澳門特別行政區
REGIÃO ADMINISTRATIVA ESPECIAL DE MACAU
民航局
AUTORIDADE DE AVIAÇÃO CIVIL
CIVIL AVIATION AUTHORITY

AC
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AERONAUTICAL CIRCULAR
CIVIL AVIATION AUTHORITY – MACAO, CHINA

SUBJECT: ***Safety Management System Requirements***

EFFECTIVE DATE:

1 November 2023

CANCELLATION:

This AC supersedes AC No. AC/GEN/005R05

GENERAL:

The President of Civil Aviation Authority – Macao, China, in exercise of his power under Paragraph 89 of the Air Navigation Regulation of Macao (ANRM) and Article 35 of the Statutes of Civil Aviation Authority, approved by the Decree-Law 10/91/M, established this Aeronautical Circular (AC).

1. Introduction

Following the International Civil Aviation Organization (ICAO) harmonization of the Safety Management System (SMS) provisions for different types of aviation services providers, AACM establishes this AC to harmonize the SMS requirements for aviation services providers governed by the Macao aviation regulations.

SMS is a systematic, explicit, proactive and data-driven approach to managing safety. An aviation services provider is expected to take an ownership role in proactively managing risks on the basis of compliance with regulatory requirements.

2. Scope

2.1 A *service provider* is required to implement a Safety Management System (SMS). This regulation specifies the requirements for a service provider SMS.

2.2 Within the context of this regulation the term "*service provider*" refers to any organization providing aviation services. The term includes aircraft operators, approved training organizations that are exposed to safety risk during the provision of their services, approved maintenance organizations, air traffic services providers and certified aerodromes, as applicable.

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2.3 The SMS of a certified operator of large and turbojet aeroplane flying for purpose other than commercial air transport or aerial work shall be commensurate with the size and complexity of the operation and meet the criteria set forth in ICAO annex 19 appendix 2 (Framework for a safety management system).

2.4 This regulation addresses aviation safety related processes, procedures and activities rather than occupational safety, environmental protection, or customer service or product quality.

2.5 The service provider is responsible for the safety of services or products contracted or sub-contracted to or purchased from other organizations.

2.6 This regulation establishes the minimum acceptable requirements; the service provider can establish more stringent requirements.

3. Applicability and acceptance

3.1 A service provider shall have in place a safety management system (SMS) acceptable to AACM that, as a minimum:

3.1.1 identifies safety hazards;
3.1.2 ensures the implementation of remedial action necessary to maintain agreed safety performance;
3.1.3 provides for continuous monitoring and regular assessment of the safety performance; and
3.1.4 aims at a continuous improvement of the overall performance of the safety management system.

3.2 In order to be acceptable to the AACM, a service provider's SMS shall meet the requirements set forth in this regulation.

4. Definitions

In this regulation unless the context otherwise requires:

- **Consequence** means the potential outcomes of a hazard;
- **Hazard** means a condition or an object with the potential to cause or contribute to an aircraft incident or accident;
- **Predictive** in relation to safety data collection means capturing system performance as it happens in real-time normal operations to identify potential future problems; flight data analysis and normal operations monitoring are examples of predictive methods of safety data collection;
- **Proactive** in relation to safety data collection means looking actively for the identification of safety risks through the analysis of the organization's activities; *voluntary reporting systems*, *safety audits* and *surveys* are examples of proactive methods of safety data collection;
- **Probability** means the likelihood that an unsafe event or condition might occur;

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- **Reactive** in relation to safety data collection means responding to the events that already happened, such as incidents and accidents; mandatory occurrence reporting system and incident reporting system are examples of reactive methods of safety data collection;
- **Risk mitigation** is the process of incorporating defences or preventive controls to lower the severity and/or likelihood of a hazard's projected consequence;
- **Safety** means 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;
- **Safety assurance** means the processes and activities undertaken by an organization to provide confidence as to the performance and effectiveness of the safety risk controls;
- **Safety audit** means an activity which focuses in the integrity of the organization's SMS and periodically assesses the status of safety risk controls;
- **Safety data** means a set of facts or set of safety values collected from various aviation related sources, which is used to maintain or improve safety.

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

  a. Accident or incident investigations;
  b. Safety reporting;
  c. Continuing airworthiness reporting;
  d. Operational performance monitoring
  e. Inspection, audits, surveys; or
  f. Safety studies and reviews.

- **Safety information** means safety data processed, organized or analyzed in a given context so as to make it useful for safety management purposes;
- **Safety management system (SMS)** means a systematic approach to managing safety, including the necessary organization structures, accountability, responsibilities, policies and procedures;
- **Safety performance** is the service provider's safety achievement as defined by its safety performance targets and safety performance indicators. The *Safety Performance* of a service provider is subject to the acceptance by AACM.

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- **Safety performance indicator** is a data-based safety parameter used for monitoring and assessing safety performance;
- **Safety performance target** is the State or service provider's planned or intended target for a safety performance indicator over a given period that aligns with the safety objectives;
- **Safety policy** means a statement of a service provider's fundamental approach to safety;
- **Safety requirement** means the tools and measures needed to achieve the safety performance indicators and safety performance targets of an SMS, such as procedures, technology, systems and programmes to which measures of reliability, availability, performance and/or accuracy can be specified;
- **Safety risk** means the predicted probability and severity of the consequences or outcomes of a hazard. Risk and safety risk have the same meaning in this regulation;
- **Safety risk assessment** means the analysis of the safety risks of the consequences of the hazards that have been determined as threatening the capabilities of an organization;
- **Safety survey** means a process to examine particular elements or procedures of a specific operation, such as problem areas or bottlenecks in daily operations, perceptions and opinions of operational personnel and areas of dissent or confusion;
- **Severity** means the possible consequences of an unsafe event or condition, taking as reference the worst foreseeable situation.

5. General

A *Service provider* shall establish, maintain and adhere to an SMS that is appropriate to the size, nature and complexity of the operations and the safety hazards and risks related to the operations.

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6. Safety policy and objectives

6.1 Safety Policy

6.1.1 A service provider shall define the organization's safety policy.

6.1.2 The safety policy shall be signed by the Accountable Executive of the organization.

6.1.3 The safety policy shall include, as a minimum, the following points:

a) a clear statement of senior management's commitment to safety;

b) commitment to continual improvement in the level of safety;

c) a clear statement about the provision of the necessary human and financial resources for its implementation;

d) commitment to the management of safety risks;

e) safety reporting procedures; and

f) commitment to encourage employees to report safety issues and the conditions under which disciplinary action would be not applicable following hazard reporting by employees.

6.1.4 The safety policy shall be communicated, with visible endorsement, throughout the organization.

6.1.5 There shall be a clear policy about which types of operational behaviours are unacceptable.

6.1.6 The safety policy shall be in accordance with all applicable legal requirements and international standards, best industry practices and shall reflect organizational commitments regarding safety.

6.1.7 The safety policy shall be reviewed periodically to ensure it remains relevant and appropriate to the organization.

6.2 Safety Objectives

A service provider shall establish safety objectives for the SMS.

Note: The safety objectives should be linked to the safety performance indicators, safety performance targets and safety requirements of the service provider SMS.

6.3 SMS organizational arrangements and safety accountabilities and responsibilities

6.3.1 A service provider shall identify an Accountable Executive to be responsible and accountable on behalf of the service provider for meeting the requirements of this regulation, and shall notify the AACM the name of the person.

6.3.2 The Accountable Executive shall be a single, identifiable person who, irrespective of other functions, shall have the ultimate responsibility and accountability, on behalf of the organization for the implementation and maintenance of the SMS.

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6.3.3 The Accountable Executive shall have:

a) full control of the human resources required for the operations;

b) full control of the financial resources required for the operations;

c) final authority over the operations;

d) direct responsibility for the conduct of the organization‘s affairs; and

e) final responsibility for all safety issues.

6.3.4 A service provider shall establish the necessary organizational arrangement for the implementation and maintenance of the organization’s SMS.

6.3.5 A service provider shall identify the safety accountabilities, responsibilities and authorities of all members of management as well as of all employees, irrespective of other responsibilities.

6.3.6 Safety-related accountabilities, responsibilities and authorities shall be defined, documented and communicated throughout the organization.

6.3.7 A service provider shall nominate a person acceptable to AACM as Safety Manager to be the responsible individual and focal point for the development and maintenance of an effective SMS.

6.3.8 The Safety Manager shall not hold other responsibilities that may conflict or impair his role as Safety Manager.

6.3.9 The Safety Manager shall *inter alia*:

a) ensure that processes needed for the SMS are established, implemented and maintained;

b) have direct access to the Accountable Executive;

c) report to the Accountable Executive on the performance of the SMS and on any need for improvement; and

d) ensure safety promotion throughout the organization.

6.4 **Coordination of emergency response planning**

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

6.4.2 The coordination of the emergency response planning shall ensure the orderly and efficient transition from normal to emergency operations and the return to normal operations.

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6.4.3 The coordination of emergency response plan shall include, inter alia:

a) designation of emergency authority within the service provider;

b) assignment of emergency responsibilities during the coordinated activities;

c) the coordination of efforts to cope with the emergency; and

d) the compatibility with other emergency response plans of other organizations.

e) provision to address preservation of safety, quality and continuity of its aviation product/services during emergency situations, where applicable.

6.5 **Documentation**

6.5.1 A service provider shall develop and maintain SMS documentation, in paper or electronic form, to describe the following:

a) the safety policy and objectives;

b) the SMS requirements;

c) the SMS processes and procedures;

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

e) SMS outputs.

6.5.2 The SMS documentation shall be developed in a manner that describes the SMS and the consolidated interrelationships between all the SMS components.

6.5.3 A service provider shall, as part of the SMS documentation, complete a gap analysis, in order to:

a) identify the safety arrangements and structures that may be already exist throughout an organization; and

b) determine additional safety arrangements required to implement and maintain the organization's SMS.

Note: See Appendix B for guidance on SMS gap analysis.

6.5.4 A service provider shall, as part of the SMS documentation, develop, adhere to and maintain an SMS implementation plan.

Note: Service providers are encouraged to adopt a phased-approach SMS implementation. See Appendix C for guidance on SMS phased-approach implementation.

6.5.5 The SMS implementation plan shall be the definition of the approach the organization will adopt for managing safety in a manner that will meet the organization's safety objectives.

6.5.6 The SMS implementation plan shall explicitly address the coordination between the SMS of the service provider and the SMS of other organizations the service provider must interface with during the provision of services.

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6.5.7 The SMS implementation plan shall include the following:

a) safety policy and objectives;

b) system description;

c) gap analysis;

d) SMS components;

e) safety roles and responsibilities;

f) safety reporting policy;

g) means of employee involvement;

h) safety training;

i) safety communication;

j) safety performance measurement; and

k) management review of safety performance.

6.5.8 The SMS implementation plan shall be endorsed by the Accountable Executive and senior management of the organization.

6.5.9 A service provider shall, as part of the development of the SMS implementation plan, complete a system description.

6.5.10 The system description shall include the following:

a) the system interactions with other systems in the air transportation system;

b) the system functions;

c) required human performance considerations of the system operation;

d) hardware components of the system;

e) software components of the system;

f) related procedures that define guidance for the operation and use of the system;

g) operational environment; and

h) contracted, sub-contracted and purchased products and/or services.

6.5.11 A service provider shall, as part of the SMS documentation, develop and maintain a safety management system (SMS) manual, to communicate the organization's approach to safety throughout the organization.

6.5.12 SMS Manual shall clearly articulate the role of safety risk management as an initial design activity and the role of safety assurance as a continuous activity.

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6.5.13 The SMS manual shall be approved by the Accountable Executive and is subject to the acceptance by the AACM and shall document all aspects of the SMS, and its contents shall include the following:

a) scope of the safety management system;

b) safety policy and objectives;

c) safety accountabilities;

d) key safety personnel;

e) documentation control procedures;

f) hazard identification and risk management schemes;

g) safety performance monitoring and measurement;

h) procedures for the management of change;

i) safety promotion (safety training and safety communication);

j) emergency response planning; and

k) control of contracted activities.

6.5.14 The SMS Manual shall include and make reference to, as appropriate, all relevant and applicable local and international regulations.

6.5.15 A service provider shall develop and maintain a documented procedure for identifying applicable regulatory requirements.

6.5.16 A service provider shall develop and maintain a documented procedure for periodically reviewing regulations, standards and exemptions to ensure that the most current information is available.

6.5.17 A service provider shall develop and maintain a records system that ensures the generation and retention of all records necessary to document and support operational requirements.

6.5.18 A service provider shall develop and maintain a process to periodically review the SMS documentation to ensure its continuing suitability, adequacy and effectiveness.

7. Safety risk management

7.1 General

7.1.1 A service provider shall develop and maintain a formal process that ensures that hazards in operations are identified.

7.1.2 A service provider shall develop and maintain safety data collection and processing systems (SDCPS) that provide for the identification of hazards and the analysis, assessment and mitigation of safety risks.

7.1.3 A service provider's SDCPS shall include reactive, proactive and predictive methods of safety data collection.

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7.1.4 Proactive reporting shall be simple, accessible and commensurate with the size of the service provider.

7.1.5 Predictive method of safety data collection shall be commensurate with the size of the service provider.

7.2 **Hazard identification**

7.2.1 A service provider shall develop and maintain formal means for effectively collecting, recording, acting on and generating feedback about hazards in operations, which combine reactive, proactive and predictive methods of safety data collection. Formal means of safety data collection shall include mandatory, voluntary and confidential reporting systems.

7.2.2 The hazard identification process shall include the following steps:

a) reporting of hazards, events or safety concerns;

b) collection and storing the safety data;

c) review and analysis of the safety data at the appropriate level of management; and

d) distribution of the safety information distilled from the safety data.

7.2.3 A service provider shall develop and maintain a process to identify hazards from internal incident and accident investigation for follow up risk assessment where applicable.

7.3 **Safety risk assessment and mitigation**

7.3.1 A service provider shall develop and maintain a formal process that ensures analysis, assessment and control of the safety risks of consequences of hazards during the provision of its services.

7.3.2 The safety risks of the consequences of each hazard identified through the hazard identification processes described in section 7.2 of this regulation shall be analysed in terms of probability and severity of occurrence, and assessed for their tolerability.

7.3.3 A service provider shall develop and maintain a process to ensure that hazards, incidents and accidents are analysed to identify contributing and root causes. When identifying contributing and root causes, the service provider considers individual human factors, the environment, supervision and organizational elements.

7.3.4 A service provider shall develop and maintain a process to ensure that occurrences and deficiencies reported are analysed to identify all associated hazards.

7.3.5 A service provider shall define the levels of management with authority to make safety risk tolerability decisions.

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7.3.6 A service provider shall define safety controls that include corrective/preventive action plans to prevent recurrence of reported occurrences and deficiencies for each risk assessed as tolerable.

7.3.7 A service provider shall develop and maintain a process to define and document safety risk mitigation actions which require senior management approval.

7.3.8 A service provider shall develop and maintain a process for periodic review of existing safety risk analysis records.

8. Safety assurance

8.1 General

8.1.1 A service provider shall develop and maintain safety assurance processes to ensure that the safety risks controls developed as a consequence of the hazard identification and risk management activities under paragraph 7 achieve their intended objectives.

8.1.2 Safety assurance processes shall apply to an SMS whether the activities and/or operations are accomplished internally or outsourced.

8.1.3 A service provider shall establish the *Safety Performance* to be assured by its SMS. The service provider's *Safety Performance* shall be acceptable to the AACM. Adjustments to previously accepted Safety Performance shall be substantiated by appropriate safety data and duly documented.

8.1.4 The Safety Performance includes safety performance indicators (SPIs) with respective safety triggers, safety performance targets (SPTs) with action plans for performance improvement which are based on the safety objective established by service provider.

8.2 Safety performance monitoring and measurement

8.2.1 A service provider shall, as part of the SMS safety assurance activities, develop and maintain the necessary means to verify safety performance of the organization in reference to the safety performance indicators and safety performance targets of the SMS, and to validate the effectiveness of safety risk controls.

Note: See Appendix A for guidance on safety performance indicators and safety performance targets.

8.2.2 Safety performance monitoring and measurement means shall include the following:

a) hazard reporting systems;

b) safety audits;

c) safety surveys; and

d) internal safety investigations.

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8.2.3 A service provider shall develop and maintain procedures for the conduct of internal investigations.

8.2.4 A service provider shall develop and maintain a system to monitor the internal reporting process and the associated corrective actions.

8.2.5 The hazard reporting procedure shall set out the conditions to ensure effective reporting, including the conditions under which disciplinary/administrative action shall not apply.

8.3 **Management of change**

8.3.1 A service provider shall, as part of the SMS safety assurance activities, develop and maintain a formal process for the management of change.

8.3.2 The formal process for the management of change shall:

a) identify changes which may affect the level of safety risk associated with its established processes and services and to identify and manage the safety risks that may arise from those changes;

b) describe the arrangements to ensure safety performance before implementing changes;

c) eliminate or modify safety risk controls that are no longer needed due to changes in the operational environment; and

d) analyse changes to operations and key personnel for safety risks.

8.3.3 The safety-related accountabilities, responsibilities and authorities, shall be reviewed after significant organizational changes.

8.3.4 The emergency response plan (ERP) shall be reviewed after key ERP personnel or organizational changes.

8.4 **Continuous improvement of the safety system**

8.4.1 A service provider shall, as part of the SMS safety assurance activities, develop and maintain formal processes to identify the causes of below standard performance of the SMS, determine the implications in its operation, and rectify situations involving below standard performance in order to ensure the continual improvement of the SMS.

8.4.2 Continuous improvement of the service provider SMS shall include:

a) proactive and reactive evaluations of facilities, equipment, documentation and procedures, to verify the effectiveness of strategies for control of safety risks; and

b) proactive evaluation of the individuals' performance, to verify the fulfillment of safety responsibilities.

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9. Safety promotion

9.1 General

Service providers shall develop and maintain formal safety training and safety communication activities to create an environment where the safety objectives of the organization can be achieved.

9.2 Safety training

9.2.1 A service provider shall, as part of its safety promotion activities, identify training requirements and develop and maintain a safety training programme that ensures that personnel are trained and competent to perform the SMS duties. The safety training programme shall include initial and recurrent training as applicable.

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

9.2.3 The Accountable Executive shall receive safety awareness training regarding:

a) safety policy and objectives;

b) SMS roles and responsibilities;

c) SMS standards; and

d) safety assurance.

9.3 Safety communication

9.3.1 A service provider shall, as part of its safety promotion activities, develop and maintain formal means for safety communication, to:

a) Ensure that all personnel are aware of the SMS to a degree commensurate with their positions;

b) convey safety critical information;

c) explain why particular safety actions are taken;

d) explain why safety procedures are introduced or changed; and

e) convey generic safety information.

10. Quality policy

A service provider shall ensure that the organization quality policy is consistent with, and supports the fulfillment of the activities of the SMS.

- END -

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Appendix A – Guidance notes

GN 6.2 Safety Objectives (AC/GEN/005 6.2)

Safety objectives are the brief, high-level statements of safety achievement or desired outcome to be accomplished by the service provider's safety management system. They are developed from the organization's top safety risks and should be taken into consideration during subsequent development of safety performance indicators (SPIs) and safety performance targets (SPTs). These would cover relevant aspects of the organization's safety vision, senior management commitments, realistic safety milestones and desired outcomes. They should be unambiguous and reviewed on a regular basis.

Examples of such safety objectives are listed below:

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

GN 6.3 SMS organizational arrangement (AC/GEN/005 6.3)

A service provider is required to have a formal process 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 Board (SRB). The SRB is chaired by the Accountable Executive or (for very large organizations) by an appropriately assigned deputy, duly substantiated in the SMS manual, and includes relevant operational or departmental Heads as members.

For a large organization, there are departmental or section Safety Action Groups (SAGs) that work in conjunction with the SRB. The SAGs are chaired by the divisional or section Head. There is an appointed Safety (SMS) coordinator within the SAG.

Processes and responsibilities related to SRB and SAG (where applicable) should be defined and documented in the SMS manual.

Records pertaining to the SRB / SAG meetings (or equivalent) minutes should be maintained and are made available to all members and the Accountable Executive.

GN 6.4 Emergency Response Planning (AC/GEN/005 6.4)

An Emergency Response Plan (ERP) outlines in writing what should be done by a service provider upon a major safety-related incident or accident resulting in emergency or crisis situation. For AMOs, it should include (where applicable) the discovery of a critical defect or maintenance error that affects the safe operation of aircraft.

An ERP should include (where applicable):

- Planned actions to minimize indirect or consequential damage upon the occurrence of a crisis or emergency situation.
- Provision for preservation of aviation product/ services/ equipment to avoid subsequent safety/ quality/ continuity problems, where applicable.
- Recovery actions as well as procedures for orderly transition from normal to emergency operations
- Designation of emergency authority
- Assignment of emergency roles and responsibilities
- Authorization of key personnel for actions contained in the plan
- Coordination procedures with contractors or operators where applicable
- Criteria for safe continuation of operations, or return to normal operations

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

GN 6.5.1e SMS outputs (AC/GEN/005 6.5.1e)

It is necessary that the organization maintain a systematic record of all measures taken to fulfill the objectives and activities of the SMS. Such records would be required as evidence of ongoing SMS processes including hazard identification, risks mitigation and safety performance monitoring. These records should be appropriately centralized and maintained in sufficient detail to ensure traceability of all safety related decisions.

Examples of such records include:

- Hazards/Risks Register
- Incident/Accident reports
- Incident/Accident investigation reports
- Safety/SMS audit reports
- Periodic analyses of safety trends/indicators
- Minutes of safety committee or safety action group meetings
- Hazard and Risk Analysis Reports, etc.

GN 6.5.13 SMS Manual (AC/GEN/005 6.5.13)

a) Scope of the SMS

- Describe the scope and extent of the service provider's aviation related operations and facilities within which the SMS will apply.
- If the SMS covers a group of interlinked organizations, such integration and associated accountabilities should be defined

b) Safety policy and objectives (Refers to 6.1 & 6.2)

- The safety policy shall address the requirements in AC/GEN/005 paragraph 6.1.
- The safety policy shall be signed by the Accountable Manager. However, it is acceptable that the safety policy incorporated in the SMS Manual is not signed by Accountable Manager, provided that a safety policy signed by the Accountable Manager is available at the service provider's premises.
- The SMS manual should contain the criteria and/or frequency for safety policy review.
- The SMS manual should define a formal process to develop a set of safety objectives necessary to provide direction and impetus to the SMS.

c) Safety accountabilities (Refers to 6.3)

- Safety authorities, responsibilities and accountabilities of personnel at all levels of the organization are defined and documented, so that all personnel understand their authorities, responsibilities and accountabilities in regards to all safety management processes, decision and actions.

d) Key safety personnel (Refers to 6.3)

- The Accountable Manager is responsible for ensuring that the safety management system is properly implemented and performing to requirements in all areas of the organization.
- Appropriate Safety Manager (office), Safety Committee or Safety Action Groups have been established as appropriate, depending on the size of the organization.

e) Documentation control procedures

- There should be documentation control procedures to ensure that the SMS Manual provided to the staff is update to date.
- The organization has a records system that ensures the generation and retention of all records necessary to document and support the SMS.
- Records kept include hazard reports, risk assessments reports, SAG/SRB meeting notes, safety performance monitoring charts, SMS audit reports, SMS training records, etc.

f) Coordination of emergency response planning (Refers to 6.4)

- Describe the organization's intentions and commitment to dealing with emergency situations and their corresponding recovery controls. Outline the roles and responsibilities of key personnel.
- The emergency response plan can be developed as a separate document or one chapter in the SMS manual. In the case of a separate document is developed, the SMS manual should contain a reference to the emergency response plan document.

- The organization has an emergency plan that outlines roles and responsibilities in the event of a major incident, crisis or accident.
- The organization has arrangements with other agencies for aid and the provision of emergency services as applicable.
- The organization has procedures for emergency mode operations where applicable.
- The organization has established procedures for handling media and insurance related issues.
- There are defined accident investigation responsibilities within the organization.
- There is emergency preparedness and response training for affected personnel
- A disabled aircraft or equipment evacuation plan is developed by the organization in consultation with aircraft/equipment owners, aerodrome operators or other agencies as applicable.
- There should be a notification process that includes an emergency call list and an internal mobilization process.
- The requirement for preservation of evidence, securing affected area and mandatory/governmental reporting should be clearly stated.
- There should be a procedure for recording activities during an emergency response.
- There should be a procedure for overseeing the welfare of all affected individuals and for notifying next of kin.

g) Hazard identification and risk management schemes (Refers to 7)

- A reporting system should include both reactive (accident/incident reports etc) and proactive/predictive (hazard reports etc) data. Describe how your reporting system is designed and how it works. Factors to consider include: report format, confidentiality, data collection and analysis and subsequent dissemination of information on corrective actions, preventive measures and recovery controls.
- The organization has a process or system that provides for the capture of internal information including incidents, accidents, hazards and other data relevant to SMS
- The reporting process is simple, accessible and commensurate with the size of the organization.
- Reports are reviewed at the appropriate level of management.
- There is a feedback process to notify contributors that their reports have been received and to share the results of the analysis.
- The report form is simple, standardized and accessible across the organization.
- There is a process to ensure that information is received from all areas of the organization within the scope of the SMS.
- There is a process in place to monitor and analyze trends.
- The organization has a process for the systematic investigation and analysis of operational conditions or activities that have been identified as potential hazards.
- Describe your hazard identification system and related schemes and how such data are collated.
- Describe your process for any categorization of hazards/risks and their subsequent prioritization for a documented safety assessment. Describe how your safety assessment process is conducted and how preventive action plans are implemented.

- There is a structured process for the assessment of risks associated with identified hazards, expressed in terms of consequence (severity) and likelihood (probability of occurrence).
- Hazard identification and risk analysis procedures do manifest aviation safety as its fundamental context.
- There is a criterion for evaluating risk and the tolerable level of risk the organization is willing to accept together with any mitigating factors.
- The organization has risk control strategies that include corrective, preventive and recovery action plans.
- The organization has a process for evaluating and updating the effectiveness of the corrective, preventive and recovery measures that have been developed.
- Corrective, preventive and recovery actions, including timelines, are documented.

h) Safety performance monitoring and measurement (Refers to 8.2)

- Describe how you plan to review the effectiveness of your SMS. This includes the safety performance of the company by reviewing the safety performance indicators.
- There is a formal process to develop and maintain a set of safety performance indicators for trend, target (desired level) as well as minimum acceptable (alert) level monitoring.
- Safety alert (caution) levels which are intended to constitute the organization's minimum Safety Performance shall be identified accordingly. These established levels shall be identified in this section of the manual and shall be subject to AACM acceptance.
- Periodic planned reviews of company safety performance indicators including an examination of the company's Safety Management System to ensure its continuing suitability, adequacy and effectiveness.

i) Procedures for the management of change (Refers to 8.3)

- Describe how you manage organizational internal/external/process changes that may have an impact on safety. How such processes are integrated with your SMS.
- The organization has a standard procedure or policy to perform or review safety assessments for all substantial internal or external changes which may have safety implications.
- There is procedure for performing safety assessment prior to introduction of new equipment or processes which may have safety implications before they are commissioned.
- All concerned stake holders within or without the organization are involved in such reviews. All such reviews are documented and approved by management as applicable.

j) Safety promotion (Refers to Section 9)

- Describe the type of SMS and other safety related training that staff receives and the process for assuring the effectiveness of the training. Describe how such training procedures are documented. Describe the safety communication processes/ channels within the organization.
- Training syllabus, eligibility and requirements are documented.
- There is a validation process that measures the effectiveness of training.

- The training includes initial, recurrent and update training, where applicable.
- The organization's SMS training is part of the organization's overall training program.
- SMS awareness is incorporated into employment or indoctrination program
- Safety communication processes/ channels within the organization.

k) Control of contracted activities

- Identify safety related functions that are contracted out.
- Contracted arrangements to provide services to other organizations (e.g. contract maintenance support to air carriers, code sharing, wet leasing, etc.)
- A process to monitor operational data of the products and services received from contractors to identify hazards, to determine the performance and effectiveness of risk controls.
- The organization should perform regularly scheduled internal audits of its operational processes performed by contractors to determine the performance and effectiveness of risk controls.

GN 7.2 Hazard identification (AC/GEN/005 7.2)

During an organization's initial Hazard Identification and Risk Assessment (HIRA) program, there will be an apparent need to identify what are the HIRA eligible operations/ processes for the organization. In principle, all operations/processes with the potential to generate hazards/risks to aviation safety should be eligible for HIRA accountability. However, it is prudent that priority be given to the identification of those operations/processes that are deemed by the organization to be crucial or pertinent to aviation safety. In due course, the HIRA eligibility identification process may then be expanded to cover other lower priority operations/ processes. For this purpose, organizations may begin by compiling an inventory (or register) of HIRA eligible operations/processes. These may be categorized to facilitate HIRA performance prioritization.

Following are some examples of what organizations may consider as candidates for their initial/ priority HIRA performance:

Flight Operations

- Operational routes with unusual or special hazard/ risk such as ULR, ETOPS, polar routes, RVSM, RNP, volcanic regions, inefficient ATC, etc.
- Line stations (aerodromes) with unusual or special hazard/ risk such as difficult terrain, high traffic density, typhoon prone areas, inefficient apron control, inadequate markings or guidance systems, extreme weather conditions, etc
- Other AOC operations/ processes deemed by the organization as essential for priority HIRA accountability.

Maintenance Organizations

- Aircraft Maintenance – high risk or complex aircraft maintenance operations/processes such as aircraft marshalling, aircraft towing, engine ground run, engine change, functional checks involving hydraulic/ pneumatic/ electrical power, fuel tank entry work, etc
- Workshop Maintenance – crucial operations/ processes on aircraft/ engine parts such as NDT, metal machining, metal put-on, heat treatment, etc
- • Other operations/ processes deemed by the organization as essential for priority HIRA accountability.

GN 8.1.3 Safety Performance (AC/GEN/005 8.1.3)

Safety Performance is the expression of a service provider's safety achievement defined by the pre-established safety performance indicators (SPIs) and safety performance targets (SPTs). This is the minimum safety performance that an organization should achieve while conducting their core business functions. Each service provider may have a slightly different SPIs and SPTs as long as they are commensurate with the complexity and scope of its operations. Where applicable, a combination of reactive (incident/accident rates), proactive (audit findings), predictive (hazard reports, FDAP deviations) indicators and the Acceptable Level of Safety Performance (ALoSP) established from AACM should be used. A service provider's Safety Performance is subject to the AACM acceptance. These SPIs and SPTs may be subject to revision where deemed appropriate.

A service provider may maintain other non Safety Performance related indicators and targets as part of their quality/reliability/productivity systems etc. These other indicators should be distinguished from the SPIs and SPTs and they are not subject to the AACM acceptance.

The Safety Performance of an SMS should be defined, to the extent possible, through quantitative SPIs and SPTs. It is recognized, however, in some cases, the safety data collection and analysis capabilities of the services providers may not be fully developed. Therefore, while such capabilities are being developed, the AACM may consider accepting that the safety performance of an SMS can be defined through a combination of quantitative and qualitative safety performance indicators and safety performance targets. The objective should nevertheless remain the definition of safety performance of an SMS through quantitative measures only.

Example of SPIs and SPTs

Safety Performance Indicators (SPIs) with safety triggers	**Safety Performance Targets (SPTs) (if necessary)**
15 FOD events in the apron per 10,000 operations	REDUCE TO 8 FOD events in the apron per 10,000 operations by December 2011.
20 events of unauthorized vehicles on the taxiways per 10,000 operations	REDUCE TO 10 events of unauthorized vehicles on the taxiways per 10,000 operations by December 2012.
5 non-stabilized approach per 1000 operations	REDUCE TO 3 non-stabilized approach per 1000 operations by March 2011.

Note: The numbers used in this example are purely arbitrary and do not take into account of actual operational conditions.

GN 8.2.1 Safety Performance Indicators and Safety Performance Targets (AC/GEN/005 8.2.1)

1. Types of safety performance indicators (SPIs)

1.1. Qualitative and quantitative indicators

SPIs are used to help senior management know whether or not the organization is likely to achieve its safety objective; they can be qualitative or quantitative. Quantitative indicators relate to measuring by the quantity, rather than its quality, whereas qualitative indicators are descriptive and measure by quality. Quantitative indicators are preferred over qualitative indicators because they are more easily counted and compared. The choice of indicator depends on the availability of reliable data that can be measured quantitatively. Does the necessary evidence have to be in the form of comparable, generalizable data (quantitative), or a descriptive image of the safety situation (qualitative)? Each option, qualitative or quantitative, involves different kinds of SPIs, and requires a thoughtful SPI selection process. A combination of approaches is useful in many situations, and can solve many of the problems which may arise from adopting a single approach. An example of a qualitative indicator for a State could be the maturity of their service providers' SMS in a particular sector, or for a service provider the assessment of the safety culture.

Quantitative indicators can be expressed as a number (x incursions) or as a rate (x incursions per n movements). In some cases, a numerical expression will be sufficient. However, just using numbers may create a distorted impression of the actual safety situation if the level of activity fluctuates. For example, if air traffic control records three altitude busts in July and six in August, there may be great concern about the significant deterioration in safety performance. But August may have seen double the movements of July meaning the altitude busts per movement, or the rate, has decreased, not increased. This may or may not change the level of scrutiny, but it does provide another valuable piece of information that may be vital to data-driven safety decision-making.

For this reason, where appropriate, SPIs should be reflected in terms of a relative rate to measure the performance level regardless of the level of activity. This provides a normalized measure of performance; whether the activity increases or decreases. As another example, an SPI could measure the number of runway incursions. But if there were fewer departures in the monitored period, the result could be misleading. A more accurate and valuable performance measure would be the number of runway incursions relative to the number of movements, e.g. x incursions per 1 000 movements.

1.2. Lagging and leading indicators

The two most common categories used by AACM and service providers to classify their SPIs are lagging and leading. Lagging SPIs measure events that have already occurred. They are also referred to as "outcome-based SPIs" and are normally (but not always) the negative outcomes the organization is aiming to avoid. Leading SPIs measure processes and inputs being implemented to improve or maintain safety. These are also known as "activity or process SPIs" as they monitor and measure conditions that have the potential to lead to or contribute to a specific outcome.

Lagging SPIs help the organization understand what has happened in the past and are useful for long-term trending. They can be used as a high-level indicator or as an indication of specific occurrence types or locations, such as "types of accidents per aircraft

type" or "specific incident types by region". Because lagging SPIs measure safety outcomes, they can measure the effectiveness of safety mitigations. They are effective at validating the overall safety performance of the system. For example, monitoring the "number of ramp collisions per number of movements between vehicles following a redesign of ramp markings" provides a measure of the effectiveness of the new markings (assuming nothing else has changed). The reduction in collisions validates an improvement in the overall safety performance of the ramp system; which may be attributable to the change in question.

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

Lagging SPIs are divided into two types:

- low probability/high severity: outcomes such as accidents or serious incidents. The low frequency of high severity outcomes means that aggregation of data (at industry segment level or regional level) may result in more meaningful analyses. An example of this type of lagging SPI would be "aircraft and/or engine damage due to bird strike".

- high probability/low severity: outcomes that did not necessarily manifest themselves in a serious accident or incident, these are sometimes also referred to as precursor indicators. SPIs for high probability/low severity outcomes are primarily used to monitor specific safety issues and measure the effectiveness of existing safety risk mitigations. An example of this type of precursor SPI would be "bird radar detections", which indicates the level of bird activity rather than the amount of actual bird strikes.

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

Leading indicators are measures that focus on processes and inputs that are being implemented to improve or maintain safety. These are also known as "activity or process SPIs" as they monitor and measure conditions that have the potential to become or to contribute to a specific outcome.

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

Leading SPIs may also inform the organization about how their operation copes with change, including changes in its operating environment. The focus will be either on anticipating weaknesses and vulnerabilities as a result of the change, or monitoring the performance after a change. An example of an SPI to monitor a change in operations would be "percentage of sites that have implemented procedure X".

For a more accurate and useful indication of safety performance, lagging SPIs, measuring both "low probability/high severity" events and "high probability/low severity" events should be combined with leading SPIs. The Fig.1 below illustrates the concept of leading and lagging indicators that provide a more comprehensive and realistic picture of the organization's safety performance.

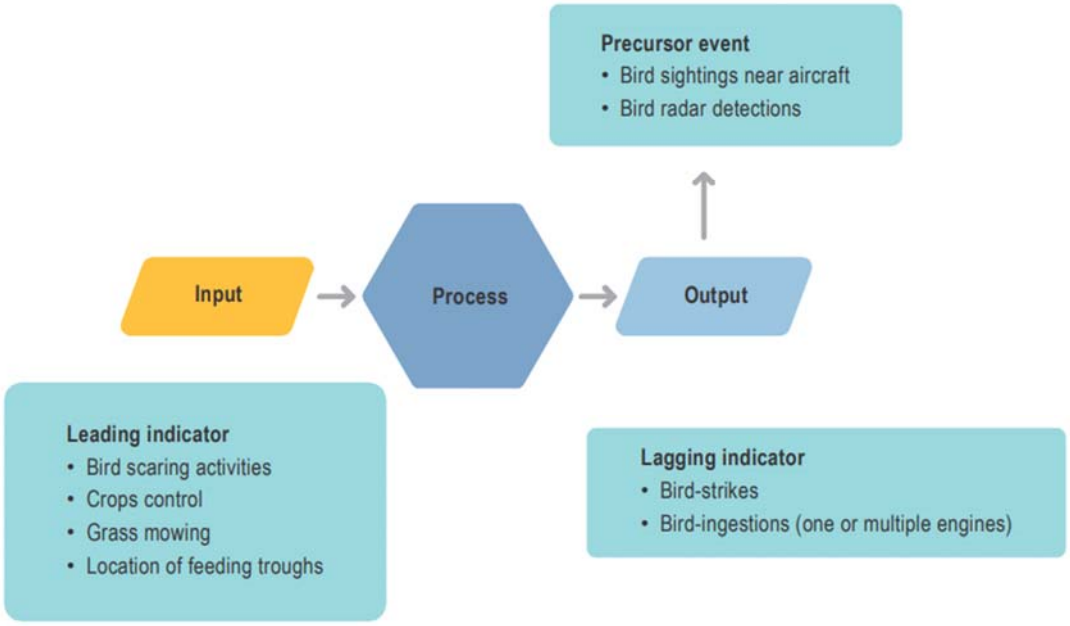

Fig. 1 - Leading vs Lagging indicator concept phases

2. Selecting and defining SPIs

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

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

SPIs should be:

a) related to the safety objective they aim to indicate;

b) selected or developed based on available data and reliable measurement;

c) appropriately specific and quantifiable; and

d) realistic, by taking into account the possibilities and constraints of the organization.

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

It is important to select SPIs that relate to the organization's safety objectives. Having SPIs that are well defined and aligned will make it easier to identify SPTs, which will show the progress being made towards the attainment of safety objectives. This allows the organization to assign resources for greatest safety effect by knowing precisely what is required, and when and how to act to achieve the planned safety performance. For example, a State has a safety objective of "reduce the number of runway excursions by 50 per cent in three years" and an associated, well-aligned SPI of "number of runway excursions per million departures across all aerodromes". If the number of excursions drops initially when monitoring commences, but starts to climb again after twelve months, the State could choose to reallocate resources away from an area where, according to the SPIs, the safety objective is being easily achieved and towards the reduction of runway excursions to alleviate the undesirable trend.

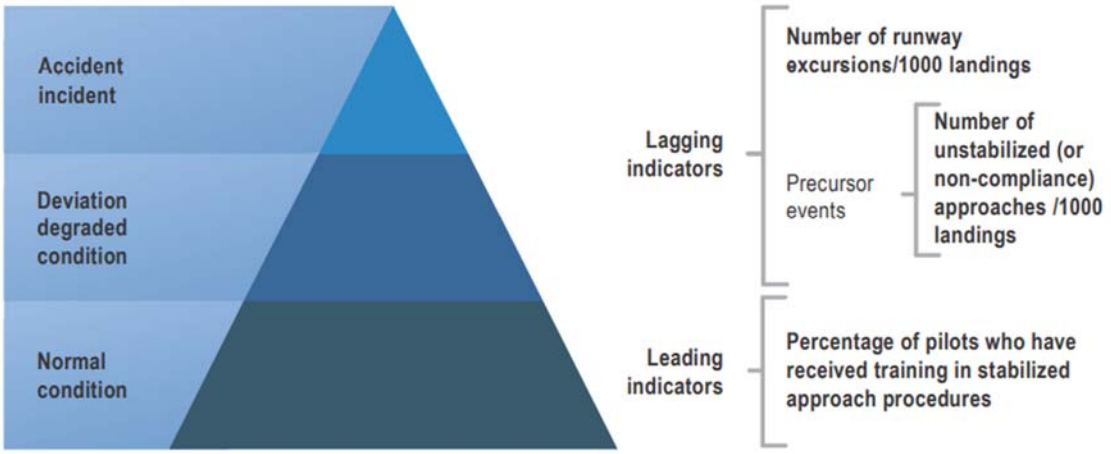

Fig. 2 - Examples of links between lagging and leading indicators

2.1. Defining SPIs

The contents of each SPI should include:

a) a description of what the SPI measures;

b) the purpose of the SPI (what it is intended to manage and who it is intended to inform);

c) the units of measurement and any requirements for its calculation;

d) who is responsible for collecting, validating, monitoring, reporting and acting on the SPI (these may be staff from different parts of the organization);

e) where or how the data should be collected; and

f) the frequency of reporting, collecting, monitoring and analysis of the SPI data.

2.2. SPIs and safety reporting

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

3. Setting safety performance targets

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

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

** SMART – specific, measurable, achievable, relevant and timely*

3.1. Setting targets with high-level safety objectives

Targets are established with senior management agreeing on high-level safety objectives. The organization then identifies appropriate SPIs that will show improvement of safety performance towards the agreed safety objective(s). The SPIs will be measured using existing data sources, but may also require the collection of additional data. The organization then starts gathering, analysing and presenting the SPIs. Trends will start to emerge, which will provide an overview of the organization's safety performance and whether it is steering towards or away from its safety objectives. At this point the

organization can identify reasonable and achievable SPTs for each SPI.

3.2. Setting targets with SMART safety objectives

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

An example of the relationship between safety objectives, SPIs and SPTs is illustrated in the Fig.3. In this example, the organization recorded 100 runway excursions per million movements in 2018. It has been determined this is too many, and an objective to reduce the number of runway excursions by fifty per cent by 2022 has been set. Specific targeted actions and associated timelines have been defined to meet these targets. To monitor, measure and report their progress, the organization has chosen "RWY excursions per million movements per year" as the SPI. The organization is aware that progress will be more immediate and effective if specific targets are set which align with the safety objective. They have therefore set a safety target which equates to an average reduction of 12.5 per year over the reporting period (four years). As shown in the graphical representation, the progress is expected to be greater in the first years and less so in the later years. This is represented by the curved projection towards their objective. In the Fig.3:

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

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

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

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

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

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

Fig. 3 - Example SPTs with SMART safety objectives

3.3. Additional considerations for SPI and SPT selection

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

a) Workload management. Creating a workable amount of SPIs can help personnel manage their monitoring and reporting workload. The same is true of the SPIs complexity, or the availability of the necessary data. It is better to agree on what is feasible, and then prioritize the selection of SPIs on this basis. If an SPI is no longer informing safety performance, or been given a lower priority, consider discontinuing in favour of a more useful or higher priority indicator.

b) Optimal spread of SPIs. A combination of SPIs that encompass the focus areas will help gain an insight to the organization's overall safety performance and enable data-driven decision-making.

c) Clarity of SPIs. When selecting an SPI, it should be clear what is being measured and how often. SPIs with clear definitions aid understanding of results, avoid misinterpretation, and allow meaningful comparisons over time.

d) Encouraging desired behaviour. SPTs can change behaviours and contribute to desired outcomes. This is especially relevant if achievement of the target is linked to organizational rewards, such as management remuneration. SPTs should foster positive organizational and individual behaviours that deliberately result in defensible decisions and safety performance improvement. It is equally important to consider the potential unintended behaviours when selecting SPIs and SPTs.

e) Choosing valuable measures. It is imperative that useful SPIs are selected, not only ones which are easy to measure. It should be up to the organization to decide what

the most useful safety parameters are; those that guide the organization to improve decision-making, safety performance management, and achievement of its safety objectives.

f) Achieving SPTs. This is a particularly important consideration, and linked to the desired safety behaviours. Achieving the agreed SPTs is not always indicative of safety performance improvement. The organization should distinguish between just meeting SPTs and actual, demonstrable organizational safety performance improvement. It is imperative that the organization consider the context within which the target was achieved, rather than looking at an SPT in isolation. Recognition for overall improvement in safety performance, rather than an individual SPT achievement, will foster desirable organizational behaviours and encourage exchange of safety information that lies at the heart of both SRM and safety assurance. This could also enhance the relationship between the State and the service provider and their willingness to share safety data and ideas.

3.4. Caveats on setting SPTs

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

a) Drive undesirable behaviours; if managers or organizations are too focused on achievement of the numbers as an indicator of success they may not achieve the intended improvement in safety performance.

b) Operational targets; too much focus on achieving operational targets (such as: on time departures, reduction in overhead costs, etc.) without a balance of SPTs can lead to "achieving the operational targets" while not necessarily improving safety performance.

c) Focus on quantity rather than quality; this can encourage personnel or departments to meet the target but in doing so deliver a poor product or service.

d) Cap innovation; although not intended, once a target is met this can lead to a relaxation and that no further improvements are needed and complacency can set in.

e) Organizational conflict; targets can create conflict between departments and organizations as they argue over who is responsible rather than focusing on trying to work together.

4. Safety Performance Measurement

Getting safety performance measurement right involves deciding how best to measure the achievement of the safety objectives. This will vary from State to State and from service

provider to service provider. Organizations should take the time to develop their strategic awareness of what it is that drives safety improvement for their safety objectives.

5. Use of SPIs and SPTs

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

Monitoring Safety Performance

6. Introduction

Once an organization has identified the targets based on the SPIs they believe will deliver the planned outcome, they must ensure the stakeholders follow through by assigning clear responsibility for delivery. Defining SPTs for each aviation authority, sector and service provider supports the achievement of the ALoSP for the State by assigning clear accountability. Mechanisms for monitoring and measuring the organization's safety performance should be established to identify what changes may be needed if the progress made isn't as expected and reinforce the commitment of the organization to meet its safety objectives.

7. Baseline safety performance

Understanding how the organization plans to progress towards its safety objectives requires that they know where they are, in relation to safety. Once the organization's safety performance structure (safety objectives, indicators, targets, triggers) has been established and is functioning, it is possible to learn their baseline safety performance through a period of monitoring. Baseline safety performance is the safety performance at the commencement of the safety performance measurement process, the datum point from which progress can be measured. In the example used above, the baseline safety performance for that particular safety objective was "100 runway excursions per million movements during the year (2018)". From this solid basis, accurate and meaningful indications and targets can be recorded.

8. Refinement of SPIs and SPTs

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

Safety performance management is an ongoing activity. Safety risks and/or availability of data change over time. Initial SPIs may be developed using limited resources of safety information. Later, more reporting channels may be established, more safety data may be available and the organization's safety analysis capabilities will likely mature. It may be appropriate for organizations to develop simple (broader) SPIs initially. As they gather more data and safety management capability, they can consider refining the scope of SPIs and SPTs to better align with the desired safety objectives. Small non-complex organizations may elect to refine their SPIs and SPTs and/or select generic (but specific) indicators which apply to most aviation systems. Some examples of generic indicators would be:

a) events including structural damage to equipment;

b) events indicating circumstances in which an accident nearly occurred;

c) events in which operational personnel or members of the aviation community were fatally or seriously injured;

d) events in which operational personnel became incapacitated or unable to perform their duties safely;

e) rate of voluntary occurrence reports; and

f) rate of mandatory occurrence reports.

Larger more complex organizations may elect to institute a broader and/or deeper range of SPIs and SPTs and to integrate generic indicators such as those listed above with activity-specific ones. A large airport, for example, providing services to major airlines and situated under complex airspace, might consider combining some of the generic SPIs with deeper-scope SPIs representing specific aspects of their operation. The monitoring of these may require greater effort but will likely produce superior safety results. There is a clear correlation between the relative complexity of SPIs and SPTs and the scale and complexity of the State's or service providers' operations. This relative complexity should be reflected in the indicator and target set. Those responsible for establishing safety performance management should be conscious of this.

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

a) SPIs continually report the same value (such as zero per cent or 100 per cent); these SPIs are unlikely to provide meaningful input to senior management decision-making;

b) SPIs that have similar behaviour and as such are considered a duplication;

c) the SPT for an SPI implemented to measure the introduction of a programme or targeted improvement has been met;

d) another safety concern becomes a higher priority to monitor and measure;

e) to gain a better understanding of a particular safety concern by narrowing the specifics of an SPI (i.e. reduce the "noise" to clarify the "signal"); and

f) safety objectives have changed and as a consequence the SPIs require updating to remain relevant.

9. Safety Triggers

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

A trigger is an established level or criteria value that serves to trigger (start) an evaluation, decision, adjustment or remedial action related to the particular indicator. One method for setting out-of-limits trigger criteria for SPTs is the use of the population standard deviation (STDEVP) principle. This method derives the standard deviation (SD) value based on the preceding historical data points of a given safety indicator. The SD value plus the average

(mean) value of the historical data set forms the basic trigger value for the next monitoring period. The SD principle (a basic statistical function) sets the trigger level criteria based on actual historical performance of the given indicator (data set), including its volatility (data point fluctuations). A more volatile historical data set will usually result in a higher (more generous) trigger level value for the next monitoring period. Triggers provide early warnings which enable decision makers to make informed safety decisions, and thus improve safety performance. An example of trigger levels based on standard deviations (SDs) is provided at the Fig.4. In this example, data-driven decisions and safety mitigation actions may need to be taken when the trend goes beyond +1SD or +2SD from the mean of the preceding period. Often the trigger levels (in this case +1SD, +2SD or beyond +2SD) will align with decision management levels and urgency of action.

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

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

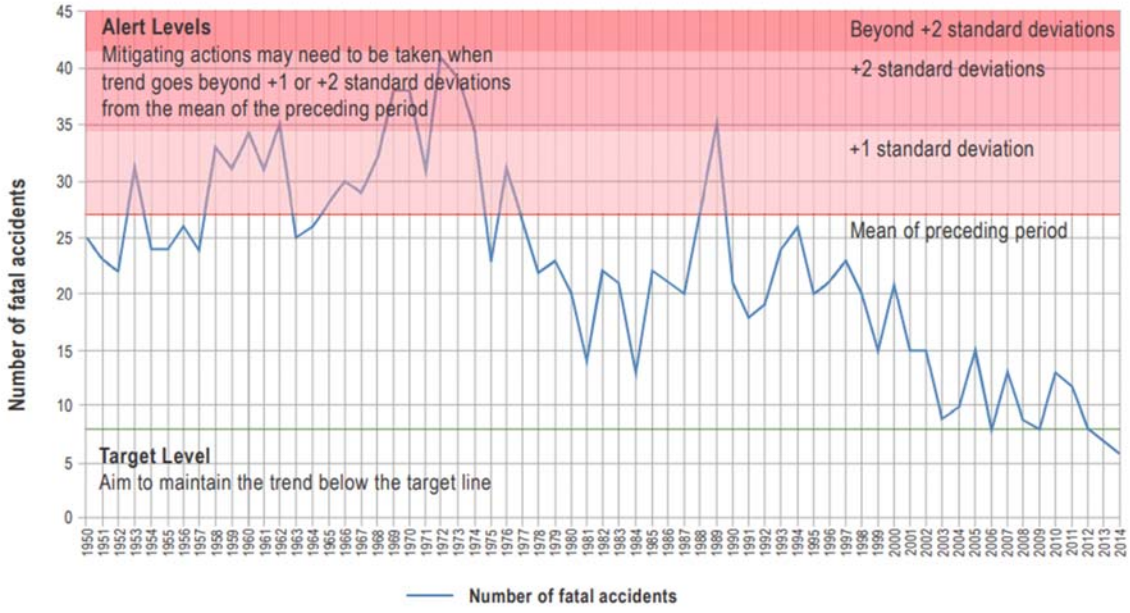

Fig. 4 - Example of representation of safety triggers (alert) levels

10. Caveat on triggers

There are challenges in identifying reliable trigger levels. Triggers and their associated levels work best when there are ample safety data and safety data management capabilities. This can impose an additional workload on the organization. The notion of trigger was designed and is

best suited to SRM of purely technical systems (e.g. aircraft engine monitoring). In this case, large amounts of quantitative data support the identification of accurate triggers and trigger levels. The notion of triggers is arguably less relevant to SRM of socio-technical systems. Socio-technical systems are systems where people actively interact with the processes and technologies to achieve the system's service delivery or production objectives. Both SSP and SMS are socio-technical systems. The less reliable and meaningful triggers used in socio-technical systems are due to the limitations of reliable measures when humans are involved.

A more flexible approach is therefore needed for the triggers to be meaningful. Annex 19 does not require that States or service providers define trigger levels for each SPI. However, there are benefits for organizations where their data for an SPI is very specific, there are enough data points and the data is sufficiently trustworthy.

The Fig.5 is an extension of the previous example, "50 per cent reduction in runway excursions by 2022". In this scenario, it is now the year 2020. The organization has been collecting safety data (SPI – "No runway excursions/million movement/yr") and working with stakeholders to reduce the instances. The SPT for 2019 (<78 runway excursions/million movement in year) was achieved. However, the SPI shows that, not only was the SPT for 2020 (<64 runway excursions/million movement in year) not achieved, the number of excursions has exceeded the trigger in two consecutive reporting periods. The decision makers have been alerted to the deterioration in safety performance and are in a position to make decisions based on the data to take further action(s). Their data-driven decisions will aim to drive the safety performance back to within the acceptable zone, and on track to achieve their safety objective.

Fig. 5 - Example of setting safety triggers

11. Identifying actions required

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

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

Data-driven decision-making also supports the evaluation of decisions made in the past to support any realignment with the safety objectives.

GN8.2.2b Safety Audit (AC/GEN/005 8.2.2b)

Internal safety (SMS) audits are used to ensure that the structure of an SMS is sound. It is also a formal process to ensure continuous improvement and effectiveness of the SMS. The protocol for conducting a SMS audit (from planning to final corrective action closure) should be no different from any other system audit. Audits should involve the use of appropriate checklists. The overall scope of an SMS audit should include:

- Regulatory SMS requirements
- Structure of safety accountabilities
- Organizational safety policies and standards
- Documentation, including SMS manual and SMS records
- Compliance with SMS hazard/ risk evaluation procedures
- Effectiveness of safety risk controls put in place and that they achieve their intended objectives
- Adequacy of staff training for their SMS roles
- Safety Performance (safety performance indicators & safety performance targets)
- Compliance with safety assessment plan or schedule
- Effective SMS integration with other control systems
- SMS integration with contractors where applicable
- Continuing assessments and management of change
- Review completed safety assessments for any aspect that may be obviously sub-standard or inadequate

GN8.2.2c Safety Surveys (AC/GEN/005 8.2.2c)

Over and above SMS audits, safety surveys may be employed as a proactive procedure for examining particular elements, processes or a specific operation for any safety concerns or sub-standard performance. Such targeted safety surveys may be initiated as a follow up to informal feedback or voluntary/confidential reports to identify issues that may contribute to generation of hazard/risks or their escalation factors, such as:

- Problem areas or bottlenecks in daily operations
- Perceptions and opinions about personnel's competency with possible safety implications
- Poor Teamwork and cooperation between employee groups or departments (especially involving safety/operational/technical functions)
- Areas of dissent or perceived confusion (especially involving safety/operational/technical functions)

- Unsafe working procedures or conditions
- Prolonged working hours or long-term manpower shortfall, etc

GN8.3 Management of Changes (AC/GEN/005 8.3)

A formal process for the management of change should aim to:
- Identify changes that might affect established processes, procedures, products and services;
- Prior to implementing changes, define arrangements to ensure safety performance taking into account the following three consideration:
- Criticality of systems and activities
- Stability of systems and operational environments
- Past performance

Criticality of systems and activities. Criticality relates to the potential consequences of equipment being improperly operated or an activity being incorrectly executed — essentially answering the question, "how important is this equipment/activity to safe system operations?"

Some activities are more essential for safe delivery of services than others. For example, the changes in activities or procedures related to an aircraft's return to service after major maintenance in an organization that has first implemented its own maintenance organization after previously subcontracting third-party maintenance, might be considered to be more safety-critical than a similar scenario regarding changes in meal catering activities. 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.

Stability of systems and operational environments. Changes may be the result of programmed change such as growth, operations to new destinations, changes in fleets, changes in contracted services, or other changes directly under the control of the organization. Changes in the operational environment are also important, such as economic or financial status, labour unrest, changes in political or regulatory environments, or changes in the physical environment such as cyclical changes in weather patterns. While these factors are not under the direct control of the organization, it must take action to respond to them. Frequent changes in either systems or operational environments dictate that managers need to update key information more frequently than in more stable situations. This is an essential consideration in management of change.

Past performance. Past performance of critical systems is a proven indicator of future performance. This is where the closed-loop nature of safety assurance comes into play. 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, investigations or reports, it is essential that such information is considered to assure the effectiveness of corrective actions.

GN9.2 Safety Training (AC/GEN/005 9.2)

Safety training and education is an essential foundation for the development and maintenance of a safety culture. The provision of appropriate safety training to all staff is an indication of management's commitment to SMS. The procedure for safety training and education should

include the following where applicable:

- a documented process to identify training requirements
- a validation process that measures the effectiveness of training
- initial general/ job-specific safety training
- initial training incorporating SMS, Human Factors and organizational factors
- Recurrent safety training as applicable

The safety manager should, in conjunction with the personnel department or functional heads, review the job descriptions of all staff, and identify those positions that have safety responsibilities. These should include operational personnel, managers/supervisors, senior managers and the Accountable Manager. This is to ensure that relevant personnel are trained and competent to perform their SMS duties. The level/mode of training should be appropriate to the individual's involvement in the SMS. SMS training may possibly be integrated with related training programs eg. HFEM, QMS etc. In-house SMS training programs (class room or web-based), should be conducted or produced by personnel who have undergone appropriate SMS training.

The organization should develop and maintain a process that measures the effectiveness of safety training.

GN 9.3.1 Safety Communication (AC/GEN/005 9.3.1)

There is a need to communicate the organization's SMS processes and activities to the organization's population. The medium for such communication/promotion may include notices or statements on safety policy/objectives, newsletters, bulletins, safety seminars/workshops, orientation program, etc.

Appendix B – GUIDANCE ON THE DEVELOPMENT OF AN SMS GAP ANALYSIS FOR SERVICE PROVIDERS

This SMS gap analysis checklist is adopted from the ICAO Safety Management Manual (Doc 9859). This checklist serves as a tool to aid service providers to conduct a gap analysis and may not contain all the detail requirements. Refer to the regulations in the Aeronautical Circular AC/GEN/005 for detail requirements.

The implementation of an SMS requires a service provider to conduct an analysis of its system to determine which components and elements of an SMS are currently in place and which components and elements must be added or modified to meet the implementation requirements. This analysis is known as gap analysis, and it involves comparing the SMS requirements against service provider's existing system.

This guidance provides, in checklist format, information to assist in the evaluation of the components and elements that comprise the ICAO SMS framework and to identify the components and elements that will need to be developed. Once the gap analysis is completed and documented, it will form one basis of the SMS implementation plan.

The gap analysis included in this appendix can be used as a guidance to conduct a 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. 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.

No.	Aspect to be analysed or questions to be answered	Answer	Status of implementation
Component 1 – SAFETY POLICY AND OBJECTIVES			
Element 1.1 – Management commitment and responsibility			
1.1-1	Is there a safety policy in place?	☐ Yes ☐ No ☐ Partial	
1.1-2	Does the safety policy reflect senior management's commitment regarding safety management?	☐ Yes ☐ No ☐ Partial	
1.1-3	Is the safety policy appropriate to the size, nature and complexity of the organization?	☐ Yes ☐ No ☐ Partial	
1.1-4	Is the safety policy relevant to aviation safety?	☐ Yes ☐ No ☐ Partial	
1.1-5	Is the safety policy signed by the accountable executive?	☐ Yes ☐ No ☐ Partial	
1.1-6	Is the safety policy communicated, with visible endorsement, throughout the [Organization]?	☐ Yes ☐ No ☐ Partial	
1.1-7	Is the safety policy periodically reviewed to ensure it remains relevant and appropriate to the [Organization]?	☐ Yes ☐ No ☐ Partial	
Element 1.2 – Safety accountabilities			
1.2-1	Has [Organization] identified an accountable executive who, irrespective of other functions, shall have ultimate responsibility and accountability, on behalf of the [Organization], for the implementation and maintenance of the SMS?	☐ Yes ☐ No ☐ Partial	
1.2-2	Does the accountable executive have full control of the financial and human resources required for the operations authorized to be conducted under the operations certificate?	☐ Yes ☐ No ☐ Partial	
1.2-3	Does the Accountable Executive have final authority over all aviation activities of his organization?	☐ Yes ☐ No ☐ Partial	
1.2-4	Has [Organization] identified and documented the safety accountabilities of management as well as operational personnel, with respect to the SMS?	☐ Yes ☐ No ☐ Partial	

No.	Aspect to be analysed or questions to be answered	Answer	Status of implementation
1.2-5	Is there a safety committee or review board for the purpose of reviewing SMS and safety performance?	☐ Yes ☐ No ☐ Partial	
1.2-6	Is the safety committee chaired by the accountable executive or by an appropriately assigned deputy, duly substantiated in the SMS manual?	☐ Yes ☐ No ☐ Partial	
1.2-7	Does the safety committee include relevant operational or departmental heads as applicable?	☐ Yes ☐ No ☐ Partial	
1.2-8	Are there safety action groups that work in conjunction with the safety committee (especially for large/complex organizations)?	☐ Yes ☐ No ☐ Partial	
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?	☐ 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?	☐ 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?	☐ Yes ☐ No ☐ Partial	
1.3-4	Is the SMS manager's position a senior management position not lower than or subservient to other operational or production positions?	☐ Yes ☐ No ☐ Partial	
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?	☐ Yes ☐ No ☐ Partial	
1.4-2	Does the emergency/contingency plan address all possible or likely emergency/crisis scenarios relating to the organization's aviation product or service deliveries?	☐ Yes ☐ No ☐ Partial	

No.	Aspect to be analysed or questions to be answered	Answer	Status of implementation
1.4-3	Does the ERP include procedures for the continuing safe production, delivery or support of its aviation products or services during such emergencies or contingencies?	☐ Yes ☐ No ☐ Partial	
1.4-4	Is there a plan and record for drills or exercises with respect to the ERP?	☐ Yes ☐ No ☐ Partial	
1.4-5	Does the ERP address the necessary coordination of its emergency response/contingency procedures with the emergency/response contingency procedures of other organizations where applicable?	☐ Yes ☐ No ☐ Partial	
1.4-6	Does [Organization] have a process to distribute and communicate the ERP to all relevant personnel, including relevant external organizations?	☐ Yes ☐ No ☐ Partial	
1.4-7	Is there a procedure for periodic review of the ERP to ensure its continuing relevance and effectiveness?	☐ Yes ☐ No ☐ Partial	
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 AACM?	☐ Yes ☐ No ☐ Partial	
1.5-2	Does the SMS documentation address the organization's SMS and its associated components and elements?	☐ Yes ☐ No ☐ Partial	
1.5-3	Is [Organization] SMS framework in alignment with the regulatory SMS framework?	☐ Yes ☐ No ☐ Partial	
1.5-4	Does [Organization] maintain a record of relevant supporting documentation pertinent to the implementation and operation of the SMS?	☐ Yes ☐ No ☐ Partial	
1.5-5	Does [Organization] have an SMS implementation plan to establish its SMS implementation process, including specific tasks and their relevant implementation milestones?	☐ Yes ☐ No ☐ Partial	

No.	Aspect to be analysed or questions to be answered	Answer	Status of implementation
1.5-6	Does the SMS implementation plan address the coordination between the service provider's SMS and the SMS of external organizations where applicable?	☐ Yes ☐ No ☐ Partial	
1.5-7	Is the SMS implementation plan endorsed by the accountable executive?	☐ Yes ☐ No ☐ Partial	
Component 2 – SAFETY RISK MANAGEMENT			
Element 2.1 – Hazard identification			
2.1-1	Is there a process for voluntary hazards/threats reporting by all employees?	☐ Yes ☐ No ☐ Partial	
2.1-2	Is the voluntary hazard/threats reporting simple, available to all personnel involved in safety-related duties and commensurate with the size of the service provider?	☐ Yes ☐ No ☐ Partial	
2.1-3	Does [Organization] SDCPS include procedures for incident/accident reporting by operational or production personnel?	☐ Yes ☐ No ☐ Partial	
2.1-4	Is incident/accident reporting simple, accessible to all personnel involved in safety-related duties and commensurate with the size of the service provider?	☐ Yes ☐ No ☐ Partial	
2.1-5	Does [Organization] have procedures for investigation of all reported incident/accidents?	☐ Yes ☐ No ☐ Partial	
2.1-6	Are there procedures to ensure that hazards/threats identified or uncovered during incident/accident investigation processes are appropriately accounted for and integrated into the organization's hazard collection and risk mitigation procedure?	☐ Yes ☐ No ☐ Partial	
2.1-7	Are there procedures to review hazards/threats from relevant industry reports for follow-up actions or risk evaluation where applicable?	☐ Yes ☐ No ☐ Partial	
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?	☐ Yes ☐ No ☐ Partial	

No.	Aspect to be analysed or questions to be answered	Answer	Status of implementation
2.2-2	Is the risk assessment reports approved by departmental managers or at a higher level where appropriate?	☐ Yes ☐ No ☐ Partial	
2.2-3	Is there a procedure for periodic review of existing risk mitigation records?	☐ Yes ☐ No ☐ Partial	
2.2-4	Is there a procedure to account for mitigation actions whenever unacceptable risk levels are identified?	☐ Yes ☐ No ☐ Partial	
2.2-5	Is there a procedure to prioritize identified hazards for risk mitigation actions?	☐ 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?	☐ Yes ☐ No ☐ Partial	
Component 3 – SAFETY ASSURANCE			
Element 3.1 – Safety performance monitoring and measurement			
3.1-1	Are there identified safety performance indicators for measuring and monitoring the safety performance of the organization's aviation activities?	☐ Yes ☐ No ☐ Partial	
3.1-2	Are the safety performance indicators relevant to the organization's safety policy as well as management's high-level safety objectives/goals?	☐ Yes ☐ No ☐ Partial	
3.1-3	Do the safety performance indicators include alert/target settings to define unacceptable performance regions and planned improvement goals?	☐ Yes ☐ No ☐ Partial	
3.1-4	Is the setting of alert levels or out-of-control criteria based on objective safety metrics principles?	☐ Yes ☐ No ☐ Partial	
3.1-5	Do the safety performance indicators include quantitative monitoring of high-consequence safety outcomes (e.g. accident and serious incident rates) as well as lower-consequence events (e.g. rate of non-compliance, deviations)?	☐ Yes ☐ No ☐ Partial	

No.	Aspect to be analysed or questions to be answered	Answer	Status of implementation
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?	☐ 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?	☐ Yes ☐ No ☐ Partial	
3.1-8	Are the safety performance indicators periodically reviewed?	☐ Yes ☐ No ☐ Partial	
Element 3.2 – The management of change			
3.2-1	Is there a procedure for review of relevant existing aviation safety-related facilities and equipment (including HIRM records) whenever there are pertinent changes to those facilities or equipment?	☐ Yes ☐ No ☐ Partial	
3.2-2	Is there a procedure for review of relevant existing aviation safety-related operations and processes (including any HIRM records) whenever there are pertinent changes to those operations or processes?	☐ Yes ☐ No ☐ Partial	
3.2-3	Is there a procedure for review of new aviation safety-related operations and processes for hazards/risks before they are commissioned?	☐ Yes ☐ No ☐ Partial	
3.2-4	Is there a procedure for review of relevant existing facilities, equipment, operations or processes (including HIRM records) whenever there are pertinent changes external to the organization such as regulatory/industry standards, best practices or technology?	☐ Yes ☐ No ☐ Partial	
Element 3.3 – Continuous improvement of the SMS			
3.3-1	Is there a procedure for periodic internal audit/assessment of the SMS?	☐ Yes ☐ No ☐ Partial	
3.3-2	Is there a current internal SMS audit/assessment plan?	☐ Yes ☐ No ☐ Partial	
3.3-3	Does the SMS audit plan include the sampling of completed/existing safety risk assessments?	☐ Yes ☐ No ☐ Partial	

No.	Aspect to be analysed or questions to be answered	Answer	Status of implementation
3.3-4	Does the SMS audit plan include the sampling of safety performance indicators for data currency and their target/alert settings performance?	☐ Yes ☐ No ☐ Partial	
3.3-5	Does the SMS audit plan cover the SMS interface with subcontractors or customers where applicable?	☐ 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?	☐ Yes ☐ No ☐ Partial	
Component 4 – SAFETY PROMOTION			
Element 4.1 – Training and education			
4.1-1	Is there a programme to provide SMS training/familiarization to personnel involved in the implementation or operation of the SMS?	☐ Yes ☐ No ☐ Partial	
4.1-2	Has the accountable executive undergone appropriate SMS familiarization, briefing or training?	☐ Yes ☐ No ☐ Partial	
4.1-3	Are personnel involved in conducting risk mitigation provided with appropriate risk management training or familiarization?	☐ Yes ☐ No ☐ Partial	
4.1-4	Is there evidence of organization-wide SMS education or awareness efforts?	☐ Yes ☐ No ☐ Partial	
Element 4.2 – Safety communication			
4.2-1	Does [Organization] participate in sharing safety information with relevant external industry product and service providers or organizations, including the relevant aviation regulatory organizations?	☐ Yes ☐ No ☐ Partial	
4.2-2	Is there evidence of a safety (SMS) publication, circular or channel for communicating safety (SMS) matters to employees?	☐ Yes ☐ No ☐ Partial	
4.2-3	Are [Organization] SMS manual and related guidance material accessible or disseminated to all relevant personnel?	☐ Yes ☐ No ☐ Partial	

Appendix C – Phased implementation approach of the SMS

1. This regulation strongly encourages, but does not mandate, a 4-phased implementation of a SMS. 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.

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.

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.

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 appendix is not meant to be absolute. Service providers may choose to make adjustments as may be deemed appropriate for the circumstances. Service providers may refer to ICAO Doc 9859 for further guidance on phased implementation approach of SMS.

5. Phase 1 SMS implementation
   5.1. 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.
   5.2. During Phase1, basic planning and assignment of responsibilities are established. Central to Phase1 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.
6. Phase 2 SMS implementation
   6.1. 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.
7. Phase 3 SMS implementation
   7.1. 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.

Table – 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 hazard 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 programme or integrate them into existing internal and external audit programme; b) Establish other operational SMS review/survey programmes where appropriate. 5) SMS Element 4.1 (ii): a) Ensure that the SMS training programme for all relevant personnel has been completed; 6) SMS Element 4.2 (ii): a) Promote safety information sharing and exchange internally and externally.
SMS Element 1.5: SMS documentation (Phases 1 to 4) >>>			
SMS Elements 4.1 and 4.2: SMS training, education and communication (Phase 1 and thereafter) >>>>>>>>>>>>>>>>>>>>>>>>>>>>			
Note 1. – The implementation period indicated is an approximation. The actual implementation period is dependent on the scope of actions required for each element allocated and the size/complexity of the organization. Note 2. – The SMS elements numbers indicated correspond to the ICAO SMS element numbers. Suffixes such as (i), (ii), (iii) indicate that the element has been subdivided to facilitate the phased implementation approach.			

8. Phase4 SMS implementation

8.1. 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.