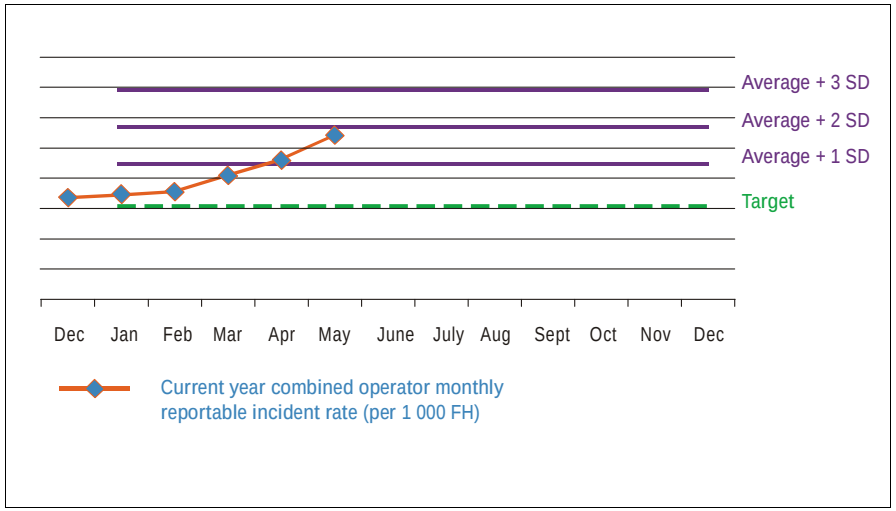
SSP safety performance indicators (aggregate State)						*SMS safety performance indicators (individual service provider)*					
High-consequence indicators (occurrence/outcome-based)			*Lower-consequence indicators (event/activity-based)*			*High-consequence indicators (occurrence/outcome-based)*			*Lower-consequence 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 incident rate — involving any aircraft (e.g. per 100 000 flight movements)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate	CAA aggregate ATS quarterly FIR TCAS RA incident rate — involving any aircraft (e.g. per 100 000 flight movements)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate	ATS operator quarterly FIR serious incident rate — involving any aircraft (e.g. per 100 000 flight movements)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate	ATS operator quarterly FIR TCAS RA incident rate — involving any aircraft (e.g. per 100.000 flight movements)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate
			CAA aggregate ATS quarterly FIR level bust (LOS) incident rate — involving any aircraft (e.g. per 100 000 flight movements)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate	ATS operator quarterly/annual near-miss incident rate (e.g. per 100 000 flight movements)	Assuming the historical annual average rate is 3, the possible alert rate could be 5.	Assuming the historical annual average rate is 3, the possible target rate could be 2	ATS operator quarterly FIR level bust (LOS) incident rate — involving any aircraft (e.g. per 100 000 flight movements)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate
			CAA aggregate ATS operator annual surveillance audit LEI % or findings rate (findings per audit)	Consideration	Consideration				ATS operator internal QMS/SMS annual audit LEI % or findings rate (findings per audit)	Consideration	Consideration
etc.											

Table 4-A4-4. POA/DOA/MRO ORGANIZATIONS

SSP safety performance 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*
DOA/POA/MRO organizations											
CAA aggregate MRO quarterly mandatory defect reports (MDR) received	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 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	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate	MRO/POA/DOA internal QMS/SMS annual audit LEI % or findings rate (findings per audit)	Consideration	Consideration
CAA aggregate POA/DOA quarterly rate of operational products which are the subject of ADs/ASBs (per product line)	Consideration	Consideration				POA/DOA quarterly rate of operational products which are the subject of ADs)/ASBs (per product line)	Consideration	Consideration	MRO/POA/DOA quarterly final inspection/testing failure/rejection rate (due to internal quality issues)	Consideration	Consideration
						MRO/POA quarterly rate of component mandatory/major defect reports raised (due to internal quality issues)	Consideration	Consideration	MRO/POA/DOA voluntary hazard report rate (per operational personnel per quarter)	Consideration	Consideration
etc.											

Table 4-A4-5. Example of an SSP safety performance indicator chart (with alert and target level settings)





a) Alert level setting:

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

b) Alert level trigger:

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

— any single point is above the 3 SD line
— 2 consecutive points are above the 2 SD line
— 3 consecutive points are above the 1 SD line.

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

c) Target level setting (planned improvement):

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

d) Target achievement:

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

e) Alert and target levels — validity period:

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

Table 4-A4-6. Sample data sheet used to generate a high-consequence SSP safety indicator chart (with alert and target setting criteria)

Preceding year				
Month	*All operator total FH*	*All operator incidents*	*Incident rate**	*Average*
January	51 837	10.00	0.19	0.16
February	48 406	15.00	0.31	0.16
March	53 354	7.00	0.13	0.16
April	52 513	4.00	0.08	0.16
May	54 037	9.00	0.17	0.16
June	52 673	6.00	0.11	0.16
July	54 086	5.00	0.09	0.16
August	54 043	13.00	0.24	0.16
September	52 383	7.00	0.13	0.16
October	53 042	10.00	0.19	0.16
November	51 353	7.00	0.14	0.16
December	53 006	9.00	0.17	0.16
		Average	0.16	
		SD	0.06	

Current year							
Month	*All operator total FH*	*All operator incidents*	*Incident rate**	*Preceding year average + 1 SD*	*Preceding year average + 2 SD*	*Preceding year average + 3 SD*	*Current year target average*
December	53 006	9.00	0.17				
January	51 635	9.00	0.17	0.23	0.29	0.35	0.15
February	44 295	8.00	0.18	0.23	0.29	0.35	0.15
March	48 323	10.00	0.21	0.23	0.29	0.35	0.15
April	47 176	11.00	0.23	0.23	0.29	0.35	0.15
May	47 469	13.00	0.27	0.23	0.29	0.35	0.15
June				0.23	0.29	0.35	0.15
July				0.23	0.29	0.35	0.15
August				0.23	0.29	0.35	0.15
September				0.23	0.29	0.35	0.15
October				0.23	0.29	0.35	0.15
November				0.23	0.29	0.35	0.15
December				0.23	0.29	0.35	0.15
		Average					
		SD					

Average + 1 SD	Average + 2 SD	Average + 3 SD
0.23	0.29	0.35

Current year target is say 5% average rate improvement over the average rate for the preceding year, which is:	0.15

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

* Rate calculation (per 1 000 FH).

Table 4-A4-7. Example of State "X's" SSP ALoSP summary (say for the year 2010)

Lower-consequence safety indicators					
SI description		*SI alert level criteria (for 2010)*	*Alert level breached (Yes/No)*	*SI target level criteria (for 2010)*	*Target achieved (Yes/No)*
1	CAA aggregate air operator monthly accident/serious incident rate (per 1 000 FH)	2009 average rate + 1/2/3 SD (annual reset)	Yes	5% improvement of the 2010 average rate over the 2009 average rate	No
2	CAA aggregate aerodrome monthly ground accident/serious incident rate — involving any aircraft (per 10 000 ground movements)	2009 average rate + 1/2/3 SD (annual reset)	Yes	3% improvement of the 2010 average rate over the 2009 average rate	Yes
3	CAA aggregate ATS monthly FIR serious incident rate — involving any aircraft (per 100 000 air movements)	2009 average rate + 1/2/3 SD (annual reset)	No	4% improvement of the 2010 average rate over the 2009 average rate	No

Lower-consequence safety indicators					
SI description		*SI alert level criteria (for 2010)*	*Alert level breached (Yes/No)*	*SI target level criteria (for 2010)*	*Target achieved (Yes/No)*
1	CAA aggregate air operator organization annual surveillance/audit outcomes	More than 25% average LEI or any Level 1 finding or more than 5 Level 2 findings per audit	Yes	Less than 10% average LEI and less than 1 Level 2 finding per audit	No
2	CAA annual air operator line station surveillance inspection average LEI % (for each operator)	More than 25% average LEI or any Level 1 finding or more than 5 Level 2 findings per audit	Yes	Less than 10% average LEI	Yes
3	CAA annual foreign air operator ramp sampling inspection programme	More than 25% average LEI or any Level 1 finding or more than 5 Level 2 findings per audit or less than 25% of foreign operators inspected	Yes	Not less than 50% of foreign operators to be inspected	No
4	CAA aggregate aerodrome operator organization annual surveillance/audit outcomes	More than 25% average LEI or any Level 1 finding or more than 5 Level 2 findings per audit	No	Less than 10% average LEI and less than 1 Level 2 finding per audit	No

Lower-consequence safety indicators					
SI description		*SI alert level/criteria (for 2010)*	*Alert level breached (Yes/No)*	*SI target level/criteria (for 2010)*	*Target achieved (Yes/No)*
1	CAA aggregate ATS operator organization annual surveillance/audit outcomes	More than 25% average LEI or any Level 1 finding or more than 5 Level 2 findings per audit	Yes	Less than 10% average LEI and less than 1 Level 2 finding per audit	Yes
2	CAA aggregate ATS quarterly FIR TCAS RA incident rate — involving any aircraft (per 100 000 flight movements)	2009 average rate + 1/2/3 SD (annual reset)	Yes	5% improvement of the 2010 average rate over the 2009 average rate	No
3	CAA aggregate D&M/MRO annual surveillance/audit outcomes	More than 25% average LEI or any Level 1 finding or more than 5 Level 2 findings per audit	Yes	Less than 10% average LEI and less than 1 Level 2 finding per audit	Yes
4	CAA aggregate AMO (MRO) quarterly rate of component warranty claims due to (major) technical defects	2009 average rate + 1/2/3 SD (annual reset)	No	5% improvement of the 2010 average rate over the 2009 average rate	No

Note 1.— Other process indicators. Apart from the above SSP level safety indicators, there may be other system level indicators within each operational area. Examples include process or system-specific monitoring indicators in AIR, OPS or AGA or indicators associated with performance-based programmes such as fatigue risk management or fuel management. Such process or system-specific indicators should rightly be administered as part of the system or process concerned. They may be viewed as specific system or process level indicators which 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 should preferably be aligned with those of the SSP level safety indicators where applicable.

Note 2.— Selection of indicators and settings. The combination (or package) of high and lower-consequence safety indicators is to be selected by a State according to the scope of its aviation system. For those indicators where the suggested alert or target level 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 5 to Chapter 4

SAFETY INFORMATION PROTECTION

1.1 International civil aviation's outstanding safety record is, among others, due to one key factor: 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.

1.2 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).

1.3 SDCPS have allowed the civil aviation community 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 the law by the appropriate authority, where appropriate, has served civil aviation well in terms of safety, while ensuring that there is no harbouring of violators.

1.4 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, thus preventing the development and free exchange of safety information which are essential to improving aviation safety.

1.5 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 in the civil aviation community'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.

1.6 To address this topic, ICAO developed Attachment E to Annex 13, which provides legal guidance 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 the following series of principles that can be adapted to meet the particular needs of the State enacting laws and regulations to protect safety information.

1.7 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.

1.8 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.

1.9 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.

1.10 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.

1.11 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.

1.12 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.

1.13 Although guidance for the protection of SDCPS was adopted as an attachment to Annex 13 on 3 March 2006, the aviation community has recommended that ICAO should 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, on 5 May 2011, began work on recommendations for new or enhanced provisions and guidance material related to the protection of safety information.

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Appendix 6 to Chapter 4

GUIDANCE ON ACCIDENT AND INCIDENT NOTIFICATION AND REPORTING

1. INTRODUCTION

1.1 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.

1.2 Throughout this guidance the Annex 13 Standards are quoted in a grey text box.

2. ACCIDENTS AND INCIDENTS — NOTIFICATION AND REPORTS

2.1 General

2.1.1 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.

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

a) notification;

b) Preliminary (ADREP) Report;

c) Final Report; and

d) Data (ADREP) Report.

These four stages are discussed further in Sections 2.2 to 2.5, and Table 4-A6-1 shows a sequential summary of a notification and reporting checklist in accordance with Annex 13, Attachment B.

2.1.3 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 provided in 3.

2.2 Notification

A notification is used for immediate dissemination of accident/incident information. As per Annex 13, Chapter 4, the following information must be sent to ICAO:

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.

. . .

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.

2.3 Preliminary Report

2.3.1 The Preliminary Report is the communication used for the prompt dissemination of data obtained during the early stages of the investigation. It 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.

2.3.2 Annex 13, Chapter 7, 7.1 and 7.2 state:

Accidents to aircraft over 2 250 kg

7.1 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

7.2 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.

2.3.3 Annex 13, Chapter 7, 7.4, stipulates:

Dispatch

7.4 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.

2.4 Final Report

2.4.1 Annex 13, Chapter 6, 6.5 to 6.7, contain the following Standards concerning the Final Report:

Release of the Final Report

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.

. . .

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.

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 5 700 kg has released a Final Report, the State shall send to the International Civil Aviation Organization a copy of the Final Report.

2.4.2 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*.

2.5 Data Report

2.5.1 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 reopened, the information previously reported should be amended as appropriate. The purpose of the Data Report is to provide accurate and complete information in a standard format.

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

2.5.3 Further, Annex 13, Chapter 7, 7.5, requires:

Accidents to aircraft over 2 250 kg

7.5 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. GENERAL INSTRUCTIONS FOR COMPILING

3.1 Options for reporting occurrences to ICAO

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

a) ICAO's Occurrence Report Manager available on iSTARS secure portal at http://www.icao.int/Safety;

b) an ADREP-compatible database report (e.g. ECCAIRS);

c) paper reports sent to ICAO.

3.2 Occurrence Report Manager

The Notification and ADREP Preliminary Report forms can now be completed electronically through ICAO's Occurrence Report Manager available on the iSTARS secure portal. iSTARS members can access the Occurrence Report forms by visiting iSTARS and then following the link to the occurrence reporting instructions. New registrations to the iSTARS secure portal can request access either through iSTARS online or by email at adrep@icao.int.

3.3 Basic rules

The validity of the safety information that 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 the guidance in this manual. Some basic rules to follow when completing the ICAO online Accident and Incident Reporting Form or the ADREP-compatible format (e.g. ECCAIRS) record of the occurrence are:

a) Determine the appropriate occurrence classification and categorization, i.e. whether it is an accident, serious incident or incident, based on injury level, aircraft damage and other information available.

b) Complete the basic data such as date, time, State and location of occurrence, airport, severity, aircraft type, operator, operation type and flight phase.

c) Choose the appropriate field units before entering values, e.g. ft, MSL or FL for altitude.

d) If more than one aircraft is involved in an occurrence, provide the information about the other aircraft. When entering event types for more than one aircraft be sure to select the appropriate aircraft (1 or 2). All events must be in time sequence and care should be taken not to exclude vital events.

e) Align events with occurrence categories.

f) Use "Unknown" entries only if it is established after investigating that information was not found.

g) Use "Blank" entries to indicate that the investigation is ongoing to find information that is currently not available.

3.4 Notifications

3.4.1 In the case of filing a notification by means of the iSTARS Occurrence Report Manager, all the information required, as per Annex 13, Chapter 4, 4.2, is contained in the electronic notification forms, now available online, and should be completed as per the instructions provided on the form.

3.4.2 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. These fields are:

a) State reporting;

b) State file number;

c) reporting organization;

d) occurrence class; and

e) date of occurrence.

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

3.5 ADREP taxonomy

The ADREP taxonomy was 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 and should be referenced whenever in doubt about the terminology on notification and report forms.

3.6 Dispatch of the reports

3.6.1 When information on the occurrence is available in an 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.

3.6.2 Online report forms submitted electronically through the 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
Montréal, Quebec H3C 5H7
Canada
Fax: + 1 (514) 954-6077

3.6.3 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. SPECIAL INSTRUCTIONS FOR COMPILING

4.1 Occurrence category coding

4.1.1 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 to prevent similar accidents or incidents from occurring in the future.

4.1.2 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 type coding

4.2.1 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 are accurately included.

4.2.2 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.

4.2.3 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 aspects in the coding of events. They are used to determine what preventive action may be required. The complete set of event types, and descriptive and explanatory factors with their detailed descriptions can be found on the ICAO ADREP taxonomy webpage.

4.2.4 General considerations when reporting events include:

a) *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".

b) *Align occurrence categories with events.* For example, if the occurrence category is SCF-NP, then there must be an event of failure of a non-powerplant component/system.

c) *Align events and descriptive factors.* Events and descriptive factors describe what went wrong, what did not work, what was out of the ordinary and what contributed to the occurrence. For example, the event "central warning-related event" can be used for events where the system malfunctioned, and the descriptive factor "central computers" can be used to specify the event.

d) *Complete the sequence of events 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

4.3.1 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 be described in chronological (time) order and be brief and specific.

4.3.2 The study and analysis of the sequence of events that led to the occurrence can help to 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.

4.3.3 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 in the Data Report 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 corrective action will resolve the identified safety problem. Include a summary of any preventive action already taken.

Table 4-A6-1. Notification and reporting checklist

In this checklist, the following terms have the meanings indicated below:

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.

Notification of accidents and serious incidents

From	*Report*	*To*	*For*	*By*
State of Occurrence	Notification	State of Registry State of the Operator State of Design State of Manufacture	International occurrences: All aircraft	With a minimum of delay
		ICAO	Aircraft over 2 250 kg or turbojet-powered aeroplanes	
State of Registry	Notification	State of the Operator State of Design State of Manufacture	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 State of Occurrence State of the Operator State of Manufacture State of Design Any State providing information, significant facilities or experts. ICAO	Aircraft over 2 250 kg	30 days*
			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		
*If, 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 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	All aircraft	With a minimum of delay
		ICAO	Aircraft over 5 700 kg	

ADREP Data Report

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

_____

Appendix 7 to Chapter 4

SSP GAP ANALYSIS CHECKLIST AND IMPLEMENTATION PLAN

1. INITIAL GAP ANALYSIS CHECKLIST (TABLE 4-A7-1)

1.1 The initial gap analysis checklist in Table 4-A7-1 can be used as a template to conduct the first step of an SSP gap analysis. This format with its overall "Yes/No/Partial" responses will provide an initial indication of the broad scope of gaps and hence overall workload to be expected. 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 as per Tables 4-A7-2 and 4-A7-3.

1.2 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.— The SMM references in square [ ] brackets refer to the guidance material in this manual relevant to the gap analysis question.

Table 4-A7-1. Gap analysis checklist

No.	*Aspect to be analysed or question to be answered*	*Answer*	*Status of implementation*
Component 1 — STATE SAFETY POLICIES AND OBJECTIVES			
Element 1.1 — State safety legislative framework			
1.1-1	Has [State] promulgated a national safety legislative framework and specific regulations that define the management of safety in the State? [4.2.1, Element 1.1; 4.3.2; 4.4.4]	☐ Yes ☐ No ☐ Partial	
1.1-2	Are the legislative framework and specific regulations periodically reviewed to ensure that they remain relevant to the State? [4.2.1, Element 1.1; 4.4.4 b)]	☐ Yes ☐ No ☐ Partial	
	Element 1.2 — State safety responsibilities and accountabilities		
1.2-1	Has [State] identified an SSP placeholder organization and an accountable executive for the implementation and coordination of the SSP? [4.2.1, Element 1.2; 4.4.3 a)]	☐ Yes ☐ No ☐ Partial	
1.2-2	Has [State] established an SSP implementation team? [4.2.1, Element 1.2; 4.4.3 b)]	☐ Yes ☐ No ☐ Partial	

No.	*Aspect to be analysed or question to be answered*	*Answer*	*Status of implementation*
1.2-3	Has [State] defined the State requirements, responsibilities and accountabilities regarding the establishment and maintenance of the SSP? [4.2.1, Element 1.2; 4.4.3]	☐ Yes ☐ No ☐ Partial	
1.2-4	Does [State] have an SSP implementation plan in place, which includes a time frame for the implementation of actions and gaps as identified through the gap analysis? [4.3; 4.4.3 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? [4.2.1, Element 1.2; Chapter 4, Appendix 1, Part 1, 1.1 d)]	☐ Yes ☐ No ☐ Partial	
1.2-6	Does [State] SSP accountable executive have control of the necessary resources required for the implementation of the SSP? [4.4.3 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? [4.4.5 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? [4.4.3 e)]	☐ Yes ☐ No ☐ Partial	
1.2-9	Does [State] SSP accountable executive coordinate, as appropriate, the activities of the different State aviation organizations under the SSP? [4.2.1, Element 1.2; 4.4.3 a)]	☐ Yes ☐ No ☐ Partial	
1.2-10	Has [State] established a safety policy? [4.2.1, Element 1.2; 4.4.5 b)]	☐ Yes ☐ No ☐ Partial	
1.2-11	Is [State] safety policy signed by the [State] SSP accountable executive or an appropriate authority within [State]? [Chapter 4, Appendix 1]	☐ Yes ☐ No ☐ Partial	
1.2-12	Is [State] safety policy reviewed periodically? [4.4.15]	☐ 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? [4.4.5 b)]	☐ Yes ☐ No ☐ Partial	

No.	*Aspect to be analysed or question to be answered*	*Answer*	*Status of implementation*
1.2-14	Has [State] initiated a unified SSP document as part of the SSP implementation plan to describe its SSP framework components and elements? [4.2.1, Element 1.2; 4.4.3 f); Appendix 8]	☐ Yes ☐ No ☐ Partial	
1.2-15	Has the SSP document been completed, approved and signed by the SSP accountable executive and the document communicated or made accessible to all stakeholders upon full implementation of the SSP? [4.4.3 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? [4.2.1, Element 1.2; 4.4.3 f)]	☐ Yes ☐ No ☐ Partial	
1.2-17	Does [State] have a periodic internal review mechanism for assurance of continuing improvement and effectiveness of its SSP? [4.2.1, Element 3.1; 4.4.15]	☐ 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? [4.2.1, Element 1.3; 4.4.6]	☐ Yes ☐ No ☐ Partial	
1.3-2	Is the organization/authority for accident investigation functionally independent (see the *Manual of Aircraft Accident and Incident Investigation* (Doc 9756, Part I, 2.1)? [4.4.6 b)]	☐ Yes ☐ No ☐ Partial	
Element 1.4 — Enforcement policy			
1.4-1	Has [State] promulgated an enforcement policy? [4.2.1, Element 1.4; 4.4.10; Appendices 10 and 11]	☐ Yes ☐ No ☐ Partial	
1.4-2	Does [State] primary aviation legislation provide for the enforcement of the applicable legislation and regulations? [4.4.7]	☐ Yes ☐ No ☐ 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 their approved SMS/QMS procedures? [4.4.10 a)]	☐ Yes ☐ No ☐ Partial	

No.	*Aspect to be analysed or question to be answered*	*Answer*	*Status of implementation*
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? [4.2.1, Element 1.4; 4.4.10 b)]	☐ Yes ☐ No ☐ Partial	
1.4-5	Does the SSP enforcement policy include provisions to prevent the use or disclosure of safety data for purposes other than safety improvement? [4.2.1, Element 1.4; 4.4.10 c)]	☐ Yes ☐ No ☐ Partial	
1.4-6	Does the SSP enforcement policy include provisions to protect the sources of information obtained from voluntary incident reporting systems? [4.4.10 d); Appendices 2 and 10]	☐ Yes ☐ No ☐ Partial	
Component 2 — STATE SAFETY RISK MANAGEMENT			
Element 2.1 — Safety requirements for the service provider's SMS			
2.1-1	Has [State] promulgated harmonized regulations to require service providers to implement an SMS? 4.2.1, Element 2.1; 4.4.9; Appendix 9]	☐ Yes ☐ No ☐ Partial	
2.1-2	Are these SMS requirements and related guidance material periodically reviewed to ensure they remain relevant and appropriate to the service providers? [4.2.1, Element 2.1; 4.4.14 a)]	☐ Yes ☐ No ☐ Partial	
Element 2.2 — Agreement on the service provider's safety performance			
2.2-1	Has [State] individually agreed/accepted the service provider's safety performance indicators and their respective alert/target levels? [4.2.1, Element 2.2; 4.4.13]	☐ 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? [4.4.13]	☐ Yes ☐ No ☐ Partial	
2.2-3	Are the agreed safety performance indicators periodically reviewed by [State] to ensure they remain relevant and appropriate to the service provider? [4.4.14 b)]	☐ Yes ☐ No ☐ Partial	

No.	*Aspect to be analysed or question to be answered*	*Answer*	*Status of implementation*
Component 3 — STATE SAFETY ASSURANCE			
Element 3.1 — Safety oversight			
3.1-1	Has [State] established a formal surveillance programme to ensure satisfactory compliance by service providers with State safety regulations and requirements? [4.2.1, Element 3.1]	☐ Yes ☐ No ☐ Partial	
3.1-2	Has [State] established a process for the initial review and acceptance of an individual service provider's SMS? [4.2.1, Element 2.2; 4.4.11 b)]	☐ Yes ☐ No ☐ Partial	
3.1-3	Has [State] established procedures for the review of individual service provider's safety performance indicators and their relevant alert/target levels? [4.2.1, Element 2.2; 4.4.13]	☐ Yes ☐ No ☐ Partial	
3.1-4	Does [State] safety oversight programme include periodic assessment of an individual service provider's SMS? [4.2.1, Element 3.1; 4.4.14]	☐ Yes ☐ No ☐ Partial	
3.1-5	Does [State] periodic SMS surveillance programme include assessment of the service provider's hazard identification and safety risk management processes? [4.4.14 c)]	☐ Yes ☐ No ☐ Partial	
3.1-6	Does [State] periodic SMS surveillance programme include assessment of the service provider's safety performance indicators and their relevant alert/target levels? [4.4.14 b)]	☐ Yes ☐ No ☐ Partial	
3.1-7	Does [State] have a periodic internal review mechanism for assurance of effective compliance of the SSP and its related safety oversight functions? [4.4.15]	☐ 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? [4.2.1, Element 3.2; 4.4.12]	☐ Yes ☐ No ☐ Partial	
3.2-2	Has [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? [4.4.16 a)]	☐ Yes ☐ No ☐ Partial	

No.	Aspect to be analysed or question to be answered	Answer	Status of implementation
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? [4.2.1, Element 3.2; 4.4.16]	☐ 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? [4.4.12 b); 4.4.16 b)]	☐ Yes ☐ No ☐ Partial	
3.2-5	Are the ALoSP safety indicators appropriate and relevant to the scope and complexity of the aviation activities? [4.4.12 b); 4.4.16 b)]	☐ Yes ☐ No ☐ Partial	
3.2-6	Does [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? [4.4.12 b); 4.4.16 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? [4.2.1, Element 3.3; 4.4.17]	☐ 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? [4.2.1, Element 3.3; 4.4.17]	☐ Yes ☐ No ☐ 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 and SMS training, for relevant personnel of the regulatory/administrative organizations? [4.4.18]	☐ 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 familiarization? [4.2.1, Element 4.1; 4.4.18]	☐ Yes ☐ No ☐ Partial	
4.1-3	Does [State] maintain a mechanism for the consolidation, communication and sharing of safety information amongst its regulatory and administrative organizations involved in the SSP? [4.4.18 d)]	☐ Yes ☐ No ☐ Partial	

No.	*Aspect to be analysed or question to be answered*	*Answer*	*Status of implementation*
4.1-4	Does the internal safety information/data sharing include occurrence, investigation and hazard reports from all of the State's aviation sectors? [4.4.16 c)]	☐ Yes ☐ No ☐ Partial	
Element 4.2 — External training, communication and dissemination of safety information			
4.2-1	Does [State] facilitate the continuing education, communication and sharing of safety information with and amongst its service providers? [4.2.1, Element 4.2; 4.4.19]	☐ Yes ☐ No ☐ Partial	
4.2-2	Do [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? [4.4.19 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? [4.4.19 a)]	☐ Yes ☐ No ☐ Partial	
4.2-4	Is [State] SSP document and its associated safety policy, enforcement policy and aggregate safety indicators included in the State's safety information communication and sharing process? [4.4.19 a)]	☐ Yes ☐ No ☐ Partial	

2. DETAILED GAP ANALYSIS AND IMPLEMENTATION TASKS (TABLE 4-A7-2).

The initial gap analysis checklist in Table 4-A7-1 should then be followed up by using the detailed "Gap analysis and implementation task identification plan" outlined in Table 4-A7-2. Once completed this table should provide follow-up analysis on details of the gaps and help translate these into actual required tasks and subtasks in the specific context of the State's environment, processes and terminology. Each task will accordingly be assigned to appropriate individuals or groups for action. It is important that correlation of individual element/task development with their descriptive placeholders in the SSP document be provided for in Table 4-A7-2 in order to trigger progressive updating of the draft SSP document as each element is implemented or enhanced. (Initial element write-ups in SSP documents tend to be anticipatory rather than declaratory.)

3. ACTION/TASK IMPLEMENTATION SCHEDULE (TABLE 4-A7-3).

Table 4-A7-3 will show the milestones (start-end dates) scheduled for each task/action. For a phased implementation approach, these tasks/actions will need to be sorted according to the phase allocation of their related elements. Refer to Section 4.4 of this chapter as appropriate. Table 4-A7-3 may be a separate consolidation of all outstanding actions/tasks or, if preferred, be a continuation of Table 4-A7-2 in the form of a spreadsheet.

Table 4-A7-2. Example gap analysis and implementation task identification plan

GAQ reference	*Gap analysis question*	*Answer (Yes/No/Partial)*	*Description of gap*	*Action/task required to fill gap*	*Assigned task group/person*	*SSP document reference*	*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 the existing regulatory organizations.	Task #1 — Legal department to review legislative framework	Task Group A	Chapter 2, Section 1	WIP
1.1-2	Are the legislative framework and specific regulations periodically reviewed to ensure that they remain relevant to the State?	Partial	Ad hoc or piecemeal review only. No SOP for periodic review process.	Task #3 — Develop SOP for the periodic review of all operating regulations	Task Group B	Chapter 2, Section 3	Open
etc.							

Note.— All gap analysis questions or only those questions with "No/Partial" answers may be addressed in this table as appropriate.

Table 4-A7-3. Example action/task implementation schedule

Action/task required to fill gap	*GAQ reference*	*Assigned task group/person*	*Action/task status*	*Schedule/timeline (start–end)*												
				1Q10	*2Q10*	*3Q10*	*4Q10*	*1Q11*	*2Q11*	*3Q11*	*4Q11*	*1Q12*	*2Q12*	*3Q12*	*4Q12*	*etc.*
Task #1 — Legal department to review legislative framework	1.1-1	Task Group A	WIP													
Task #2 — Define the scope of the SMS		Group 3														
etc.																

Note.— Table 4-A7-3 can be a separate consolidation or a continuation of Table 4-A7-2 (spreadsheet) if preferred. Where prioritization of task implementation is necessary, refer to Section 4.4 of this chapter.

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Appendix 9 to Chapter 4

EXAMPLE OF A STATE SMS REGULATION

1. STATUTORY BASIS

SMS regulation 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 Operations.*

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.

2.3 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.

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

3. EXAMPLE OF AN SMS REGULATION/REQUIREMENT CLAUSE

3.1 Effective [Date(s)], [Type of service provider] shall have in place a safety management system (SMS) acceptable to [Name of CAA] and which addresses four high-level safety objectives as follows:

a) identifies safety hazards;

b) ensures the implementation of the remedial action necessary to maintain agreed safety performance;

c) provides for continuous monitoring and regular assessment of safety performance; and

d) aims at a continuous improvement of the overall performance of the safety management system.

3.2 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 Safety risk assessment and mitigation

3. Safety assurance

   3.1 Safety performance monitoring and measurement
   3.2 The management of change
   3.3 Continuous improvement of the SMS

4. Safety promotion

   4.1 Training and education
   4.2 Safety communication.

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

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SAMPLE 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 The [State's CAA] enforcement policies and procedures will 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 in order to distinguish between premeditated violations and 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 [All applicable service providers] 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 an 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 proposed (including any appropriate internal disciplinary actions) 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 or 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.

3. 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;

b) [State's CAA] will seek to educate and promote training or supervision of those who show commitment to resolving safety deficiencies; and

c) [State's CAA] will give due and equitable consideration to distinguish premeditated violations from unintentional errors or deviations.

4. 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.

5. EXCEPTIONS

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

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

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

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

(Signed) _____
SSP Accountable Executive

_____

Appendix 11 to Chapter 4

GUIDANCE ON STATE ENFORCEMENT PROCEDURES IN AN SSP-SMS ENVIRONMENT

1. GENERAL

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.

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 the SMS implementation status of the service providers. 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 yet have a fully implemented or accepted SMS, 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 is made available to the 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 (e.g. gross/recurring non-conformance) that enforcement action should be considered?

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

When 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 a 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.

Appendix 12 to Chapter 4

EXAMPLE OF AN SMS REGULATORY ACCEPTANCE/ASSESSSMENT CHECKLIST

1. Table 4-A12-1 is a sample regulatory SMS assessment checklist (85 questions) which can be used for the initial assessment and acceptance of a service provider's SMS. For an initial acceptance process, the assessment questions need to be comprehensive in order to adequately address all SMS elements of the organization. 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.

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

3. Where a phased-element SMS implementation approach, as discussed in Chapter 5 of this document, is adopted the questions in the 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.

4. An illustrative corrective action notice (CAN) procedure is provided at the end of the checklist.

5. Table 4-A12-2 is a sample regulatory SMS assessment checklist (39 questions) 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 will no longer be expedient or necessary for routine assessment purposes. A routine SMS assessment checklist need only focus on the operational aspects of an SMS and evidence of the satisfactory implementation of its supporting processes.

6. Routine SMS assessment may be conducted on a stand-alone 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 4-A12-1. SMS assessment checklist — Initial SMS acceptance

SMS Assessment Checklist — Initial Acceptance			SMS audit checklist_routine /18 Aug 2011	
Input column: Annotate "Y" for Yes," N " for No, "N/A" for not applicable				
Organization name:	Date of assessment:		Assessed by POI/PMI:	Ref:

SMS Element	Level 1	Input	Doc ref/ remarks	Level 2	Input	Doc ref/ remarks	Level 3	Input	Doc ref/ remarks
Management commitment and responsibilities [1.1]	**SMS Component 1. Safety Policy and Objectives**								
	1.1/L1/1			1.1/L2/1			1.1/L3/1		
	There is a documented safety policy statement.	Y		There is evidence that the safety policy is communicated to all employees with the 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	
	1.1/L1/2			1.1/L2/2			1.1/L3/2		
	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	
	1.1/L1/3			1.1/L2/3					
	The safety policy is relevant to the scope and complexity of the organization's operations.	N		The safety policy addresses the provision of the necessary human and financial resources for its implementation.	N		–		
Safety accountabilities [1.2]	1.2/L1/1			1.2/L2/1					
	There is a documented safety (SMS) accountability within the organization that begins with the accountable manager.	Y		The accountable manager's terms of reference indicates his ultimate responsibility for his organization's safety management.	N		–		
	1.2/L1/2			1.2/L2/2					
	The accountable executive has final authority over all the 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		–		

SMS Element	Level 1	Input	Doc ref/ remarks	Level 2	Input	Doc ref/ remarks	Level 3	Input	Doc ref/ remarks
Safety accountabilities [1.2]	1.2/L1/3			1.2/L2/3			1.2/L3/1		
	There is a safety committee (or equivalent mechanism) that reviews the SMS and its safety performance.	Y		For a large organization, there are departmental or section safety action groups that work in conjunction with the safety committee.	N/A		The safety committee is chaired by the accountable manager or (for very large organizations) by an appropriately assigned deputy, duly substantiated in the SMS manual.	Y	
	1.2/L1/4			1.2/L2/4			1.2/L3/2		
	The safety committee includes relevant operational or departmental heads as applicable.	N		There is an appointed safety (SMS) coordinator within the safety action group.	N/A		The safety action groups are chaired by the departmental or section head where applicable.	N/A	
Appointment of key safety personnel [1.3]	1.3/L1/1			1.3/L2/1			1.3/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 and operation of the SMS.	N	
	1.3/L1/2						1.3/L3/2		
	The manager performing the SMS role has 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]	1.4/L1/1			1.4/L2/1			1.4/L3/1		
	There is a documented ERP or equivalent operational contingency procedure.	Y		The ERP includes procedures for the continuing safe production, delivery or support of aviation products or services during such emergencies or contingencies.	N		The ERP addresses relevant integration with external customer or subcontractor organizations where applicable.	N	
	1.4/L1/2			1.4/L2/2			1.4/L3/2		
	The ERP is appropriate to the size, nature and complexity of the organization.	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 and effectiveness.	N	
	1.4/L1/3			1.4/L2/3					
	The emergency plan addresses 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 the result of drills carried out are documented.	N		–		

SMS Element	Level 1	Input	Doc ref/ remarks	Level 2	Input	Doc ref/ remarks	Level 3	Input	Doc ref/ remarks
SMS documentation [1.5]	1.5/L1/1			1.5/L2/1			1.5/L3/1		
	There is an 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 reflect appropriate integration with other relevant management systems within the organization, such as QMS, OSHE, security, as applicable.	N	
	1.5/L1/2			1.5/L2/2			1.5/L3/2		
	The SMS document provides an overview or exposition of the organization's SMS framework and elements.	Y		The SMS document's exposition of each SMS element includes cross-references to supporting or related procedures, manuals or systems as appropriate.	Y		The SMS procedures reflect relevant coordination or integration with external customer or subcontractor organizations where applicable.	N	
	1.5/L1/3			1.5/L2/3			1.5/L3/3		
	The SMS document is a stand-alone controlled document or a distinct part/section of an existing CAA endorsed/accepted document.	Y		Records are maintained pertaining to safety committee/SAG meeting (or equivalent) minutes.	Y		There is a process to periodically review the SMS exposition and supporting documentation to ensure their continuing relevance.	N	
	1.5/L1/4			1.5/L2/4					
	All components and 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		–		
	1.5/L1/5								
	Records are maintained pertaining to safety risk assessments performed.	Y		–			–		
	1.5/L1/6								
	Records pertaining to identified or reported hazards/threats are maintained.	Y		–			–		

SMS Element	Level 1	Input	Doc ref/ remarks	Level 2	Input	Doc ref/ remarks	Level 3	Input	Doc ref/ remarks
Hazard identification [2.1]	**SMS Component 2. Safety Risk Management**								
	2.1/L1/1			2.1/L2/1			2.1/L3/1		
	There is a procedure for voluntary hazards/threats reporting by all employees.	Y		In the hazard identification system, there is a clear definition of and distinction 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	
	2.1/L1/2			2.1/L2/2			2.1/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	
	2.1/L1/3			2.1/L2/3			2.1/L3/3		
	There is a procedure for investigation of incident/accidents relating to quality or safety.	Y		The organization's internal investigation and disciplinary procedures distinguish between premeditated and deliberate violations and unintentional errors and mistakes.	N		There is a procedure for periodic review of existing risk analysis records.	N	
Safety risk assessment and mitigation [2.2]	2.2/L1/1			2.2/L2/1					
	There is a documented HIRM procedure involving the use of objective risk analysis tools.	Y		Risk assessment reports are approved by departmental managers or at a higher level where appropriate.	N		–		
	2.2/L1/2			2.2/L2/2					
	There is a procedure for identification of operations, processes, facilities and equipment which are deemed (by the organization) as relevant for HIRM.	N		Recommended mitigation actions which require senior management decision or approval are accounted for and documented.	N		–		
	2.2/L1/3			2.2/L2/3			2.2/L3/1		
	There is a programme for progressive HIRA performance of all aviation safety-related operations, processes, facilities and equipment as identified by the organization.	N		There is a procedure to prioritize HIRA performance for operations, processes, facilities and equipment with identified or known safety-critical hazards/risks.	N		There is evidence of progressive compliance and maintenance of the organization's HIRA performance programme.	N	

SMS Element	Level 1	Input	Doc ref/ remarks	Level 2	Input	Doc ref/ remarks	Level 3	Input	Doc ref/ remarks
Safety performance monitoring and measurement [3.1]	**SMS Component 3. Safety Assurance**								
	3.1/L1/1			3.1/L2/1			3.1/L3/1		
	There are identified safety performance indicators for measuring and monitoring the organization's safety performance.	Y		There are lower-consequence safety performance indicators (e.g. 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	
	3.1/L1/2			3.1/L2/2			3.1/L3/2		
	There are high-consequence data-based safety performance indicators (e.g. accident and 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 levels that have been exceeded and target achievement where applicable.	Y	
The management of change [3.2]	3.2/L1/1			3.2/L2/1			3.2/L3/1		
	There is a procedure for review of relevant existing aviation safety-related facilities and equipment (including 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 HIRM records) whenever there are pertinent changes external to the organization such as regulatory/industry standards, best practices or technology.	N	
	3.2/L1/2			3.2/L2/2					
	There is a procedure for review of relevant existing aviation operations and processes (including 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		–		

SMS Element	Level 1	Input	Doc ref/ remarks	Level 2	Input	Doc ref/ remarks	Level 3	Input	Doc ref/ remarks
Continuous improvement of the SMS [3.3]	3.3/L1/1			3.3/L2/1			3.3/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	
	3.3/L1/2			3.3/L2/2			3.3/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	
	3.3/L1/3			3.3/L2/3			3.3/L3/3		
	There is a documented internal SMS audit/assessment procedure.	N		The SMS audit plan includes the sampling of completed safety assessments.	N		The SMS audit plan covers the SMS roles/inputs of contractors where applicable.	N	
Training and communication [4.1, 4.2]	**SMS Component 4. Safety Promotion**								
	4.1/L1/1			4.1/L2/1			4.1/L3/1		
	There is a documented SMS training/familiarization policy for personnel.	Y		Personnel involved in conducting risk evaluation are provided with appropriate risk management training or familiarization.	N		There is evidence of organization-wide SMS education or awareness efforts.	N	
	4.1/L1/2			4.1/L2/2			4.1/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 familiarization.	N		There is evidence of a safety (SMS) publication, circular or channel for communicating safety and SMS matters to employees.	N	
	4.1/L1/3								
	The accountable manager has undergone appropriate SMS familiarization, briefing or training.	Y		–			–		

SUBTOTAL	CATEGORY 1
Y	23
N	11
N/A	0
Number of questions completed	34

CATEGORY 2
6
21
2
29

CATEGORY 3
2
19
1
22

GRAND TOTAL*	
Y	31
N	51
N/A	3
Number of questions completed	85

ASSESSMENT RESULT (% OF YES):
38.7%

CORRECTIVE ACTION NOTICE (CAN) PROCEDURE

1) Minimum overall acceptable performance (phased SMS implementation):

First year/phase of assessment (e.g. 2012) — 45%.
Second year/phase of assessment (e.g. 2013) — 65%.
Third year/phase of assessment (e.g. 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 assessment subsequent to State's SMS required 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 4-A12-2. SMS assessment checklist — Routine SMS assessment

SMS element		*Assessment question*
Management commitment and 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 the 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 has 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 and 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	The ERP addresses possible or likely emergency/crisis scenarios relating to the organization's aviation service deliveries.
	2	The ERP includes procedures for the continuing safe production, delivery or support of its aviation products or services during emergencies or contingencies.
	3	ERP drills or exercises are carried out according to plan and the result of drills carried out are documented.
	4	The ERP addresses relevant integration with external customer or subcontractor organizations where applicable.
	5	There is evidence of periodic review of the ERP to ensure its continuing relevance and effectiveness.
SMS documentation [1.5]	1	The organization's SMS components and elements are adequately manifested in the SMS document.

SMS element		*Assessment question*
	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 subcontractor organizations where applicable.
	4	There is evidence of procedures for periodic review of the SMS document and 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 the 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.
Safety risk assessment and mitigation [2.2]	1	There is evidence that operations, processes, facilities and equipment with aviation safety implications are progressively subjected to the organization's HIRM process.
	2	Completed risk assessment reports are approved by an appropriate level of management.
	3	There is a procedure for periodic review of completed risk mitigation records.
Safety performance monitoring and 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 data-based safety performance indicators (e.g. accident and serious incident rates).
	3	There are lower-consequence safety performance indicators (e.g. 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 includes the requirement for a 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.

SMS element		*Assessment question*
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 includes the requirement for a safety risk assessment to be conducted whenever applicable.
Continuous improvement of the SMS [3.3]	1	There is evidence that an internal SMS audit/assessment has been planned and carried out.
Training, education and communication [4.1, 4.2]	1	There is evidence that all personnel involved in SMS operations have undergone appropriate SMS training or familiarization.
	2	Personnel involved in conducting risk evaluation are provided with appropriate risk management training or familiarization.
	3	There is evidence of a safety (SMS) publication, circular or channel for communicating safety and SMS matters to employees.

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Chapter 5

SAFETY MANAGEMENT SYSTEM (SMS)

5.1 INTRODUCTION

5.1.1 An SMS is a system to assure the safe operation of aircraft through effective management of safety risk. This system is designed to continuously improve safety by identifying hazards, collecting and analysing data and continuously assessing safety risks. 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.

5.1.2 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.

5.2 SCOPE

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

g) the flying public.

5.3 SMS FRAMEWORK

5.3.1 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.

5.3.2 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.

5.3.3 *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 of the delivery of the organization's products or services. Safety assurance is accomplished through ongoing 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.

5.3.4 The four components and twelve elements that 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 Safety risk assessment and mitigation

3. Safety assurance

   3.1 Safety performance monitoring and measurement
   3.2 The management of change
   3.3 Continuous improvement of the SMS

4. Safety promotion

   4.1 Training and education
   4.2 Safety communication.

5.3.5 Additional details regarding each of the four components and twelve elements follow. A high-level summary of each component is provided, followed by the text from the SMS framework for each element. General guidance/implementation strategies for each element are then presented.

SMS Component 1. Safety Policy and Objectives

5.3.6 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.

SMS Element 1.1 Management commitment and responsibility

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

a) reflect organizational commitment regarding safety;

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

c) include safety reporting procedures;

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

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

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

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

General guidance

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

a) setting the organizational priorities and tasking;

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

c) hiring, training and supervising employees;

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

e) using the skills of its personnel; and

f) allocating the necessary resources.

5.3.8 Management should ensure that:

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

b) employees adhere to SOPs and safety directives; and

c) equipment remains in a serviceable condition.

5.3.9 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

5.3.10 Senior management develops and endorses the safety policy, which is signed by the accountable executive. (See Appendix 1 for a discussion on the acceptance and use of electronic signatures in safety policy and other SMS-related documentation.) An example of a safety policy statement is included in Figure 5-1.

5.3.11 Once the safety policy has been developed senior management should:

a) visibly endorse the policy;

b) communicate the policy to all appropriate staff;

c) establish safety performance targets for the SMS and the organization; and

d) establish safety objectives that identify what the organization intends to achieve in terms of safety management.

5.3.12 The safety policy must include a commitment to:

a) achieve the highest safety standards;

b) comply with all applicable regulatory requirements;

SAFETY POLICY STATEMENT

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

All levels of management and all employees are accountable for the delivery of this highest level of safety performance, starting with the [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* that 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;
- *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;
- *ensure* that all staff are provided with adequate and appropriate aviation safety information and training, are competent in safety matters, and are allocated only tasks commensurate with their skills;
- *establish and measure* our safety performance against realistic safety performance indicators and safety performance targets;
- *continually improve* our safety performance through continuous monitoring and measurement, regular review and adjustment of safety objectives and targets, and diligent achievement of these; and
- *ensure* that externally supplied systems and services to support our operations are delivered meeting our safety performance standards.

(Signed)

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CEO/Managing Director/or as appropriate

Figure 5-1. Example of a safety policy statement

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.

5.3.13 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.

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

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

1. James Reason, *Managing the Risks of Organizational Accidents*, 1997.
2. Sidney Dekker, *Just Culture: Balancing Safety and Accountability*, Second Edition, 2012.

SMS Element 1.2 Safety accountabilities

The service provider shall:

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

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

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

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

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

General guidance

5.3.16 In the SMS context accountability means being ultimately responsible for safety performance, whether at the overall SMS level (accountable executive) or specific product/process levels (members of the management team). This includes being responsible for ensuring appropriate corrective actions are taken to address hazards and errors reported, as well as responding to accidents and incidents.

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

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

Note.— In the context of SMM, the term "accountabilities" may be perceived as responsibilities which should not be delegated.

Implementation strategy

5.3.19 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.

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

a) provision and allocation of human, technical, financial or other resources necessary for the effective and efficient performance of SMS;

b) direct responsibility for the conduct of the organization's affairs;

c) final authority over operations under the certificate/approval of the organization;

d) establishment and promotion of the safety policy;

e) establishment of the organization's safety objectives and safety targets;

f) acting as the organization's safety champion;

g) having final responsibility for the resolution of all safety issues; and

h) establishing and maintaining the organization's competence to learn from the analysis of data collected through its safety reporting system.

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

5.3.21 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.

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

5.3.23 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).

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

a) there is a policy clearly establishing a safety accountability and authority flow between the service provider and the subcontractor;

b) the subcontractor has a safety reporting system commensurate with its size and complexity that facilitates the early identification of hazards and systemic failures of concern to the service provider;

c) the service provider's safety review board includes subcontractor representation, where appropriate;

d) safety/quality indicators to monitor subcontractor performance are developed, where appropriate;

e) the service provider's safety promotion process ensures subcontractor employees are provided with the organization's applicable safety communications; and

f) any subcontractor roles, responsibilities and functions relevant to the service provider's emergency response plan are developed and tested.

5.3.25 The SMS-related accountabilities, responsibilities and authorities of all appropriate senior managers must be described in the organization's SMS 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.

5.3.26 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.

SMS Element 1.3. Appointment of key safety personnel

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

General guidance

5.3.27 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

5.3.28 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.

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

a) safety/quality management experience;

b) operational experience;

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

d) people skills;

e) analytical and problem-solving skills;

f) project management skills; and

g) oral and written communications skills.

Note.— A sample job description for a safety manager is contained in Appendix 2 to this chapter. For small organizations, it may be viable to combine safety and quality management functions within the same office.

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

5.3.31 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.

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

a) monitors the effectiveness of the SMS;

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

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

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

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

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

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

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

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

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

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

e) reviews the effectiveness of previous safety recommendations; and

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

SMS Element 1.4 Coordination of emergency response planning

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

Implementation strategy

5.3.34 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.

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

SMS Element 1.5 SMS documentation

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

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

a) the safety policy and objectives;

b) SMS requirements;

c) SMS processes and procedures;

d) accountabilities, responsibilities and authorities for SMS processes and procedures; and

e) SMS outputs.

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

General guidance

5.3.36 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 stand-alone document or it can be a distinct "SMS section/chapter" within an existing organization- or 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, they may require CAA concurrence where necessary. Guidance for the compilation of an SMS document is in Appendix 4.

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

Implementation strategy

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

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

1) document and records management;

2) regulatory SMS requirements;

3) framework, scope and integration;

4) safety policy and safety objectives;

5) safety accountabilities and key personnel;

6) voluntary hazard reporting system;

7) incident reporting and investigation procedures;

8) hazard identification and risk assessment processes;

9) safety performance indicators;

10) safety training and communication;

11) continuous improvement and SMS audit;

12) management of change; and

13) emergency or operations contingency planning;

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

1) hazards report register and samples of actual reports;

2) safety performance indicators and related charts;

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

4) SMS internal review or audit records;

5) safety promotion records;

6) personnel SMS/safety training records;

7) SMS/safety committee meeting minutes; and

8) SMS implementation plan (during implementation process).

SMS Component 2. Safety Risk Management

General guidance

5.3.39 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 5-2.

5.3.40 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.

5.3.41 Understanding the system and its operating environment is also essential for achievement of high safety performance. Hazards may be discovered during the operational life cycle, through employee reports or incident investigations. Analysis of these hazards should be conducted in the context of the system. This context is key to avoiding attribution of events to "human error," where defects in the system may be neglected, remaining latent for future and potentially more serious events to occur. Guidance on hazard identification and risk assessment procedures and format are addressed in 5.3.42 to 5.3.61 as well as in Chapter 2, 2.14 and 2.15, respectively.

SMS Element 2.1 Hazard identification

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

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

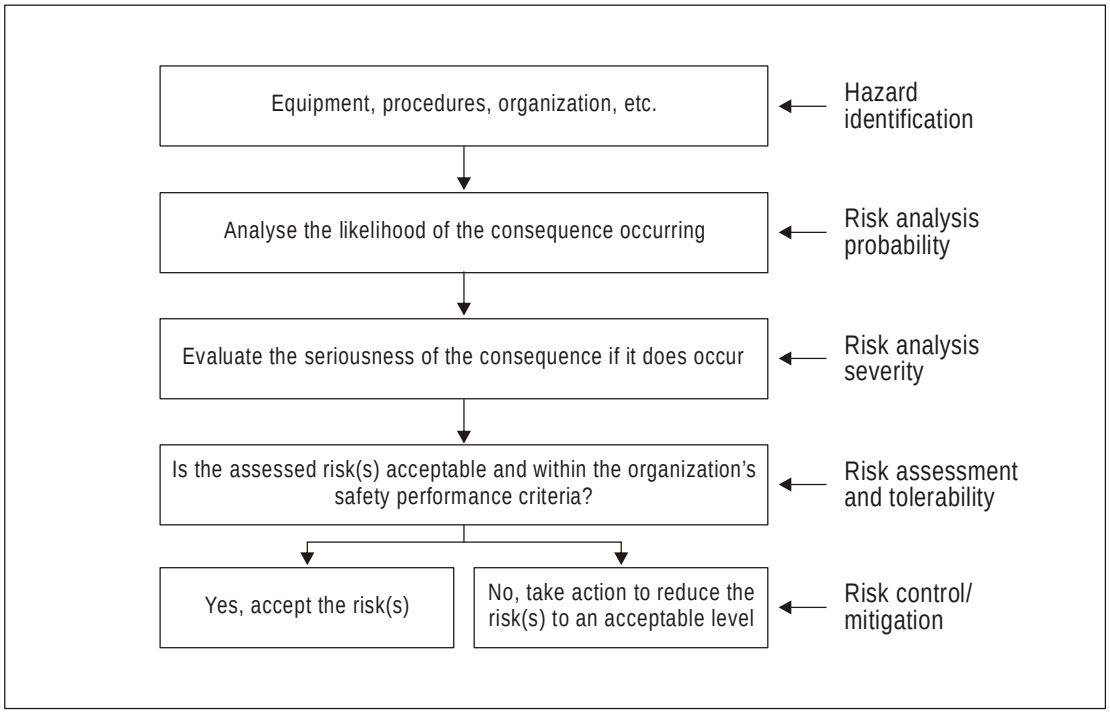

Figure 5-2. The safety risk management process

General guidance

5.3.42 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 Element 3.2 — The management of change.

5.3.43 Hazard identification is based on a combination of reactive, proactive and predictive safety data collection methods as discussed in Chapter 2. Hazard identification is the first step in the safety risk management process. The corresponding safety risks are then assessed within the context of the potentially damaging consequences related to the hazard. Where the safety risks are assessed to be unacceptable, additional safety risk controls must be built into the system.

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

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

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

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

5.3.45 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.

5.3.46 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.

5.3.47 Figure 5-3 illustrates the hazard documentation and follow-up risk management process. Hazards are constantly identified through various data sources. The service provider is expected to identify hazards, eliminate these hazards or to mitigate the associated risks. In the case of hazards identified in products or services delivered through subcontractors, a mitigation could be the service provider's requirement for such organizations to have an SMS or an equivalent process for hazard identification and risk management.

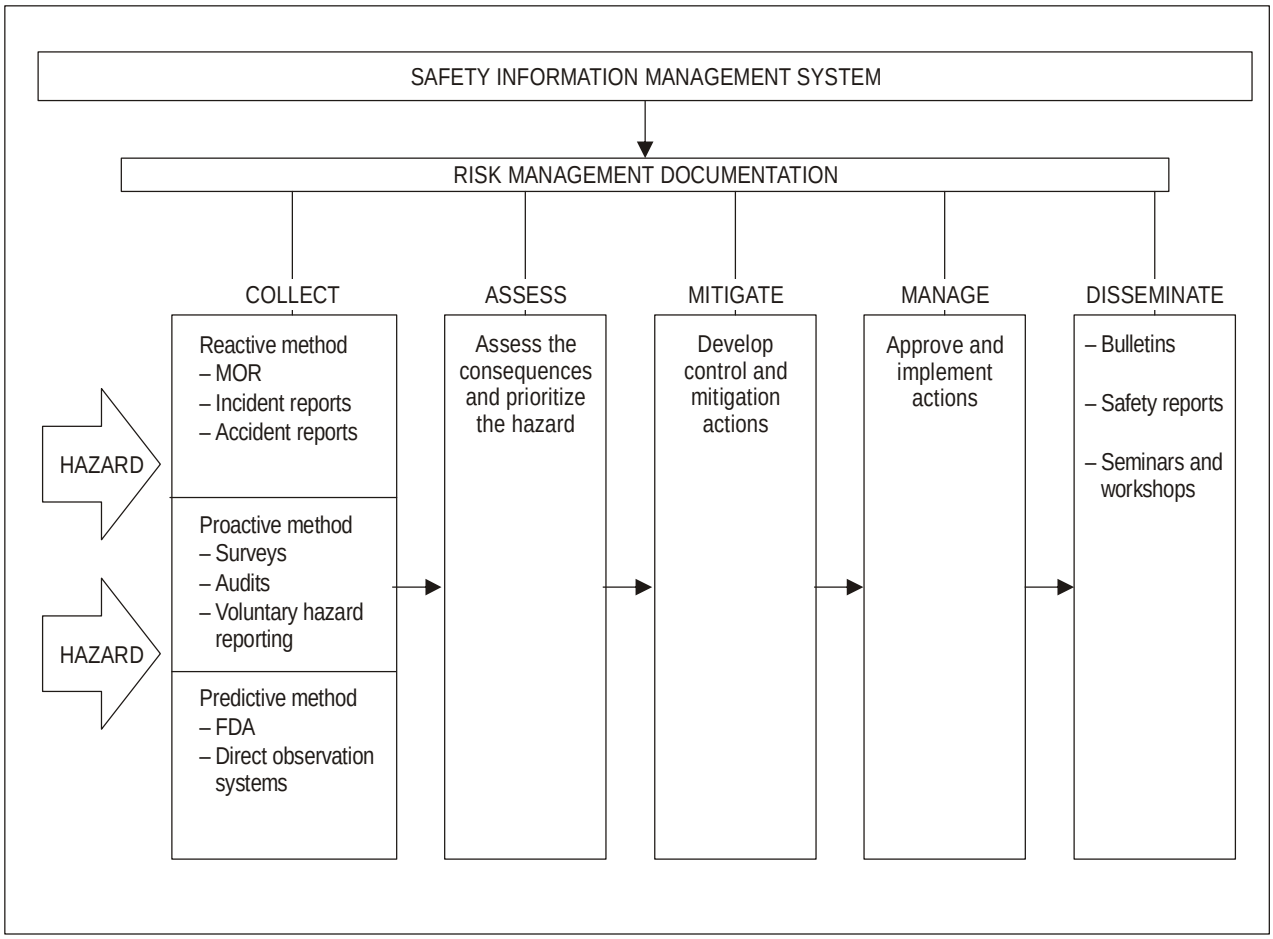

Figure 5-3. Hazard documentation and follow-up risk management process

5.3.48 The safety management information system becomes a source of safety knowledge to be used as reference in organizational safety decision-making processes. This safety knowledge provides material for safety trend analyses as well as for safety education. Guidance on voluntary and confidential hazard reporting systems is provided in Appendix 5.

Implementation strategy

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

a) design factors, including equipment and task design;

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

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

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

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

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

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

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

i) human-machine interface factors.

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

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

b) voluntary and mandatory reporting systems;

c) safety surveys;

d) safety audits;

e) feedback from training; and

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

5.3.51 Examples of external data sources for hazard identification include:

a) industry accident reports;

b) State mandatory incident reporting systems;

c) State voluntary incident reporting systems;

d) State oversight audits; and

e) information exchange systems.

5.3.52 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 5 for guidance on an organization's voluntary and confidential reporting system.

SMS Element 2.2 Safety risk assessment and mitigation

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

General guidance

5.3.53 Figure 5-4 presents the safety risk management process in its entirety. The process starts with the identification of hazards and their potential consequences. The safety risks are then assessed in terms of probability and severity, to define the level of safety risk (safety risk index). If the assessed safety risks are deemed to be tolerable, appropriate action is taken and the operation continues. The completed hazard identification and safety risk assessment and mitigation process is documented and approved as appropriate and forms part of the safety information management system.

5.3.54 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.

5.3.55 Safety risk assessment involves an analysis of identified hazards that includes two components:

a) the severity of a safety outcome; and

b) the probability that it will occur.

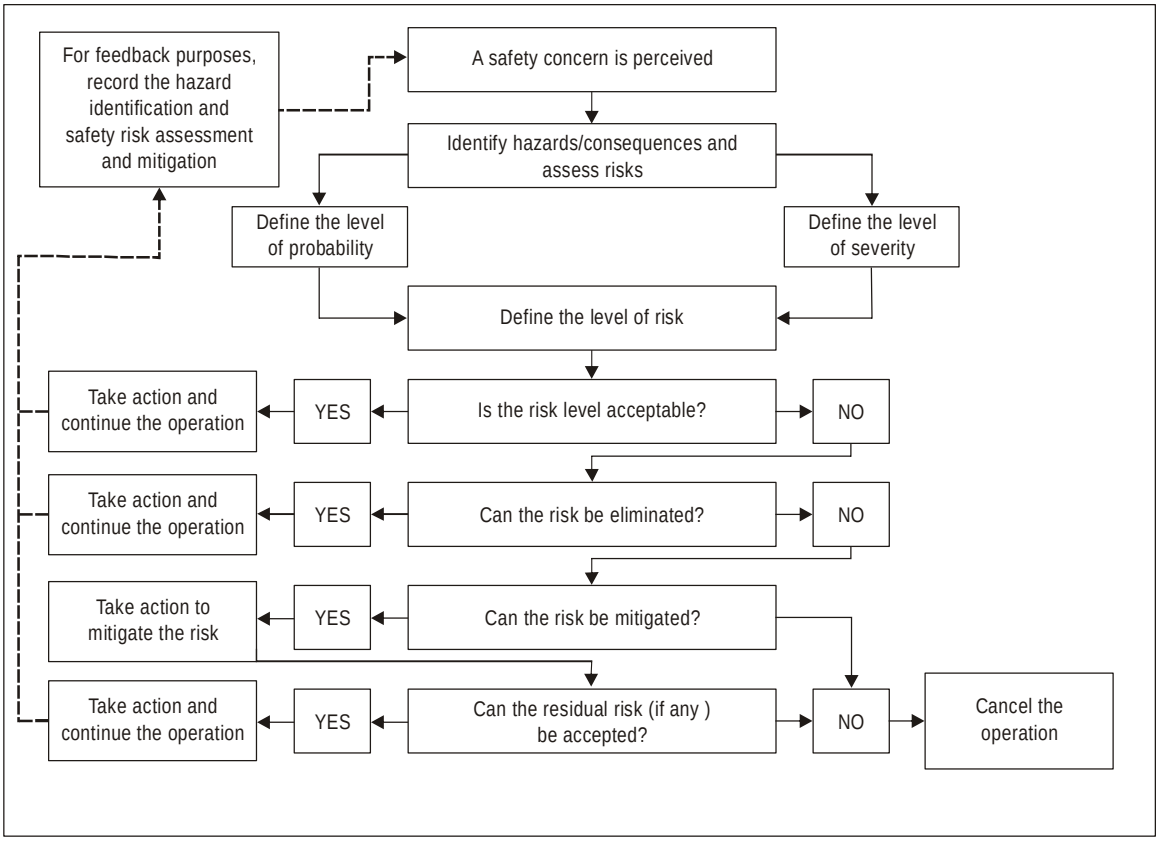

Figure 5-4. The safety risk management process

Guidance on how safety information should be analysed in complex, large organizations is provided in Chapter 2. Once risks 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 an assessment matrix. An example of a safety risk (index) assessment matrix is provided in Figure 5-5.

5.3.56 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 and 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 probability, severity and the risk tolerability matrix is located in Chapter 2 of this document.

5.3.57 After safety risks have been assessed, appropriate mitigation measures 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 regulation. A determination of any unintended consequences, particularly the introduction of new hazards, should be made prior to the implementation of any risk mitigation measures.

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 5-5. Example of a safety risk (index) assessment matrix

5.3.58 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.

5.3.59 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 mitigation can be implemented and how appropriate it is 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.

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

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

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

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

5.3.60 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 the integrity, efficiency and effectiveness of the defences under the new operational conditions.

5.3.61 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 the appropriate level of management. For an example of a basic hazard risk mitigation worksheet, refer to Appendix 2 to Chapter 2.

SMS Component 3. Safety Assurance

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

5.3.63 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.

5.3.64 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.

5.3.65 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.

SMS Element 3.1 Safety performance monitoring and measurement

3.1.1 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.

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

Implementation strategy

5.3.66 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 5.4.5 and Appendix 6 to this chapter.

5.3.67 There are two types of reporting systems:

a) mandatory incident reporting systems; and

b) voluntary incident reporting systems.

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

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

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

5.3.71 To be effective, safety reporting tools should be readily accessible to operational personnel. Operational personnel should be educated on the benefits of safety reporting systems and provided with positive feedback regarding remedial actions taken in response to the report. The alignment of reporting system requirements, analysis tools and methods can facilitate exchange of safety information as well as comparisons of certain safety indicators. Guidance on voluntary and confidential reporting systems is provided in Appendix 5 to this chapter.

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

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

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

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

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

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

5.3.73 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 5.4.5 and Appendix 6.

SMS Element 3.2 The management of change

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

Implementation strategy

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

a) organizational expansion or contraction;

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

c) changes to the organization's operating environment.

5.3.75 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.

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

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

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

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

5.3.77 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.

SMS Element 3.3 Continuous improvement of the SMS

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

Implementation strategy

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

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

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

5.3.81 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.

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

SMS Component 4. Safety Promotion

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

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

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

SMS Element 4.1 Training and education

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

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

Implementation strategy

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

a) organizational safety policies, goals and objectives;

b) organizational safety roles and responsibilities related to safety;

c) basic safety risk management principles;

d) safety reporting systems;

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

f) lines of communication for dissemination of safety information;

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

h) documented initial indoctrination and recurrent training requirements.

5.3.87 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.

5.3.88 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.

5.3.89 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).

5.3.90 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.

5.3.91 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.

SMS Element 4.2 Safety communication

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

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

b) conveys safety-critical information;

c) explains why particular safety actions are taken; and

d) explains why safety procedures are introduced or changed.

Implementation strategy

5.3.92 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.

5.3.93 Examples of organizational communication initiatives include:

a) dissemination of the SMS manual;

b) safety processes and procedures;

c) safety newsletters, notices and bulletins; and

d) websites or email.

5.4 SMS IMPLEMENTATION PLANNING

5.4.1 System description

A system review and description of the SMS elements and their interface with existing systems and processes is the first step in defining the scope and applicability of the SMS. This exercise provides an opportunity to identify any gaps related

to the service provider's SMS components and elements. The system description includes the SMS interfaces within the organization, as well as pertinent interfaces with other external organizations such as subcontractors. An overview of the system description and its accountability and reporting structure should be included in the SMS documentation. For large and complex organizations, details of basic systems and organizational procedures are addressed in the service provider's relevant exposition or administrative manuals. In such cases, a brief outline together with an organizational chart with appropriate cross references may be adequate for the purpose of the system description.

5.4.2 Integration of management systems

5.4.2.1 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

5.4.2.2 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).

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

a) must be planned and managed;

b) depend upon measurement and monitoring of performance indicators;

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

d) strive for continuous improvement.

5.4.2.4 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.

5.4.2.5 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.

5.4.2.6 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.

5.4.2.7 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.

5.4.2.8 The relationship between SMS and QMS leads to the complementary contributions of each system to the attainment of the organization’s safety and quality goals. A summary comparison of the two systems is provided in Table 5-1.

Table 5-1. Summary comparison of QMS and SMS

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

5.4.3 Gap analysis

5.4.3.1 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 has been completed and fully documented, the resources and processes that have been identified as missing or inadequate will form the basis of the SMS implementation plan.

5.4.3.2 Appendix 7 to this chapter provides a list of gap analysis questions to facilitate service providers in systematically assessing their existing processes. From an objective response to each gap analysis question, it will be apparent what enhancements or actions are required.

5.4.4 SMS implementation plan

5.4.4.1 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.

5.4.4.2 The service provider's implementation plan may be documented in different forms, varying from a simple spreadsheet to specialized project management software. The implementation plan should address gaps through completion of specific actions and milestones according to the stated timeline. Assignment of each task assures accountability throughout the implementation process. The plan should be reviewed regularly and updated as necessary. A format example of an SMS implementation plan/schedule is in Appendix 7 to this chapter.

5.4.4.3 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 Section 5.5.

5.4.5 Safety performance indicators

5.4.5.1 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.

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

5.4.5.3 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.

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

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

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

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

5.4.5.7 Once safety performance indicators and their corresponding targets and alert settings have been defined, the performance outcome of each indicator should be updated and monitored on a regular basis. The target and alert level for each indicator may be tracked for their respective performance status. A consolidated summary of the overall target and alert performance outcome of the complete safety performance indicators package may also be compiled/aggregated for a given monitoring period. Qualitative values (satisfactory/unsatisfactory) may be assigned for each "target achieved" and each "alert level not breached". Alternatively, numeric values (points) may be used to provide a quantitative measurement of the overall performance of the package of indicators. Examples of safety performance indicators and their target and alert setting criteria are provided in Appendix 6 to this chapter.

5.5 PHASED IMPLEMENTATION APPROACH

5.5.1 General

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

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

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

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

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

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

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

5.5.1.4 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 Table 5-2.

5.5.2 Phase 1

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

5.5.2.2 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.

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

   1) developing the SMS implementation plan;

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

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

c) Define the scope of the organization's activities (departments/divisions) to which the SMS will be applicable. The scope of the organization's SMS applicability will subsequently need to be described in the SMS document as appropriate. This activity is based on Element 1.5 of the ICAO SMS framework. Guidance on the system description is provided in 5.4.1 of this chapter.

d) Conduct a gap analysis of the organization's current systems and processes in relation to the ICAO SMS framework requirements (or the relevant SMS regulatory requirements). Guidance on an SMS gap analysis for a service provider is provided in Appendix 7 to this chapter.

Table 5-2. Four phases of SMS implementation

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

SMS 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 provided in Appendix 7 to this Chapter.

Appointment of key safety personnel — Element 1.3

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

b) Establish the safety services office.

Training and education — Element 4.1 (i)

a) Conduct a training needs analysis.

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

c) Develop safety training considering:

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

   2) recurrent training.

d) Identify the costs associated with training.

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

f) Establish a safety training records system.

Safety communication — Element 4.2 (i)

a) Initiate a mechanism or medium for safety communication.

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

   1) safety newsletters, notices and bulletins;

   2) websites;

   3) email.

5.5.3 Phase 2

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

Management commitment and responsibility — Element 1.1 (ii)

a) Develop a safety policy.

b) Have the accountable executive sign the safety policy.

c) Communicate the safety policy throughout the organization.

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

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

   1) safety performance indicators;

   2) safety performance targets and alert levels; and

   3) action plans.

f) Establish the SMS requirements for subcontractors:

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

   2) establish the SMS requirements in the bidding documentation.

Safety accountabilities — Element 1.2

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

b) Establish the safety action group (SAG).

c) Establish the safety/SMS coordination committee.

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

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

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

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

Coordination of emergency response planning — Element 1.4

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

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

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

d) Assess the respective ERPs of the external entities.

e) Establish coordination between the different ERPs.

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

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

SMS documentation — Element 1.5 (ii)

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

1) developing an SMS document that is either a stand-alone manual or a distinct section within an existing controlled organization manual (refer to Appendix 4 for guidance on developing an SMS manual);

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

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

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

5.5.4 Phase 3

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

Hazard identification — Element 2.1 (i)

a) Establish a voluntary reporting procedure. Refer to Appendix 5 for guidance.

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

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

Safety risk assessment and mitigation — Element 2.2

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

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

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

Safety performance monitoring and measurement — Element 3.1 (i)

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

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

c) Establish high consequence safety indicators (initial ALoSP) and their associated target and alert settings. Examples of high-consequence safety indicators are accident rates, serious incident rates and monitoring of high risk non-compliance outcomes. Refer to Appendix 6 for guidance on safety performance indicators.

d) Reach an agreement 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:

1) the vulnerability of systems and activities;

2) the stability of systems and operational environments;

3) past performance;

4) regulatory, industry and technological changes.

b) Ensure that management of change procedures address the impact on existing safety performance and risk mitigation records before implementing new changes.

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

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.

5.5.5 Phase 4

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

Management commitment and responsibility — Element 1.1 (iii)

a) Enhance the 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 and risk management procedures with the subcontractor or customer SMS where applicable.

c) If necessary, develop a process for prioritizing collected hazards for risk mitigation based on areas of greater need or concern. Refer to Appendix 3 to Chapter 2 for guidance.

Safety performance monitoring and measurement — Element 3.1 (ii)

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

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

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c) Reach an agreement 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 SMS audits or integrate them into existing internal and external audit programmes.

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

Training and education — Element 4.1 (ii)

a) Complete an SMS training programme for all relevant personnel.

Safety communication — Element 4.2 (ii)

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

5.5.6 SMS elements progressively implemented throughout Phases 1 to 4

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

SMS documentation — Element 1.5

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

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

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

Appendix 1 to Chapter 5

ELECTRONIC SIGNATURES

Note.— This appendix consists of extracts from United States Federal Aviation Administration (FAA) Advisory Circular AC No. 120-78 "Acceptance and Use of Electronic Signatures, Electronic Recordkeeping Systems, and Electronic Manuals", dated 29 October 2002.[1] 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

1. The full text of FAA AC No: 120-78 can be found on the FAA website: http://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/23224.

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.

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5. What is an acceptable electronic signature?

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.

Appendix 2 to Chapter 5

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

Among other duties, the safety manager is responsible for:

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

4. NATURE AND SCOPE

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

5. QUALIFICATIONS

To qualify as a safety manager a person should have:

- full-time experience in aviation safety in the capacity of an aviation safety investigator, safety/quality manager or safety risk manager;
- sound knowledge of the organization's operations, procedures and activities;
- broad aviation technical knowledge;
- an extensive knowledge of safety management systems (SMS) and have completed appropriate SMS training;
- an understanding of risk management principles and techniques to support the SMS;
- experience implementing and/or managing an SMS;
- experience and qualifications in aviation accident/incident investigation and human factors;
- experience and qualifications in conducting safety/quality audits and inspections;
- sound knowledge of aviation regulatory frameworks, including ICAO Standards and Recommended Practices (SARPS) and relevant civil aviation regulations;
- the ability to communicate at all levels both inside and outside the company;
- the ability to be firm in conviction, promote a "just and fair culture" and yet advance an open and non-punitive atmosphere for reporting;
- the ability and confidence to communicate directly to the accountable executive as his advisor and confidante;
- well-developed communication skills and demonstrated interpersonal skills of a high order, with the ability to liaise with a variety of individuals and organizational representatives, including those from differing cultural backgrounds;
- computer literacy and superior analytical skills.

6. AUTHORITY

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 SMS documentation.

6.4 The safety manager should not hold other positions or responsibilities that may conflict or impair his role as an SMS/safety manager. This should be a senior management position not lower than or subservient to the production or operational functions of the organization.

Appendix 3 to Chapter 5

EMERGENCY RESPONSE PLANNING

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

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

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

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

a) delegation of emergency authority;

b) assignment of emergency responsibilities;

c) documentation of emergency procedures and processes;

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

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

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

5. To be effective, an ERP should:

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

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

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

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

e) be regularly tested through exercises;

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

ERP contents

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

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

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

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

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

3) clarifying the reporting lines of authority;

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

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

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

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

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

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

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

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

1) management;

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

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

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

5) company personnel;

6) media; and

7) legal, accounting, insurers, etc.

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

1) Who should lead the initial response team?

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

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

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

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

1) acting as passengers or customers in exercises;

2) handling survivors or external parties;

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

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

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

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

3) documentation requirements, maintenance of emergency activity logs;

4) impounding related company records;

5) office furnishings and supplies; and

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

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

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

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

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

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

4) any photographic or other evidence.

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

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

— at home base;

— away from home base;

— offshore or in a foreign State;

2) management of surviving victims;

3) the needs of the relatives of victims;

4) security of the wreckage;

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

6) preservation of evidence;

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

8) removal and disposal of the wreckage; etc.

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

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

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

3) prepared statements for immediate response to media queries;

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

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

6) provisions for regular updates to the media.

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

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

1) State requirements for the provision of assistance services;

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

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

4) provision of up-to-date information;

5) temporary assistance to victims or customers.

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

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

Checklists

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

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

b) tested through realistic exercises.

Training and exercises

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

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Appendix 4 to Chapter 5

GUIDANCE ON THE DEVELOPMENT OF AN SMS MANUAL

1. GENERAL

1.1 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. The manual can be a stand-alone SMS manual or be integrated as a consolidated SMS section/chapter within an appropriate approved manual of the organization (e.g. the organization's exposition manual or company manual). The actual configuration may depend on regulatory expectation.

1.2 Using the suggested format and content items in this appendix and adapting them as appropriate is one way in which an organization can develop its own top-level SMS manual. The actual content items will depend on the specific SMS framework and elements of the organization. The description under each element will be commensurate with the scope and complexity of the organization's SMS processes.

1.3 The manual will serve to communicate the organization's SMS framework internally as well as with relevant external organizations. The manual 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 an SMS manual and its operational supporting records and documents. The 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 ongoing SMS activities of the organization.

2. FORMAT OF THE SMS MANUAL

2.1 The SMS manual may be formatted in the following manner:

a) section heading;

b) objective;

c) criteria;

d) cross-reference documents.

2.2 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 that section. The "criteria' defines the scope of what should be considered when writing that section. The "cross-reference documents" links the information to other relevant manuals or SOPs of the organization which contain details of the element or process as applicable.

3. CONTENTS OF THE MANUAL

3.1 The contents of the manual may include the following sections:

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.

3.2 Below is an example of the type of information that could be included in each section using the format prescribed in 2.2.

1. Document control

Objective

Describe how the manual(s) will be kept up to date and how the organization will 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) The correlation between the SMS manual and other existing manuals such as the maintenance control manual (MCM) or the operations manual.

c) The process for periodic review of the manual and its related forms/documents to ensure their continuing suitability, adequacy and effectiveness.

d) The manual's 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 material for necessary reference and awareness by all concerned.

Criteria

a) Spell out the current SMS regulations/standards. Include the compliance timeframe and advisory material references as applicable.

b) Where appropriate, elaborate on or explain the significance and implications of the regulations to the organization.

c) Establish a correlation with other safety-related requirements or standards where appropriate.

Cross-reference documents

SMS regulation/requirement references, SMS guidance document references, etc.

3. Scope and integration of the safety management system

Objective

Describe the scope and extent of the organization's aviation-related operations and facilities within which the SMS will apply. The scope of the processes, equipment and operations deemed eligible for the organization's hazard identification and risk management (HIRM) programme should also be addressed.

Criteria

a) Spell out the nature of the organization's aviation business and its position or role within the industry as a whole.

b) Identify the major areas, departments, workshops and facilities of the organization within which the SMS will apply.

c) Identify the major processes, operations and equipment which are deemed eligible for the organization's HIRM programme, especially those which are pertinent to aviation safety. If the scope of the 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, define and document such integration and associated accountabilities as applicable.

e) Where there are other related control/management systems within the organization, such as QMS, OSHE and SeMS, identify their relevant integration (where applicable) within the aviation SMS.

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 terms of 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 and signed 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.

Cross-reference documents

OSHE safety policy, etc.

5. Safety objectives

Objective

Describe the safety objectives of the organization. The safety objectives should be a short statement that describes in broad terms what the organization hopes to achieve.

Criteria

a) The safety objectives have been established.

b) The 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) The safety objectives are publicized and distributed.

e) Resources have been allocated for achieving the objectives.

f) The 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 is performing to requirements in all areas of the organization.

b) An 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 with regard to all safety management processes, decisions 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 the appropriate level of management.

f) Reports are collected in an appropriate database to facilitate the necessary analysis.

Cross-reference documents

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8. Hazard identification and risk assessment

Objective

Describe the hazard identification system and how such data are collated. Describe the process for the 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 and 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 focus on aviation safety as their fundamental context.

d) The risk assessment process utilizes worksheets, forms or software appropriate to the complexity of the organization and operations involved.

e) Completed safety assessments are approved by the appropriate level of management.

f) There is a process for evaluating the effectiveness of the 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

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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) The formal process to develop and maintain a set of safety performance indicators and their associated performance targets.

b) Correlation established between the SPIs and 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 their correlation with the organization's SMS hazard identification and risk management system.

Criteria

a) Procedures 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) A process for ensuring that corrective actions taken or recommended are carried out and for evaluating their outcomes/effectiveness.

d) Procedure on disciplinary inquiry and actions associated with investigation report outcomes.

e) Clearly defined conditions under which punitive disciplinary action would be considered (e.g. illegal activity, recklessness, gross negligence or wilful misconduct).

f) A 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 receive 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) The 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 programme.

e) SMS awareness is incorporated into the employment or indoctrination programme.

f) The safety communication processes/channels within the organization.

Cross-reference documents

- - - - - - - - - - - - - -

12. Continuous improvement and SMS audit

Objective

Describe the process for the continuous review and improvement of the SMS.

Criteria

a) The process for regular internal audit/review of the organization's SMS to ensure its continuing suitability, adequacy and effectiveness.

b) Describe any other programmes contributing to continuous improvement of the organization's SMS and safety performance, e.g. MEDA, safety surveys, ISO systems.

Cross-reference documents

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13. SMS records management

Objective

Describe the method of storing all SMS-related records and documents.

Criteria

a) The organization has an 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 assessment reports, safety action group/safety meeting notes, safety performance indicator charts, SMS audit reports and SMS training records.

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

- - - - - - - - - - - - - -

14. 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) Procedures to ensure that substantial organizational or operational changes take into consideration any impact which they may have on existing safety risks.

b) Procedures to ensure that appropriate safety assessment is performed prior to introduction of new equipment or processes which have safety risk implications.

c) Procedures 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.

15. Emergency/contingency response plan

Objective

Describe the organization's intentions regarding, 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 the 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 the media and insurance-related issues.

g) There are defined accident investigation responsibilities within the organization.

h) The requirement for preservation of evidence, securing the 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 has been 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.

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Appendix 5 to Chapter 5

VOLUNTARY AND CONFIDENTIAL REPORTING SYSTEMS

(Refer to 5.3.42 to 5.3.52; 5.3.66 to 5.3.73; 5.5.4, Element 2.1 a))

Note.— The guidance below is based on the example of an integrated air operator and maintenance organization. For other service provider organization types, this guidance material may be customized as necessary.

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

a) the objective of the reporting system;

Example:

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

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

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

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

Example:

The [Name of system] covers areas such as:

a) flight operations;

b) hangar aircraft maintenance;

c) workshop component maintenance;

d) technical fleet management;

e) inventory technical management;

f) engineering planning;

g) technical services;

h) technical records;

i) line maintenance;

j) etc.

c) who can make a voluntary report;

Example:

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

a) flight and cabin crew members;

b) air traffic controllers;

c) licensed aircraft engineers, technicians or mechanics;

d) employees of maintenance, design and manufacturing organizations;

e) airport ground handling operators;

f) aerodrome employees;

g) general aviation personnel;

h) etc.

d) when to make such a report;

Example:

You should make a report when:

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

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

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

e) how the reports are processed;

Example:

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

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

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

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

Safety information sharing within the company
and the aviation community

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

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

f) contacting the [Name of system] manager;

Example:

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

[Name of system] administrator	Alternate administrator
Mr. ABC	Mr. XYZ
Tel.:	Tel.:

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Appendix 6 to Chapter 5

SMS SAFETY PERFORMANCE INDICATORS

1. Tables 5-A6-1 to 5-A6-4 (safety indicator examples) provide illustrative examples of State aggregate safety performance indicators (SPIs) and their corresponding alert and target level setting criteria. The SMS SPIs are reflected on the right-hand side of the tables. The corresponding alert and target level criteria for each indicator are to be accounted for as shown. The SSP safety performance indicators on the left-hand side of the tables are shown to indicate the necessary correlation between the SMS and SSP safety indicators. SMS SPIs should be developed by product and service providers in consultation with their respective State regulatory organizations. Their proposed SPIs will need to be congruent with the State's SSP safety indicators; hence necessary agreement/acceptance should be obtained.

2. Table 5-A6-5 (example of an SMS safety performance indicator chart) is an example of what a high-consequence SMS safety performance indicator chart looks like. In this case it is an airline operator's reportable/mandatory incident rate. The chart on the left is the preceding year's performance, while the chart on the right is the current year's ongoing data updates. The alert level setting is based on basic safety metrics standard deviation criteria. The Excel spreadsheet formula is "=STDEVP". For the purpose of manual standard deviation calculation, the formula is:

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

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

3. The target setting is a desired percentage improvement (in this case 5%) over the previous year's data point average. This chart is generated by the data sheet shown in Table 5-A6-6.

4. The data sheet in Table 5-A6-6 is used to generate the safety performance indicator chart shown in Table 5-A6-5. The same can be used to generate any other safety performance indicator with the appropriate data entry and safety performance indicator descriptor amendment.

5. Table 5-A6-7 (example of an SMS performance summary) provides a summary of all the operators' SMS safety indicators, with their respective alert and target level outcomes annotated. Such a summary may be compiled at the end of each monitoring period to provide an overview of the SMS performance. If a more quantitative performance summary measurement is desired, appropriate points may be assigned to each Yes/No outcome for each target and alert outcome. Example:

High-consequence indicators:

Alert level not breached	[Yes (4), No (0)]
Target achieved	[Yes (3), No (0)]

Lower-consequence indicators:

Alert level not breached	[Yes (2), No (0)]
Target achieved	[Yes (1), No (0)]

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

Table 5-A6-1. Examples of safety performance indicators for 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 operator monthly/quarterly accident/serious incident rate (e.g. per 1 000 FH)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 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 (e.g. per 1 000 FH)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate	Operator combined fleet monthly incident rate (e.g. per 1 000 FH)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate
CAA aggregate air operator quarterly engine IFSD incident rate (e.g. per 1 000 FH)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 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 (e.g. per 1 000 FH)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate	Operator internal QMS/SMS annual audit LEI % or findings rate (findings per audit)	Consideration	Consideration
			CAA annual foreign air operator ramp surveillance inspection average LEI % (for each foreign operator)	Consideration	Consideration	Air operator engine IFSD incident rate (e.g. per 1 000 FH)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate	Operator voluntary hazard report rate (e.g. per 1 000 FH)	Consideration	Consideration
			CAA aggregate operator DGR incident report rate (e.g. per 1 000 FH)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate				Operator DGR incident report rate (e.g. per 1 000 FH)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate
etc.											

Table 5-A6-2. Examples of safety performance indicators for 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 aerodrome monthly/quarterly ground accident/serious incident rate — involving any aircraft (e.g. per 10 000 ground movements)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate	CAA aggregate aerodrome operator annual surveillance audit LEI % or findings rate (findings per audit)	Consideration	Consideration	Aerodrome operator quarterly ground accident/serious incident rate — involving any aircraft (e.g. per 10 000 ground movements)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate	Aerodrome operator internal QMS/SMS annual audit LEI % or findings rate (findings per audit)	Consideration	Consideration
CAA aggregate aerodrome monthly/quarterly runway excursion incident rate — involving any aircraft (e.g. per 10 000 departures)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate				Aerodrome operator quarterly runway excursion incident rate — involving any aircraft (e.g. per 10 000 departures)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate	Aerodrome operator quarterly runway foreign object/debris hazard report rate (e.g. per 10 000 ground movements)	Consideration	Consideration
CAA aggregate aerodrome monthly/quarterly runway incursion incident rate — involving any aircraft (e.g. per 10 000 departures)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate				Aerodrome operator quarterly runway incursion incident rate — involving any aircraft (e.g. per 10 000 departures)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate	Operator voluntary hazard report rate (per operational personnel per quarter)	Consideration	Consideration
									Aerodrome operator quarterly aircraft ground foreign object damage incident report rate — involving damage to aircraft (e.g. per 10 000 ground movements)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate
etc.											

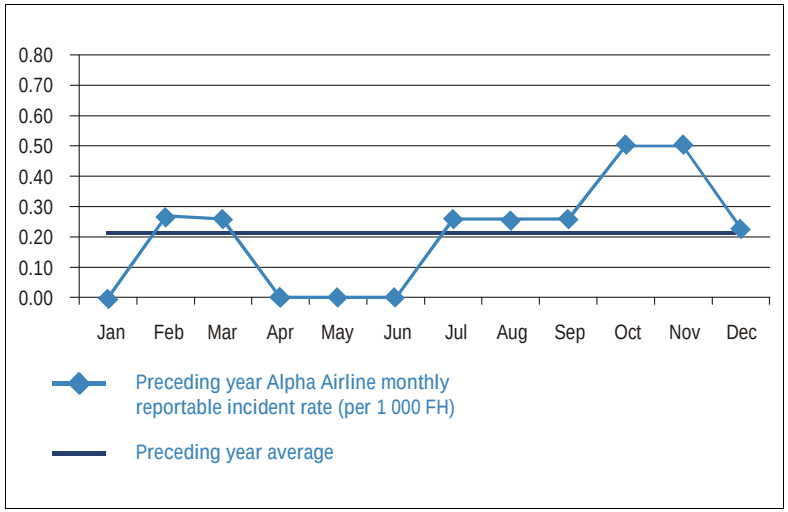
Table 5-A6-3. Examples of safety performance indicators for ATS operators

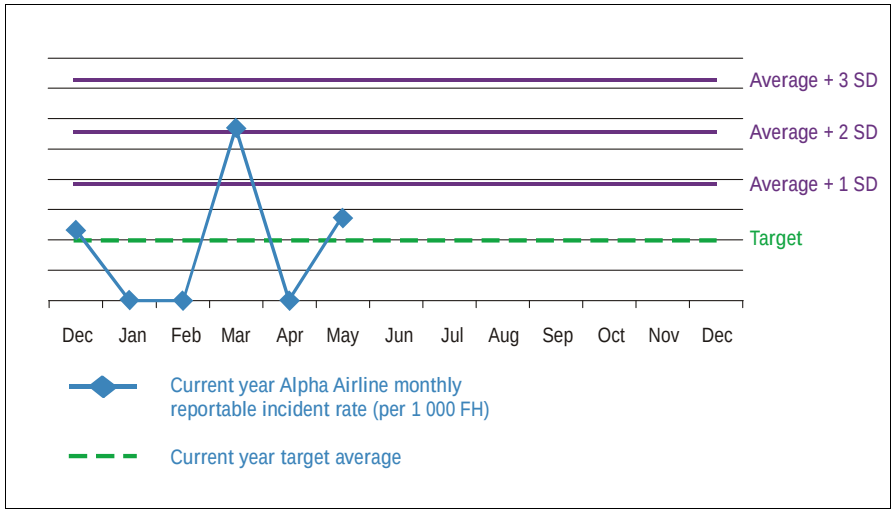
SSP safety indicators (aggregate State)						*SMS safety performance indicators (individual service provider)*					
High-consequence indicators (occurrence/outcome-based)			*Lower-consequence indicators (event/activity-based)*			*High-consequence indicators (occurrence/outcome-based)*			*Lower-consequence 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 incident rate — involving any aircraft (e.g. per 100 000 flight movements)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate	CAA aggregate ATS quarterly FIR TCAS RA incident rate — involving any aircraft (e.g. per 100 000 flight movements)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate	ATS operator quarterly FIR serious incident rate — involving any aircraft (e.g. per 100 000 flight movements)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate	ATS operator quarterly FIR TCAS RA incident rate — involving any aircraft (e.g. per 100 000 flight movements)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate
			CAA aggregate ATS quarterly FIR level bust (LOS) incident rate — involving any aircraft (e.g. per 100 000 flight movements)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate	ATS operator quarterly/annual near-miss incident rate (e.g. per 100 000 flight movements)	Assuming the historical annual average rate is 3, the possible alert rate could be 5.	Assuming the historical annual average rate is 3, the possible target rate could be 2.	ATS operator quarterly FIR level bust (LOS) incident rate — involving any aircraft (e.g. per 100 000 flight movements)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate
			CAA aggregate ATS operator annual surveillance audit LEI % or findings rate (findings per audit)	Consideration	Consideration				ATS operator internal QMS/SMS annual audit LEI % or findings rate (findings per audit)	Consideration	Consideration
etc.											

Table 5-A6-4. Examples of safety performance indicators for maintenance, production and design organizations (DOA/POA/MRO)

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*
DOA/POA/MRO											
CAA aggregate MRO quarterly mandatory defect reports (MDR) received	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 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	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate	MRO/POA/DOA internal QMS/SMS annual audit LEI % or findings rate (findings per audit)	Consideration	Consideration
CAA aggregate POA/DOA quarterly rate of operational products which are the subject of ADs/ASBs (per product line)	Consideration	Consideration				POA/DOA quarterly rate of operational products which are the subject of ADs/ASBs (per product line)	Consideration	Consideration	MRO/POA/DOA quarterly final inspection/testing failure/rejection rate (due to internal quality issues)	Consideration	Consideration
						MRO/POA quarterly rate of component mandatory/major defect reports raised (due to internal quality issues)	Consideration	Consideration	MRO/POA/DOA voluntary hazard report rate (per operational personnel per quarter)	Consideration	Consideration
etc.											

Table 5-A6-5. Example of an SMS safety performance indicator chart (with alert and target level settings)





a) Alert level setting:

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

b) Alert level trigger:

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

— any single point is above the 3 SD line
— 2 consecutive points are above the 2 SD line
— 3 consecutive points are above the 1 SD line.

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

c) Target level setting (planned improvement):

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

d) Target achievement:

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

e) Alert and target levels — validity period:

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

Table 5-A6-6. Sample data sheet used to generate a high-consequence SMS safety indicator chart (with alert and target setting criteria)

Preceding year				
Month	*Alpha Airline total FH*	*Number of reportable/MOR incidents*	*Incident rate**	*Average*
January	3 992	—	0.00	0.21
February	3 727	1.00	0.27	0.21
March	3 900	1.00	0.26	0.21
April	3 870	—	0.00	0.21
May	3 976	—	0.00	0.21
June	3 809	—	0.00	0.21
July	3 870	1.00	0.26	0.21
August	3 904	1.00	0.26	0.21
September	3 864	1.00	0.26	0.21
October	3 973	2.00	0.50	0.21
November	3 955	2.00	0.51	0.21
December	4 369	1.00	0.23	0.21
		Average	0.21	
		SD	0.18	

Average + 1 SD	Average + 2 SD	Average + 3 SD
0.39	0.56	0.73

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

Current year							
Month	*Alpha Airline total FH*	*Number of reportable/ MOR incidents*	*Incident rate**	*Preceding year average + 1 SD*	*Preceding year average + 2 SD*	*Preceding year average + 3 SD*	*Current year target average*
December	4 369	1.00	0.23	0.39	0.56	0.73	0.21
January	4 090	0.00	0.00	0.39	0.56	0.73	0.20
February	3 316	0.00	0.00	0.39	0.56	0.73	0.20
March	3 482	2.00	0.57	0.39	0.56	0.73	0.20
April	3 549	0.00	0.00	0.39	0.56	0.73	0.20
May	3 633	1.00	0.28	0.39	0.56	0.73	0.20
June				0.39	0.56	0.73	0.20
July				0.39	0.56	0.73	0.20
August				0.39	0.56	0.73	0.20
September				0.39	0.56	0.73	0.20
October				0.39	0.56	0.73	0.20
November				0.39	0.56	0.73	0.20
December				0.39	0.56	0.73	0.20
		Average					
		SD					

Current year target is say 5% average rate improvement over the average rate for the preceding year, which is:	0.20

* Rate calculation (per 1 000 FH).

Table 5-A6-7. Example of Alpha Airline's SMS safety performance measurement (say for the year 2010)

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

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

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

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

———————————

Appendix 7 to Chapter 5

SMS GAP ANALYSIS CHECKLIST AND IMPLEMENTATION PLAN

1. INITIAL GAP ANALYSIS CHECKLIST (TABLE 5-A7-1)

1.1 The initial gap analysis checklist in Table 5-A7-1 can be used as a template to conduct the first step of an SMS gap analysis. This format with its overall "Yes/No/Partial" responses will provide an initial indication of the broad scope of gaps and hence overall workload to be expected. The questionnaire may be adjusted to suit the needs of the organization and the nature of the product or service provided. This initial information should be useful to senior management in anticipating the scale of the SMS implementation effort and hence the resources to be provided. This initial checklist would need to be followed up by an appropriate implementation plan as per Tables 5-A7-2 and 5-A7-3.

1.2. 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.— The SSP references in square [ ] brackets refer to guidance material in this manual relevant to the gap analysis question.

Table 5-A7-1. Gap analysis checklist

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

No.	*Aspect to be analysed or question to be answered*	*Answer*	*Status of implementation*
1.1-5	Is the safety policy signed by the accountable executive? [5.3.7 to 5.3.15; 5.5.3]	☐ Yes ☐ No ☐ Partial	
1.1-6	Is the safety policy communicated, with visible endorsement, throughout the [Organization]? [5.5.3]	☐ Yes ☐ No ☐ Partial	
1.1-7	Is the safety policy periodically reviewed to ensure it remains relevant and appropriate to the [Organization]? [5.5.3]	☐ Yes ☐ No ☐ Partial	
Element 1.2 — Safety accountabilities			
1.2-1	Has [Organization] identified an accountable executive who, irrespective of other functions, shall have ultimate responsibility and accountability, on behalf of the [Organization], for the implementation and maintenance of the SMS? [5.3.16 to 5.3.26; 5.5.2]	☐ Yes ☐ No ☐ Partial	
1.2-2	Does the accountable executive have full control of the financial and human resources required for the operations authorized to be conducted under the operations certificate? [5.3.16 to 5.3.26]	☐ Yes ☐ No ☐ Partial	
1.2-3	Does the Accountable Executive have final authority over all aviation activities of his organization? [5.3.16 to 5.3.26]	☐ Yes ☐ No ☐ Partial	
1.2-4	Has [Organization] identified and documented the safety accountabilities of management as well as operational personnel, with respect to the SMS? [5.3.16 to 5.3.26]	☐ Yes ☐ No ☐ Partial	
1.2-5	Is there a safety committee or review board for the purpose of reviewing SMS and safety performance? [5.3.27 to 5.3.33; Appendix 4]	☐ Yes ☐ No ☐ Partial	
1.2-6	Is the safety committee chaired by the accountable executive or by an appropriately assigned deputy, duly substantiated in the SMS manual? [5.3.27 to 5.3.33; Appendix 4]	☐ Yes ☐ No ☐ Partial	
1.2-7	Does the safety committee include relevant operational or departmental heads as applicable? [5.3.27 to 5.3.33; Appendix 4]	☐ Yes ☐ No ☐ Partial	
1.2-8	Are there safety action groups that work in conjunction with the safety committee (especially for large/complex organizations)? [5.3.27 to 5.3.33; Appendix 4]	☐ Yes ☐ No ☐ Partial	

No.	*Aspect to be analysed or question to be answered*	*Answer*	*Status of implementation*
Element 1.3 — Appointment of key safety personnel			
1.3-1	Has [Organization] appointed a qualified person to manage and oversee the day-to-day operation of the SMS? [5.3.27 to 5.3.33; 5.5.2; Appendix 2]	☐ Yes ☐ No ☐ Partial	
1.3-2	Does the qualified person have direct access or reporting to the accountable executive concerning the implementation and operation of the SMS? [5.3.27 to 5.3.33; 5.5.2; Appendix 2, 6.1]	☐ Yes ☐ No ☐ Partial	
1.3-3	Does the manager responsible for administering the SMS hold other responsibilities that may conflict or impair his role as SMS manager? [Appendix 2, 6.4]	☐ Yes ☐ No ☐ Partial	
1.3-4	Is the SMS manager's position a senior management position not lower than or subservient to other operational or production positions? [Appendix 2, 6.4]	☐ Yes ☐ No ☐ Partial	
Element 1.4 — Coordination of emergency response planning			
1.4-1	Does [Organization] have an emergency response/contingency plan appropriate to the size, nature and complexity of the organization? [Appendix 3]	☐ Yes ☐ No ☐ Partial	
1.4-2	Does the emergency/contingency plan address all possible or likely emergency/crisis scenarios relating to the organization's aviation product or service deliveries? [Appendix 3, 4 f)]	☐ Yes ☐ No ☐ Partial	
1.4-3	Does the ERP include procedures for the continuing safe production, delivery or support of its aviation products or services during such emergencies or contingencies? [Appendix 3, 4 e)]	☐ Yes ☐ No ☐ Partial	
1.4-4	Is there a plan and record for drills or exercises with respect to the ERP? [Appendix 3, 5 c)]	☐ Yes ☐ No ☐ Partial	
1.4-5	Does the ERP address the necessary coordination of its emergency response/contingency procedures with the emergency/response contingency procedures of other organizations where applicable? [Appendix 3, 4 d)]	☐ Yes ☐ No ☐ Partial	
1.4-6	Does [Organization] have a process to distribute and communicate the ERP to all relevant personnel, including relevant external organizations? [Appendix 3, 5 d)]	☐ Yes ☐ No ☐ Partial	

No.	Aspect to be analysed or question to be answered	Answer	Status of implementation
1.4-7	Is there a procedure for periodic review of the ERP to ensure its continuing relevance and effectiveness? [Appendix 3, 5 f)]	☐ Yes ☐ No ☐ Partial	
Element 1.5 — SMS documentation			
1.5-1	Is there a top-level SMS summary or exposition document which is approved by the accountable manager and accepted by the CAA? [5.3.36 to 5.3.38]	☐ Yes ☐ No ☐ Partial	
1.5-2	Does the SMS documentation address the organization's SMS and its associated components and elements? [5.3.36 to 5.3.38; 5.4.1; Appendix 4]	☐ Yes ☐ No ☐ Partial	
1.5-3	Is [Organization] SMS framework in alignment with the regulatory SMS framework? [5.3.36 to 5.3.38; 5.4.1; Appendix 4]	☐ Yes ☐ No ☐ Partial	
1.5-4	Does [Organization] maintain a record of relevant supporting documentation pertinent to the implementation and operation of the SMS? [5.3.36 to 5.3.38; 5.5.5]	☐ Yes ☐ No ☐ Partial	
1.5-5	Does [Organization] have an SMS implementation plan to establish its SMS implementation process, including specific tasks and their relevant implementation milestones? [5.4.4]	☐ Yes ☐ No ☐ Partial	
1.5-6	Does the SMS implementation plan address the coordination between the service provider's SMS and the SMS of external organizations where applicable? [5.4.4]	☐ Yes ☐ No ☐ Partial	
1.5-7	Is the SMS implementation plan endorsed by the accountable executive? [5.4.4; 5.5.2]	☐ Yes ☐ No ☐ Partial	
Component 2 — SAFETY RISK MANAGEMENT			
Element 2.1 — Hazard identification			
2.1-1	Is there a process for voluntary hazards/threats reporting by all employees? [5.3.42 to 5.3.52; 5.5.4]	☐ Yes ☐ No ☐ Partial	
2.1-2	Is the voluntary hazard/threats reporting simple, available to all personnel involved in safety-related duties and commensurate with the size of the service provider? [5.3.42 to 5.3.52]	☐ Yes ☐ No ☐ Partial	

No.	*Aspect to be analysed or question to be answered*	*Answer*	*Status of implementation*
2.1-3	Does [Organization] SDCPS include procedures for incident/accident reporting by operational or production personnel? [5.3.42 to 5.3.52; 5.5.4; Chapter 4, Appendix 3]	☐ Yes ☐ No ☐ Partial	
2.1-4	Is incident/accident reporting simple, accessible to all personnel involved in safety-related duties and commensurate with the size of the service provider? [5.3.42 to 5.3.52; 5.5.4]	☐ Yes ☐ No ☐ Partial	
2.1-5	Does [Organization] have procedures for investigation of all reported incident/accidents? [5.3.42 to 5.3.52; 5.5.4]	☐ Yes ☐ No ☐ Partial	
2.1-6	Are there procedures to ensure that hazards/threats identified or uncovered during incident/accident investigation processes are appropriately accounted for and integrated into the organization's hazard collection and risk mitigation procedure? [2.13.9; 5.3.50 f); 5.5.5]	☐ Yes ☐ No ☐ Partial	
2.1-7	Are there procedures to review hazards/threats from relevant industry reports for follow-up actions or risk evaluation where applicable? [5.3.5.1]	☐ Yes ☐ No ☐ Partial	
Element 2.2 — Safety risk assessment and mitigation			
2.2-1	Is there a documented hazard identification and risk mitigation (HIRM) procedure involving the use of objective risk analysis tools? [2.13; 2.14; 5.3.53 to 5.3.61]	☐ Yes ☐ No ☐ Partial	
2.2-2	Is the risk assessment reports approved by departmental managers or at a higher level where appropriate? [2.15.5; 5.3.53 to 5.3.61]	☐ Yes ☐ No ☐ Partial	
2.2-3	Is there a procedure for periodic review of existing risk mitigation records? [5.5.4]	☐ Yes ☐ No ☐ Partial	
2.2-4	Is there a procedure to account for mitigation actions whenever unacceptable risk levels are identified? [5.5.4]	☐ Yes ☐ No ☐ Partial	
2.2-5	Is there a procedure to prioritize identified hazards for risk mitigation actions? [5.5.4]	☐ Yes ☐ No ☐ Partial	
2.2-6	Is there a programme for systematic and progressive review of all aviation safety-related operations, processes, facilities and equipment subject to the HIRM process as identified by the organization? [5.5.4]	☐ Yes ☐ No ☐ Partial	

No.	Aspect to be analysed or question to be answered	Answer	Status of implementation
Component 3 — SAFETY ASSURANCE			
Element 3.1 — Safety performance monitoring and measurement			
3.1-1	Are there identified safety performance indicators for measuring and monitoring the safety performance of the organization's aviation activities? [5.3.66 to 5.3.73; 5.4.5; 5.5.4; 5.5.5; Appendix 6]	☐ Yes ☐ No ☐ Partial	
3.1-2	Are the safety performance indicators relevant to the organization's safety policy as well as management's high-level safety objectives/goals? [5.3.66 to 5.3.73; 5.4.5; Appendix 6]	☐ Yes ☐ No ☐ Partial	
3.1-3	Do the safety performance indicators include alert/target settings to define unacceptable performance regions and planned improvement goals? [5.3.66 to 5.3.73; 5.4.5; 5.5.4; 5.5.5; Appendix 6]	☐ Yes ☐ No ☐ Partial	
3.1-4	Is the setting of alert levels or out-of-control criteria based on objective safety metrics principles? [5.3.66 to 5.3.73; 5.4.5; Appendix 6]	☐ Yes ☐ No ☐ Partial	
3.1-5	Do the safety performance indicators include quantitative monitoring of high-consequence safety outcomes (e.g. accident and serious incident rates) as well as lower-consequence events (e.g. rate of non-compliance, deviations)? [5.3.66 to 5.3.73; 5.4.5; 5.5.4; 5.5.5; Appendix 6]	☐ Yes ☐ No ☐ Partial	
3.1-6	Are safety performance indicators and their associated performance settings developed in consultation with, and subject to, the civil aviation authority's agreement? [5.3.66 to 5.3.73; 5.4.5.2; 5.5.4; 5.5.5]	☐ Yes ☐ No ☐ Partial	
3.1-7	Is there a procedure for corrective or follow-up action to be taken when targets are not achieved and alert levels are exceeded/ breached? [5.4.5; Appendix 6, Table 5-A6-5 b)]	☐ Yes ☐ No ☐ Partial	
3.1-8	Are the safety performance indicators periodically reviewed? [5.4.5; Appendix 6]	☐ Yes ☐ No ☐ Partial	
Element 3.2 — The management of change			
3.2-1	Is there a procedure for review of relevant existing aviation safety-related facilities and equipment (including HIRM records) whenever there are pertinent changes to those facilities or equipment? [5.3.74 to 5.3.77; 5.5.4]	☐ Yes ☐ No ☐ Partial	

No.	*Aspect to be analysed or question to be answered*	*Answer*	*Status of implementation*
3.2-2	Is there a procedure for review of relevant existing aviation safety-related operations and processes (including any HIRM records) whenever there are pertinent changes to those operations or processes? [5.3.74 to 5.3.77; 5.5.4]	☐ Yes ☐ No ☐ Partial	
3.2-3	Is there a procedure for review of new aviation safety-related operations and processes for hazards/risks before they are commissioned? [5.5.4]	☐ Yes ☐ No ☐ Partial	
3.2-4	Is there a procedure for review of relevant existing facilities, equipment, operations or processes (including HIRM records) whenever there are pertinent changes external to the organization such as regulatory/industry standards, best practices or technology? [5.5.4]	☐ Yes ☐ No ☐ Partial	
Element 3.3 — Continuous improvement of the SMS			
3.3-1	Is there a procedure for periodic internal audit/assessment of the SMS? [5.3.78 to 5.3.82; 5.5.4; 5.5.5]	☐ Yes ☐ No ☐ Partial	
3.3-2	Is there a current internal SMS audit/assessment plan? [5.3.78 to 5.3.82; 5.5.4; 5.5.5]	☐ Yes ☐ No ☐ Partial	
3.3-3	Does the SMS audit plan include the sampling of completed/existing safety risk assessments? [5.5.5]	☐ Yes ☐ No ☐ Partial	
3.3-4	Does the SMS audit plan include the sampling of safety performance indicators for data currency and their target/alert settings performance? [5.4.5; 5.5.5]	☐ Yes ☐ No ☐ Partial	
3.3-5	Does the SMS audit plan cover the SMS interface with subcontractors or customers where applicable? [5.4.1; 5.5.5]	☐ Yes ☐ No ☐ Partial	
3.3-6	Is there a process for SMS audit/assessment reports to be submitted or highlighted for the accountable manager's attention where appropriate? [5.3.80; 5.5.5]	☐ Yes ☐ No ☐ Partial	

No.	*Aspect to be analysed or question to be answered*	*Answer*	*Status of implementation*
Component 4 — SAFETY PROMOTION			
Element 4.1 — Training and education			
4.1-1	Is there a programme to provide SMS training/familiarization to personnel involved in the implementation or operation of the SMS? [5.3.86 to 5.3.91; 5.5.5]	☐ Yes ☐ No ☐ Partial	
4.1-2	Has the accountable executive undergone appropriate SMS familiarization, briefing or training? [5.3.86 to 5.3.91; 5.5.5]	☐ Yes ☐ No ☐ Partial	
4.1-3	Are personnel involved in conducting risk mitigation provided with appropriate risk management training or familiarization? [5.3.86 to 5.3.91; 5.5.5]	☐ Yes ☐ No ☐ Partial	
4.1-4	Is there evidence of organization-wide SMS education or awareness efforts? [5.3.86 to 5.3.91; 5.5.5]	☐ Yes ☐ No ☐ Partial	
Element 4.2 — Safety communication			
4.2-1	Does [Organization] participate in sharing safety information with relevant external industry product and service providers or organizations, including the relevant aviation regulatory organizations? [5.3.92; 5.3.93; 5.5.5]	☐ Yes ☐ No ☐ Partial	
4.2-2	Is there evidence of a safety (SMS) publication, circular or channel for communicating safety (SMS) matters to employees? [5.3.92; 5.3.93; 5.5.5]	☐ Yes ☐ No ☐ Partial	
4.2-3	Are [Organization] SMS manual and related guidance material accessible or disseminated to all relevant personnel? [5.3.92; 5.3.93; 5.5.5]	☐ Yes ☐ No ☐ Partial	

2. DETAILED SMS GAP ANALYSIS AND IMPLEMENTATION TASKS (TABLE 5-A7-2)

The initial gap analysis checklist in Table 5-A7-1 should then be followed up by using the detailed “SMS gap analysis and implementation task identification plan” in Table 5-A7-2. Once completed, Table 5-A7-2 will provide follow-up analysis on details of the gaps and help translate these into actual required tasks and subtasks in the specific context of the organization’s processes and procedures. Each task will then accordingly be assigned to appropriate individuals or groups for action. It is important that correlation of individual element/task development with their descriptive placeholders in the SMS document be provided for in Table 5-A7-2 in order to trigger progressive updating of the draft SMS document as each element is implemented or enhanced. (Initial element write-ups in SMS documents tend to be anticipatory rather than declaratory.)

3. ACTIONS/TASKS IMPLEMENTATION SCHEDULE (TABLE 5-A7-3)

Table 5-A7-3 will show the milestones (start-end dates) scheduled for each task/action. For a phased implementation approach, these tasks/actions will need to be sorted according to the phase allocation of their related elements. Refer to Section 5.5 of this chapter for the phased prioritization of SMS elements as appropriate. Table 5-A7-3 can be a separate consolidation of all outstanding actions/tasks or, if preferred, be a continuation of Table 5-A7-2 in the form of a spreadsheet. Where it is anticipated that the actual number of tasks/actions and their milestones are sufficiently voluminous and complex so as to require utilizing a project management software to manage them, this may be done by using software such as MS project/Gantt chart as appropriate. Table 5-A7-4 is an illustration of a Gantt chart.

Table 5-A7-2. Example SMS gap analysis and implementation task identification plan

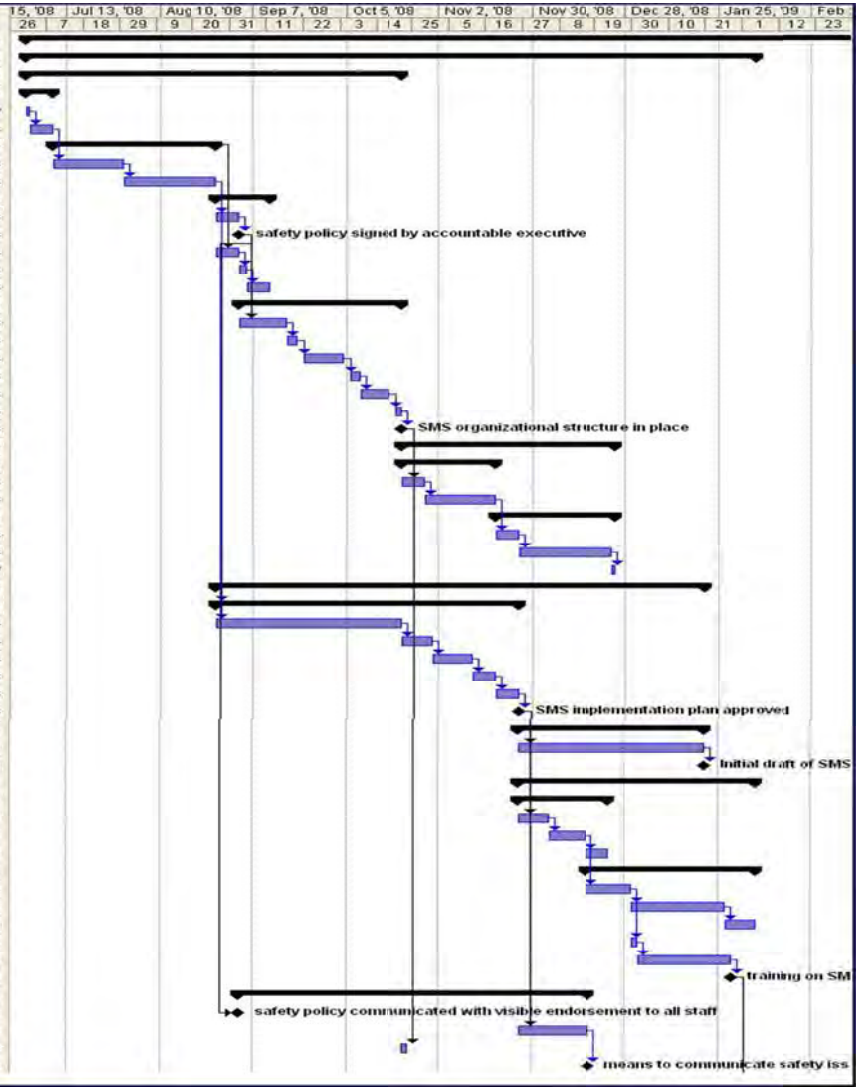
GAQ Ref.	*Gap analysis question*	*Answer (Yes/No/Partial)*	*Description of gap*	*Action/task required to fill the gap*	*Assigned task group/person*	*SMS document reference*	*Status of action/task (Open/WIP/Closed)*
1.1-1	Is there a safety policy in place?	Partial	The existing safety policy addresses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

Table 5-A7-3. Example SMS implementation schedule

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

Table 5-A7-4. Sample SMS implementation schedule (Gantt chart)

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



Attachment

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ISBN 978-92-9249-214-4