

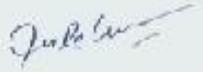
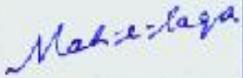


## SMS GUIDE FOR ATS PROVIDERS

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# MANUAL

VERSION : 1.0  
DATE OF IMPLEMENTATION : 01-12-2017  
OFFICE OF PRIME INTEREST : Airspace and Air Navigation Standards (AANS)

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TYPE OF DOCUMENT	MANUAL (MNL)		
STATUS OF DOCUMENT	CONTROLLED		

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## INTRODUCTION:

The purpose of this document is to provide guidance on the implementation of Safety Management Systems (SMS) for Air Navigation Service Providers. It has been developed to give sufficient understanding on SMS concepts and the development of management policies and processes to implement and maintain an SMS that meets ICAO requirements and implementing rules. ATS organisations are encouraged to refer to this document and ICAO Doc 9859 as their principal source of guidance on SMS. Safety management goes beyond the traditional approach of compliance with prescriptive regulations to a systematic approach to managing safety where potential safety risks are identified and managed to a tolerable level as the industry develops and evolves. SMS adopts a business-like approach to safety, similar to the way that finances are managed, with safety plans, safety performance indicators and targets and continuous monitoring of the safety performance of the organisation. It provides for effective risk based decision making processes across the business. It is important to recognize that SMS is a top down driven system, which means that the Accountable Manager of the organisation is responsible for the implementation and continuing compliance of the SMS. Without the wholehearted support and ownership of the Accountable Manager the SMS will not be effective.

There is not a 'one size fits all' model for SMS that will cater for all types and size of organisations. A complex SMS is unlikely to be appropriate for small organisations, and all organisations should tailor their SMS to suit the size, nature and complexity of the operation, and the hazards and associated risks inherent with its activities. Guidance for smaller non complex organisations is contained in a separate guidance document where an organisation is part of a group that has several approvals a single Group SMS may be developed provided that there is clear accountability between the group and the subsidiary companies.

SMS is a proactive and integrated approach to Safety. It should be integrated into the management system of an organisation. It should describe the structure and scope of the organisation, available resources, staff accountabilities, authorities and responsibilities and how decisions are taken and managed throughout the organisation.

## Chapter 1

### **GUIDANCE FOR IMPLEMENTATION OF SMS**

- 1.1 The safety management systems (SMS) across the aviation industry bring some specific challenges for ATS Providers. Indeed, it is felt that SMS is too complex or too costly to implement. This manual has been developed in view of guiding ATS organization in developing SMS in their ATS system.
- 1.2 ATS Organizations may be categorize as follows
  - Small: Unit having staff less than ten
  - Medium: Unit having staff between ten and fifty
  - Large: Unit having staff more than fifty
- 1.3 SMS can be explained in a very simple manner:
  - 1.3.1 Actively look for safety issues in your operations or services;
  - 1.3.2 Develop corrective actions to reduce the risks, which may arise from safety issues present; and
  - 1.3.3 Monitor to ensure that risks are appropriately controlled.
- 1.4 SMS does not have to be complicated so that it becomes ineffective.
- 1.5 Before starting SMS identify the requirements for SMS according to the size of unit. Then carry out a gap analysis with respect to National Regulation / Requirements to evaluate the existing and missing elements.

**Note:** As with any management system, it is also important to remember that your SMS should be customized to reflect your organization and the operating environment.

#### 1.6 **HOW COMPLEX THE UNIT IS?**

- 1.6.1 It is not just the size of ATS unit that matters but the risk and complexity of the activity is very important issue.
- 1.6.2 Complexity considerations include:
  - 1.6.2.1 Operating environment (mountainous terrain, arctic operations, offshore operations, etc.);
  - 1.6.2.2 Types of operations (passenger operations, cargo, aerial work, Emergency Medical Services, etc.);
  - 1.6.2.3 Number of locations (sectors);
  - 1.6.2.4 Types of services;
  - 1.6.2.5 Number of aircraft movements (aerodromes and Air Navigation Service Providers(ANSPs);
  - 1.6.2.6 Surrounding terrain and levels of equipment at aerodromes;

- 1.6.2.7 Density and complexity of traffic;
- 1.6.2.8 Extent of contracted activities; and
- 1.6.2.9 Number of runways and taxiways at aerodromes.
- 1.6.3 A Step by Step Guidance for Implementation provides a step by step guide on how to implement and develop SMS to help make your organization safer.
- 1.6.4 The following is a summary of the main considerations when implementing an SMS within an ATS organization.

Step 1	GAP ANALYSIS	1.1 Review the requirement of an SMS 1.2 Identify what you have 1.3 Identify what you need
Step 2	DESIGN AND DEVELOPMENT	2.1 Implementation Plan 2.2 Document your SMS
Step 3	INTRODUCTION AND ROLLOUT	3.1 Get your people involved 3.2 Communicate the changes 3.3 Set a realistic timeframe
Step 4	IMPROVEMENT AND MEASUREMENT	4.1 Gather feedback 4.2 Measure performance 4.3 Continuously improve your SMS

## 1.7 **STEP 1: GAP ANALYSIS**

### 1.7.1 **REVIEW THE REQUIREMENTS OF AN SMS**

- 1.7.1.1 The first step is to know what an ideal SMS looks like, and then consider this in the light of your organization. Look at your regulatory requirements.

### 1.7.2 **IDENTIFY WHAT YOU HAVE**

- 1.7.2.1 Consider and document what you already have in place. Write down some notes as you go about what you already do, and what you do well.
- 1.7.2.2 This is where you need to consider carrying out a gap analysis. Here is the part where you may feel initially overwhelmed by observing most of the things may not in place which may results in failing to start gap analysis. If you follow these steps, you will end up with an easy, manageable list of actions to focus on.
- 1.7.2.3 A gap analysis does not have to take too long or be overly complex. Here's an example of a simple table to capture results:

**No. 1 Element Safety** policy and objectives

**What we have** Quality Policy (with safety mentioned)

**What we don't have**

Safety commitment statement. Safety objectives for the Year ....

**Actions**

Top management to develop and sign commitment statement

## 1.8 **STEP 2: DESIGN AND DEVELOPMENT**

- 1.8.1 In this step, the person responsible for the SMS needs to design and develop a plan to implement the SMS.

## 1.8.2 **IMPLEMENTATION PLAN**

- 1.8.2.1 Using the action item list from the gap analysis, go through and introduce all under-developed or absent elements in an implementation plan.
- 1.8.2.2 Just a few things to consider while you do this:
  - 1.8.2.2.1 Think about each action. Does it require the development of a philosophy (e.g., safety objectives), a process (e.g., safety reporting system) or a practice (e.g., risk assessment tool)? It can help to differentiate these to make sure you have the philosophies sorted out first.
  - 1.8.2.2.2 Read through the actions identified, and prioritize them. It is useful to do a quick sensibility check, ask yourself, "Do I really need everything I've identified to achieve a successful system?" This is a good time to see if your actions sufficiently address the gaps identified and are suitable for ATS organization.
  - 1.8.2.2.3 You do not need to have each action up and running straight away. Develop an implementation plan that will allow you to phase different elements over a period of time. Building an SMS overnight will be far too challenging and your goal at this stage is just setting up the foundations.
  - 1.8.2.2.4 Go with what works. Do not try to force a process or activity that clearly has no place in your business. For example, if you are attempting to develop a risk assessment methodology, think about how complex you want to make this process; make it practical and keep a focus on what you're trying to achieve (e.g., identifying the safety and business risks of a new venture).

## 1.8.3 **DOCUMENT YOUR SMS**

- 1.8.3.1 You need to document the processes and activities you currently carry out, and the ones you plan to introduce. A sensible approach is to add your SMS processes and activities to the documentation you already have such as your Operations Manual.

## 1.9 **STEP 3: INTRODUCTION OF SMS**

### 1.9.1 **GET YOUR PEOPLE INVOLVED**

- 1.9.1.1 No matter how small your unit is, failing to get people involved will be a missed opportunity and a showstopper. So, be sure people are on board and understand what you are trying to achieve. A clear safety policy and a commitment from the accountable executive is the best place to start. A good safety culture begins with the accountable executive 'walking the talk.' A few one-on-one discussions go a long way.

### 1.9.2 **COMMUNICATE THE CHANGES**

- 1.9.2.1 Let staff know about the changes, why they are being implemented, the benefits they are designed to bring, and, of course, their own roles within the SMS.
- 1.9.2.2 Who else may benefit from knowing that you have an SMS in place? For example, your customers and your contractors and if you are a small unit based on an aerodrome, it might be valuable to let the aerodrome operator know your reporting system may have safety information that's worthwhile passing on to them.

### 1.9.3 **SET A REALISTIC TIMEFRAME**

- 1.9.3.1 Be sure to space out the implementation activities over a reasonable timeframe. Even for small unit, it will take time to implement SMS and longer for it to become effective. Do one or two things at a time. Make sure these are in place and working before moving to the next step in your plan.
- 1.9.3.2 Keep checking your progress. For example, if you have implemented a new safety reporting process but have not received (or submitted) any reports, find out the reason.

## 1.10 **STEP 4: IMPROVEMENT AND MEASUREMENT**

1.10.1 An important part of implementation is seeing whether your actions have worked. This step focuses on what you can do to determine this. Consider doing a review six months after your initial development has started; you can increase the interval as your SMS matures.

### 1.10.2 **GATHER FEEDBACK**

1.10.2.1 To understand what is working, and what is not, consider getting both an internal and external perspective.

#### 1.10.2.2 **Internally:**

1.10.2.2.1 Review any regulatory guidance material and compare your thoughts now with what they were when you first read it. Use your initial gap analysis to identify what may need updating. Have things changed?. Talk to people and see what they think.

#### 1.10.2.3 **Externally:**

1.10.2.3.1 Check in with your partner organization or industry association. Consider having an independent evaluation done. Ask for feedback from your regulatory inspector.

### 1.10.3 **MEASURE PERFORMANCE**

1.10.3.1 Establish some performance measures that will help you measure your safety performance. This can be simply measuring the amount of significant safety events you have, the amount of voluntary safety reports you receive or the amount of safety meetings you have. Use them to see how far you have come and tell your staff about the progress made.

### 1.10.4 **CONTINUE TO IMPROVE SMS**

1.10.4.1 The previous steps should give you an indication of what can be improved. Refining and enhancing your SMS does not stop. If you think you have done all you can, just remember that continual improvement is fundamental to your SMS. Your implementation is successful when it is embedded in your day- to- day activity (and has been for a while), it works consistently, and it is actually effective. This won't happen overnight, but with time you'll see the system maturing and your confidence growing.

### 1.10.5 **REVIEW AND ACCEPTANCE OF SMS BY REGULATOR**

1.10.5.1 All ATS Units within Pakistan shall submit their SMS manual to DAAR for initial review before acceptance of that manual.

1.10.5.2 ATS units shall submit their final and approved copy of SMS manual to ANS branch for acceptance.

1.10.5.3 SMS manual of any ATS unit shall be considered valid when it is accepted by the ANS branch of DAAR

**1.10.6 MECHANISM FOR THE PERIODIC REVIEW OF THE SMS REQUIREMENTS**

1.10.6.1 To ensure that SMS is relevant and appropriate to ATS providers, ANS Branch of DAAR shall periodically review their SMS by following means:

1.10.6.1.1 Review of Oversight Audit reports

1.10.6.1.2 Review of Safely related Data

1.10.6.1.3 During Oversight Audit/ Inspections review of documents/ data

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## Chapter 2

### SAFETY POLICY AND OBJECTIVES

2.1 The Safety Policy outlines the methods and processes that the organisation will use to achieve desired safety outcomes. It should declare the principles and philosophies that lay the foundation for the organization's safety culture and be communicated to all staff throughout the organisation. The creation of a positive safety culture begins with a clear, unequivocal direction and ownership from the Accountable Manager. In preparing a safety policy, Senior Management should consult with key staff members in charge of safety critical areas. Consultation will ensure that the safety policy and stated objectives are relevant to all staff and generate a sense of shared responsibility for the safety culture in the organisation. A positive safety culture is one where all staff must be responsible for, and consider the impact of, safety on everything they do. The Safety Policy and Objectives can be divided into the following five areas:

- (a) Management Commitment and Responsibility;
- (b) Safety Accountabilities;
- (c) Appointment of Key Safety Personnel;
- (d) Coordination of Emergency Response Planning;
- (e) SMS Documentation.

2.2 The policy and objectives set out what you want to achieve. It is the best place to start; if you do not know what you want to do, you are probably going to have a really hard time doing anything useful!

2.3 Safety objectives define what your organization hopes to accomplish with your SMS. It is a statement of a desired outcome and should be a short, high-level statement of your safety priorities. Safety objectives should address your organization's most significant risks. Goals or targets should be established to achieve each safety objective. Ideally they should be SMART:

<b>Specific</b>	Each target should be focused on one thing only.
<b>Measurable</b>	You should be able to measure whether or not you hit the target.
<b>Achievable</b>	The target should be within your organization's capabilities.
<b>Relevant</b>	The target should be something of importance or significance to safety.
<b>Timed</b>	There should be a deadline for achieving the target.

#### Example:

Safety objective	To gain a full picture of the safety hazards in our operation.
Goals or targets	Conduct quarterly hazard identification workshops.
Safety performance indicators	Increase the number of voluntary reports received by 20% this year.
	Number of hazard identification workshops carried out this year.
	Number of new hazards identified through workshops conducted this year.
	Number of hazard reports received per employee this year versus last year.

Ideally, you should include your safety objectives and how you intend to achieve them in a simple safety plan.

## 2.4 **MANAGEMENT COMMITMENT AND RESPONSIBILITY**

- 2.4.1 Management commitment means that the management is totally committed to safety. Develop a statement of your commitment by writing and signing your Safety Policy. Make it clear that you will do what it takes to meet that commitment. Outline your safety reporting policy; your staff needs to know that you will operate a fair reporting system, and what type of behavior would attract disciplinary action. Then sign it, post it in a prominent place - and live up to it!
- 2.4.2 Your Safety Policy should set out what you want to achieve and how you mean to achieve it. In addition to your safety commitment statement and your safety reporting policy, it should also include your key safety objectives.
- 2.4.3 It is important that everyone sees the Safety Policy. In a Small organization, you could circulate it and have everyone sign as having read it, as well as posting it on the notice board.
- 2.4.4 The Accountable Manager should have full responsibility and accountability for the SMS and should have:
- (a) Corporate authority for ensuring all activities can be financed and carried out to the required standard;
  - (b) Full authority for ensuring adequate staffing levels;
  - (c) Direct responsibility for the conduct of the organization's affairs;
  - (d) Final authority over operational matters;
  - (e) Final accountability for all safety issues.
- 2.4.5 Senior Management should:
- (a) Develop the safety policy, which is endorsed and actively supported by the Accountable Manager;
  - (b) Continuously promote the safety policy to all staff and demonstrate their commitment to it;
  - (c) Specify and allocate necessary human and financial resources;
  - (d) Establish safety objectives and performance standards for the SMS. The safety objectives and performance standards should be linked to the safety performance indicators (SPIs), safety performance targets and regulatory safety requirements of the SMS.

## 2.5 **SAFETY ACCOUNTABILITY**

- 2.5.1 ATS units should clearly define the lines of safety accountability throughout the organisation. This should include the direct accountability for safety on the part of the Accountable Manager and senior management. There is also a need to define the safety responsibilities and expected behaviours of key personnel (e.g. Nominated Post-holders, Safety Manager, Safety Officers, Safety committee members). Safety is everyone's responsibility and all staff should be aware of their safety roles and responsibilities. It is essential that safety management is seen as an integral strategic part of the organization's business by assigning the highest priority to safety. With this in mind, there has to be a demonstrable Board level commitment to an effective SMS. The Accountable Manager, together with the Senior Management team, set the standard for the organization's safety culture. Without this commitment and leadership, SMS will be ineffective.
- 2.5.2 Nominate the Accountable Executive who has the ultimate accountability for Safety.

## 2.6 **APPOINTMENT OF KEY SAFETY PERSONNEL**

2.6.1 Appoint a safety manager for each ATS unit. However for small units Safety Manager for Aerodrome may look after the responsibilities of ATS safety Manager.

2.6.2 Person Responsible for the SMS

2.6.2.1 The person responsible for the SMS should ideally have some operational experience and understand the systems that support your operation. He/she should have an understanding of safety management principles, ideally acquired through formal training and practical experience.

### 2.6.3 **RESPONSIBILITIES:**

2.6.3.1 The person responsible for the SMS will:

2.6.3.1.1 Ensure that the SMS processes are established, implemented, and maintained;

2.6.3.1.2 Promote safety awareness and a positive safety culture;

2.6.3.1.3 Liaise with the authorities on safety-related issues;

2.6.3.1.4 Exchange valuable lessons learned with other organizations;

2.6.3.1.5 Manage internal incident and accident investigations;

2.6.3.1.6 Ensure identified hazards and issues are being managed;

2.6.3.1.7 Maintain safety documentation; and

2.6.3.1.8 Organize safety training.

## 2.7 **COORDINATION OF EMERGENCY RESPONSE PLANNING**

2.7.1 Coordinate your emergency response plan (ERP) with other organizations/stakeholders that may be affected and with the emergency services, so that every one should be aware of their duties once the emergency situations arises. If you do not have an ERP, think about the sort of emergencies you might face and work from there.

## 2.8 **SMS DOCUMENTATION**

2.8.1 You do need to document your SMS, but you may already have some of the documentation, and the rest should be fairly easy to put in place. You have your Safety Policy and objectives and you have named your key safety personnel. You will need some documentation about your risk management processes, incident investigations, and so on.

### 2.8.2 **CONSIDERATIONS FOR DOCUMENTATION**

2.8.2.1 SMS documentation is the basis for sharing your Safety Policy and explaining your SMS processes to everyone. In addition, it is important that there are records of your safety management activity. Clear documentation makes sure that everyone including ATS personnel, your contractors, and your regulator understand your SMS.

2.8.2.2 Keep your SMS documentation simple, concise and to the point. You may need to produce an SMS manual, but it can refer to existing documentation that covers SMS requirements.

2.8.2.3 Sample SMS Manuals are available and might be used as a basis for your own, but do not simply copy them. Yours should be a living document that reflects the structure, the processes and the features of your organization.

2.8.2.4 The SMS documentation does not need to exactly follow the format of the regulatory framework, but it should describe clearly who does what, when, where, and how as well as show that your SMS meets the requirements. Don't forget that SMS Documentation includes additional records such as:

2.8.2.4.1 Records of audits, safety meetings and management reviews;

2.8.2.4.2 Records of risk assessments; and

2.8.2.4.3 A Hazard log or risks register with records of actions.

### 2.8.3 **WRITING PROCEDURES**

2.8.3.1 A good SMS will have good supporting procedures. To ensure these are effective and error free consider the following seven points.

**Be Clear and Concise.** Make sure procedures are easy to understand and follow.

**Be Correct.** Make sure they are grammatically correct with no spelling errors.

**Be Consistent.** Use the same format and delivery system for all procedures.

**Be Complete.** Review and test a procedure with someone who does not know it, to make sure no steps have been omitted.

**Be in Context.** Ensure that actions properly describe the activity to be performed.

**Be in Control.** Incorporate feedback and process controls to be effective and remain effective.

**Be Compliant.** Make sure that procedures comply with any requirements, such as user needs, national regulations, and company policies.

2.8.3.2 Your SMS Manual might be a very short, simple document mainly referencing your existing procedures, or you might just add a section to your operating manual. The following is an example of an SMS Manual layout.

2.8.3.2.1 Table of Contents

2.8.3.2.2 List of Effective Pages

2.8.3.2.3 Distribution List

2.8.3.2.4 Safety Policy and Objectives

2.8.3.3 Safety Policy signed by the Accountable Executive to indicate "Management commitment and responsibility". Safety Organization

2.8.3.4 Safety accountabilities and responsibilities

2.8.3.5 The Accountable Executive and key safety personnel.

- 2.8.3.6 What, when, who, where and how to document and record the SMS activities. Safety Risk Management
- 2.8.3.7 Safety reporting and hazard identification process
- 2.8.3.8 How to assess hazards and risks and how to take corrective actions. Safety Assurance
- 2.8.3.9 Safety performance monitoring and measurement
- 2.8.3.10 Safety audits and surveys
- 2.8.3.11 How to manage changes using SMS
- 2.8.3.12 How to improve the SMS continuously using the monitoring result
- 2.8.3.13 Management Review. Safety Promotion
- 2.8.3.14 How to provide safety training and education to all staff
- 2.8.3.15 How to achieve safety communication.
- 2.8.3.16 How to deal with emergency situations
- 2.8.3.17 Quick reference guide for key staff members

## 2.9 **ATS SAFETY MANAGEMENT REQUIREMENTS:**

- 2.9.1 ANSP/ATSP and all ATS units shall implement safety management system (SMS) acceptable to regulator (DAAR) that, as a minimum:
  - 2.9.1.1 Identifies safety hazards;
  - 2.9.1.2 Ensures the implementation of remedial action necessary to maintain agreed safety performance
  - 2.9.1.3 Provides for continuous monitoring and regular assessment of the safety performance; and
  - 2.9.1.4 Aims at a continuous improvement of the overall performance of the safety management system.
- 2.9.2 The objectives of ATS safety management are to ensure that:
  - 2.9.2.1 the established level of safety applicable to the provision of ATS within an airspace or at an aerodrome is met; and
  - 2.9.2.2 safety-related enhancements are implemented whenever necessary.

## 2.10 **ATS SAFETY MANAGEMENT ACTIVITIES**

- 2.10.1 ATS SMS should include, inter alia, the following with respect to the provision of air traffic services:
  - 2.10.1.1 monitoring of overall safety levels and detection of any adverse trend;
  - 2.10.1.2 safety reviews of ATS units;

2.10.1.3 safety assessments in respect of the planned implementation of airspace reorganizations, the introduction of new equipment systems or facilities, and new or changed ATS procedures;

2.10.1.4 post implementation monitoring and

2.10.1.5 a mechanism for identifying the need for safety enhancing measures.

2.10.2 All activities undertaken in an ATS SMS shall be fully documented. All documentation shall be retained for at least three years or reviewed.

## 2.11 **POST IMPLEMENTATION MONITORING:**

2.11.1 ANSP shall ensure post implementation monitoring of all activities where safety assessment was carried out.

2.11.2 Report / Result of each monitoring shall be submitted to DAAR on monthly basis.

### 2.11.3 **MONITORING OF SAFETY LEVELS**

2.11.3.1 Collection and evaluation of safety-related data

2.11.3.1.1 Data for use in safety monitoring programmes should be collected from as wide a range of sources as possible, as the safety-related consequences of particular procedures or systems may not be realized until after an incident has occurred.

2.11.3.1.2 The appropriate ATS authority should establish a formal incident reporting system for ATS personnel to facilitate the collection of information on actual or potential safety hazards or deficiencies related to the provision of ATS, including route structures, procedures, communications, navigation and surveillance systems and other safety significant systems and equipment as well as controller workloads.

2.11.3.2 Review of incident and other safety-related reports

2.11.3.2.1 Safety-related reports concerning the operation of air traffic services, including air traffic incident reports, shall be systematically reviewed by the appropriate ATS authority in order to detect any adverse trend in the number and types of incidents which occur.

2.11.3.2.2 Reports concerning the serviceability of ATS facilities and systems, such as failures and degradations of communications, surveillance and other safety significant systems and equipment, shall be systematically reviewed by the appropriate ATS authority in order to detect any trend in the operation of such systems which may have an adverse effect on safety.

### 2.11.4 **SAFETY REVIEWS**

#### 2.11.4.1 **General requirements**

2.11.4.1.1 Safety reviews of ATS units shall be conducted on a regular and systematic basis by personnel qualified through training, experience and expertise and having a full understanding of relevant Standards and Recommended Practices (SARPs), Procedures for Air Navigation Services (PANS), safe operating

practices and Human Factors principles. Safety review may be conducted after every two years

#### 2.11.4.2 Scope

2.11.4.2.1 The scope of ATS unit safety reviews should include at least the following issues:

2.11.4.2.1.1 Regulatory issues to ensure that:

- a) ATS operations manuals, ATS unit instructions and air traffic control (ATC) coordination procedures are complete, concise and up-to-date;
- b) the ATS route structure, where applicable, provides for:
  - i. adequate route spacing; and
  - ii. crossing points for ATS routes located so as to reduce the need for controller intervention and for inter- and intra-unit coordination;
- c) the separation minima used in the airspace or at the aerodrome are appropriate and all the provisions applicable to those minima are being complied with;
- d) where applicable, provision is made for adequate observation of the manoeuvring area, and procedures and measures aimed at minimizing the potential for inadvertent runway incursions are in place. This observation may be performed visually or by means of an ATS surveillance system;
- e) appropriate procedures for low visibility aerodrome operations are in place;
- f) traffic volumes and associated controller workloads do not exceed defined, safe levels and that procedures are in place for regulating traffic volumes whenever necessary;
- g) procedures to be applied in the event of failures or degradations of ATS systems, including communications, navigation and surveillance systems, are practicable and will provide for an acceptable level of safety; and
- h) procedures for the reporting of incidents and other safety-related occurrences are implemented, that the reporting of incidents is encouraged and that such reports are reviewed to identify the need for any remedial action.

2.11.4.2.1.2 Operational and technical issues to ensure that:

- a) the environmental working conditions meet established levels for temperature, humidity,

- ventilation, noise and ambient lighting, and do not adversely affect controller performance;
- b) automation systems generate and display flight plan, control and coordination data in a timely, accurate and easily recognizable manner and in accordance with Human Factors principles;
  - c) equipment, including input/output devices for automation systems, are designed and positioned in the working position in accordance with ergonomic principles;
  - d) communications, navigation, surveillance and other safety significant systems and equipment:
    - i. are tested for normal operations on a routine basis;
    - ii. meet the required level of reliability and availability as defined by the appropriate authority;
    - iii. provide for the timely and appropriate detection and warning of system failures and degradations;
    - iv. include documentation on the consequences of system, subsystem and equipment failures and degradations;
    - v. include measures to control the probability of failures and degradations; and
    - vi. include adequate backup facilities and/or procedures in the event of a system failure or degradation; and
  - e) detailed records of systems and equipment serviceability are kept and periodically reviewed.

2.11.4.2.1.3 Licensing and training issues to ensure that:

- a) controllers are adequately trained and properly licensed with valid ratings;
- b) controller competency is maintained by adequate and appropriate refresher training, including the handling of aircraft emergencies and operations under conditions with failed and degraded facilities and systems;
- c) controllers, where the ATC unit/control sector is staffed by teams, are provided relevant and adequate training in order to ensure efficient teamwork;
- d) the implementation of new or amended procedures, and new or updated communications, surveillance and other safety significant systems and equipment is preceded by appropriate training and instruction;

- e) controller competency in the English language is satisfactory in relation to providing ATS to international air traffic; and
- f) standard phraseology is used.

## 2.11.5 **SAFETY ASSESSMENTS**

### 2.11.5.1 Need for safety assessments

2.11.5.1.1.1 A safety assessment shall be carried out Safety assessment shall be carried out by a team comprising from ATS, CNS, APS (If required), Airline Operators, Engineering Services (If required) and SQMS, in respect of proposals for significant airspace reorganizations, for significant changes in the provision of ATS procedures applicable to an airspace or an aerodrome, and for the introduction of new equipment, systems or facilities, such as:

2.11.5.1.1.2 reduced separation minimum to be applied within an airspace or at an aerodrome;

2.11.5.1.1.3 new operating procedure, including departure and arrival procedures, to be applied within an airspace or at an aerodrome;

2.11.5.1.1.4 reorganization of the ATS route structure;

2.11.5.1.1.5 re-sectorization of an airspace;

2.11.5.1.1.6 physical changes to the layout of runways and/or taxiways at an aerodrome; and

2.11.5.1.1.7 implementation of new communications, surveillance or other safety-significant systems and equipment, including those providing new functionality and/or capabilities.

2.11.5.1.2 Proposals shall be implemented only when the assessment has shown that an acceptable level of safety will be met.

### 2.11.5.2 Safety-significant factors

2.11.5.2.1 The safety assessment shall consider relevant all factors determined to be safety-significant, including:

2.11.5.2.1.1 types of aircraft and their performance characteristics, including aircraft navigation capabilities and navigation performance;

2.11.5.2.1.2 traffic density and distribution;

2.11.5.2.1.3 airspace complexity, ATS route structure and classification of the airspace;

2.11.5.2.1.4 aerodrome layout, including runway configurations, runway lengths and taxiway configurations;

2.11.5.2.1.5 type of air-ground communications and time parameters for communication dialogues, including controller intervention capability;

2.11.5.2.1.6 type and capabilities of surveillance system, and the availability of systems providing controller support and alert functions. The safety assessment shall take account of adequate contingency measures to mitigate the risk of either degradation or loss of this common source (i.e. common mode failure); and

2.11.5.2.1.7 any significant local or regional weather phenomena.

## 2.11.6 **SAFETY-ENHANCING MEASURES**

2.11.6.1 Any actual or potential hazard related to the provision of ATS within airspace or at an aerodrome, whether identified through an ATS safety management activity or by any other means, shall be assessed and classified by the appropriate ATS authority for its risk acceptability.

2.11.6.2 Except when the risk can be classified as acceptable, the ATS authority concerned shall, as a matter of priority and as far as practicable, implement appropriate measures to eliminate the risk or reduce the risk to a level that is acceptable.

2.11.6.3 If it becomes apparent that the level of safety applicable to an airspace or an aerodrome is not, or may not be achieved, the appropriate ATS authority shall, as a matter of priority and as far as practicable, implement appropriate remedial measures.

2.11.6.4 Implementation of remedial measure shall be followed by an evaluation of the effectiveness of the measure in eliminating or mitigating of risk.

## 2.12 **SAFETY MANAGEMENT MANUAL**

2.12.1 The safety management manual shall be:

2.12.1.1 Typewritten or printed and signed by the ATS provider / Aerodrome Operator;

2.12.1.2 In a format that is easy to revise;

2.12.1.3 Having a system for recording the currency of page and amendments therein including a page for logging revisions;

2.12.1.4 Organized in a manner that will facilitate the preparation, review and acceptance/approval process, and shall include:

2.12.1.4.1 Documentation identification;

2.12.1.4.2 Document control procedures;

2.12.1.4.3 Scope of safety management system;

2.12.1.4.4 Safety organization, defining responsibilities and accountabilities of key safety personnel;

2.12.1.4.5 Safety policy and objectives:

2.12.1.4.5.1 Management commitment and responsibilities;

2.12.1.4.5.2 Safety accountability;

2.12.1.4.5.3 Appointment of key safety personnel;

2.12.1.4.5.4 Coordination of emergency response planning;

2.12.1.4.5.5 SMS documentation

2.12.1.4.6 Safety risk management:

2.12.1.4.6.1 Hazard identification;

2.12.1.4.6.2 Safety risk assessment and mitigation;

2.12.1.4.7 Safety assurance:

2.12.1.4.7.1 Safety performance monitoring and measurement;

2.12.1.4.7.2 Management of change;

2.12.1.4.7.3 Continuous improvement of SMS;

2.12.1.4.8 Safety auditing;

2.12.1.4.9 Safety promotion:

2.12.1.4.9.1 Training and education;

2.12.1.4.9.2 Safety communication.

2.12.2 Safety Management Manual shall include all information required under this Air Navigation Order ANO-002-DRAN-1.0 ATS Standards Manual, MATS, ASMP and conditions imposed from time to time by the Federal Government or Director General.

### 2.12.3 **REVISION OF INFORMATION:**

2.12.3.1 ANSP shall alter or amend the safety management manual, as and when any change is made or instruction is issued, in order to maintain the accuracy of the manual.

2.12.3.2 Amendments should be made at specified period as defined in CAAO-001-SQMS

2.12.3.3 SQMS shall establish mechanism for review of manual.

### 2.12.4 **NOTIFICATION OF CHANGES:**

2.12.4.1 ANSP shall notify the Director General in writing of any changes that they intend to make in the safety management manual.

## Chapter 3

### SAFETY RISK MANAGEMENT

This is where you work out or expect the risks and decide how to reduce them.

#### 3.1 HAZARD IDENTIFICATION

3.1.1 Hazard identification is vital and sometimes it is easier to refer to hazards as safety issues. Safety issues can be anything that could lead to an aircraft accident; unless you know what hazards are out there, you cannot identify the risks they pose a if you do not know what the risks are, you cannot do anything about them.

3.1.2 Do not leave the identification of safety issues to chance; develop a simple process to actively look for safety issues. Some safety issues can be identified from

3.1.2.1 occurrence or incident reports,

3.1.2.2 some may be reported by individuals, and

3.1.2.3 others may be the result of proactive brainstorming sessions.

Encourage everyone to report any safety issues they find. Where aviation safety is concerned, it is better to follow a few false trails than to miss a lurking disaster. Publicly celebrate good reporting.

3.1.3 You will need a Hazard Log to record the safety issues people find or think of, but it can be very simple. It might be a notebook in the ATS Units or a sheet on the notice board. It should be easily accessible and visible; it is for everyone. Encourage people to comment on the safety issues others have logged.

#### 3.1.4 HAZARD LOG

3.1.4.1 Note: Hazard Log information can be directly populated from reporting form.

Issue (hazard)	What is the result (consequence)	How bad is the result	How likely is it to occur	What action are we taking (Who and when)	Follow-up (if applicable)

### 3.1.4.2 **Reporting System**

- 3.1.4.2.1 Hazards or safety occurrences can only be controlled if their existence is known. Underlying issues that have the potential to endanger the safety of aircraft operations can be identified through a safety reporting system. Safety reporting can be reactive (from an event that has happened) or proactive (from a potentially unsafe situation being identified).
- 3.1.4.2.2 Reporting of less significant incidents, which may not be subject to mandatory reporting, should be actively encouraged. This will give you a better understanding of what is going on and allow you to monitor your organization's safety performance and help to identify developing safety trends. Encourage all issues to be reported and then decide if they need investigating.
- 3.1.4.2.3 For the reporting system to be effective, everyone connected to the organization, whether internally or externally, needs to actively participate. Everyone needs to be clear about how to report, what to report and who to report it to. Information from the reports can then be used to identify safety risks so that appropriate action can be taken. You can also ask other organizations and customers that use your services to report any safety issues that are related to what you have provided. Be sure to give feedback to the person reporting an event so they can see that reports are taken seriously and acted on; this will encourage further reporting.
- 3.1.4.2.4 The Hazard Reporting Form is a good way to gather this vital information. The person responsible for the SMS is the best person to manage these reports and assign them to the appropriate person for action. Safety reporting in an organization may be by word of mouth but it is important that it is still documented so it is not lost or forgotten.
- 3.1.4.2.5 Safety reports should be used to enhance safety rather than to apportion blame. To encourage reporting without fear of repercussion, it is important that staff members understand the open and just culture expressed in your reporting policy.

### 3.1.4.3 **SAFETY OCCURRENCES TO BE REPORTED AND ANALYZED:**

3.1.4.3.1 It shall be noted that reporting of accidents, incidents, hijacked aircraft, bomb threat and non-compliance of Rules/Regulations is a mandatory requirement.

3.1.4.3.2 The following categories of ATM-related occurrences shall be reported and assessed subsequently:

#### 3.1.4.3.2.1 **ACCIDENTS:**

- a) Mid Air collision;
- b) Controlled Flight into Terrain (CFIT);
- c) Collision on the ground between aircraft;
- d) Collision between an airborne aircraft and vehicle/another aircraft on the ground;
- e) Collision on the ground between aircraft and vehicle/person/obstruction(s);

- f) Other accidents like “losses of control in flight”, due to VORTEX or meteorological conditions etc.

3.1.4.3.2.2 **INCIDENTS:**

- a) Near collision – Encompassing specific situations where one aircraft and another aircraft/the ground/a vehicle/person or objects are perceived to be too close to each other:
- i. Separation minima infringement (e.g. TCAS RA);
  - ii. Inadequate separation (e.g. TCAS TA);
  - iii. Near Controlled Flight into Terrain (Near CFIT);
  - iv. Runway incursion whenever avoiding action was necessary.
- b) Potential for collision or near collision – Encompassing specific situations having the potential to be an accident or a near collision, if another aircraft is in the vicinity:
- i. Runway incursion where no avoiding action is necessary;
  - ii. Runway excursion by aircraft;
  - iii. Aircraft deviation from ATC clearance;
  - iv. Aircraft deviation from applicable ATM regulation:
    - I. Aircraft deviation from applicable published ATM procedures;
    - II. Unauthorized penetration of airspace;
    - III. Deviation by aircraft from carriage of ATM-related equipment and operations as mandated in applicable regulation(s).
- c) ATM-specific occurrences – Encompassing situations during which the ability to provide safe ATM services is affected, including those situations where, by chance, the safe operations of aircraft has not been jeopardized. This shall include the following occurrences:
- i. Inability to provide Air Traffic Management Services;
  - ii. Inability to provide Air Traffic Services;
  - iii. Inability to provide Airspace Management Services;
  - iv. Inability to provide Air Traffic Flow Management Services.
- d) Failure of Communication function (VHF, E-VHF, UHF & HF etc.);

- e) Failure of Surveillance function (PSR, SSR, ADS-B & ADS-C etc.);
- f) Failure of Coordination function (DSC, ISD, RICS & Telephones etc.);
- g) Failure of Data Processing and Distribution function (Radar/FPL data processing computers, Flight Progress Strip Printers, AMHS, AFTN & CPDLC etc.);
- h) Failure of Navigation function (ILS, MLS, VOR, DME, NDB, PAPI, Approach/Runway/Taxiway/Apron lights, AGNIS etc.); and
- i) ATM System security.

3.1.4.3.2.3 **Other occurrences:** The following occurrences shall also be reported:

- a) Bird hits to aircraft;
- b) Diversion of aircraft from flight plan due technical;
- c) Diversion of aircraft from flight plan due meteorological conditions;
- d) Aircraft equipment failure during flight;
- e) Failure of Meteorological Instruments;
- f) Operational Vehicles (Fire fighting vehicles, Ambulance, Fire Jeep etc.);
- g) Un-serviceability of operational areas (Runway, Taxiway, Apron etc.); and
- h) Aircraft reports.

#### 3.1.4.4 **Reporting Policy**

3.1.4.4.1 ATS organization should have a reporting policy so that everyone has a clear understanding of the organization's values regarding the reporting of safety-related information and how it encourages a healthy reporting culture. For ATS units separate reporting policy may not be required if individuals are intimately involved in most aspects of the organization's operations and employees feel free to report safety-related information.

3.1.4.4.2 In an organization, the reporting policy could be combined with the Safety Policy and should:

- 3.1.4.4.2.1 Encourage employees to report hazards, incidents or accidents; and
- 3.1.4.4.2.2 Define the conditions under which punitive disciplinary action would be considered (e.g., illegal activity, negligence, wilful misconduct).

3.1.4.4.3 A sample Safety Reporting Policy is as follows:

3.1.4.4.3.1 Our organization fully supports and encourages a culture of openness and trust between all personnel. This cannot

be achieved unless employees feel they are able to report occurrences or hazards without the fear of unwarranted retribution. To that end, personnel reporting safety-related issues shall not be subject to disciplinary action except where there is clear evidence of:

- a) Gross negligence;
- b) Intentional disregard of regulations or procedures;
- c) Attempted cover up;
- d) Criminal intent; or
- e) Use of illicit substances.

### 3.1.4.5 **INVESTIGATION**

3.1.4.5.1 Accident/ incident investigation is the sole responsibility of Safety Investigation Board (SIB). SIB after completing the investigation forwards recommendations to Operation Directorate in order to avoid the incident again.

3.1.4.5.2 At times further investigation of a safety issue becomes necessary to determine the exact cause and the contributing factors. Development of corrective action only to find the issues which could not solve the underlying problem is not the correct solution. The root cause analysis helps in getting to the Latent condition (The main issue) which actually create or may be the cause of problems.

3.1.4.5.3 Due to limited time or resources it is not possible to investigate everything which is reported, so it is good to define what is to investigate. For example, it does not make sense to investigate a problem that is of negligible consequence, however problems which are in both likely and potentially serious shall certainly be investigated.

3.1.4.5.4 A simple approach to identify the serious problems is to review the safety reports and any operational occurrences and then use the risk matrix to assess the need to investigate.

3.1.4.5.5 Document the investigation and add the outcomes to the Hazard Log. The following is a generic investigation approach.

#### 3.1.4.5.5.1 **Gather information**

- a) What happened, when, and where?
- b) What is the impact on the organization?
- c) What were the conditions and actions that led to the safety issue?
- d) Who was involved? Interview those involved.. Analyze the information.
- e) Why Examine all the facts and determine what happened and why (the root causes).
- f) Assess whether this event or something similar has happened before
- g) Identify contributory factors, such as:

- i. Job factors (e.g., Did the work require too much or too little attention? Were there distractions or conflicting demands? Were the procedures adequate and properly understood?);
  - ii. Human factors (e.g., physical ability (size and strength), competence (knowledge, skill and experience), fatigue, stress, morale);
  - iii. Organizational factors (e.g., work pressure, long hours, availability of sufficient resources, quality of supervision, safety culture);
  - iv. Equipment factors (e.g., clarity of the controls and instrumentation, layout, the role of unusual circumstances); and •
  - v. Unsafe acts: Most safety issues are caused by unsafe acts whether deliberate or unintentional. By identifying unsafe acts and understanding what drives them you can establish a lasting and valuable safety culture.
- h) Identify suitable corrective actions.
  - i) Draw up the action plan and implement it.
  - j) Corrective actions may need to be prioritized due to resources and practical implementation timescales. Keep employees fully informed of the corrective action plan and progress with its implementation.

3.1.4.5.6 Upon completion of the investigation document the results of the investigation and summarize on the Hazard Log for tracking purposes and to identify any follow up activities.

3.1.4.5.7 Follow up is needed to ensure the problem has been corrected or adequately controlled.

## 3.2 **SAFETY RISK MANAGEMENT PROGRAM – AIR TRAFFIC SERVICES:**

- 3.2.1 As part of the SMS, the ANSP shall develop and use a formal, documented methodology for conducting safety risk assessments that is tailored to the scope and timelines of the planned change. However, planned changes within the National Air Traffic Services System, including those at the local level, shall apply safety risk assessment techniques before ANSP can implement changes. Safety risk assessment techniques may range from formal statistical modeling, to dynamic simulations, to qualitative judgments from content experts.
- 3.2.2 ANSP shall conduct the analysis at the appropriate level of complexity and rigour for the scope and immediacy of the potential hazard. Tactical decision-making in the field, even involving significant safety risk, may require such rapid decision making that formal safety risk assessment is not feasible.
- 3.2.3 ANSP shall conduct risk assessments in accordance with the provisions of the ATS SMS Manual duly approved by the DAAR.
- 3.2.4 Risk assessments shall include a plan, to evaluate identified safety critical parameters during initial operational implementation and after its completion. These measurements shall take in the actual operating environment to validate that predicted performance is being realized and, therefore, the original safety assessment remains valid.

3.2.5 The ANSP shall develop and implement a safety status-reporting program consistent with its own internal review of programs to provide ANS-DAAR insight into ATS System changes. The ANSP will provide to DAAR regular and periodic (as prescribed hereunder) status briefings, to include information regarding ATS System changes.

3.2.5.1 Status briefings shall be provided bi-annually in addition to when circumstances/situation so demand.

3.2.5.2 DAAR may, at its discretion, participate in the planning and conduct of safety risk assessments.

3.2.5.3 In accordance with the ANSP SMS Manual, the safety risk management program shall include hazard identification, risk assessment, risk-control decision-making, and a hazard tracking and risk resolution process.

3.2.5.4 High-risk hazards (intolerable) identified in the safety risk assessment.

3.2.5.5 ANSP shall mitigate all high residual risk hazards. No changes should be allowed that result in high residual risk hazards, which cannot be mitigated down to medium or low risk.

3.2.5.6 DAAR shall approve controls that are defined to mitigate or eliminate initial or current high-risk hazards before ANSP can implement the change.

3.2.5.7 Medium-risk (tolerable) hazards may be accepted. ANSP will develop and maintain a hazard-tracking database that will track all medium- and high-risk hazards, and provide DAAR with continuous access to the database. ANSP will maintain a process for acceptance of medium risk hazards in accordance with the provisions contained in ICAO Doc 9859.

3.2.5.8 Low-risk (acceptable) hazards may be accepted. ANSP will maintain a process for acceptance of low-risk hazards in accordance with the provisions contained in ICAO Doc 9859.

3.2.5.9 In cases where medium- or low-safety risk and/or controls/mitigations go beyond the domains of ANSP, the mitigations shall be approved by the designated management officials within each affected line of business, and subsequently accepted by DAAR. The ANSP SMS will ensure that all concerned are informed of medium-/low-risk hazards that it has either accepted or approved.

### 3.2.6 **SAFETY RISK ASSESSMENT AND MITIGATION**

3.2.6.1 You will also need a process to identify what could happen as a result of each safety issue (the consequence) and assess how bad the outcome will be and the likelihood of it happening (the risk). Risk assessment, put simply, is determining whether you can accept the risk as it is; if not, you must do something to reduce it (control or mitigation).

3.2.6.2 The summary of the risk assessment should be documented in a Hazard Log. This should include the risk assessment for each hazard and any actions required to control the risk.

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## Chapter 4

### **SAFETY ASSURANCE**

We can all do better but if we do not know how well we are doing, we will not know how to do better.

#### **4.1 SAFETY PERFORMANCE MONITORING AND MEASUREMENT**

4.1.1 The number of safety issues reported or resolved is a useful measure of safety performance of any organization than the number of accidents. Keep monitoring to see how we are doing and whether our mitigations are working as planned.

#### **4.1.2 WHAT IS SAFETY PERFORMANCE?**

4.1.2.1 Safety is 'the state in which risks associated with aviation activities, related to, or in direct support of the operation of aircraft, are reduced and controlled to an acceptable level' and safety performance as 'a service provider's safety achievement is defined by its safety performance targets and safety performance indicators'. These definitions provide a good indication of the complexity related to measuring safety performance.

4.1.2.2 In many areas safety metrics tend to focus on serious incidents and accidents, as these are easy to measure and often receive more attention. In terms of safety management, the focus on such negative events should be considered with some caution, because:

4.1.2.2.1 in systems such as aviation with a low number of high consequence negative outcomes, the low frequency of such outcomes may give the wrong impression that your system is safe;

4.1.2.2.2 the information is available too late to act on it;

4.1.2.2.3 counting final outcomes will not reveal any of the systemic factors, hazards or latent conditions that have a potential to result in high consequence negative outcomes, under the same conditions; and

4.1.2.2.4 where the resilience of a system has been undermined, such outcomes are more likely to occur by chance and therefore these outcomes may draw unwarranted attention and use scarce resources when they are not predictive of later events.

4.1.2.3 The issue is further complicated because the aviation system is a highly dynamic, complex system with many different players, interactions, dependencies and parameters that may have a bearing on final safety outcomes. Therefore, in most cases it is impossible to establish a linear relationship between specific parameters or safety actions and the final, aggregate safety outcome. Hence, the absolute measurement of safety is itself unachievable. Whilst there are many models of what makes up the level of safety (and conversely the level of exposure to risk), indicators will always constitute imperfect markers of these levels.

4.1.2.4 Safety is more than the absence of risk; it requires specific systemic enablers of safety to be maintained at all times to cope with the known risks, to be well prepared to cope with those risks that are not yet known, and to address the natural 'erosion' of risk controls over time. Thus, from the perspective of your company there cannot be any direct measures of safety.

4.1.2.5 Measures should in particular focus on those features of your system that are intended to ensure safe outcomes —those elements that will constitute

organizational enablers of safe outcomes and specific safety controls and barriers for any risks identified. Measures also need to address how external factors may influence these enabling elements, risk controls and barriers or how these controls and barriers influence each other.

- 4.1.2.6 The principles above are valid both from a regulator’s perspective and from the perspective of an individual service provider; in all cases the dynamic nature of the systemic, operational and external components of safety performance should be considered.

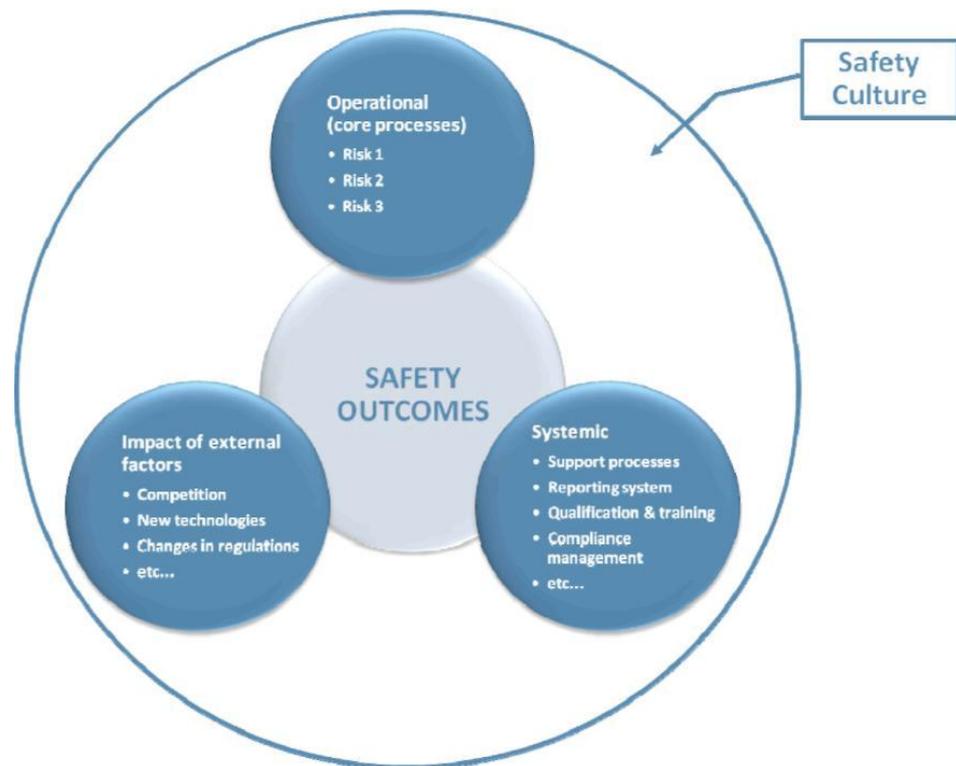


Figure : Components of safety performance

### 4.1.3 Why measure safety performance?

- 4.1.3.1 Safety Management System (SMS) standards and recommended practices promote the development and maintenance of means to verify the safety performance and to validate the effectiveness of safety risk controls.
- 4.1.3.2 The analysis and assessment of how ATC ‘functions’ to deliver its activities should form the basis for defining your safety policy, the related safety objectives and the corresponding safety performance indicators and targets.
- 4.1.3.3 SMS requires a systemic approach as with any other element of business management (e.g., quality, finance), and in this respect safety performance measurement provides an element that is essential for management and effective control: ‘feedback.’
- 4.1.3.3.1 Feedback will allow management to validate the analysis and assessment of how well your organization functions in terms of safety and to make adjustments as required (Plan-Do-Check-Act).

- 4.1.3.3.2 Feedback to your management will guide decision-making and resource allocation.
- 4.1.3.3.3 Feedback to all staff will ensure that everyone is informed on your company's safety achievements. This will help to create commitment and contribute to fostering in aviation's safety culture.

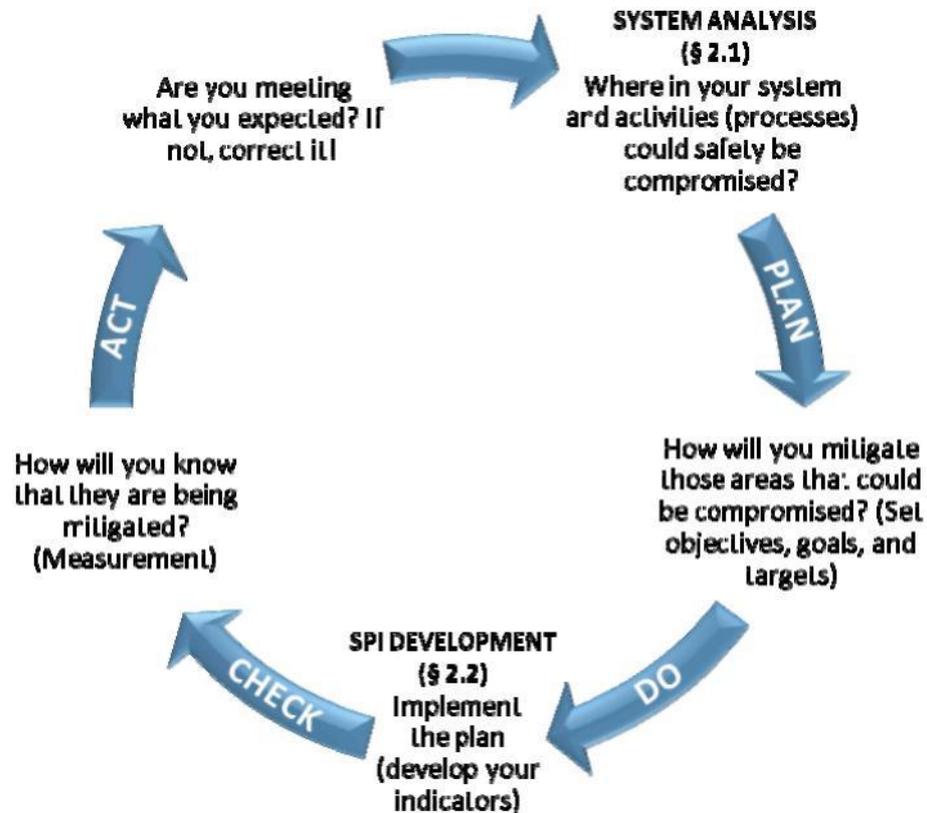


Figure 2: The measurement cycle

- 4.1.3.4 Effective safety performance measurement will support the identification of opportunities for improvement not only related to safety, but also to efficiency and capacity.
- 4.1.3.5 The management of safety relies on the capabilities of your organization to systematically anticipate, monitor, and further develop your organizational performance to ensure safe outcomes of your activities. Effective safety management requires a thorough understanding and sound management of your system and processes. This cannot be achieved without some form of measurement. Rather than randomly selecting outcomes that are easy to measure, you should select safety performance indicators that consider the type of feedback needed to ensure your company's capabilities for safety management can be properly evaluated and improved. This implies that you will need to measure performance at all levels of your organization by adopting a broad set of indicators involving key aspects of your system, and operations and allowing to measure those key aspects in different ways.

## 4.2 SAFETY PERFORMANCE MEASUREMENT PROCESS

### 4.2.1 PREREQUISITES FOR EFFECTIVE SAFETY PERFORMANCE MEASUREMENT

- 4.2.1.1 Organization's safety performance depends upon the capability to implement and maintain those organizational elements required to ensure safe operation/outcomes. The purpose of SMS is to build up, maintain, and continually improve this capability.
- 4.2.1.2 As a prerequisite for effective safety management, ATS organization needs to perform a system analysis to generate an accurate and reliable description of organizational structures, policies, procedures, processes, staff, equipment, and facilities.
- 4.2.1.3 This analysis should have a particular focus on the interactions between system components and external factors. This will provide with a model of how the system elements and activities interact to produce the expected safety outcomes, allowing the Organization to identify the strengths and weaknesses of the system.
- 4.2.1.4 The system description and related model of activities lead to the expected outcomes will inform on what to measure to drive safety performance and what to monitor to keep an eye on all of those elements that may affect on organization's safety performance.
- 4.2.1.5 ATS providers have to ensure that system and process description properly addresses aviation safety risks as well as business risks.
- 4.2.1.6 Following completion of the system description, including analysis and assessment, organization should have gained or confirmed its understanding of where it stands with regard to safety.
- 4.2.1.7 Through this exercise you should have identified:
- 4.2.1.7.1 At the systemic level:
    - 4.2.1.7.1.1 whether the elements that constitute enablers of effective safety management are present, suitable, and effective;
    - 4.2.1.7.1.2 the elements that are still missing for effective safety management;
    - 4.2.1.7.1.3 whether the elements are sufficiently integrated with each other and with the core management and operational processes of your organization; and
    - 4.2.1.7.1.4 the weaknesses and vulnerabilities in your organization.
  - 4.2.1.7.2 At the operational level:
    - 4.2.1.7.2.1 the main risks in operations that need to be addressed (the things that may cause 'next accident').
- 4.2.1.8 This will form the basis for reviewing the adequacy of your safety policy, defining or adapting your safety objectives, and deriving your safety performance indicators.

## 4.2.2 **SAFETY PERFORMANCE INDICATORS:**

- 4.2.2.1 SPIs are used to monitor the achievement of safety goals, targets, and objectives. These will help to identify how effective the SMS is. Rather than just using the numbers for the annual management review, monitor SPIs regularly so that ATS providers can see how well the SMS is performing. This will allow to take action when starting to see undesirable trends.
- 4.2.2.2 Make sure that everybody knows what the SPIs are and what targets have been set; this will enhance the commitment to safety and make clear what the organization is trying to achieve through its SMS.

## 4.2.3 **HOW TO MEASURE: TYPES OF SAFETY PERFORMANCE INDICATORS**

- 4.2.3.1 Defines safety performance indicator is 'a data-based safety parameter used for monitoring and assessing performance' and safety performance target as 'the planned or intended objective for safety performance indicator(s) over a given period.'
- 4.2.3.2 Safety performance indicators (SPIs) can be 'classified' in accordance with specific features; and different classifications are commonly used in different areas. The types of indicators described in this document have been defined following a review of such commonly used classifications and definitions to identify commonalities. An explanation is provided where relevant on the use of each. You may adopt any terms for your specific safety performance indicators as you see fit; the information below is provided to complement the conceptual information required for effective safety performance measurement.

### 4.2.3.3 **Lagging indicator**

- 4.2.3.3.1 Lagging indicators are measures of safety occurrences, in particular the negative outcomes that the organization is aiming to prevent.
- 4.2.3.3.2 Lagging indicators are mainly used for aggregate, long-term trending, either at a high level or for specific occurrence types or locations.
- 4.2.3.3.3 Lagging indicators measure safety outcomes and can be used to assess the effectiveness of safety measures, actions, or initiatives
- 4.2.3.3.4 These are the way of validating the safety performance of the system.
- 4.2.3.3.5 Trends in these indicators may be analyzed to determine if latent conditions exist in present systems that should be addressed.
- 4.2.3.3.6 Two types of lagging indicators are generally defined as:
- 4.2.3.3.6.1 Indicators for high severity negative outcomes, such as accidents or serious incidents.
- 4.2.3.3.6.2 The low frequency of high severity negative outcomes means that aggregation (e.g., at industry segment level or regional level) may produce more meaningful analyzes.

*Example: number of runway excursions/1000 landings.*

- 4.2.3.3.6.3 Indicators for lower level system failures and safety events that did not manifest themselves in serious incidents or accidents (including system failures and procedural deviations); however, safety analysis indicates there is the potential for them to lead to a serious incident or accident when combined with other safety events or

conditions. Such indicators are sometimes referred to as 'precursor event' indicators<sup>1</sup>.

4.2.3.3.7 Indicators for lower level system failures and safety events are primarily used to monitor specific safety issues and measure the effectiveness of safety controls or barriers put in place for mitigating the risk associated with these hazards.

#### 4.2.3.4 **Leading indicator**

*'Metrics that provide information on the current situation that may affect future performance'*

4.2.3.4.1 Leading indicators should measure both: things that have the potential to become or contribute to a negative outcome in the future ('negative' indicators), and things that contribute to safety ('positive' indicators).

4.2.3.4.2 From a safety management perspective, it is important to provide sufficient focus on monitoring positive indicators to enable strengthening of those positive factors that make up company's safety management capability.

4.2.3.4.3 Leading indicators, which are particularly relevant from a management perspective, may be used to influence safety management priorities and the determination of actions for safety improvement.

4.2.3.4.4 This type of indicator may be used proactively to develop organization's safety management capabilities, in particular during initial implementation of SMS. This may entail the setting of performance targets.

4.2.3.4.5 Leading indicators may also be used to inform management about the dynamics of system and how it copes with any changes, including changes in its operating environment.

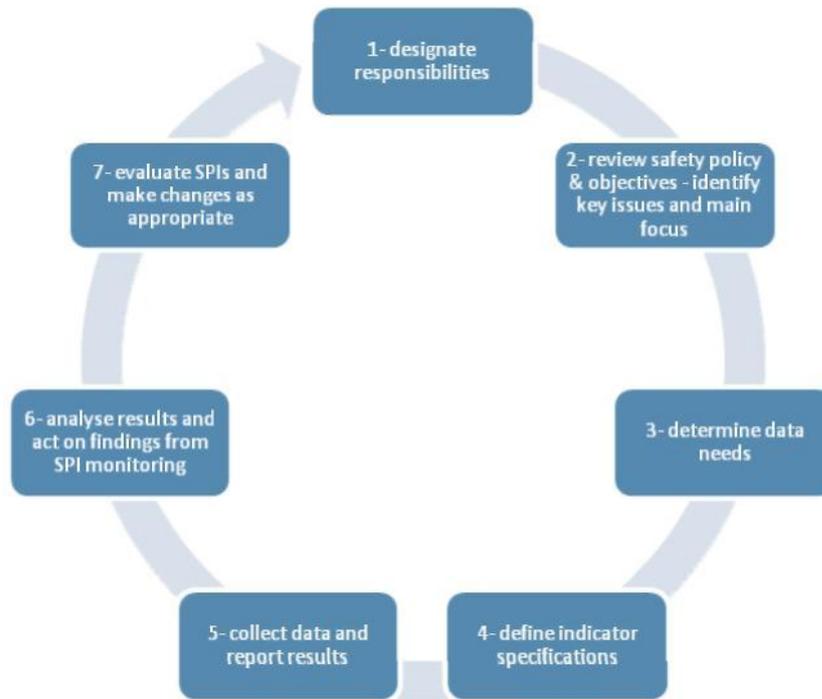
4.2.3.4.6 The focus will be either: on anticipating emerging weaknesses and vulnerabilities to determine the need for action or on monitoring the extent to which certain activities required for safety are being performed. For these 'monitoring' indicators, alert levels can be defined.

4.2.3.4.7 The concept of leading and lagging indicators has existed in domains outside of aviation for a number of years. In particular, economists use them as a means to measure the health of an economy.

4.2.3.4.8 Safety performance measurement should ideally consider a combination of leading and lagging indicators. The main focus should be to measure and to act upon the presence of those systemic and operational attributes that enable effective safety management within your company and meanwhile, use lagging indicators to ensure that this safety management is effective. Lagging indicators, particularly indicators for lower level system failures, are useful to validate the effectiveness of specific safety actions and risk barriers or to support the analysis of information derived from your leading indicators.

#### 4.2.4 Process for defining and reviewing safety performance indicators

4.2.4.1 As with anything that relates to effective safety management, defining and using safety performance indicators must be a dynamic process. A step-by-step process for developing your own set of safety performance indicators is proposed, which follows the 'Plan-Do-Check-Act' logic for continual improvement. This should help you to involve and get buy-in from all staff concerned.



**Figure 3: Process steps**

#### 4.2.4.2 Step 1: Designate responsibilities

4.2.4.2.1 It is critical to the success of the SPI project, as to the SMS journey in general, that your management are fully committed to implementing SPIs as a fundamental part of your company's safety management approach. Rather than just supporting a system of SPIs, management must define aspects of your organization that require measurement and management and then must commit to a systematic approach to managing those elements, in accordance with your safety policy and defined safety objectives.

4.2.4.2.2 The first step for establishing SPIs to designate personnel (SPI Team) with responsibilities for initiating the effective promotion and coordination of the introduction of the SPIs.

4.2.4.2.3 This will require responsibility for ensuring effective communication and generally overseeing the implementation, with due consideration of existing organizational setup in relation to safety management.

4.2.4.2.4 The 'SPI team' should ideally include, and certainly have access to, personnel with appropriate experience and knowledge of safety and/or quality management principles and data analysis.

- 4.2.4.2.5 The SPI team must clearly be shown to be in either a support or advisory role to management and process owners.
- 4.2.4.2.6 Management should be kept informed of progress on a regular basis and should take an active role in steering the process of implementing SPIs. For larger organizations it may be useful to develop an analysis of the costs and benefits of the SPI development project, with particular focus on the positive effects on your company's 'management information system' that will lead to improved resource allocation.
- 4.2.4.2.7 Finally the SPI team should set a reasonable timetable, including milestones, to ensure adequate progress in developing the SPIs.
- 4.2.4.3 **Step 2: Review safety policy and objectives – identify key issues and main focus**
- 4.2.4.3.1 At this step, the SPI team should identify the scope and focus of measurement considering the results of the system analysis, paying particular attention to the completeness and adequacy of SMS.
- 4.2.4.3.2 To define indicators for specific operational safety issues, different tools can be used to determine the safety actions and risk barriers that would be most suitable for the definition of operational SPIs. A thorough hazard identification will be required as part of your system analysis to provide a good understanding of threats to safety in your operations.
- 4.2.4.3.3 The SPI team may also review typical indicators used within ATS segment and assess them to determine whether they are pertinent to your organization. For example, measuring the number of internal reports may not be meaningful if your system analysis reveals that there are no easily accessible means to report or there are concerns about confidentiality.
- 4.2.4.4 **Step 3: Determine data needs**
- 4.2.4.4.1 To be meaningful, measures of performance must be based on reliable and valid data, both qualitative and quantitative. Therefore the SPI team should identify all pertinent data and information that is available and determines what additional information is needed. It should also consider information available through the internal audit/compliance monitoring system.
- 4.2.4.4.2 Regardless of the type of data, quality is one of the most important elements in ensuring that the data can be integrated and used properly for analysis purposes. Data quality principles and practices should be applied throughout the processes from data capture and integration to analysis.
- 4.2.4.4.3 Action should be taken to being measured instead of identifying what you should measure.
- 4.2.4.4.4 This is likely to result in identifying SPIs that are most obvious and easy to measure rather than SPIs that are most valuable for effective safety management.
- 4.2.4.4.5 It is important to focus on what changes the organization wants to 'drive' and what aspects it needs to 'monitor.'
- 4.2.4.4.6 To be effective at assessing system safety, a broad set of indicators involving key aspects of system and operations should be developed;

this will reduce the possibility of having a narrow and therefore potentially flawed view of company's safety performance.

- 4.2.4.4.7 It may be necessary to measure the same system in several ways in order to gain a more precise idea of the actual level of safety performance.
- 4.2.4.4.8 In the area of hazard identification and risk management in operations (core processes), availability of data will depend in part on the maturity of internal safety reporting schemes.
- 4.2.4.4.9 Aggregate data for ATS segment may also be considered, particularly when SMS has not yet generated sufficient data.
- 4.2.4.4.10 Continuous availability of data should be ensured to generate relevant and timely indicators.
- 4.2.4.4.11 Delays in compiling data for the generation of indicators are likely to delay any safety actions that may be required.

#### 4.2.4.5 **Step 4: Define indicator specifications**

- 4.2.4.5.1 Once the scope and focus of SPIs have been determined and available data/information reviewed, the specifics need to be defined. Each SPI should be accompanied by sufficient information (or metadata) which enables any user to determine both the source and quality of the information, and place this indicator in the context necessary to interpret and manage it effectively.
- 4.2.4.5.2 Whenever possible, indicators should be quantitative, as this facilitates comparison and detecting trends. Quantitative metrics should be precise enough to allow highlighting trends in safety performance over time or deviations from expected safety outcomes or targets.
- 4.2.4.5.3 For qualitative SPIs, it is important to minimize subjectivity. This may be achieved through an evaluation by members of staff not directly involved in the definition of SPIs.
- 4.2.4.5.4 Depending on the size of ATS unit and the complexity of activities, a hierarchical framework for SPIs could be defined to reflect the different processes and sub-systems within ATS structure. While some indicators for assessing systemic issues may be common to different processes and subsystems, indicators for assessing operational issues will need to be specific. This underlines the importance of having performed an accurate system analysis identifying all system components and sub-systems as a prerequisite for implementing SMS.
- 4.2.4.5.5 Aspects of good SPIs include :
  - 4.2.4.5.5.1 The indicator is:
    - a) valid and reliable,
    - b) sensitive to changes in what it is measuring, and
    - c) not susceptible to bias in calculating or interpretation.
  - 4.2.4.5.6 Capturing the data is cost effective.
    - 4.2.4.5.6.1 The indicator is:

- a) broadly applicable across company operations,
- b) and ideally throughout the larger aviation sector, and
- c) easily and accurately communicated.

#### 4.2.4.6 **Step 5: Collect data and report results**

4.2.4.6.1 Once SPIs have defined, you must decide how you will collect the data and report the results. Data collection approaches (i.e., data sources, how data will be compiled, and what the reports will look like), as well as roles and responsibilities for collection and reporting, should be specified and documented. Data collection procedures should also consider the frequency with which data should be collected and the results reported for each SPI. Some of these issues will have been addressed when deciding on the SPIs in steps 3 and 4.

4.2.4.6.2 The presentation format of the indicator results should take into account the target audience. For example, if you track several indicators addressing the same key issue, it may be useful to identify a subset of the most critical indicators to be given greater emphasis for reporting to top management. The presentation of indicator results should facilitate understanding of any deviations and identification of any important trends (e.g., scoreboards with traffic lights, histograms, linear graphs).

#### 4.2.4.7 **Step 6: Analyze results and act on findings from SPI monitoring**

4.2.4.7.1 This is the most relevant step in terms of safety management, as the ultimate goal of implementing SPIs is to maintain and improve safety performance over time. There is no point in collecting information if the results are not used. Remember that SPIs are indicators of safety performance, not direct measures of safety. The information collected through different SPIs needs to be carefully analyzed, and SPIs collected for different issues need to be put in perspective and the results interpreted, so as to gain an overall picture of the organization's safety performance. The results obtained through an individual indicator may be insignificant if taken in isolation, but may be important when considered in combination with other indicators.

4.2.4.7.2 Inconsistencies between SPIs may be an indication of an inaccurate system description or problems with the SPIs themselves. For example, you may encounter situations where leading and lagging indicators associated with the same safety issue provide contradictory results or where a positive trend in systemic indicators goes with a negative trend in operational indicators.

4.2.4.7.3 If you find that the metrics are not defined well enough to capture safety critical information the SPIs should be reviewed. Any inconsistencies in the overall picture represent a potential opportunity for learning and for adjusting not only the SPIs (see Step 7) but your SMS itself.

4.2.4.7.4 Indicators should not be simply seen as a metric, with actions being taken to get a good score rather than to improve safety performance. It is important that results obtained through the collection, analysis and interpretation of SPIs are conveyed to your management for decision and action. Ideally, these results should be presented at regular meetings (e.g., management reviews, safety review board meetings) to determine what actions are required to address deficiencies or to further improve the system. It is important that such actions do not focus on certain indicators in isolation, but on optimizing your organization's overall safety performance.

4.2.4.7.5 As part of your safety communication and promotion, all staff should be informed of the results obtained through the collection, analysis, and interpretation of SPIs.

4.2.4.8 **Step 7: Evaluate SPIs and make changes as appropriate**

4.2.4.8.1 The systems analysis of ATS units, along with the set of SPIs and their specifications, including the metrics and any defined targets, should be periodically reviewed and evaluated to consider:

- 4.2.4.8.1.1 the value of experience gained,
- 4.2.4.8.1.2 new safety issues identified,
- 4.2.4.8.1.3 changes in the nature of risk,
- 4.2.4.8.1.4 changes in the safety policy, objectives; and priorities identified,
- 4.2.4.8.1.5 changes in applicable regulations, and
- 4.2.4.8.1.6 organizational changes, etc.

4.2.4.8.2 The frequency of the review cycle should be defined. Periodic reviews will help to ensure that the indicators are well defined and that they provide the information needed to drive and monitor safety performance. Periodic reviews will also help identify when specific 'drive' indicators are no longer needed (e.g., if the intended positive changes have been achieved) and allow adjustment of SPIs so that they always focus on the most important issues in terms of safety. Nevertheless, too frequent reviews should be avoided, as they may not allow establishing a stable system.

4.3 **SPI EXAMPLES**

4.3.1 Below is a non-exhaustive list with examples of indicators intended to assist organization with selecting own set of safety performance indicators. Before adopting any of these as own SPIs, you should determine if the particular indicator is relevant to your specific organization, considering the maturity of your SMS and the specific features you would like to improve or that need attention.

4.3.2 **INDICATORS FOR SYSTEMIC ISSUES**

Area	Focus of measurement	Metrics
Compliance	<ul style="list-style-type: none"> <li>▪ internal audits/compliance monitoring: all non-compliances</li> </ul>	<ul style="list-style-type: none"> <li>▪ total number per audit planning cycle / trend</li> <li>▪ % of findings analyzed for their safety significance,</li> </ul>
	<ul style="list-style-type: none"> <li>▪ internal audits/ compliance monitoring: significant non-compliances</li> </ul>	<ul style="list-style-type: none"> <li>▪ number of significant findings versus total number of findings</li> <li>▪ number of repeat findings within audit planning cycle</li> </ul>
	<ul style="list-style-type: none"> <li>▪ internal audits/ compliance monitoring: responsiveness to corrective action requests</li> </ul>	<ul style="list-style-type: none"> <li>▪ average lead time for completing corrective actions per oversight planning cycle - trend</li> </ul>

Area	Focus of measurement	Metrics
	<ul style="list-style-type: none"> <li>external audits/ compliance monitoring: all non-compliances</li> </ul>	<ul style="list-style-type: none"> <li>total number per oversight planning cycle / trend</li> <li>% of findings analyzed for their safety significance,</li> </ul>
	<ul style="list-style-type: none"> <li>external audits: significant non-compliances</li> </ul>	<ul style="list-style-type: none"> <li>number of significant findings versus total number of findings</li> </ul>
	<ul style="list-style-type: none"> <li>external audits: responsiveness to corrective action requests</li> </ul>	<ul style="list-style-type: none"> <li>average lead time for completing corrective actions per oversight planning cycle - trend</li> </ul>
	<ul style="list-style-type: none"> <li>consistency of results between internal and external audits/compliance monitoring</li> </ul>	<ul style="list-style-type: none"> <li>number of significant findings only revealed through external audits</li> </ul>
<b>SMS effectiveness</b>	<ul style="list-style-type: none"> <li>strategic management</li> </ul>	<ul style="list-style-type: none"> <li>the degree to which safety is considered in the organization's official plans and strategy documents</li> <li>the frequency with which the organization's official plans and strategy documents are reviewed with regards to safety</li> </ul>
	<ul style="list-style-type: none"> <li>management commitment</li> </ul>	<ul style="list-style-type: none"> <li>number of management walk-arounds per month/quarter/year</li> <li>number of management meetings dedicated to safety per month/quarter/year</li> </ul>
	<ul style="list-style-type: none"> <li>turnover rate of key safety personnel</li> </ul>	<ul style="list-style-type: none"> <li>length of term</li> <li>number of cases where the reasons for departure of key personnel have been analyzed</li> </ul>
	<ul style="list-style-type: none"> <li>supervision</li> </ul>	<ul style="list-style-type: none"> <li>number of cases where supervisors provided positive feedback on safety-conscious behavior of your staff per month/quarter/year</li> </ul>
	<ul style="list-style-type: none"> <li>reporting</li> </ul>	<ul style="list-style-type: none"> <li>number of reports received per month/quarter/year &amp; trend</li> <li>% of reports for which feedback to reporter was provided within 10 working days</li> <li>% of reports followed by an independent safety review</li> </ul>
	<ul style="list-style-type: none"> <li>hazard identification</li> </ul>	<ul style="list-style-type: none"> <li>number of accident/serious incident scenarios analyzed to support Safety Risk Management (SRM) per month/quarter/year</li> <li>number of new hazards identified through the internal reporting system per month/quarter/year &amp; trend</li> <li>findings from external audits concerning hazards that have not been perceived by personnel/ management previously</li> <li>number of safety reports received from staff per month/quarter/year &amp; trend</li> </ul>

Area	Focus of measurement	Metrics
	<ul style="list-style-type: none"> <li>▪ risk controls</li> </ul>	<ul style="list-style-type: none"> <li>▪ number of new risk controls validated per month/quarter/year</li> <li>▪ % of overall budget allocated to new risk controls</li> </ul>
	<ul style="list-style-type: none"> <li>▪ HR management &amp; competence development</li> </ul>	<ul style="list-style-type: none"> <li>▪ % of staff for which a competence profile has been established</li> <li>▪ % of staff who have had safety management training</li> <li>▪ frequency for reviewing competence profiles</li> <li>▪ frequency of reviewing the scope, content, and quality of training programs</li> <li>▪ number of changes made to training programs following feedback from staff per month/quarter/year</li> <li>▪ number of changes made to training programs following analysis of internal safety reports per month/quarter/year</li> </ul>
	<ul style="list-style-type: none"> <li>▪ management of change</li> </ul>	<ul style="list-style-type: none"> <li>▪ number of organizational changes for which a formal safety risk assessment has been performed per month/quarter/year &amp; trend</li> <li>▪ number of changes to Standard Operating Procedures (SOPs) for which a formal safety risk assessment has been performed per month/quarter/year &amp; trend</li> <li>▪ number of technical changes (e.g., new equipment, new facilities, new hardware) for which a formal safety risk assessment has been performed per month/quarter/year &amp; trend</li> <li>▪ number of risk controls implemented for changes per month/quarter/year &amp; trend</li> <li>▪ % of changes</li> <li>▪ (organizational/SOP/technical etc.) that have been subject to risk assessment</li> </ul>

Area	Focus of measurement	Metrics
	<ul style="list-style-type: none"> <li>▪ management of contractors</li> </ul>	<ul style="list-style-type: none"> <li>▪ % of contractors whose safety performance has been assessed</li> <li>▪ frequency for assessing safety performance of contractors</li> <li>▪ % of contractors integrated with your company's safety reporting scheme</li> <li>▪ % of contractors for which safety training has been provided</li> <li>▪ % of contractors that have implemented training control procedures</li> <li>▪ % of contractors that have a feedback system on safety issues in place with their customer</li> <li>▪ number of safety reports received from contractors per month/quarter/year &amp; trend</li> <li>▪ number of safety actions initiated following assessment of safety performance or safety reports received per month/quarter/year &amp; trend</li> </ul>
	<ul style="list-style-type: none"> <li>▪ emergency response planning (ERP)</li> </ul>	<ul style="list-style-type: none"> <li>▪ number of emergency drills per year</li> <li>▪ frequency of reviewing the ERP</li> <li>▪ number of trainings on ERP per month/quarter/year</li> <li>▪ % of staff trained on the ERP within a quarter/year</li> <li>▪ number of meetings with main partners and contractors to coordinate ERP per month/quarter/year</li> </ul>
	<ul style="list-style-type: none"> <li>▪ safety promotion</li> </ul>	<ul style="list-style-type: none"> <li>▪ number of safety communications published</li> <li>▪ number of trainings performed</li> <li>▪ number of safety briefings performed.</li> <li>▪ (per month/quarter/year)</li> </ul>

Area	Focus of measurement	Metrics
	<ul style="list-style-type: none"> <li>▪ safety culture</li> </ul>	<ul style="list-style-type: none"> <li>▪ the extent to which personnel consider safety as a value that guides their everyday work (e.g., on a scale from 1=low to 5=high)</li> <li>▪ the extent to which personnel consider that safety is highly valued by their management</li> <li>▪ the extent to which human performance principles are applied</li> <li>▪ the extent to which the personnel take initiatives in improving organizational practices or report problems to management</li> <li>▪ the extent to which safety-conscious behavior is supported</li> <li>▪ the extent to which staff and management are aware of the risks your operations imply for themselves and for others.</li> </ul>

#### 4.3.3 INDICATORS FOR OPERATIONAL ISSUES

Area	High Severity outcome to be prevented	Metrics
<b>Air operators</b> See also Air Traffic management/ Air Navigation Services for additional indicators	<ul style="list-style-type: none"> <li>▪ traffic collision</li> </ul>	<ul style="list-style-type: none"> <li>▪ number of Traffic Collision Avoidance System (TCAS) resolution advisories per 1000 flight hours (FH)</li> </ul>
	<ul style="list-style-type: none"> <li>▪ runway excursion -</li> </ul>	<ul style="list-style-type: none"> <li>▪ number of unsterilized approaches per 1000 landings</li> </ul>
	<ul style="list-style-type: none"> <li>▪ ground collision</li> </ul>	<ul style="list-style-type: none"> <li>▪ number of runway incursions per 1000 take-offs</li> </ul>
	<ul style="list-style-type: none"> <li>▪ controlled flight into terrain</li> </ul>	<ul style="list-style-type: none"> <li>▪ number of Ground Proximity Warning System (GPWS) and Enhanced Ground Proximity Warning System (EGPWS) warnings per 100 take-offs</li> </ul>
	<ul style="list-style-type: none"> <li>▪ accident/incident related to poor flight preparation</li> </ul>	<ul style="list-style-type: none"> <li>▪ number of cases where flight preparation had to be done in less than the normally allocated time</li> <li>▪ number of short fuel events per 100 flights</li> <li>▪ number of fuel calculation errors per 100 flights</li> </ul>
	<ul style="list-style-type: none"> <li>▪ accident/incident related to fatigue</li> </ul>	<ul style="list-style-type: none"> <li>▪ number of extensions to flight duty periods per month/quarter/year &amp; trends</li> </ul>

Area	High Severity outcome to be prevented	Metrics
	<ul style="list-style-type: none"> <li>▪ accident/incident related to ground-handling</li> </ul>	<ul style="list-style-type: none"> <li>▪ number of incidents with ground handlers per month/quarter/year &amp; trends</li> <li>▪ number of mass and balance errors per ground handler per month/quarter/year &amp; trends</li> <li>▪ number of dysfunctions per ground handler per month/quarter/year &amp; trends</li> </ul>
	<ul style="list-style-type: none"> <li>▪ maintenance related accident/incidents</li> </ul>	<ul style="list-style-type: none"> <li>▪ Pilots Reports (PIREPS) per 100 take offs</li> <li>▪ deferred items per month and aircraft</li> <li>▪ In Flight Shut Down (IFSD) per 1000 FH</li> <li>▪ In Flight Turn Backs (IFTB) and deviations per 100 take offs</li> <li>▪ number of service difficulty reports filed with the Civil Aviation Authority dispatch reliability:</li> <li>▪ number of delays of more than 15 minutes due to technical issues per 100 take offs</li> <li>▪ number of cancellations per 100 scheduled flights due to technical issues</li> <li>▪ rejected take offs per 100 take offs due to technical issues</li> </ul>
<b>Maintenance organization</b>	<ul style="list-style-type: none"> <li>▪ maintenance planning/rostering related accident/incidents</li> </ul>	<ul style="list-style-type: none"> <li>▪ % of work orders for which a detailed planning has been made</li> </ul>
	<ul style="list-style-type: none"> <li>▪ maintenance planning/rostering related accident/incidents</li> </ul>	<ul style="list-style-type: none"> <li>▪ maintenance engineer fatigue / maintenance error:</li> <li>▪ % of work orders with a difference &gt; 10% between the expected lead time and the actual processing time</li> <li>▪ % of work orders with a difference &gt; 10% between the estimated work force and the actual needs</li> </ul>
	<ul style="list-style-type: none"> <li>▪ maintenance related accident/incidents</li> </ul>	<ul style="list-style-type: none"> <li>▪ maintenance error:</li> <li>▪ % of work orders that required re-work</li> <li>▪ number of duplicate inspections that identified a maintenance error</li> </ul>
	<ul style="list-style-type: none"> <li>▪ maintenance data related accident/incidents</li> </ul>	<ul style="list-style-type: none"> <li>▪ number of safety reports related to ambiguous maintenance data</li> </ul>

Area	High Severity outcome to be prevented	Metrics
	<ul style="list-style-type: none"> <li>▪ maintenance related accident/incidents</li> </ul>	<ul style="list-style-type: none"> <li>▪ number of investigations performed following components removed from service significantly before expected life limit was reached</li> </ul>
<b>Air Traffic management/ Air Navigation Services</b>	<ul style="list-style-type: none"> <li>▪ traffic collision</li> </ul>	<ul style="list-style-type: none"> <li>▪ number of level busts/exposure</li> <li>▪ number of TCAS required action (RA) (with and without loss of separation) /exposure</li> <li>▪ number of minimum separation infringement/ exposure</li> <li>▪ number of inappropriate separation (airspace in which separation minima is not applicable) /exposure</li> <li>▪ number of aircraft deviation from air traffic control (ATC) clearance/exposure</li> <li>▪ number of airspace infringements/exposures</li> </ul>
	<ul style="list-style-type: none"> <li>▪ traffic collision / controlled flight into terrain</li> </ul>	<ul style="list-style-type: none"> <li>▪ number of aircraft deviations from air traffic management (ATM) procedures/exposure</li> <li>▪ number of inappropriate or absences of ATC assistance to aircraft in distress</li> </ul>
	<ul style="list-style-type: none"> <li>▪ controlled flight into terrain</li> </ul>	<ul style="list-style-type: none"> <li>▪ number of near Controlled Flight Into Terrain (CFIT) IFSD /exposure</li> </ul>
	<ul style="list-style-type: none"> <li>▪ runway excursion</li> </ul>	<ul style="list-style-type: none"> <li>▪ number of inappropriate ATC instruction (no instruction, wrong information, action communicated too late, etc.)</li> </ul>
	<ul style="list-style-type: none"> <li>▪ runway incursion</li> </ul>	<ul style="list-style-type: none"> <li>▪ % of runway incursions where no avoiding action was necessary</li> <li>▪ % of runway incursion where avoiding action was necessary</li> </ul>
		<ul style="list-style-type: none"> <li>▪ post-accident/incident fire</li> </ul>
<b>Airports</b>	<ul style="list-style-type: none"> <li>▪ post-accident/incident fire</li> </ul>	<ul style="list-style-type: none"> <li>▪ Fire Extinguishing Services (ICAO Airport Fire Fighting Categories) decrease in value (# decrease-hours/ # airport annual operating hours)</li> <li>▪ number of radio/phone failures per 100 operations number of fire rescue vehicles failures per 100 operations</li> </ul>

Area	High Severity outcome to be prevented	Metrics
	<ul style="list-style-type: none"> <li>runway incursion</li> </ul>	<ul style="list-style-type: none"> <li>runway incursions per 1000 operations signage:</li> <li>number of failures or defects found during routine inspection</li> <li>number of defects reported</li> <li>average lead-time for repair/replacement (per month/quarter/year &amp; trends)</li> </ul>
	<ul style="list-style-type: none"> <li>collision with vehicle on ground / ground-equipment</li> </ul>	<ul style="list-style-type: none"> <li>notified platform safety rules violations per 1000 operations.</li> </ul>
	<ul style="list-style-type: none"> <li>ground collision with wildlife</li> </ul>	<ul style="list-style-type: none"> <li>number of ground collisions with wildlife</li> <li>number of inspections of fences and other protective devices per month/quarter/year</li> </ul>
	<ul style="list-style-type: none"> <li>FOD (Foreign Object Damage)</li> </ul>	<ul style="list-style-type: none"> <li>number of FOD found during routine inspections</li> <li>number of FOD found out of inspections and after report</li> </ul>
	<ul style="list-style-type: none"> <li>runway incursion</li> </ul>	<ul style="list-style-type: none"> <li>runway lights</li> <li>number of failures or defects found during routine inspection</li> <li>number of defects reported</li> <li>average lead-time for repair/replacement (per month/quarter/year &amp; trends)</li> </ul>
	<ul style="list-style-type: none"> <li>bird-strike In Flight Shut Down (IFSD)</li> </ul>	<ul style="list-style-type: none"> <li>number IFSD per 10000 FH following bird-strike</li> </ul>
<b>Flight training organization</b>	<ul style="list-style-type: none"> <li>accident/incident related to poor training</li> </ul>	<ul style="list-style-type: none"> <li>number of trainees per instructor</li> <li>number of changes in instructor per training</li> <li>number of major changes to training program (per month/quarter/year &amp; trends)</li> </ul>
	<ul style="list-style-type: none"> <li>accident/incident related to poor training/complacency during examinations</li> </ul>	<ul style="list-style-type: none"> <li>number of significant deviations from average pass rates</li> </ul>
<b>Design organization</b>	<ul style="list-style-type: none"> <li>design related accident/incidents</li> </ul>	<ul style="list-style-type: none"> <li>During the design phase:</li> <li>number of design changes requested due to design errors per program and per period</li> <li>number of rejected compliance demonstrations per program and per period</li> </ul>

Area	High Severity outcome to be prevented	Metrics
	<ul style="list-style-type: none"> <li>design planning related accident/incident</li> </ul>	<ul style="list-style-type: none"> <li>% of technical reports with a difference &gt; 10% between the expected lead time and the actual processing time</li> <li>% of technical reports with a difference &gt; 10% between the estimated work force and the actual needs</li> </ul>
	<ul style="list-style-type: none"> <li>design related accident/incidents</li> </ul>	Post certification: <ul style="list-style-type: none"> <li>number of service difficulty/safety reports due to design errors per program and per period</li> <li>number of safety reports related to ambiguous design data</li> <li>number of design changes classified incorrectly (minor/major) per period</li> </ul>
<b>Manufacturing organization</b>	<ul style="list-style-type: none"> <li>manufacturing related accident/incidents</li> </ul>	<ul style="list-style-type: none"> <li>number of service difficulty/safety reports due to manufacturing errors per program and per period</li> </ul>
	<ul style="list-style-type: none"> <li>manufacturing process related accident/incidents</li> </ul>	<ul style="list-style-type: none"> <li>% of work orders that required re-work</li> <li>number of investigations performed following work orders that required re-work</li> </ul>
	<ul style="list-style-type: none"> <li>manufacturing process related accident/incidents</li> </ul>	<ul style="list-style-type: none"> <li>% of duplicate inspections that identified a manufacturing error</li> </ul>
	<ul style="list-style-type: none"> <li>manufacturing process related accident/incidents</li> </ul>	<ul style="list-style-type: none"> <li>number of cases where final delivery was delayed due to significant non-compliances</li> <li>number of investigations performed following delayed delivery</li> </ul>
	<ul style="list-style-type: none"> <li>manufacturing data related accident/incidents</li> </ul>	<ul style="list-style-type: none"> <li>number of safety reports related to ambiguous manufacturing data</li> </ul>
	<ul style="list-style-type: none"> <li>manufacturing planning related accident/incidents</li> </ul>	<ul style="list-style-type: none"> <li>Production personnel fatigue / production error:</li> <li>% of work orders with a difference &gt; 10% between the estimated work force and the actual needs</li> <li>% work orders with a difference &gt; 10% between the expected lead time and the actual processing time</li> </ul>

#### 4.3.4 INDICATORS TO MONITOR EXTERNAL FACTORS

Area	Monitoring focus	Metrics
Regulations	▪ new regulations	▪ number of new regulatory requirements that will affect your organization within the next 12 months
	▪ amendments to regulations	▪ number of amended regulatory requirements that will affect your organization within the next 6 months
	▪ evolution towards performance-based regulations	▪ number of objective based rules for which you have defined your own means of compliance
Technology	▪ new technologies relevant to your core business— hardware	▪ % of total investment that is spent on new technologies
	▪ new technologies relevant to your core business— software	▪ % of total investment that is spent on new technologies
	▪ new technologies relevant to your core business	▪ rate of obsolescence of existing qualifications
	▪ new technologies installed in aircraft	▪ number of aircraft modifications / Supplemental Type Certificates (STCs) that require a change to your company's rating
	▪ new technologies installed in aircraft	▪ number of new modifications / STC that require new qualifications
Competition	▪ financial turn -over	▪ evolution in your turnover
	▪ staff turnover	▪ average time to fill a vacant post ▪ number of staff leaving to work for a competitor
	▪ market opportunities	▪ evolution in the number of requests for quotation from new customers ▪ ratio of requests for quotation from new customers that are followed by a firm order
	▪ competitors	▪ evolution in the number of your direct competitors

##### 4.3.4.1 How to Go About Setting SPIs

4.3.4.1.1 Focus on developing SPIs for ATS to measure the effectiveness of SMS and safety performance.

4.3.4.1.2 There are some generic SPIs that apply to Operations Directorate others may apply depending upon type of ATS units.

##### 4.3.4.1.3 Generic organizational SPIs include:

4.3.4.1.3.1 Number of major risk incidents (as defined in your Safety Management Manual),

4.3.4.1.3.2 Number of mandatory reports,

4.3.4.1.3.3 Number of voluntary reports,

- 4.3.4.1.3.4 Number of overdue safety report closures,
- 4.3.4.1.3.5 Number of safety meetings,
- 4.3.4.1.3.6 Number of safety briefings, and
- 4.3.4.1.3.7 Number of safety audits.

4.3.4.1.4 These indicators are all easily monitored and show the organization's general safety health. You will need to set targets for each, probably on the basis of number of events in the previous 12 months or by calendar year; make sure this is stated clearly.

#### 4.3.5 SAFETY PERFORMANCE INDICATORS YEAR 20XX

Performance Indicator	Target	Performance			
		Qtr1	Qtr2	Qtr3	Qtr4
Major Risk Incidents* per 100 flights	0				
Mandatory Reports per 100 flights	3 or less				
Voluntary Reports per employee per year	More than 10				
Overdue safety report closures per year	2 or less				
Safety meetings per year	4				
Safety briefings per year	2				
Safety audits per year	2				
<b>Organization-specific SPIs</b>					
Operator: Flights flown with operational MEL restrictions per 100 flights	Less than 5%				
Aerodrome: Runway incursions per year	Less than 5				
Maintenance: Maintenance errors per year	Less than 5				
ATS: Airspace infringements per 100 movements	Less than 2				

- 4.3.5.1 These are only suggested to give organizations some ideas for safety performance indicators (SPIs) and the targets will need to be customized to the size and nature of the operation and the values given are just examples.
- 4.3.5.2 The objectives and SPIs should be reviewed as part of the Management Review to decide whether they need to be amended or updated.
- 4.3.5.3 Safety Performance Indicators for a Organization, shows some examples, but the SPIs and the specific targets may not be right for your organization.
- 4.3.5.4 Mandatory reports indicate things that went wrong, so the target should be "less than x" or "reduce by \_\_\_%."
- 4.3.5.5 Voluntary reporting offers an opportunity for improvement, as well as being an indicator of a good safety culture, so the target should be "more than y" or "increase by \_\_\_%." Encourage your staff to report every safety issue they see, so that you can deal \_\_\_ with these issues; if it is not reported it cannot get fixed. A large number of voluntary reports is a sign of a mature SMS; it is not necessarily a sign of bad things happening.

- 4.3.5.6 It may be more useful to monitor some SPIs against the number of movements (e.g., flights, flying hours, maintenance cycles), as this will allow for changes in your operation. So, for example, if your target was less than 2 mandatory reports per year and you bought a second aircraft, you would need to change your target, probably to 4 reports per year. But if your target was 2 reports per 1000 flights, doubling the number of aircraft would have no effect on the target.
- 4.3.5.7 Be careful when reviewing SPIs, unless you have a reasonably large number of events. A change from one to two incidents per year is a 100% rate increase, but is not nearly as useful an indicator as a 10% change from 50 to 55.
- 4.3.5.8 The following are examples of organization-type SPIs.
- 4.3.5.8.1 **Operator:** Number of flights flown with operational Minimum Equipment List (MEL) restrictions
- 4.3.5.8.2 **Aerodrome:** Number of runway incursions, number of bird incidents .
- 4.3.5.8.3 **Maintenance:** Number of maintenance errors .
- 4.3.5.8.4 **Air Traffic Service (ATS):** Number of airspace infringements, number of losses of separation
- 4.3.5.9 You will need to think carefully about these. Good indicators will help you improve safety, while poorly thought out indicators may just waste everybody's time.
- 4.3.5.10 Only you can decide if, and what, indicators are applicable and valuable to your organization.
- 4.3.5.11 Finally, once you have set these targets, be sure to regularly measure your actual performance against them. That will tell you how well you are doing.

#### 4.4 **PROCESS FOR ACCEPTANCE AND REVIEW OF SPI's**

- 4.4.1 DAAR shall develop in mutual agreement the safety performance indicators (SPIs) alert levels and target levels of individual ATS providers
- 4.4.2 DAAR before agreeing shall review the service provider's proposed safety performance indicators (SPIs) and their associated targets and alerts and shall ensure that the proposed SPIs are appropriate and pertinent to the individual ATS unit. DAAR shall also monitor ATS provider's safety performance indicators (SPI) and their respective alert and target levels through monitoring of safety related data.
- 4.4.3 DAAR shall periodically review SPIs and associated targets and alert settings of each ATS unit. Such review should take into consideration the performance and effectiveness of each SPI and its associated target and alert settings. Any necessary adjustments to previously agreed SPIs, target or alert settings should be substantiated by appropriate safety data and be documented as appropriate.

## Chapter 5

### AUDIT AND INSPECTIONS

#### 5.1 AUDIT AND INSPECTION

5.1.1 Audit and Inspection are two different things. Both has similar tools, however the processes and the way of conduct make them different. Inspection generally uses a checklist format with “yes/no” answers. The question is asked or the item on the checklist is evaluated, and it either passes the inspection or does not. “Shades of gray” very seldom come into the picture during an inspection. Inspections are usually performed in a very short timeframe and they usually focus on a single item or process. Audits, however, are more detailed and in-depth, they can take several hours or several days, depending on the scope and depth of the audit. Audits will look at an entire *process* from start to finish, and include reviews of written procedures and observation of tasks as well as an inspection of the equipment and processes to which the written procedures apply. Audits frequently include interviews with employees and document reviews to assure that the steps an operator actually takes are in line with the written procedure (do the procedures say what the operators/ service providers do, and do the operators/ service providers do what the procedures says). Additionally, if a procedure is based on a regulatory requirement, an audit will evaluate a written procedure to assure it meets the requirements of the regulations. With an audit, there is frequently a question checklist that determines if the topic “meets compliance”, “needs improvement”, “does not meet compliance” or is “not applicable”. Audit tools will generally be more “soft” to allow for the auditor to investigate deeper into the process to determine if it complies, and to what degree it complies. Audit tools and questions are seldom in a yes/no format, and the tools are designed so that auditors ask open-ended questions that allow for the operator to elaborate on what they do and how they do it. Audit findings are generally more detailed in nature and point out specifically what is required and what parts of the process are out of compliance (hence the availability of the “needs improvement” determination).

5.1.2 Often, Regulator wants to evaluate how well the ATS safety management system is performing. To make this evaluation Regulator may use audits or inspections. The data and measurements discovered during audits and inspections are often used to assist Regulator in determining if they are achieving their safety goals, or if they need to establish new goals. Though, that audits and inspections are only as good as the tools used and the people performing the audit or inspection. The audit and inspections should focus towards areas of greater safety concern or need. If the questions and tools aren’t appropriate, then the results and findings will not give relevant data to use in making improvements or evaluation. Likewise, if the inspectors and auditors “overlook” items, or if they do not have the appropriate amount of integrity to point out a problem, then the results will be skewed as well

5.1.3 The audit and inspection schedule of ATS units shall be developed by giving priority to the safety data or greater safety concern of location/ATS units.

5.1.4 The audit and inspections should focus towards areas of greater safety concern or need. If the questions and tools aren’t appropriate, then the results and findings will not give relevant data to use in making improvements or evaluation. Likewise, if the inspectors and auditors “overlook” items, or if they do not have the appropriate amount of integrity to point out a problem, then the results will be skewed as well

#### 5.2 SCOPE AND DEPTH OF AUDIT:

5.2.1 The scope and depth of audit/inspection is influenced by the following:

5.2.1.1 Type of inspection/audit

5.2.1.2 The period last audit/inspection to the present

5.2.1.3 The enforcement record of the service provider

5.2.1.4 The confidence in corrective action taken by the service provider

## 5.2.2 **TYPE OF INSPECTION/AUDIT:**

5.2.2.1 The type of inspection/audit is determined by the circumstances under which the inspection/audit is convened and includes the following:

5.2.2.1.1 Scheduled conformance inspection/ audit.

5.2.2.1.2 Random inspection/ audit

### 5.2.2.2 **SCHEDULED CONFORMANCE INSPECTION / AUDIT:**

5.2.2.2.1 A scheduled conformance inspection/audit will be conducted for the purpose of determining service providers overall level of conformance to regulatory requirements. All applicable characteristics of the organization will be subject to review. While developing the schedule plan priority must be given to the locations/unit with significant number of safety concern issues.

### 5.2.2.3 **RANDOM INSPECTION/AUDIT:**

5.2.2.3.1 A random inspection /Audit may be conducted to respond to the safety concern or circumstances other than that requiring scheduled confirmation audit/inspection. Prior notification to the service provider is not required. Random inspection/audit may preclude certain team member's activities and responsibilities that are associated with routine conformance inspection/audit.

## 5.3 **INTERNAL AUDIT**

5.3.1 Internal audit will assess your processes and procedures and give you a level of confidence that everything is being done properly and your staff members are following your policy and procedures.

5.3.2 Audits should be carried out by someone who is independent of the process being audited and any findings from audits recorded, together with the agreed corrective actions. These findings may be new hazards or weaknesses in your defences so you should capture them in the Hazard Log.

5.3.3 It may be challenging to establish an independent internal audit. You might consider using an external auditor, but we encourage you to do the audit internally. This will give you a better insight into your operations.

5.3.4 Audits should be more than checking items on a compliance checklist; they should look at the effectiveness of processes, identify corrective and preventive actions, and check on any follow up and continuous improvement. An important area is the identification, analysis, and follow up of safety issues. The auditor should review the Hazard Log before auditing operational area to check that those mitigations are in place and working.

5.3.5 **Frequency:** Audits and reviews should be carried out at least annually, but covering the scope in several smaller audits or reviews may be more productive and effective.

5.3.6 **Addressing Findings:** Audit and review findings should be addressed with preventive and corrective actions. A template for managing this can be found in Corrective and Preventive Action Report Template

CORRECTIVE ACTION		PREVENTIVE ACTION	
ORGANIZATION/ OPERATIONAL AREA/ DEPARTMENT			
DESCRIPTION OF THE ISSUE OR NON- CONFORMANCE			
Auditor / Reviewer	Auditor	Signature	Date
ROOT CAUSE(S)			
PROPOSED CORRECTIVE / PREVENTIVE ACTION TO BE TAKEN INCLUDING RESPONSIBLE PERSON AND DEADLINE	What	Who	by when
Accepted by	Name	Signature	Date
ACTUAL DATE OF ACTION (S) TAKEN:			
Comments:			
Further Action Needed	<input type="checkbox"/> YES		<input type="checkbox"/> NO
Closure Acceptance	Auditor / Reviewer	Signature	Date

#### 5.4 **OVERSIGHT AUDIT:**

5.4.1 **Safety Audit/Inspection:** Safety audit is a core safety oversight/ management activity, providing a means of identifying potential problems before they have an impact on safety.

5.4.2 **Safety Oversight:** A function by means of which the Authority ensures effective implementation of the National Aviation Legislation, Rules, safety-related Standards and Recommended Practices (SARPs) and associated procedures prescribed in the Air Navigation Orders/Manuals/Directives including amendments thereto; to meet the obligations as contained in the Annexes to the Convention on international Civil Aviation and related ICAO documents. Safety oversight also ensures that the national aviation industry provides a safety level equal to, or better than, that defined by the SARPs.

5.4.2.1 **Safety Oversight Audit/Inspection Process:** A prescribed three-phase process that consists of the pre-audit/inspection, audit/inspection and post-audit/inspection activities.

- 5.4.2.2 **Safety Oversight Audit/Inspection Activities:** Audit/Inspection-related activities commencing with the opening meeting of the Inspection/Audit Team with authorities of the service provider and concluding with the closing meeting, including the provision of the draft findings and recommendations.
- 5.4.2.3 **Safety Oversight Pre-Audit/Inspection Activities:** Audit/Inspection-related activities commencing with the time the initial letter advising the Service Provider of the forthcoming audit/inspection is forwarded by the DAAR/Inspection/Audit Team and concludes with the audit/inspection preparation briefing for team members.
- 5.4.2.4 **Safety Oversight Post-Audit/Inspection Activities:** Audit/Inspection-related activities commencing after the Audit/Inspection team's debriefing to the Service Provider and concluding with the publication of the final audit/inspection report.
- 5.4.2.5 **Safety Regulatory Audit/Inspection:** Safety regulatory audit/inspection means a systematic and independent examination conducted by, or on behalf of, a national supervisory authority to determine whether complete safety related arrangements or elements thereof, related to processes and their results, products or services, comply with required safety-related arrangements and whether they are implemented effectively and are suitable to achieve expected results.

#### 5.4.3 **OBJECTIVES OF SAFETY OVERSIGHT AUDIT/INSPECTION:**

- 5.4.3.1 Safety Oversight Audit (SOA) of aviation activities is a systematic and objective review to verify compliance with the provisions of International or national regulations, conformance with or adherence to Standards and Recommended Practices (SARPs), procedures and good aviation safety practices wherein audit finding defines the implementation status of critical elements of a safety oversight system.
- 5.4.3.2 The primary objectives of safety oversight audit/inspections are to:
- 5.4.3.2.1 Observe and assess the Service Provider's adherence to National Aviation Legislation, Civil Aviation Rules-1994, Regulations, Air Navigation Orders (ANOs), Prescribed Standards and Procedures, Operating Manuals, Directives and other related documents;
- 5.4.3.2.2 Determine the degree of conformance by the Service Providers in implementing National Aviation Legislation, Civil Aviation Rules-1994, Regulations, Air Navigation Orders (ANOs), Prescribed Standards and procedures, Operating Manuals, Directives of the Federal Government & the Director General and other related documents;
- 5.4.3.2.3 Maintain the Database for the safety-related information from the Audit/Inspection Findings and Differences
- 5.4.3.2.4 Monitor and report the Service Provider's safety performance;
- 5.4.3.2.5 Assist the Service Providers in resolution of safety concerns/issues; and
- 5.4.3.2.6 Determine the effectiveness of the Safety Oversight System of Airspace and Air Navigation Services and submit proposals to improve their safety oversight capabilities.

### 5.5 **PRIORITIZING FINDINGS**

- 5.5.1 *Inspection findings* are fairly easy to prioritize and fix. Either the equipment or process is in compliance or it is not. The inspection questions are generally straight-forward enough

that the solution to the problem is fairly evident and management will know (or should know) how to address the finding.

5.5.2 *Audit findings, because they are frequently based on regulatory compliance, or based on written documentation, are sometimes more difficult to prioritize, hence, the need to prioritize the findings into categories. Audit categories are generally placed into one of four categories.*

5.5.3 *In general the prioritization of inspections and audits are based on the analysis of safety risks or quality data)*

5.5.3.1 ***Non Compliance:*** A deficiency in characteristic, documentation or procedure with respect to provisions of the Chicago Convention or a national regulation

5.5.3.2 ***Non-Adherence:*** A deficiency in characteristic, documentation or procedure with respect to a Recommended Practice, procedure, guideline or good aviation safety practice.

5.5.4 Audit findings, based upon their gravity, needs further prioritization. This process of prioritization is also required by Quality Management system (ISO standard). In general the inspections and audits are based on the analysis of safety risks or quality data and may be prioritize as under:

5.5.4.1 Major or “serious” findings. These are findings that in which a deficiency in characteristic, documentation or procedure with respect to provisions of the Chicago Convention or a National regulation is observed which if not addressed will lead or will very possibly lead to a workplace injury or citation by a regulatory authority. These findings have top priority to address.

5.5.4.2 Minor findings in which a deficiency in characteristic, documentation or procedure with respect to a recommended practice, procedure, guideline or good aviation safety practices are ignored. These are frequently small items that are easily overlooked

5.5.4.3 Awareness required findings. These are simple errors, usually in documentation. Awareness findings could also be errors where the auditors or inspectors feel that management should be aware of something, but it does not really pertain to the scope of the audit.

#### 5.5.5 **WHAT TO DO WITH THE FINDINGS:**

5.5.5.1 The findings generated from an audit or inspection will point out errors or hazards presented by the process or by the equipment. Findings will not point out the solutions to the problems, only the problems themselves. It is up to the ATS management to address the findings and improve safety and quality in the workplace. Occasionally, there are many findings, some of which have simple solutions that can be easily and inexpensively addressed. Some of the more in-depth or more expensive items should be addressed in accordance safety issues short term measures to be taken.

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## Chapter 6

### THE MANAGEMENT OF CHANGE

Change brings risk, whereas managing change reduces the risk.

6.1 Whether it is the introduction of a new aircraft type, a new maintenance procedure, or a move to new premises, your SMS needs to cover the identification of any changes that may pose a risk to aviation safety. These include the changes that would have a noticeable impact on your resources, materials, procedures, processes, training, management control, and above all your people. Your management of change processes will help you identify potential problems.

#### 6.2 CONSIDERATIONS FOR MANAGING A CHANGE

##### 6.2.1 TYPICAL CHANGES INCLUDE:

6.2.1.1 **Organizational change** (a new executive, the departure of experienced personnel, organizational restructuring); .

6.2.1.2 **Operational change** (a new aircraft type, a new contract, new systems/equipments, new operating procedures); and .

6.2.1.3 **Physical change** (a new facility, a new base, aerodrome layout changes).

6.2.2 Risk assessment is a key part of the process, so when you decide to make a change, start by assessing the overall risk of the change itself. It may be that the change is simply not worth the risk or that the risk of not making the change is just too high. You have probably done this intuitively, but make sure you involve the right people as they may bring up risks you had not taken into account. This may mean involving people from outside your organization (key stakeholders).

6.2.3 Once you decide to go ahead, identify all the factors that must be considered. For instance, if you plan to introduce a new sector/area, you will probably need to consider, training requirements and schedules and maintenance arrangements among other things. Do not forget to ask the question, "Is it suitable for our operations?". You will need to determine when things will need to happen, who will be involved, what needs to be done beforehand, what will happen next, and so on.

6.2.4 Once you have your basic plan in place, you can start to identify and manage the risks. And remember, introducing any new procedure, operation, or equipment type is likely to bring new safety risks.

6.2.5 You should include a risk assessment of each issue, so that you can take any necessary steps to minimize the risks and their potential effects. For example: What is the likelihood that the training will not be completed as scheduled? If the training is late, what will be the effect on your operations? And how will you minimize the risk?

6.2.6 Be prepared to manage the effects of changes in other organizations on your operation. For example: How would it affect your organization if your third party maintenance provider had a significant leadership change or a move to another location? How would it affect your organization if your ANSP was to reduce operations at your aerodrome?

6.2.7 Document what you plan to do and what you actually do at each stage. This will help you and others to see what went well and what did not. This will also help provide a historic record of why certain actions were taken as the organization continues to improve and expand its operations.

6.2.8 **MANAGEMENT OF CHANGE TEMPLATE**

**Management of Change**

MOC REF:

1) What is the change?

*Describe the change*

2) Who?

*Describe who is responsible to implement the change*

3) Describe the major components of the change

*This will help you identify the main risks of each component that will be populated in section 7*

4) Who does the change affect?

*Consider who it affects individuals, departments and organizations?*

5) What is the impact of the change?

*Consider why the change is taking place and the impact on the organization and its processes and procedures*

6) What follow up action is needed? (assurance)

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

7) Safety Issues and the risk assessment

<b>What is the issue? (hazard)</b>	<b>What could happen as a result? (consequences)</b>	<b>How Bad will it be? (severity)</b>	<b>How likely is it to occur?  (likelihood)</b>	<b>Risk rating</b>	<b>What action(s) are we taking?  (mitigations)</b>	<b>Action by whom and when</b>
1					<i>There may be more than one mitigation for each issue</i>	
2						
3						

The Change is acceptable to implement

**Final Acceptance Signature**

**Name**

**Date:**

### 6.3 **CONTINUOUS IMPROVEMENT OF THE SMS**

- 6.3.1 'Safe enough' is not the same as 'safe'. There is room for betterment and SMS is main tool for this, so working to improve it is a good way to become a safer organization.
- 6.3.2 Two important paths to improvement are the internal audit and the Management Review for effectiveness. You have a quality management system (QMS) in place, you are doing these already; they may just need some adjustment to the SMS environment.

### 6.4 **MANAGEMENT REVIEW**

- 6.4.1 The Management Review lets you judge how effective your SMS is. Review your SMS at least once per year and look at your safety performance indicators, the results of audits, and the risk mitigation actions you have implemented. These should give you an idea of how well your SMS is performing and what you might change to improve it. Write down the results so that you and your staff can track your progress.
- 6.4.2 To ensure the continuing adequacy and effectiveness of the SMS, the Accountable Executive should conduct periodic reviews of SMS processes and procedures, and evaluate the organization's safety performance.
- 6.4.3 Organizations should monitor their safety performance indicators as part of the management review process. Management Reviews should:
- 6.4.3.1 Be conducted periodically (usually annually) or more often if there is a need; and
  - 6.4.3.2 Cover at least the following topics:
    - 6.4.3.2.1 Audit/review results;
    - 6.4.3.2.2 Safety objective achievement results;
    - 6.4.3.2.3 Hazard and event status and results;
    - 6.4.3.2.4 Corrective and preventive action(s) status and results;
    - 6.4.3.2.5 Training program effectiveness;
    - 6.4.3.2.6 Follow up actions from previous management reviews; o Changes that could affect the SMS; and o Recommendations for improvement.
  - 6.4.3.3 Management review can be conducted via a safety review meeting, and actions documented in a form, such as the template in Appendix 14, Management Review Template.
  - 6.4.3.4 The expected result of management review is to answer the question: How effective your SMS is ?

**Management Review Template**  
**Management Review Meeting Report**  
**Date Time**

<b>Present</b>	

<b>Absent</b>	

**AGENDA 1. Review of actions arising from previous meetings**

Action Item #	Status	Completion Date	Further Required	Action

**2. Safety Performance Review**

Performance Indicator	Target	Performance			
		Qtr1	Qtr2	Qtr3	Qtr4
# of Major Risk Incidents (as defined in our Safety Management Manual)					
# of Mandatory Reports					
# of Voluntary Reports					
# of Overdue Safety Report Closures					
# of Safety Meetings					
# of Safety Briefings					
# of Safety Audits					
Organization-specific SPIs					

**3. Safety Events Review (reported since last Management Review)**

Safety Report #	Report Status	Corrective/Preventive Action Effectiveness	Further Action Required

#### 4. Hazard Log and Management of Change (MoC) Review

Hazard/ MoC #	Mitigation Status	Mitigation Effectiveness	Further Action Required

#### 5. Training and Safety Promotion Review

Area	Training and Promotion Effectiveness	Action Required
Operational		
Management		

#### 6. Internal and External Audit / Review Findings

Finding #	Corrective/ Preventive Action Status	Corrective/Preventive Action Effectiveness	Further Action Required

#### 7. Changes Required to SMS

Type of Change	Change Required	Action (date)	by Person responsible
Safety Policy and Objectives			
SPIs			
Documentation			

#### 8. Other Business

Issue	Follow up Action	Person fulfilling Action	Completion Date

#### 9. Date of next meeting

## Chapter 7

### **SAFETY PROMOTION**

Keep the safety message alive and well; tell your people, tell your customers, tell everyone!

#### **7.1 TRAINING AND EDUCATION**

7.1.1 You and your staff need SMS training. Your safety manager, should certainly be given some SMS training. He or she should then know what is needed for the rest of the staff and will probably be able to deliver the training.

#### **7.1.2 THE BASIC REQUIREMENTS**

7.1.2.1 Organization Safety Training:

7.1.2.1.1 The simplest way is to require all staff to read and understand the SMS Manual and sign for reading the manual as part of the Training Record.

7.1.2.1.2 All staff members need to understand their role and responsibilities in the SMS and this can be done through training and/or reading and understanding the SMS Manual. All training needs to be recorded.

#### **7.1.3 WHAT IS INVOLVED?**

7.1.3.1 **Key Issues:** It is important to ensure that your staff are trained and competent to carry out their safety-related functions. Training should suit the size, the management style, and the needs of the company. Training could be computer or classroom based, supplemented by reading specific training material. The delivery method is not important; what is important is that your staff are trained and understand how your SMS works.

7.1.3.2 All staff need to be trained on how to report safety issues, why it is important and what safety issues should be reported.

7.1.3.3 Your training program should include:

7.1.3.3.1 . Importance of the SMS;

7.1.3.3.2 . Employee's responsibilities for safety;

7.1.3.3.3 . SMS policy and processes in your organization; and

7.1.3.3.4 . Safety reporting (why, what and how).

7.1.3.4 Refresher Training: Your safety training program should include periodic refresher training; this could involve regular briefings rather than formal training sessions, or a workshop format where the staff can discuss hazards or safety issues and risk mitigations. It is useful to include lessons arising from incidents and investigations, both internal and external.

7.1.3.5 Training Plan and Record: You should have a training plan, which includes as a minimum a list of staff requiring SMS training and a record of when the specific safety training (including refresher training) took place.

7.1.3.6 Training Materials: Some regulators have online training packages (some can be tailored) that could fulfil the training needs on general concepts, though you may still need to develop specific training for your organization. Your training material should be reviewed from time to time to ensure that the training continues to meet the needs of your staff and the organization.

- 7.1.3.7 Safety education is an ongoing process; try to make safety-related information (magazines, books, pamphlets, posters, videos, DVDs, online resources) readily available.
- 7.1.3.8 Your training program should be reviewed for effectiveness during the Management Review process.

## 7.2 **SAFETY COMMUNICATION:**

- 7.2.1 Safety communication is about letting people know what the safety issues are and what measures have been taken for them. You could bring this into your team briefings or staff meetings; you might put a regular safety bulletin on the notice board. It is a good idea to have a formal safety meeting from time to time, so that your staff can discuss the various issues in an open forum; it would also give you the opportunity to tell staff about the successes (or failures) of the SMS and about any planned changes.
- 7.2.2 The most important thing is to lead by example. Showing that you are committed to safety will help to develop a strong safety culture in your organization.

## **Chapter 8**

### **DEALING WITH CONTRACTORS AND OTHER ORGANIZATIONS**

8.1 Your SMS does not just apply within your organization; it extends down to people who supply you with products and services and it extends up to organizations that you supply with products or services. It is also important to consider the interactions with your contractors in respect of your SMS.

#### **8.2 PEOPLE CONTRACTING TO YOU**

8.2.1 It is your responsibility to make sure that your SMS is not compromised by services or products provided by third parties.

8.2.2 Some of these third parties may not have (or require) an SMS, but you should make sure that they are not going to compromise safety for your organization. Even if the third party has an SMS, you should be prepared to check that it is effective. In either case, you might carry out an inspection or audit. If there is no SMS, there may be less to audit and it exposes your organization to more unknowns.

8.2.3 It is useful to work out a scheme for sharing safety data with your third party contractors: their hazard and occurrence reports may alert you to a potential problem, and vice versa. This could be done through meetings with your key contracting organizations.

8.2.4 It is important to include your SMS requirements in any contract or service agreement; your contractors need to understand your expectations from the outset, which should include how safety issues are reported.