AIRPORTS COUNCIL INTERNATIONAL

Safety Management Systems HANDBOOK

First Edition 2016

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Authors: ACI World Safety and Technical Standing Committee

Written by: Warren Askew (GTAA), Li Ma Bomholtz (Copenhagen), John Chase (San Antonio), Thomas Christensen (Copenhagen), Carol Kavish (GTAA), Jason McArthur (YVR), Tim O'Krongley (San Antonio), Nahla Palmer (YVR)

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Email: aci@aci.aero
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FOREWORD

The idea of an ACI guidance handbook on Safety Management Systems (SMS) emerged from discussions in the Safety and Technical Standing Committee. ACI had already published an SMS Gap Analysis Tool and a chapter on SMS in the Airside Safety Handbook, and wished to follow up by producing an action-orientated guide on SMS for aerodrome operators. Members of the committee developed a table of contents and wrote and sourced material, including best practices from both inside and outside the aviation industry. We especially acknowledge the ICAO materials that are referenced.

The handbook now before you is a useful summary of the action that aerodrome operators should take to develop an SMS. This can never be an "off-the-shelf" system because, in order to function properly, such a system must be fully tailored to the circumstances of the individual aerodrome.

We sincerely hope that this handbook will help our members to produce better, more appropriate, responsive and interactive SMS.

As a complement to this handbook, ACI Global Training offers safety management training along with a range of courses relevant to safety, both online and in the classroom.

I commend the handbook to you, and thank its authors for giving so generously of their time and expertise.

Angela Gittens

Director General
ACI World

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INTRODUCTION

According to ICAO Annex 14, it is mandatory for a certified aerodrome to have a Safety Management System (SMS). This is a standard for aerodromes used for international operations and is recommended that it should also apply to aerodromes open to public use for domestic operations.

Ref: ICAO Annex 14 Standard 1.4.4

1.4.4 As part of the certification process, States shall ensure that an aerodrome manual which will include all pertinent information on the aerodrome site, facilities, services, equipment, operating procedures, organization and management including a safety management system, is submitted by the applicant for approval/acceptance prior to granting the aerodrome certificate.

Note.— The intent of a safety management system is to have in place an organized and orderly approach in the management of aerodrome safety by the aerodrome operator. Annex 19 — Safety Management contains the safety management provisions applicable to certified aerodromes. Guidance on an aerodrome safety management system is given in the Safety Management Manual (SMM) (Doc 9859) and in the Manual on Certification of Aerodromes (Doc 9774).

1.0 Purpose: This handbook should be of interest to airport managers and others responsible for preparing and implementing SMS at their airports. It provides a reference based on ICAO SMS principles but it is specifically adapted to the aerodrome-operator domain. The handbook will help the user understand what constitutes an airport SMS. It describes the components of an SMS and their interactions and offers guidance in the planning, implementation, and operation of an airport SMS. It also provides detailed information on how to carry out each of the necessary SMS steps. This handbook provides an overview of SMS and explains how a systems approach to safety management can benefit both the safety operations and the business activities of airports.

1.1 The handbook outlines the methods used to support the implementation of SMS principles by:

- Step 1 (PLAN): Establish a safety management framework;
- Step 2 (DO): Implement safety risk management;
- Step 3 (CHECK): Evaluate achievements through safety assurance;
- Step 4 (ACT): Continuous improvement through safety promotion; and
- Annexes: Best practices of airports.

1.2 General: This handbook is organized according to the four components and 12 elements of SMS identified by ICAO.

Ref: ICAO Annex 19 Appendix 2 Framework for a Safety Management System

This appendix specifies the framework for the implementation and maintenance of an SMS. The framework comprises of four components and 12 elements as the minimum requirements for SMS implementation.

a. Safety policy and objectives

i. Management commitment and responsibility
ii. Safety accountabilities
iii. Appointment of key safety personnel
iv. Coordination of emergency response planning (accident and incident investigation)
v. SMS documentation

b. Safety risk management

i. Hazard identification
ii. Safety risk assessment and mitigation

c. Safety assurance

i. Safety performance monitoring and measurement
ii. The management of change
iii. Continuous improvement of the SMS

d. Safety promotion

i. Training and education
ii. Safety communication

A

STEP A (PLAN)

ESTABLISH A SAFETY MANAGEMENT FRAMEWORK

SMS Element A1 RESPONSIBILITY

- Airport management is responsible for taking the lead in adopting, implementing and enforcing all safety policies and procedures within the SMS Manual with the accountable executive having the overall responsibility of the SMS.

- Supervisors are responsible for ensuring that all employees understand and carry out the procedures outlined in the SMS Manual.

- Each employee:

  a. has a major responsibility to ensure their personal safety and that of their fellow employees;
  b. must comply with the SMS Manual and all applicable administrative publications;
  c. must report all unsafe conditions or acts to their immediate supervisor upon detecting such conditions; and
  d. must report all accidents immediately to their immediate supervisor or to the next highest supervisor if their immediate supervisor is not available.

- Failure to comply with SMS Manual procedures may result in disciplinary action.

SMS Element A2 SMS IMPLEMENTATION (Organization, policy and processes)

Implementing an SMS requires a four-phase approach, with each phase building on the previous phase.

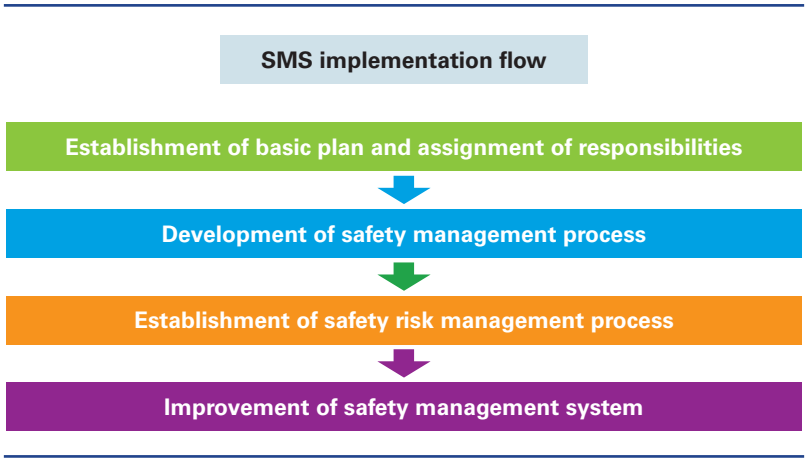

Figure 1: SMS Implementation Flow

Step A 2.1: Establishment of basic plan and assignment of responsibilities

The objective of the SMS implementation is to provide a blueprint of how the SMS requirements will be met and integrated into the organization's control systems, as well as an accountability framework for the implementation of the SMS. During this phase, basic **planning and assignment of responsibilities** are established. This phase can take about 12 months to complete. During this initial phase, the aerodrome needs to:

a) **Identify the SMS accountable executive**: No safety management system will function effectively unless an "accountable executive" has ultimate authority to manage and delegate resources to implement the SMS. It is important to understand the concept of the accountable executive, because it is one of the primary elements of a successful SMS. An SMS is different from other safety programmes because it holds each individual responsible for safety. Each management official has the authority to establish policies and procedures, and to allocate and direct resources within his or her division(s). This means that the responsibility for safety in each division must be accepted by the management of that division. There should be a letter appointing the accountable executive and this should be made available to all aerodrome employees. This will help set the stage for what comes next. The three most important roles of the accountable executive are:

i. Visibly and actively promoting implementation of the SMS and requiring active participation by all employees;
ii. Creating an organizational structure, with designated positions and responsible individuals, that supports the Safety Management System, and
iii. Providing both human and financial resources.

b) **Establish an SMS implementation team**: This team should be comprised of representatives from the relevant departments/divisions. The members of this team should drive implementation of the SMS from beginning to end. The accountable executive should also appoint a person to be the "SMS manager." This manager's main role is to be the project manager for SMS implementation. This individual should have a good understanding of management principles, as well as functional knowledge of the aerodrome's operational activities. It is advantageous for this person to have good communications skills, as well as to have won respect and recognition within the organization, since most of the job will be to promote the SMS with front-line personnel and middle management, and to obtain resources and support from top management. This person must also have a solid understanding of the SMS.

The SMS implementation team needs specialized SMS training in order to have a better understanding of implementation of the SMS. Here are some examples of relevant training:

i. Introduction to safety management
ii. Hazard training
iii. Human factors
iv. Root cause analysis
v. Risk management

c) **Define the scope of the SMS**: The SMS implementation team will have to come together to define the activities within the departments/divisions to which the SMS will be applicable. However, to set a "just culture" (safety culture) in motion, the SMS should be applicable to every department/division.

d) **Perform an SMS gap analysis**: The main function of the initial phase is the SMS gap analysis. This analysis compares the service provider's existing safety management processes and procedures with requirements contained in the SMS framework. The gap analysis facilitates development of an SMS implementation plan by identifying the gaps that must be addressed to implement an SMS fully. In ICAO Doc 9859, Third Edition 2013, Appendix 7 to Chapter 5, there is a checklist which will guide the implementation team in performing the gap analysis. However, this checklist is not all-inclusive: the members of the SMS implementation team may have to add to the gap analysis additional areas which pertain to their respective areas of expertise.

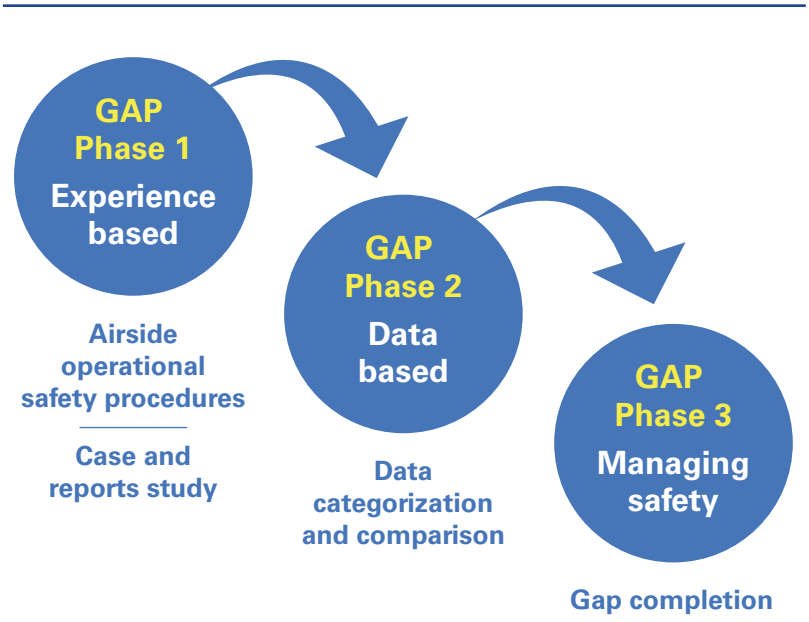

Figure 2: Steps of SMS gap analysis

Step A2.2: Development of safety management process

The objective is to implement all essential **safety management processes.** This phase consolidates into the SMS the aerodrome's existing safety activities and develops those additional safety activities which may have been identified by the SMS gap analysis. In this phase, the accountable executive, SMS manager and SMS implementation team develop safety policy and objectives, establish the SMS committee and write the SMS Manual and procedures. This phase can take about 12 months to complete.

Safety policy and objectives:

a) Binding these components and elements together contributes to developing a positive safety/ just culture in the aerodrome organization. With an effective SMS programme it will be easier for the aerodrome to develop a positive safety culture.

b) Management must define the safety standards and polices for the aerodrome organization, encouraging participation in the SMS process, facilitating the flow of information, and supporting safety objectives by allocating the required resources.

c) The safety policy is management's vehicle to communicate its intentions and commitment to safe operation and continuous improvement. By reading this policy, all staff members should be able to identify and understand that the safety of the aerodrome's operations is management's top priority and must be the top priority for staff members as well.

d) Safety objectives identify specific outcomes that the SMS is trying to achieve. Generally speaking, an objective is a desired safety outcome for a specific activity or process. Usually, an organization will want to achieve objectives within a finite period of time and will set a deadline for each objective.

e) Safety objectives give individuals and the organization measurable targets to work toward. They provide direction and guidance for safety management activities. Once the SMS programme is up and running, safety objectives should be linked to the safety risk profile to identify safety risks. Analysis of how well safety risks are mitigated by risk-mitigation procedures should be used as a basis for performance measurement.

f) Safety objectives should be based on the risks associated with operational activities and should be compatible with the aerodrome's safety policy.

IIAC Safety Policy

Safety is core value and the highest priority in airport operations.

For customer's safety
Safe operation of airport should be recognized as the responsibility of the management and all employees, and ; through the provision of safe environment constantly, we make an effort continuously to be Global Top 5 in airport safety related area.

For promoting open safety culture
We encourage to facilitate smooth communication and raise issues freely ; and
pursue positive safety culture by sharing safety information.

For removing hazards and prevention of accident
we promote voluntary reporting system, observe related regulations and procedures, and resolve the related problems in positive attitude.

For efficient and safe airport operations
IIAC and related company should cooperate all together, duly perform their duties related to airport safety by systematic organization and practical use of resources.

Figure 3: Safety Policy of Incheon Airport

Non-reprisal reporting policy: Management should foster a positive "just culture" (safety culture) and encourage open reporting of all safety hazards or incidents. Employees must be responsible for communicating any information that may affect safety of flight, facilities, equipment or persons. Employees should not be disciplined for reporting safety issues in accordance with the procedures described in this and other aerodrome safety publications. However, this policy does not apply to the following:

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a) reckless conduct;
b) criminal behaviour;
c) violations of the aerodrome's drug and alcohol policy;
d) deliberate or willful disregard of aviation department policies, administrative directives, regulations, procedures; or
e) intentional falsification.

An employee should not be exempt from disciplinary action when the employee knowingly fails to report a safety-related failure, concern or issue.

Establishment of an SMS committee: The objective of the SMS committee is to provide a forum in which to discuss issues related to the safety performance and the health of the SMS. The SMS committee makes recommendations and decisions concerning safety policy and procedures and reviews safety performance results. The accountable executive should be the chairman of the SMS committee; in his/her absence, the SMS manager will chair the SMS committee meeting. Meeting minutes and action items must be recorded as part of normal committee functions and be made available to each of the members of the SMS committee. The objective of the SMS committee is to provide a source of expertise, guidance and advice on safety matters to the organization. The SMS committee's responsibilities are to:

a) review and comment on safety-management strategies;
b) review and comment on safety risk-mitigation strategies;
c) review and accept safety risk-assessment analysis performed by aerodrome staff;
d) promote the SMS programme at the aerodrome by leading by example; and
e) promote safety awareness to the aerodrome and its stakeholders.

Figure 4: Structure of the SMS Committee of Incheon Airport

Development of SMS manual and procedures: The SMS manual contains specific information pertaining to the safety policies and procedures for the aerodrome and should outline the methods to support the implementation of SMS principles. The SMS manual should include instructions and information necessary for personnel to perform their duties and responsibilities with a high degree of safety. It should emphasize the personnel and other requirements needed for:

a) overseeing the collection and analysis of safety data;
b) working with management to identify hazards and determine associated risks;
c) guiding management in developing and implementing intervention strategies to mitigate risks;
d) tracking and evaluating the effectiveness of safety interventions;
e) providing safety awareness among all employee groups and contractors; and
f) promoting safety by disseminating the results of safety investigations and analysis; and sharing safety lessons learned both internally within the aerodrome organization and externally from or with stakeholders, as warranted.

The policies and procedures contained in the SMS manual should be promulgated to attain compliance with applicable regulations (as required), standard operating procedures, the aerodrome's rules and regulations, and the Aerodrome Operating Certificate. The manual should make clear which requirements will take precedence when a conflict exists between the SMS manual and other document (e.g., "When a conflict exists between this manual and other documents/regulations/SOPs, the more restrictive guidance will take precedence.").

Step A2.3: Establishment of the safety-risk management process

The objective is to establish a **safety-risk management process**. The risk-management process should be designed to assure proactively and/or reactively that any safety risk is identified, evaluated, documented, eliminated or controlled within the defined risk parameters of the process. The principles of risk management are to accept risk only when necessary and when the benefits outweigh the costs; to make risk decisions; and to integrate risk management into planning at all levels within the organization. This phase can take about 18 months to complete.

Development of the **safety-risk management process** includes, but is not limited to, the following steps:

a) building risk matrices which are relevant to the organization's operational or production processes and the instructions within the SMS manual;
b) identifying current and/or potential hazardous scenarios for equipment, property and personnel;
c) assessing the severity of each hazard and the likelihood that consequences will occur;
d) monitoring acceptable risks determined to be within safety performance criteria;
e) mitigating unacceptable risks to levels that are acceptable;
f) evaluating the effectiveness of measures implemented to mitigate risk;
g) ensuring risk management is applicable to all divisions within the organization's structure;
h) ensuring risk assessment is initiated when the need to use the risk-management process is identified;
i) ensuring risk assessment applies special technical managerial skills to the identification and control of hazards throughout the life cycle of a project, programme and/or activity;
j) establishing an internal reporting and investigation system—this should include mandatory and voluntary reports;
k) establishing data collection, processing and analysis of safety reports; and
l) developing an agreement with the oversight authority on safety performance indicators and safety performance targets.

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In order to understand safety-risk management better, the terms "hazard," "consequence," "risk" and "mitigation measure" need to be understood. See the illustration below.

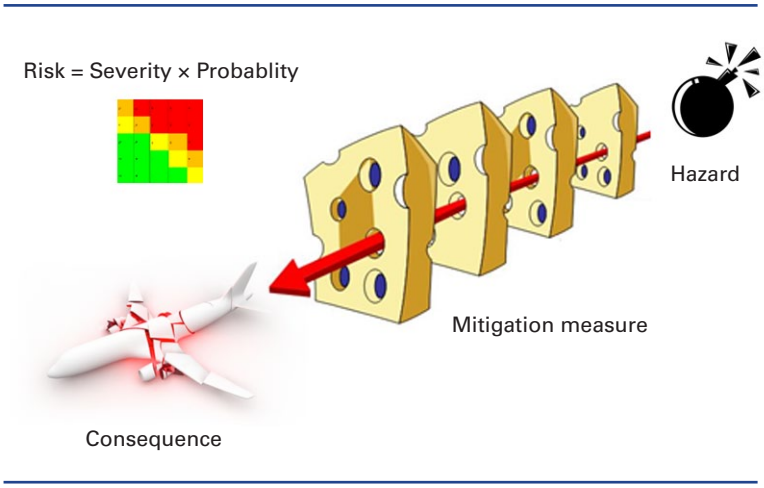


Figure 5: A Concept of Accident Causation

There needs to be a formal process for the **management of change.** This process should address the stability of systems and operational environments, past performance and regulatory, industry and technological change. It should:

a) ensure that management of change procedures addresses the impact on existing safety performance and risk-mitigation records before implementing new change; and
b) establish procedures to ensure that safety-risk assessments of new aviation operations, processes and equipment are completed before these are commissioned.

Step A2.4: Improvment of Safety Management System

The final phase of implementation of the SMS is **collecting safety data and analyzing it**, by purchasing or building a database that can track training, incidents and accidents, property damage and payouts of insurance claims. An SMS internal evaluation programme must also be established. This phase can take about 18 months to complete and should establish:

a) **A continuous improvement programme for the SMS**: As part of the risk-management process, there should be an SMS continuous improvement programme. This involves establishing an internal evaluation programme, which is a central part of the SMS. It provides the organization with an independent, systems-oriented evaluation process (allowing evaluation of both external and internal factors and regulations) which focuses on:

i. evaluating the organization's compliance with external regulatory requirements;
ii. identifying areas of non-conformance to internal policies and procedures;
iii. identifying opportunities to improve policies, procedures and processes;
iv. evaluating corrective actions to ensure effectiveness and eliminate recurrences of non-compliance; and
v. ensuring that technical issues receive the attention and support of senior management.

b) **An SMS training programme**: This needs to be established to ensure all relevant staff members are current in all aspects of safety as required. Examples of required training include:

i. SMS initial training (this explains what the SMS is and does);
ii. airfield driver training;
iii. runway safety training;
iv. first aid/CPR training;
v. blood-borne pathogen training, etc.; and
vi. safety training courses, etc.

c) **Safety data collection**: Management needs to research and authorize acquisition of some type of database software package that is designed to track safety data and is able to display trends in the data. This software package should also allow users to build dashboards for comparing current data and historical data. The software also must have a records management module, for use by the aerodrome's safety department/division.

STEP B (DO)

IMPLEMENT SAFETY RISK MANAGEMENT

B

Aviation safety-related hazards exist at all levels in the organization. The objective of safety risk management is to identify hazards, assess the subsequent risks and develop appropriate mitigation measures in the context of the delivery of the organization's products or services. This can be achieved by means of the following four key process elements:

- **Hazard identification and risk mitigation**: This is the critical first step in managing safety, by identifying hazards, assessing the subsequent risks and developing appropriate mitigations.
- **Management of change**: This process systematically and proactively identifies hazards and mitigates the subsequent risks in relation to change.
- **Incident reporting and investigation**: This process is performed to obtain information on actual or potential safety deficiencies, correct and learn from deficiencies in a timely fashion.
- **Coordination of emergency response planning**: This process ensures continuous improvement of the systems and procedures contained within the plan; and coordination with the emergency response plans (ERPs) of other, interfacing organizations.

SMS Element B1 HAZARD IDENTIFICATION AND RISK MITIGATION

Ref: ICAO Annex 19, Appendix 2, Section 2.1 (Hazard Identification)

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

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

Ref: ICAO Annex 19, Appendix 2, Section 2.2 (Safety Risk Assessment and Mitigation)

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

Identifying hazards and mitigating the subsequent risks

The process of identifying hazards and mitigating risks is depicted in Figure 6. It comprises five steps. Each of these steps is described in detail in this chapter.

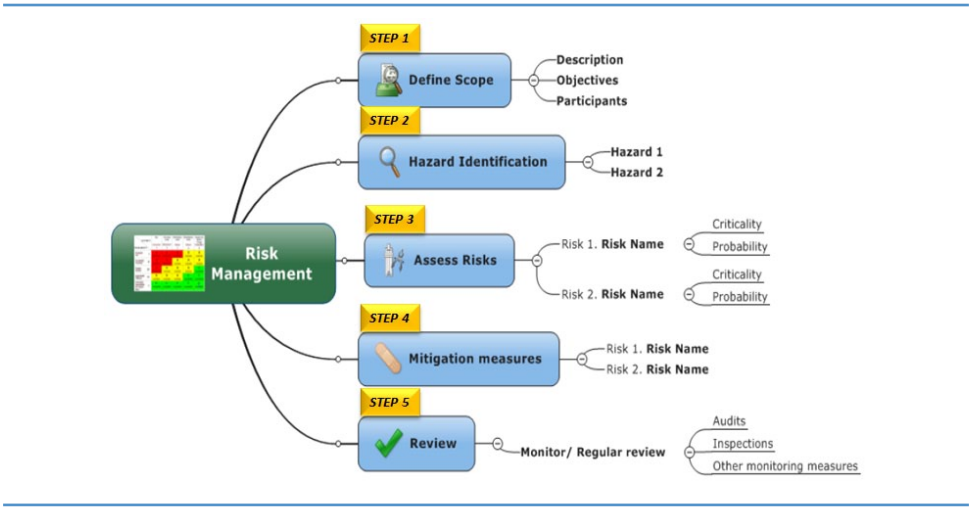


Figure 6: ICAO SMS Safety Risk Management Framework

Step B1.1: Define the scope

This step describes the process, system, activity/operation, situation or change that generates hazards which need to be assessed for the risks they may present. The main objectives of this step are 1) to characterize, limit and document the scope of the problem or change; and 2) to specify stakeholders who will affect or be affected by the scope in question.

Step B1.2: Hazard identification

The key to this step is to answer the question "**What can go wrong?"** Hazards can be as obvious as jet blast or unclear pavement markings; or they can be more subtle, for instance an overstressed ATCO performing air traffic control tasks. Form a group including, at minimum, a facilitator (who knows the risk-assessment process thoroughly) and subject-matter experts (who normally are technical or operations personnel who are knowledgeable about the scope of the operations under scrutiny for the potential hazards they may present. Use this group to look for hazards from all four of the following viewpoints and the interactions among these aspects:

- **People**: Human performance can be degraded by physical factors (e.g., lack of strength), physiological factors (e.g., fatigue, illness), psychological factors (e.g., stress, depression) and psychosocial factors (e.g., conflicts at work or at home).

- **Machinery and equipment**: Performance of machinery and equipment can be affected by poor design, improper installation, poor layout, lack of maintenance, misuse, etc.

- **Organizational components**: These encompass issues such as poor planning, lack of resources, conflicting goal setting, lack of or insufficient procedures, poor recruitment, lack of training, insufficient emergency readiness, etc.

- **Environment**: This includes problems such as violation of system operating limits, unsuitable weather conditions, unsuitable ambient environment (e.g., hot, cold, dry, moist air), etc.

As shown in Table 1, hazards can be identified by various means.

Predictive means	Proactive means	Reactive means
Monitoring of normal operations Monitoring of change Test data Simulation data	Incident trend analysis Safety directives Brainstorming sessions Safety surveys, audits and inspections Feedback from training Hazard and unsafe condition reports	Accident reporting Accident investigation Accident trend analysis

Table 1: Means of Identifying Hazards

Step B1.3: Assess risks

The key to this step is to answer the following questions in sequence for each hazard:

a) **Consequences: What possible adverse consequence could the hazard induce?** Be aware that a hazard can lead to more than one consequence.

b) **Severity: How severe could the adverse consequence be, taking as reference the worst foreseeable (but plausible) scenario and considering the existing mitigation measures in place?** The scale below can be used to assess severity.

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

Table 2: ICAO DOC 9859 3rd Edition SMM Safety Risk Severity Table

c) **Probability: How likely is it that the adverse consequence could occur, considering the existing mitigation measures in place?** Be aware that the probability of an adverse consequence occurring becomes greater through increased exposure to a hazard. The scale below can be used to assess probability.

Likelihood	Meaning	Value
Frequent	Likely to occur many times (has occurred frequently)	5
Occasional	Likely to occur sometimes (has occurred infrequently)	4
Remote	Unlikely to occur, but possible (has occurred rarely)	3
Improbable	Very unlikely to occur (not known to have occurred)	2
Extremely improbable	Almost inconceivable that the event will occur	1

Table 3: ICAO DOC 9859 3rd Edition SMM Safety Risk Probability Table

d) **Magnitude of Risk (A hazard's severity multiplied by its probability): Where is the risk plotted on a risk assessment matrix?** The risk assessment matrix below can be used.

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

Table 4: ICAO DOC 9859 3rd Edition SMM Safety Risk Assessment Matrix

e) **Acceptability: Is the magnitude of the risk (its severity times its probability) acceptable?** On one hand, it is impossible to eliminate all risks and create a risk-free safe environment. On the other hand, it is necessary to define the order in which all identified risks should be treated, particularly when the aerodrome does not have all the resources needed to treat all risks in the short term.

Therefore, the aerodrome needs to determine whether a risk is acceptable or not, and compare and prioritize among risks. Either of the two risk tolerability matrices below can be used to assist this process.

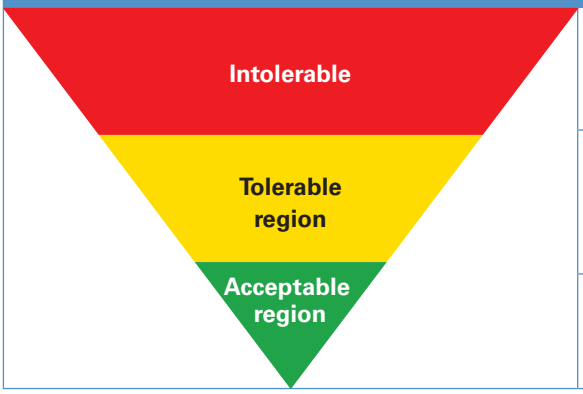
Tolerability description	Assessed risk index	Suggested criteria
	5A, 5B, 5C, 4A, 4B, 3A	Unacceptable under the existing circumstances
	5D, 5E, 4C, 4D, 4E, 3B, 3C, 3D, 2A, 2A, 2C, 1A	Acceptable based on risk mitigation. It may require management decision.
	3E,2D,2E, 1B, 1C, 1D, 1E	Acceptable

Table 5: ICAO DOC 9859 3rd Edition SMM Safety Risk Tolerability Matrix

Risk index range	Description	Recommended action
5A, 5B, 5C, 4A, 4B, 3A	High risk	Cease or cut back operation promptly if necessary. Perform priority risk mitigation to ensure that additional or enhanced preventive controls are put in place to bring down the risk index to the moderate or low range.
5D, 5E, 4C, 4D, 4E, 3B, 3C, 3D, 2A, 2A, 2C, 1A	Moderate risk	Schedule performance of a safety assessment to bring down the risk index to the low range if viable.
3E,2D,2E, 1B, 1C, 1D, 1E	Low risk	Acceptable as is. No further risk mitigation required.

Table 6: ICAO DOC 9859 3rd Edition SMM Safety Risk Tolerability Matrix Alternative

It is important to note that while the risk assessment matrix concepts of severity and probability are universal, each airport may determine its own scale for severity and probability and determine its own specific levels of risk tolerance. It is essential for an aerodrome to have its risk assessment matrix and tolerability matrix approved by the accountable executive. See further examples of risk assessment matrices and tolerability matrices in Annex 1.

Step B1.4: Mitigation measures

Follow the steps below in sequence to eliminate or reduce risks:

a) **Identify feasible mitigation measures**: Aim to reduce or eliminate the probability of a consequence (e.g., by closing a taxiway for operations during maintenance activities), or the severity of a consequence (e.g., by improving the emergency response), or both.

b) **Re-assess risks associated with identified hazards**: Repeat **Step B1.3: Assessing and evaluating risks** to consider the action of newly introduced risk-mitigation measures in concert with previously existing measures.

c) **Develop an action plan**: Translate risk-mitigation measures into tasks and specify what actions are to be performed, how they are to be performed, when they are to be performed and by whom they are to be performed.

Try to explore all four of the following mitigation strategies before choosing the preferred risk-mitigation measure, considering factors such as timeliness, cost, organizational capabilities and overall effectiveness.

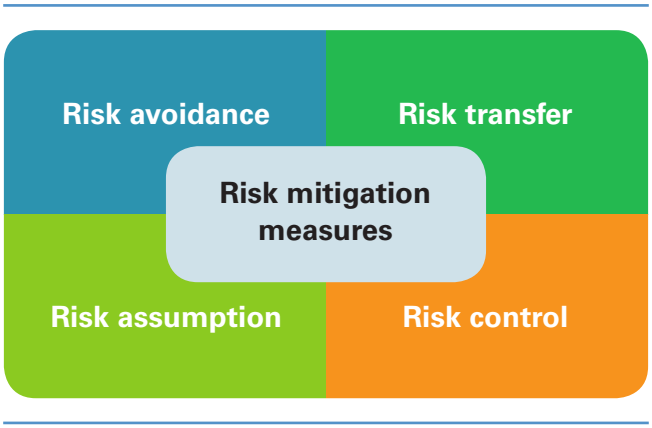


Figure 7: Types of risk mitigation measures

- **Risk avoidance**: Prevent an adverse consequence occurring by selecting a different approach or by not participating in the operation, procedure or system development. For example, if operation of a crane in the vicinity of an approach to a runway violates the outer limitation of the approach/departure surfaces, an airport might determine it would be better to prevent any risk of a collision between aircraft and crane by closing the runway, rather than trying to keep it open as an example, by temporarily displacing the runway threshold.

- **Risk transfer:** Shift the ownership of risk to another party. Where applicable, transfer the risk to the organization or operation most capable of managing it. For example, an airport may issue a NOTAM advising pilots of hazardous runway conditions, leaving pilots to assess the operational safety of landing their aircraft given current conditions. However, while risk transfer is an acceptable means of dealing with risk, it cannot be the only method of mitigation: the airport must still mitigate the safety risk to a medium or low level.

- **Risk assumption:** When a risk falls into the "acceptable" parts of the safety risk tolerability matrix, there is normally no need to establish further mitigation measures.

- **Risk control**: Perform actions which reduce or eliminate the risk. Examples include improvement of airport infrastructure, improvement of designs or technologies, implementation of additional procedures, introducing new training or campaigns, etc.

Note: Keep in mind that risk mitigations based on administrative solutions (e.g. signage/warnings, procedures) and human performance (e.g. training, supervision) are the least reliable defenses. They are less reliable than mitigations based upon elimination (e.g. removing obstacles), substitution (e.g. using buses to transfer passengers rather than have passengers walk on the apron) and engineering/mechanical solutions (e.g., using detection or surveillance systems).

Step B1.5: Review

Risk assessment and the associated action plan must be:

- **communicated**, to ensure that affected personnel and stakeholders are aware of the residual risks. Communication may be achieved by means of training, procedures, meetings/ workshops, or newsletters, etc.; and

- **documented in a hazard register**, and **reviewed regularly**, to ensure that identified hazards and their associated risks continue to exist and that measures implemented to mitigate the risks work as expected. Reviews and updates should be performed whenever there is a need; for example, when a new hazard is identified, a previously existing hazard is eliminated or a risk level has changed. Please refer to examples in Annex 2

SMS Element B2 MANAGEMENT OF CHANGE

Ref: ICAO Annex 19, Appendix 2, Section 3.2 (The Management of Change)

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

Change can introduce new hazards, and impact the appropriateness and/or effectiveness of existing risk-mitigation measures and strategies. Therefore, whenever changes are contemplated that would imply an effect on the level of safety, the change management process should be started ***before*** the implementation of the contemplated changes.

Change management process

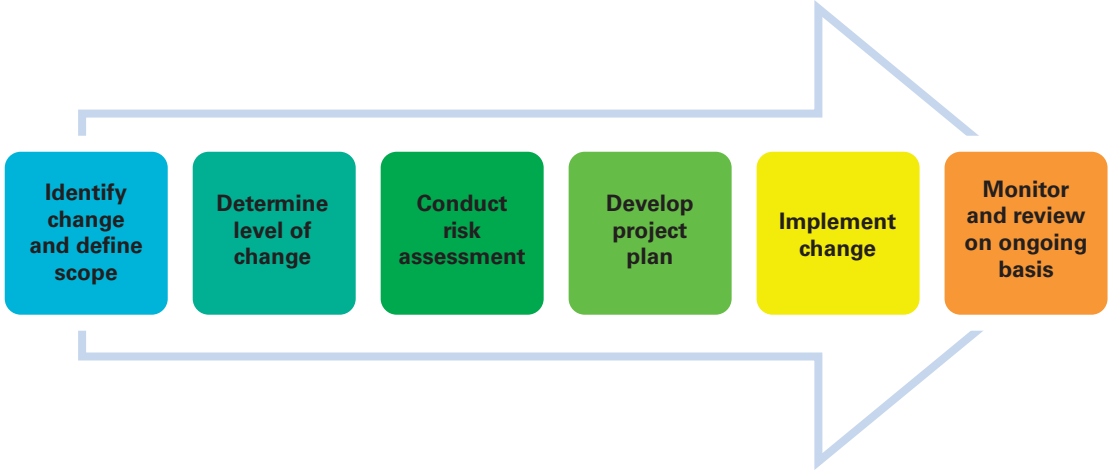


Figure 8: Change management process

Step B2.1: Identify change and define scope

As with **Step B1.1 Define scope** under **SMS Element B1: HAZARD IDENTIFICATION AND RISK MITIGATION**, it is necessary to describe the scope of the change and identify stakeholders during this step. To begin with, the key is to identify changes.

Change may be external to the organization, or internal. It is any proposed action that will give rise to a difference (e.g., an introduction, development, substitution, modification, revision or withdrawal/ decommission) in, for example:

- **Physical characteristics**, such as:
  - aerodrome infrastructure (e.g., a new building, or relocation of a building);
  - the layout of runways and/or taxiways;
  - introduction of a new aircraft type;
  - communications, navigation, surveillance or other safety-significant systems and equipment (hardware, software, human-machine interface); and
  - new or alternative technology.

- **Organizational characteristics**, such as:
  - training programmes;
  - airside work processes and associated management systems and procedures;
  - key personnel and/or safety responsibilities;
  - rapid organizational expansion or contraction; and
  - service providers and tenants.

- **Regulations and standards** under which the organization operates.

Changes can be identified through the SMS elements described under **STEP C (CHECK): EVALUATE ACHIEVEMENTS THROUGH SAFETY ASSURANCE**.

Change management may not be required where standard operating procedures adequately address:

- preventive maintenance and repair;
- identical replacement of pre-existing infrastructure or equipment; and
- areas outside of the runway, taxiway or apron area.

Step B2.2: Determine level of change

A two-level change management process can be implemented to assist business and operational groups in the process of assessing the risk involved when making a change.

The first level can be considered a triage to determine if a deeper look at the risk is required. A simple change form can be used. This form takes little time to complete but it can assist participants in understanding the true nature of the change being planned and some of the associated risks.

Should a deeper look at the change be required, a second-level change form can be completed. This form considers the hazards the change may create, the associated risks that would make those hazards unsafe and mitigation measures to eliminate the hazards or mitigate the risks. Examples can be found in Annex 4, "Change Risk Assessment Examples".

Step B2.3: Conduct risk assessment

Refer to **Step B1.2 Hazard Identfication** and **Step B1.3 Assess risks** to evaluate risks under **SMS Element B1: HAZARD IDENTIFICATION AND RISK MITIGATION**.

Step B2.4: Develop project plan

Refer to **Step B1.4 Mitigation measures** under **SMS Element 1: HAZARD IDENTIFICATION AND RISK MITIGATION**.

Step B2.5: Implement change

a) Complete the change tasks identified in the project plan
b) Review progress
c) Review and revise the SMS based on the impact of the change

Complete a documented final inspection to confirm if a new or modified facility has been built in accordance with published aviation regulations and standards before it becomes operational.

Step B2.6: Monitor and review on an ongoing basis

Once a change is implemented, the change form stands as a historical record that provides future stakeholders with an understanding of the elements of the decision to change and why the decision was made.

SMS Element B.3 INCIDENT REPORTING AND INVESTIGATION

Ref: ICAO Doc. 9774, Chapter 3D.4 (Aerodrome Operator's Safety Management System)

3D.4.3 The aerodrome operator shall require all users of the aerodrome, including fixed-base operators, ground handling agencies and other organizations referred to in regulation 3D.4.2, to cooperate in the programme to promote safety at, and the safe use of, the aerodrome by immediately informing it of any accidents, incidents, defects and faults which have a bearing on safety.

Incident reporting and investigation process

The objective of accident/incident reporting is to prevent occurrence and re-occurrence of accidents and incidents, not to attribute blame or liability if they happen. Follow the steps below in sequence to gather reports of accidents and incidents:

Figure 9: Incident reporting and investigation process

Step B3.1: Establish reporting requirement

All personnel on the aerodrome, not only those directly employed by the airport, should be encouraged to report events that may lead to an incident or accident. This is so that the airport authority and supervisory departments receive correct information in order to be able to analyze the risks such events present and take action.

In order to build a well-functioning reporting system which all personnel on the aerodrome can trust and are willing use to report safety-related episodes, the aerodrome operator must clearly define and communicate:

- **The non-punitive "just culture" principle**

  The aerodrome operator's management must make a commitment that reported safety information will be kept confidential as far as possible. The operator's management must also commit to the principle that both the people submitting the report and the people who may be responsible for the reported episode will be protected and will not be punished (e.g., have their licenses suspended) for the reported safety information, unless the unsafe act is committed deliberately or gross negligence is demonstrated. This commitment must be communicated clearly to all relevant personnel and management must adhere strictly to it.

  If it is not possible to gain the trust of the employees, an offer of anonymous reporting can be considered. Anonymous reporting systems have the disadvantage that call-backs are not possible, so information cannot be verified and further explanations cannot be sought from any individuals reporting anonymously.

- **Mandatory reporting**

  A mandatory reporting system must be established to ensure that, at a minimum, safety-related accidents/incidents are reported according to regional and/or national regulations. For example, in Europe, the Regulations (EU) No 376/2014 and No 2015/1018 have laid down clear requirements defining the categories of safety-related accidents/incidents that must be reported by aerodrome operators.

Where a mandatory reporting system is in force, everyone is expected to report anything they notice when regulations, procedures and standards in their area of work are not being followed. This is not always obvious in aviation, because there are so many different factors which can have an impact on operations. All personnel on the aerodrome should report risks that may lead to incidents or accidents, even where they are unsure how significant any irregularities they have noticed may be.

Mandatory reporting requirements often identify reporting of very specific facts, highly technical issues, or both; therefore, there is also a need for a voluntary reporting system.

- **Voluntary reporting**

A voluntary reporting system can be established to facilitate the collection of details of accidents/incidents which may not be captured by the mandatory reporting system; or to acquire other safety-related information not required by the mandatory reporting system.

Any hazard that has the potential to cause damage or injury or that threatens the organization's viability should be reported. A hazard should be reported if it is believed that:

- something can be done to improve safety;
- other aviation personnel could learn from the report; and
- the system and its inherent defenses did not work as it should have done.

In short, if any person working on the aerodrome sees a possible safety-related event but is in doubt as to the event's safety significance, the person should report it.

The generic rule for reporting is established by the principle: ***If in doubt, report it***.

Step B3.2: Collect incident reports

Once the basic reporting requirements are settled and have been communicated well by management, the reporting process should be established. This process should be as simple as possible and at the same time well-documented, including details regarding what, where, when and to whom to report.

Means for accident/incident reporting include, but are not limited to:

- **Dedicated telephone line:** This may be a single reporting number or a series of numbers (i.e., emergency/non-emergency numbers).

- **Email address:** Dedicated email addresses should be set up where free-form reports can be emailed.

- **Paper form:** These should be blank report forms that can be completed by hand and returned to a collection location.

- **Electronic reporting form:** Reporting forms available through the airport website or intranet portal. These forms have pre-set information fields that can be completed online and sent immediately, or downloaded, completed by hand and sent in manually.

- **Electronic incident-reporting tool:** Usually used by responders to incidents, electronic reporting tools are often proprietary systems with associated databases that allow the organization to receive, organize, report and search on large numbers of incident records.

- **Smartphone app:** Such apps will provide reporting forms similar in concept and detail to those described above.

Examples of means for accident/incident reporting are in the Annexes.

The operator of the aerodrome should choose those means for collecting accident/incident reports which are most appropriate to the size of the airport. While larger airports might be able to sustain the personnel and infrastructure required to support a complete safety department and online reporting management systems, it is entirely appropriate for smaller airports to take a less intensive and complex approach to their safety reporting systems. For example, smaller airports may use a paper-based approach and handle report management on a part-time basis.

Regardless of the situation, a well-functioning reporting system should possess the following characteristics:

- **Confidentiality:** The system must protect the personal information of both the person reporting an accident/incident and any person involved in it.

- **Accessibility:** Anyone may submit a report, from anywhere work takes place.

- **User-friendly:** The reporting system must not be too time-consuming or too difficult to use.

- **Bi-directionality (two-way communication):** People who submit a report should receive feedback and see results.

- **Relevance:** Reports must be used only for safety-management purposes.

- **Support:** Promotional campaigns should be run to encourage people to use the system.

Step B3.3: Root cause analysis and internal investigation

In situations where the causes of an accident or incident are unclear or where time and resources are being wasted on addressing symptoms, a root cause analysis may help to reveal the underlying issues creating the problem.

Criteria where a root cause investigation is strongly recommended are as follows:

- the incident/accident compromised the safety of the runway operating environment;
- the incident/accident resulted in damage to an aircraft, where any portion of the airport facility caused or may have contributed to that damage; and
- evidence suggests that the incident is part of a trend.

Follow the steps below in sequence to identify root causes:

a) Gather facts and reconstruct the storyline by asking "who + what + where + when + how + why."

Accidents/incidents are seldom caused by a single human error or technical failure. They are mostly a result of series of failures in different parts of multiple systems. Therefore, you may need to conduct an internal accident/incident investigation (including visiting the scene, conducting interviews, taking phones, and checking records, etc.) to improve understanding of the events leading up to the accident/incident.

Keep in mind that apportioning blame or liability is not the goal of internal accident/incident investigation. The sole goal is to minimize the chance or reoccurrence and in turn to prevent further and/or more severe accidents in the future, rather than to identify persons to discipline.

b) Identify direct causes (i.e., symptoms)—"Fishbone" diagram

The main purpose of using a fishbone diagram is to ensure that, during the process of identifying direct causes, the investigator or investigation team will not focus with preconceived ideas on just one single aspect of the accident/incident. The fishbone diagram allows hard-engineering issues and human-factors issues to be drawn out equally during investigation.

A fishbone diagram normally contains six elements: people, machines/equipment, materials, methods, measurement and environment. Connect the gathered facts to see if the investigation has covered all of these aspects. Application of a 'Fishbone' diagram is displayed in Figure 9.

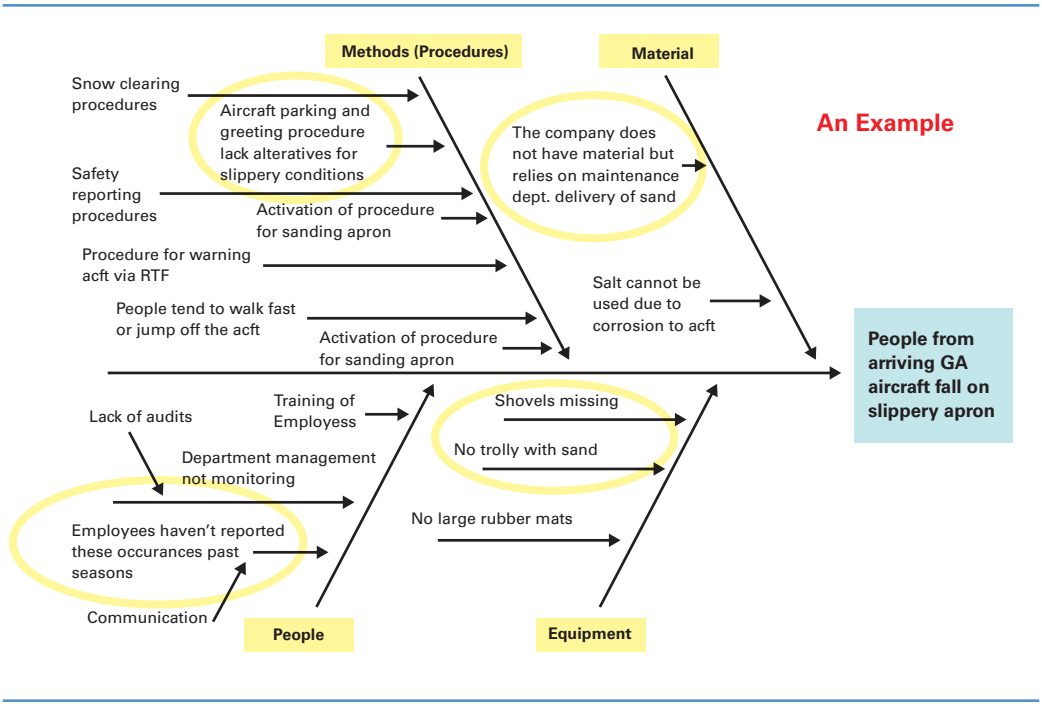


Figure 10: Example of a completed fishbone diagram

c) Identify root causes ("5 Whys")

The 5 Whys technique can be used to drill down to its root causes the individual direct cause of an accident/incident, as identified through using a fishbone diagram.

Keep asking the question "Why?" to peel the layers of symptoms away until you reach the deepest level of root cause(s) which is still within the range of your organization's influence and is fundamental enough to prevent reoccurrence. For example, if you conclude that global warming is a root cause of extreme weather which leads to an aircraft accident, your organization will not be able to take any actions upon that finding and so it is not a relevant root cause. Also, concluding that fast driving on the ramp is a root cause of collisions between aircraft and vehicles will not be sufficient, because there must be deeper root causes behind this behaviour. As a rule of thumb, you normally should ask "Why?" five times in order to reach a reasonable root cause your organization can act upon.

An application of the 5 Whys technique is displayed in Figure 11.

Note: One direct cause or indirect cause can be branched out to multiple root causes. Also, multiple direct causes or indirect causes can be concluded to stem from the same root cause.

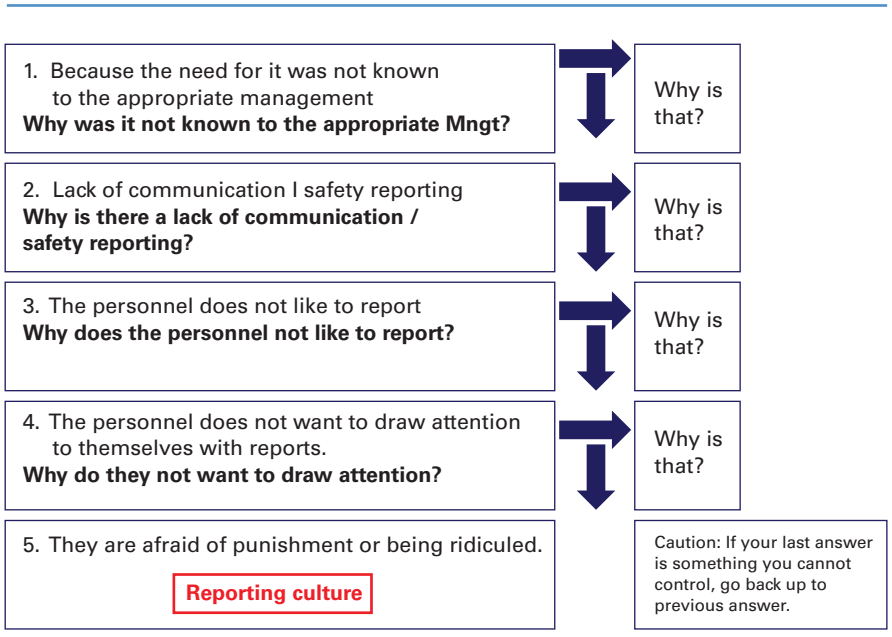


Figure 11: Example of a completed 5 Whys diagram

Step B3.4: Action recommendation and feedback

Once root causes are identified, recommendations should be made in order to treat the root causes, in order to prevent reoccurrence. The four mitigation strategies described in **Step B1: 4 Mitigation measures** under **SMS Element B1: HAZARD IDENTIFICATION AND RISK MITIGATION** are also applicable here.

Upon completion of the investigation, a closing meeting should be scheduled between the investigation team and the parties responsible for implementing recommendations. All parties should commit themselves to respect the results of the investigation and to develop a corrective action plan in response to the findings. Corrective action plans should be documented in a way that allows for accountability and future follow-up.

Feedback to person(s) reporting an incident/accident

To build up and maintain employees' confidence in reporting accidents/incidents, ways should be established for employees to follow up to find out what actions are taken as a result of their reports. Feedback to employees is even more important when no action is taken, because in the absence of any visible action and follow-up, employees will come to see less meaning in reporting accidents/incidents and eventually will stop reporting them.

For anonymous reports, this feedback may be circulated in the form of a notice board, a message on the airport intranet or an e-mail to all employees containing a brief statement of the reported issue and action(s) taken based on the report, or the reason(s) why no action needs to be taken.

Step B3.5: Trend analysis and continuous monitoring

Monitor and analyze reported accidents/incidents continuously for incident location, time or period, work process involved, type of hazard, direct and root causes, etc., to spot trends and identify root causes of groups of accidents/incidents. Based on the trend analysis, the need to review or reassess any safety measure should be evaluated, documented and acted upon accordingly. Refer to **SMS Element C1: SAFETY PERFORMANCE MONITORING** under **STEP C (CHECK): EVALUATE ACHIEVEMENTS THROUGH SAFETY ASSURANCE**.

SMS Element B4 COORDINATION OF EMERGENCY RESPONSE PLANNING

Ref: ICAO Annex 19, Appendix 2, Section 1.4 (Coordination of Emergency Response Planning)

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

The Emergency Response Plan (ERP) provides an overall framework for managing emergencies affecting the airport. The ERP is activated when there is an accident or incident. It defines the actions to be taken during an emergency and procedures for resuming normal operations.

Coordination of ERPs is of high importance to ensure the coordinated response of all organizations involved in airport operations. The coordination should also take the roles of contractors/third parties into consideration.

While emergency response planning and its coordination is an operational process, it is highly important that the ERPs of all organizations involved in an emergency response be coordinated.

Continuous improvement of the systems and procedures contained within the aerodrome ERP may be obtained by:

a) conducting a review of the relevant parts of the emergency response plan after a full or partial exercise;
b) debriefing and analyzing the emergency response operations after an emergency situation; and
c) developing new emergency procedures or systems as part of the emergency response plan when new hazards are identified by the safety management system.

For further information on Emergency Response Planning, please refer to the ACI Handbook on Emergency Preparedness and Contingency Planning.

STEP C (CHECK)

EVALUATE ACHIEVEMENTS THROUGH SAFETY ASSURANCE

C

Safety assurance consists of processes and activities undertaken by an airport operator in order to determine whether the SMS is operating as expected. It can also verify the safety performance of your organization. Safety assurance monitors the airport's internal SMS processes. It also monitors changes to the external environment and thus may help identify changes in risk and any degradation in the delivery of safety-risk controls. Corrective action can then follow. The overall aim is to monitor the effectiveness of the safety-risk controls.

The **ICAO Safety Management Manual** includes text relevant to this topic. The text notes the benefits of gathering data from reporting of incidents, accidents and trends. Sources of this data can be internal reporting systems or data reporting (sometimes mandatory) for or by the state. In general, reporting should be open to all staff to ensure that the best picture of risk is obtained.

Other methods include undertaking safety studies, safety reviews (often associated with changes), audits and investigations.

These methods are achieved by using the following four key elements:

- **Safety performance monitoring** can verify safety performance and validate the effectiveness of safety risk management.
- **The safety survey** is a cost-effective, easy-to-conduct and flexible method to allow the workforce to provide improvement proposals, and self-reflect and confirm their conformance with SMS requirements. Recommend improvements where needed to provide assurance to managers of the safety of activities within their areas and to confirm conformance with applicable parts of their safety management systems.
- **Audit and inspection** activities should be undertaken to identify and eliminate any sub-standard performance of the SMS and safe operation, before it has an impact on safety.
- **Documentation** should be used to demonstrate activities performed or results achieved.

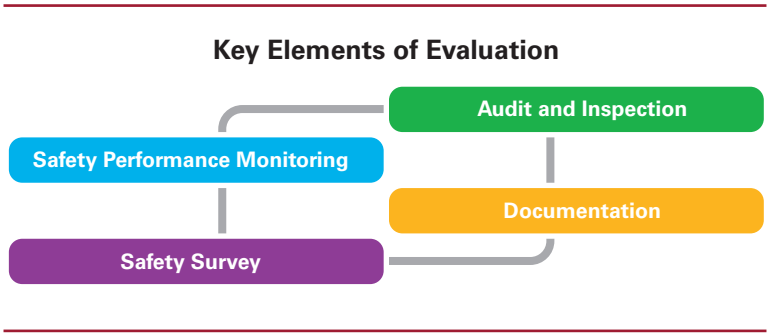


Figure 12: Safety assurance evaluation elements

SMS Element C.1 SAFETY PERFORMANCE MONITORING

Safety performance monitoring and measurement

Ref: ICAO Annex 19, Appendix 2, Section 3.1 (Safety Performance Monitoring and Measurement)

3.1.1 The service provider shall develop and maintain the means to verify the safety performance of the organization and to validate the effectiveness of safety risk controls.

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

Feedback is critical for safety performance so that it can be evaluated and changes made when necessary, and because stakeholders may need assurance of the level of safety within the organization.

Every airport should establish systems to ensure it receives feedback on safety performance and that this data is analyzed.

Types of monitoring will depend on the size and complexity of the organization. Monitoring can include, but is not limited, to:

- audits;
- a hazard/incident reporting system;
- reports from front-line supervisors;
- formal/informal inspections of safety-critical areas;
- capturing performance data;
- safety surveys of employees' views on safety;
- systematic review of and follow-up on reports of safety issues; and
- communicating safety results to all personnel.

Feedback data should be used to evaluate safety performance and identify changes. Each finding on the overall level of safety within the organization should be available to all stakeholders.

Risk profile

Airports establish risk profiles to highlight their areas of greatest risk exposure and take necessary steps toward continually improving safety performance. The risk profile contains a description of the high-risk hazards to aircraft present at the airport and a description of the activities in place to mitigate the hazards to an acceptable risk level. The risk profile is used to formulate safety objectives and goals, which measure the effectiveness of the hazard mitigations listed on the risk profile.

Risk profiles should reflect each airport's unique operating environment. Some high-risk hazards are present at most airports, while other high-risk hazards might address an individual airport's unique geography, climate, aircraft mix, and other relevant factors. The risk profile should be reviewed annually, in advance of setting the airport's annual safety objectives and goals.

A risk profile can be developed by reviewing the airport's safety data and trends. In the early stages of implementing an SMS, airports will have incomplete data to work from. The risk profile will be adapted over time by reviewing the data and trends tracked in the SMS, and by consultation with airport management personnel tasked with safety oversight in airside operations.

On an annual basis, when setting annual objectives and goals, the safety management team tasked with updating the risk profile should initiate the following steps:

- review the annualized statistics for hazard and incident reports;
- identify the categories of hazards or incidents reported most frequently;
- identify the categories of hazards and incidents whose risk scenarios pose the greatest consequence (even if there were no runway incursions during the previous 12 months, this category will remain a high-risk event and should remain on the risk profile); and
- propose the airport's top three to five risks that are unique to its operating environment. Large airports with more advanced data collection may expand their risk profiles to list five to ten risks.

C

Setting objectives

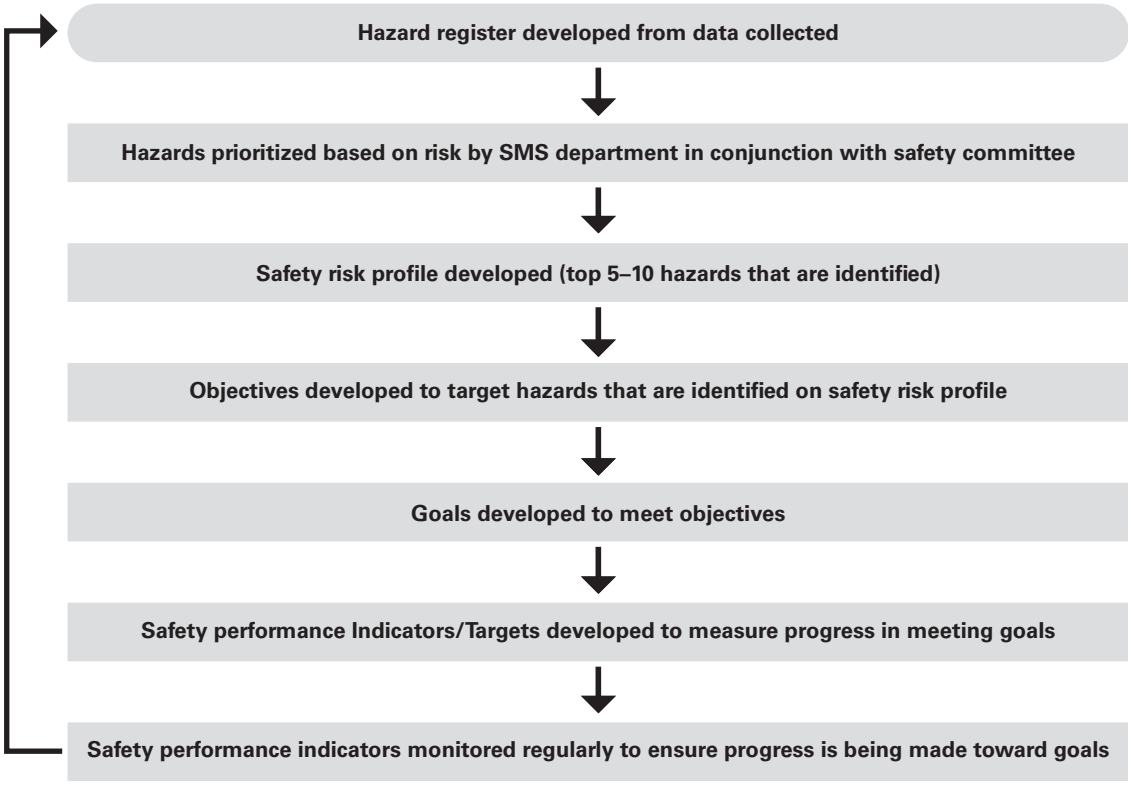
Annual safety objectives and goals should be developed by the safety department and approved by the accountable executive. The safety department should seek consultation from airport management personnel tasked with safety oversight in airside operations.

An example of a high-level view of how objectives and goals are determined is outlined below.

During the development and implementation of the SMS within the organization, the annual objectives can be associated with specific tasks required to implement processes or parts of the SMS. These tasks can be considered as implementation or developmental objectives and provide targets for the safety manager or person with a similar function.

Risk profile ranking	Risk profile element	Hazardous condition	Safety objective
1	Runway incursion (aircraft, vehicle or pedestrian)	Aircraft moving at high speed on the runway cannot avoid a collision with an incurring object **Mitigations:** Airside training and certification program	Reduce number of Runway Incursions
2	Foreign object debris	Foreign objects on runways and taxiways pose a significant safety risk to aircraft operations **Mitigations:** FOD Radar detection system; Runway inspections every six hours	Reduce damage to aircraft as a result of FOD incidents
3	Safe movement of aircraft on runway, taxiway, apron	Low-speed aircraft accidents, asset damage, and injuries can result if surfaces and navigation aids are not regularly inspected and maintained **Mitigations:** Visual inspections of runway (every six hours), taxiway and apron (every 12 hours)	No incidents of aircraft initiating a manoeuvre to avoid a hazard
4	Wildlife activity (on and in the vicinity of the airport)	Airport is situated near a major wintering area for migrating and wintering raptors and waterfowl. **Mitigations:** Wildlife discouragement programme in place, with 24/7 patroller coverage of airfield.	Reduce the mass of raptors and geese struck

Table 7: Objectives and goals example



Note: All steps in process are initiated and developed as outlined in owner SMS manual. ensuring hazard register, objectives, goals and safety performance indicators are approved by all accountable individuals within SMS.

Figure 13: Flow chart for setting and monitoring objectives

C

The steps of safety performance monitoring

Figure 14: Safety performance monitoring steps

Step C1.1: Identification of safety performance indicators

Safety performance indicators

Safety performance indicators can be set in various ways. These are performance indicators that relate to safety. They might include the number of times something has happened (e.g., the number of runway incursions, the rate of incursions per 10,000 movements, the number of FOD incidents causing damage to aircraft, the number of high-risk bird strikes, etc.) There are further details on this subject in the document *ACI Recommended Practice on Safety KPIs*.

Safety performance indicators can be reactive and lag events—for instance, counting the number of times something has gone wrong or an unwanted event has occurred (e.g., the number of runway incursions). Another method is to report leading indicators. These measure or count the number of times a preventative measure has been achieved successfully. Examples of leading indicators might include the number of runway inspections undertaken or bird patrols carried out, or how many staff are fully trained.

Safety objective	Reactive indicators	Proactive indicators
Reduce damage to aircraft as a result of FOD incidents	Number of FOD incidents causing damage to aircraft on runway Number of FOD incidents causing damage to aircraft on apron Number of FOD items reported	Number of FOD inspection hours Completion rate of runway inspections Number of FOD walks with stakeholders
Reduce number of runway incursions	Number of runway incursions in each category (aircraft, vehicle, pedestrian) Rate of incursions per 10,000 movements (aircraft, vehicle, pedestrian)	Number of Airside Vehicle Operator licensing tests passed Number of staff completing training
Reduce number of aircraft deviations due to airside construction and modification to facilities	Number of instances where a pilot deviated from intended clearance	Green Tagging inspections performed prior to returning a modified facility to service No unplanned surface or gate closures after returning a modified facility to service Increase in number of safety alerts/ bulletins
Reduce bird strikes	Total mass reduction of birds struck by species group: Raptors and Geese	Increase in the number of wildlife harassment hours

Table 8: Example of performance indicators

Step C1.2: Set safety performance targets and alert levels

Safety performance targets

Targets can be set once an safety performance indicator has been established. Targets should be quantifiable goals such as numerical goals or percentages and can be expressed as absolute measures or relative measures, for example:

Safety objective	Safety performance indicator	Safety performance target
Reduce damage to aircraft as a result of FOD incidents	Number of FOD incidents causing damage to aircraft on runway Rate of FOD incidents causing damage to aircraft per 10,000 movements	Zero FOD incidents causing damage to aircraft on runway (absolute measure) Decrease of 10% in average rate of FOD incidents causing damage to aircraft per 10,000 movements compared to prior year (relative measure)
Reduce number of runway Incursions	Number of runway incursions Rate of runway incursions per 10,000 movements	Zero runway incursions in each category (aircraft, vehicle, pedestrian) (absolute measure) Decrease of 10% in rate of runway incursions per 10,000 movements (aircraft, vehicle, pedestrian) compared to prior year (relative measure)

Table 9: Setting safety performance targets example

Establishing safety targets should not just be a paper exercise. In order for safety objectives and targets to be meaningful, they must be communicated to front-line staff and lived through the organization's safety culture. For instance, setting a target of 0 (zero) runway incursions may send a stronger message to front-line staff of "zero tolerance". This may result in greater diligence compared to a 5% reduction target, which suggests there might be some tolerance for deviation.

Actual safety performance should be monitored against established targets to determine whether safety objectives and goals are on track to be achieved.

Alert levels can be established to allow an airport to respond to trends which may threaten the achievement of goals, as illustrated in the chart below. Once a safety alert level has been triggered, certain actions may occur in order to bring performance back on track. For instance, a root-cause investigation may be conducted in order to identify corrective actions, to mitigate the risk of reoccurrence.

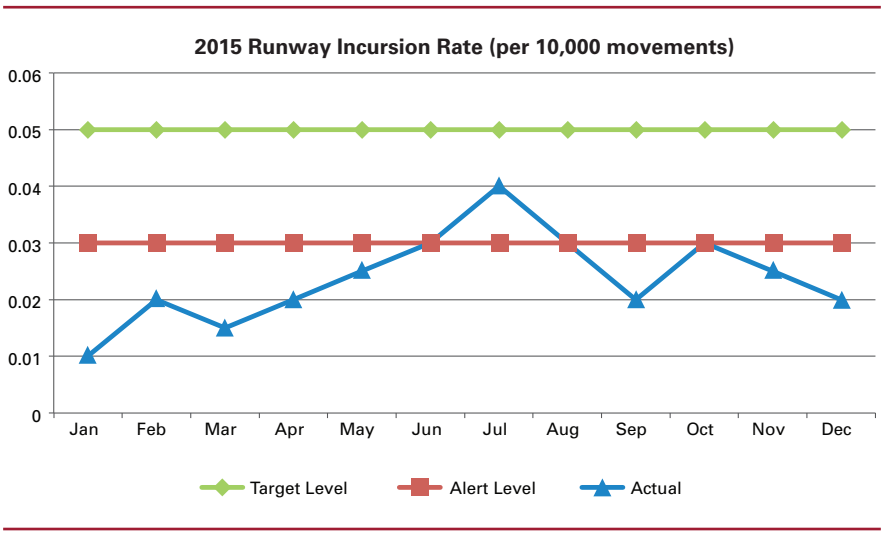


Figure 15: Safety performance indicator example

Determining performance indicators and setting target and alert levels is not an absolute science and will vary for each airport, depending on the overall safety objectives and the quality and availability of data.

Step C1.3: Data collection

Actual performance is measured against the target level using the data generated for each safety performance indicator. Data on hazards and incidents collected through the hazard register should be organized according to classification groupings for trending purposes (e.g., FOD, runway incursions, procedure violations, etc.). The classification groupings or categories should be specific, so that they enable tracking and trending to support the safety performance indicators. However, the categories should also be general enough to enable aggregation. For instance, 'Runway Incursions' can be the broad category, but sub-categories could include "Runway Incursions—Aircraft", "Runway Incursions—Vehicles", and "Runway Incursions—Pedestrians".

As additional data is collected each year, the data should be used to refine safety performance indicators, targets and alert levels annually in order to set more realistic and specific measures.

Step C1.4: Monitor and evaluate performance

Actual performance figures should be monitored against prior years, and against targets and alert levels, to compare how performance is trending and where corrective action is required to achieve safety objectives. Performance results may also be evaluated against external benchmarks such as performance achieved at other, similar airports.

Performance results and comparisons can be reported monthly (to the safety committee), quarterly (to the accountable executive), and annually (in an annual report). Performance results can also be communicated to stakeholder groups to alert them to trends or significant changes.

The frequency of performance reporting to all interested parties should be determined based on the reporting structure at each airport.

Step C1.5: React based on Step C1.4

When significant changes in an area of safety performance are noted (as described in Step C1.4), subsequent steps needed to identify and understand the underlying causes for the trends may include the following:

- audit the programme area for cause;
- root-cause analysis by means of an investigation;
- increase inspections and monitoring of the area; and
- establish a working group with subject-matter experts or safety stakeholders to determine the root cause and corrective actions needed.

Once corrective actions have been identified, the area should continue to be monitored to ensure that corrective actions have been implemented effectively, in order to reduce the risk of recurrence.

SMS Element C2 SAFETY SURVEY

Safety surveys

Safety surveys can be an effective way to determine the health of an airport's safety culture. Surveys can be conducted on both airport and non-airport employees (depending on the scope of the SMS). The results of these surveys can then be analyzed for trends, effectiveness of communication, and areas suitable for continuous improvement. Results should be communicated widely to the organization through an appropriate method of communication (e.g. a newsletter).

Base questions from past surveys should be maintained, so that changes to responses over time can be measured.

At minimum, questions should cover employee reactions to statements on airport safety and security and the effectiveness of the airport's safety culture. They should also probe for overall levels of awareness regarding key safety and security messages.

Recommend using a combination of survey question formats, such as rating scales and open-ended questions, in order to generate valuable feedback from respondents.

Survey data may be entered into a database in order to analyze results quickly and effectively.

A plan to improve survey scores based on results of questions on culture, communication effectiveness, training, etc., should be developed based on the survey results.

Sample of employee safety survey (Vancouver International Airport)

Sample rating questions (responses were ranked on a scale from 1 to 5):

- Have you received training on how to report hazards and occurrences?
- Has your supervisor communicated what is expected of you with regards to your role in SMS?
- Have the annual aviation safety goals been communicated to you?
- How often do you enter the airside environment as part of your duties?
- How often do you report hazards identified in the workplace?
- What best describes your level of comfort with using the reporting system to submit information related to a hazard or occurrence?
- How satisfied are you with the progress that SMS is making in ensuring our airport is safe, secure, and environmentally responsible?

Sample open-ended questions:

- What works well about the current SMS programme?
- What suggestions do you have for improving the SMS programme?

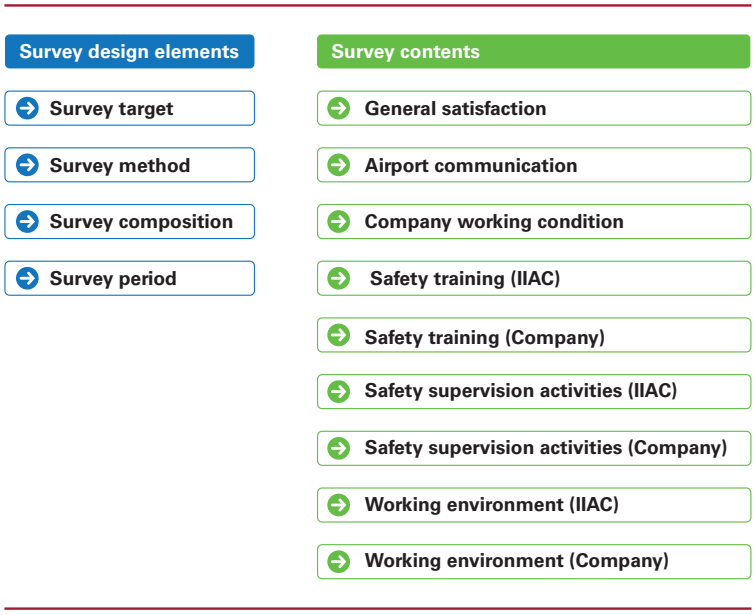


Figure 16: Sample of employee safety survey (Incheon International Airport)

SMS Element C3 AUDIT

The SMS audit is an objective and independent assessment to ensure that processes and procedures are operating effectively to achieve a defined set of safety objectives.

The audit process is part of the continuous-improvement feedback loop to evaluate and improve the effectiveness of the SMS. It also highlights where processes and procedures are not addressing risks adequately and where changes are needed to improve their efficiency or effectiveness.

Continuous improvement of SMS

Ref: ICAO Annex 19, Appendix 2, Section 3.3 (Continuous Improvement of the SMS)

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

The audit process also serves as a method of compliance monitoring—that is, a means for the airport operator to ensure that its activities comply with applicable regulations. The benefit of this is that it provides the airport operator with its own method to report on its regulatory compliance, which usually leads to fewer findings of non-compliance by regulators' audits.

The audit programme for the SMS is intended to provide that level of scrutiny. It can be broken down into two activities:

a) A system audit is a periodic independent assessment to ensure the SMS as a whole complies with the regulations and other applicable standards, organizational requirements and documented processes and procedures, and is effective.

b) Operational audit encompasses tasks associated with ensuring that individual business processes comply with the regulations and other applicable standards, organizational requirements and documented processes and procedures, and provide the required level of aviation safety in an effective manner.

System and operational audits should both examine the following:

a) Documentation of policies, programs, manuals, processes, procedures: Does the programme owner know what to do? (i.e., is the programme designed effectively?)

b) Evidence to support assurance that documented processes are being followed and understood by stakeholders: Do the staff know what they are doing and are they doing what they are supposed to be doing? (i.e., is the programme operating effectively as designed?)

c) How well the programme is performing relative to its targets: Does the programme do what it needs to do?

d) If the programme is improving continually: Does the programme owner know of gaps and does it continually close them or improve? In this way, audits should create opportunities for improvement.

Programme scope

The programmes subject to operational audits are included in the Airport Operations Manual (AOM). They are either regulated activities or they are unregulated but mitigate aviation safety risks. For regulated programmes, a full audit should include regulatory compliance and effectiveness, but unregulated programmes should be evaluated for effectiveness only. In the context of the SMS, the audit programme ensures that the activities the airport conducts comply with regulations and are effective in ensuring system-level safety.

The audit process is not intended to look at the end result of a product or service. Audits focus more on the process of how an end product or service was created, in order to assure the organization that sustainable, compliant, and effective processes are in place.

Frequency

The SMS should be reviewed on a regular basis in order to ensure it is meeting the basic safety objectives and that it is operating effectively and efficiently.

Audit frequencies should be determined by the safety audit manager (or the members of staff performing those roles) and subsequently published in an audit plan that is approved by the safety committee. The progress made against the audit plan should be reported to the safety committee on a periodic basis. Audits may be prioritized based on the criticality or pervasiveness of the programmes to be audited and linked to organizational risk ratings. For example, programmes that represent a greater risk to aviation safety may be audited more frequently. Significant changes to programmes or regulations may also trigger an audit to be performed.

The audit plan should be tailored to the size of the airport and the resources available.

Audits should also be conducted on partners and/or organizations which have assumed responsibility for activities described in the AOM on behalf of the airport.

Both scheduled and unscheduled audits should be considered, with unscheduled audits taking place when non-conformities, non-compliances, shortcomings or discrepancies in airside safety are repeatedly observed.

Audit principles

Auditors/evaluators should conduct themselves in accordance with the following auditing principles:

- Independence: Evaluators should be independent of the tasks, functions or operations being audited.
- Objectivity: Auditors should be impartial and their roles should not be related to the activity under review.
- Integrity: There should be a foundation of professionalism: "Say what you mean; mean what you say."
- Diligence: Auditors should display due professional care and pursue excellence—providing diligence and judgment in auditing.
- Confidentiality: Evaluators should ensure the information they gather remains secure;
- Ethics: Auditors should be trustworthy, honest and discreet.
- Professionalism and competency: Where possible, audits should include subject-matter experts, while maintaining independence.
- Fairness in presentation: Evaluators should report truthfully and accurately, based on reliable and reproducible evidence.

Figure 17: Audit process

Step C 3.1: Plan the audit

Audit objectives

The first step is to determine the objectives of the audit —that is, what is the audit seeking to evaluate?

If completing a regulatory compliance audit, then the audit objective may be to ensure that the programme is operating in accordance with the stipulated regulations (i.e. auditing the programme against the regulations). For an unregulated programme, the audit objective may be to determine whether the programme is operating effectively under the organizational processes and procedures documented for it.

Audit scope

Once the audit objectives are set, the next step is to define the scope of the audit. Factors to be considered include:

- The location or area being audited (defining if the audit is to be limited to certain parts of the manoeuvring area versus the entire airfield);
- Time frame (Will the audit examine all records over the past year, or over a shorter pperiod, such as the last 90 days, for example?); and
- Any items which are out of scope: assessing whether certain items are covered by another audit or subject to different processes and procedures that will be examined separately.

Audit methodology

The audit methodology—that is, the nature, extent and timing of the audit procedures to be performed—should be designed and performed by the audit team in a manner that achieves the audit objectives. The team should bear in mind the planned characteristics of the audit:

- Nature: What types of audit procedures are to be performed—records review, interviews, physical inspections, observations, etc.?
- Extent: Will records and locations be examined on a test basis or is a more extensive review required?
- Timing: When will the audit fieldwork be performed, taking into account peak periods and availability of resources?

C

Resources

Assemble the audit team based on the following criteria:

- subject-matter expertise;
- independence from the area under audit;
- audit experience; and
- availability of resources.

Requests for required information

The audit team should schedule a preliminary meeting with the accountable manager from the organization or department being audited to notify them of the upcoming audit and to gather relevant information.

During the meeting the following topics should be covered:

- the audit methodology, scope and objectives;
- the principles being applied;
- the evaluation criteria; and
- the practical arrangements for the audit.

The organization or department being audited should make sure that the audit team has access to a copy of the organization's/department's safety manual or guide, a safety briefing and a discreet place to work.

Step C3.2: Perform the audit

AUDIT PROCEDURES	
Document and records review	• Verify activities are conducted in accordance with the documented plan/directive/procedure.
Interviews with stakeholders	• Perform assessments of knowledge of individuals with responsibilities under the programme.
Site observations	• Verify the airside environment is maintained in accordance with applicable standards.
Equipment inspection	• Verify equipment matches description in the prescribed Plan.
Training	• The audit should include a review of the training requirements set out in the plan, as well as a review of any training material provided to participants.
SMS compliance	• Determine if the audit activity under review is being managed in compliance with SMS Procedures.

Figure 18: Audit Procedures

For instance, audit procedures can consist of carrying out proactive inspections of the whole or parts of the airfield, of teams carrying out functions airside, of training etc. Surveys of staff can be undertaken to obtain an understanding of the activities and opinions of staff working airside, either staff of the airport operator or staff from all organizations which work airside. Proactive monitoring can be undertaken to observe a process in action (e.g. ground handling activities); and to record positive and negative examples of whether correct procedures are being followed or prescribed behaviours are being demonstrated.

Audit evidence

Audit evidence should be reliable, reproducible and documented in such a way that another person can understand and re-perform the audit work.

The results of audit procedures performed and evidence collected should be documented and/or cross-referenced in the audit checklist.

Access to information

The audit team should be provided with access to all information sources, including:

- programme data and records, including relevant hazard and incident reports;
- risk analyses;
- manuals, user guides and other documentation;
- procedures;
- job descriptions; and
- training programmes and records.

C

Step C3.3: Completion and reporting

Summarize and classify audit findings

AUDIT FINDING CATEGORIES

During evidence gathering, the audit team is looking for evidence of compliance, conformity, and effectiveness. Where no evidence exists or is forthcoming, a finding will be made against the programme.

The audit finding should be categorized by its potential risk to aviation safety (in terms of severity and probability) and can be determined using the same risk matrix that is used for the overall SMS programme.

Examples of categories of findings are as follows:

a) Major: Non-compliance with a regulation or standard; a serious deficiency or substantial systemic failure to meet a programme requirement; a number of minor findings related to the same requirement; a finding that has the potential to create a significant safety hazard;
NOTE: If a safety-critical issue is noted during the audit, it should be communicated ***immediately*** in accordance with hazard and incident reporting procedures;

b) Minor: A failure to conform to a programme requirement which is not likely to lead to a systemic failure; a single observed lapse or isolated incident; a finding that does not pose a significant safety hazard or there are compensating controls to mitigate the risk;

c) Observation: A programme element is complying and/or conforming, but is susceptible to failure if intervening action is not taken;

d) Recommendation or Continuous Improvement Finding (CIF): Compliant or conforming practices where a recommendation is noted to improve efficiencies or to implement best practices; and

e) Strengths: A finding that demonstrates the auditee's actions or programme has exceeded regulatory or effectiveness expectations and may be considered a best practice.

To support continuous improvement, the audit process considers observations, CIFs and strengths as proactive findings. Observations and CIFs are intended to provide the programme being audited with information to use as a basis for improvement. Strengths are intended to be a method to share best practices with other auditees, for which best practices can be identified as CIFs.

Major and minor findings are reactive in nature, because they have been identified after a failure has occurred. An ideal state for the audit process is when it achieves an audit cycle where there are no reactive findings, because the programmes can identify and correct themselves prior to an audit. The programme owner should respond to major and minor findings with corrective action plans.

Reference	Review requirements	Procedure	Finding	Comments
Regulatory reference or specific section of the plan or AOM	Review plan and any associated procedures and checklists, etc., and verify that the plan covers all aspects required under regulations.	Describe how the auditor will validate the review requirement.	Enter one of: Major -or- Minor -or- Recommendation If correct, state 'Meets Standard'.	Provide evidence to support the stated finding.
Example: Canadian TP312 5.2.5.3	The aiming point marking shall commence no closer to the threshold than the distance of 400m.	Inspect the end of RWY 08R to ensure the aiming point is positioned 400m from the threshold.	Meets standard	Inspected RWY 08R end and confirmed aiming point exists 400m from threshold marking.

Table 10: Example of an audit checklist with audit finding categories

Reporting audit results

On completion of the audit, a closing meeting should be scheduled between the audit team and the organization or department being audited, to present the results of the audit and discuss any subsequent steps required to complete the audit.

The Safety Audit Manager should provide a report with information about the methodology and results of the audit to the organization or department audited.

Both parties should commit themselves to respect the results of the audit and to develop a corrective action plan in response to the audit findings. Corrective action plans should be documented in such a way that allows for accountability and future follow-up. Recommended practice would be to track audit findings in the hazard register but separately classify them as 'audit findings' so as not to skew hazard and incident trending and reporting.

A summary of the audit and relevant findings may also be communicated to the organization's safety committee.

Step C3.4: Follow-up

Status of audit findings

The audit team (or lead auditor) and a representative of the audited organization or department should perform a follow-up review, in order to update the status of the audit findings and determine whether the corrective action plans have been successfully implemented.

The frequency of follow-up activities may vary depending on the department or activity being audited, but they should be performed in an appropriate time frame following the initial audit (e.g. within one year of completion of the initial audit).

In order to determine the effectiveness of implemented corrective actions, the auditor may use a variety of audit procedures such as physical inspection, site observations, records review, or stakeholder interviews.

The follow-up review should also be documented and retained in a manner consistent with the original audit checklist.

SMS Element C4 SAFETY RECORD-KEEPING

Records management

A records management system can be used to maintain the hazard register and assign SMS file numbers, perform trend analysis, and track SMS files at all stages. The records management system (the hazard register) acts as a central repository of all hazards and incidents which have been reported and represents the "one source of the truth". The system:

- assigns SMS file numbers for file storage, archiving, and retrieval of reported hazards and incidents;
- tracks progress on active files and closing of files;
- organizes hazards and incidents according to classification groupings for trending purposes; and
- retains records of actions, decisions, and safety-related information.

In addition to the documentation that is included in the hazard register, the following supporting documentation should also be retained to support administration of the SMS programme, as well as for internal and external auditing and inspection purposes:

- hazard reports;
- incident reports;
- risk assessments;
- safety plans (change management);
- investigation reports;
- training records;
- Safety committee meeting minutes;
- safety performance reports (monthly/quarterly/annually);
- safety survey results; and
- system and operational audit results and documentation (checklists and audit evidence).

Records and documents should be:

- protected from unauthorized changes;
- restricted to designated personnel;
- backed up frequently and on a regular basis; and
- retained in accordance with the organization's specified minimum file-retention periods.

STEP D (ACT)

CONTINUOUS IMPROVEMENT THROUGH SAFETY PROMOTION

Importance or benefit

Safety promotion is instrumental to the success of SMS. Positively promoting safety throughout your organization will demonstrate and enhance management's visibility and commitment to safety. This is an essential way to motivate employees and build and maintain a positive safety culture.

Continuous improvement through safety promotion is achieved by the following two key elements:

- **training and education**, to ensure that personnel are trained and competent to perform their duties; and
- **communication**, to allow for two-way communication of safety matters (not only issues/ challenges, but also innovative ideas for improvement) across the organisation, both vertically and horizontally.

SMS Element D1 TRAINING AND EDUCATION

Ref: ICAO Annex 19, Appendix 2, Section 4.1 (Training and Education)

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

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

Step D1.1: Develop a training need analysis

The goal of a training need analysis is to establish training requirements clearly, and to establish target audiences, the specific training needs of the audiences and the knowledge gaps between the current and intended levels of knowledge.

Results from the training needs analysis can be used to create an SMS training plan for the organization. This plan may include:

- a list of those requiring SMS training, identifying what training they require based on their roles;
- course learning objectives, a brief description of topics covered and course timing;
- a training schedule;
- a description of the evaluation approach for each course; and
- A training register that can be used to track course completion and achievement.

An example of a basic SMS training outline is shown below:

Figure 19: SMS Training Outline Example

Step D 1.2: Create a training plan

Employees' roles within the SMS will determine the type of training they will receive. This will be established during the training needs analysis.

Items in a training plan can include, but are not limited to, the following:

- introduction to the key concepts of SMS;
- the structure of the SMS within your organization;
- how to report safety incidents;
- how/where safety-related information is available;
- human and organizational factors;
- seasonal safety hazards and irregular operations;
- emergency procedures;
- individuals' responsibilities within the SMS;
- risk management;
- monitoring safety performance;
- root cause analysis;
- audits; and
- investigation techniques.

Step D 1.3: Conduct training and check knowledge and skills

As part of the training programme, knowledge and skills should be verified as appropriate and the results documented.

Measuring the effectiveness of safety training is a critical part of ensuring that the training is meeting the needs of the organization. This activity also validates the skills and knowledge of the users.

Organizations may use a knowledge check at the end of the training, with an established pass rate. Ideally, learners can be given an assessment before and immediately after training to determine their baseline skill levels, as well as which skills and how much knowledge the training has developed.

Step D 1.4: Record and document training results

Airports may be required by their state regulatory authorities to record and report training results. In such cases, authorities might stipulate which information must be recorded and reported and in what manner it must be reported (i.e., who has taken specific training and how training records are to be completed).

Even if keeping a record of results is not a requirement, it can benefit an organization to retain the information for future resource allocation, budgeting or internal auditing purposes.

Step D 1.5: Ongoing verification (recurrent training)

Depending on the criticality of the specific training required, training may be provided as an initial induction course (i.e., the training may be provided only once for each employee), or recurrent training may be required on a set schedule (e.g., employees must retake the course annually). The frequency and content of recurrent training should be defined and documented for each relevant person.

SMS Element D2 SAFETY COMMUNICATION

Ref: ICAO Annex 19, Appendix 2, Section 4.2 (Safety Communication)

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

a) ensures personnel are aware of the SMS to a degree commensurate with their positions;
b) conveys safety-critical information;
c) explains why particular safety actions are taken; and
d) explains why safety procedures are introduced or changed.

One of the key methods of promoting safety through the organization is by means of a robust safety communication programme. Your communication programme should share safety information, create awareness about the SMS and provide an avenue to gather feedback from your audience for the continuous improvement of the programme and safety.

The most effective communication programme will use multiple methods of communication, in order to ensure that the messaging reaches the widest possible audience and in as many different ways as possible.

When communicating safety information, always consider the following questions:

- Who is the audience? (Ensure that you provide your target audience with information that is relevant to them);

- Why are we communicating this information? (What is the goal of communicating this information?);
- What message needs to be communicated? (What do you want your audience to know?);
- When is the best time to communicate this message? (When is the most effective time to communicate the message? Should it be repeated and if so, how frequently?); and
- How will the safety message be communicated? (What is the most appropriate method for communicating the message?)

Methods of communicating safety information may include:

- safety awareness talks;
- safety bulletins/advisories;
- safety newsletters;
- poster campaigns;
- safety workshops/seminars;
- regular workplace meetings; and
- a safety website (either intranet or extranet).

Figure 20: Safety Poster Example

Using consistent branding for safety communication can serve to promote confidence in the ability of the organization to enhance safety. Branding may be as simple as referring to an "Airport Safety Programme" in all documentation. However, if significant graphic design resources are available, the safety branding may extend to an all-encompassing brand approach, including a unique name, logo, slogan and detailed design specifications for all documents; and even a safety "mascot" which presents the "face" of the safety programme.

Proactive communication	Reactive communication
• Initial safety training prior to starting job • Communication of safety policy • Reporting/feedback for improvement, requiring a proposal and observations • Employee safety survey • Plan of change or work planning meetings • Celebration of successes in improving safety • Management praise/recognition of safety practice • Dissemination of external lessons learned	• Incident reporting • Feedback on reported incidents • Follow-up on safety performance, at management level or between management and workforce • Safety campaigns addressing key concerns • Dissemination of internal lessons learned

Table 11: Proactive and reactive methods of safety communication

It is imperative that safety is embedded in the way you do business. Safety needs to be a cornerstone in the decision-making process. All personnel must understand the organization's safety philosophy and understand their roles and responsibilities within that safety-management framework. Safety training and communication should begin with the initial job and workplace familiarization process for each employee and continue throughout the duration of each person's employment.

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ACI Recommended Practice on Safety KPIs (RP 600A14)

DEFINITIONS

ATCO: Air Traffic Control Officer

Consequence: An undesirable outcome that can be triggered by a hazard. For example, a runway excursion (overrun) is a projected consequence related to the hazard of a contaminated runway; a runway incursion is a projected consequence related to the hazard of unclear pavement markings.

Defences: Existing measures in place (systems, procedures, safety, equipment) to prevent a hazard from developing.

Hazard: An object or condition with the potential to cause injuries to personnel, damage to equipment or structures, loss of material, or reduction of ability to perform a specific function.

In aviation safety risk management, the term 'hazard' should be focused on those conditions which could cause or contribute to unsafe operation of aircraft or aviation safety-related equipment, products and services.

Incident: An occurrence, other than an accident, associated with the operation of an aircraft which affects or could affect the safety of operation.

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

Occurrence: Any safety-related event which endangers or which, if not corrected or addressed, could endanger an aircraft, its occupants or any other person and includes in particular an accident or serious incident.

Operational Audit: Tasks associated with ensuring that individual business processes comply with the aerodrome's regulations and other applicable standards, its organizational requirements and documented processes and procedures, and are providing a level of aviation safety in an effective manner.

Probability: The likelihood that a consequence will occur.

Risk: The predicted probability and severity of the consequences of a hazard. Risk is the likelihood that a hazard's potential to cause harm will be realized.

Severity: The possible effects of a consequence, taking as reference the worst foreseeable (but credible) condition.

System Audit: A periodic independent assessment to ensure the SMS as a whole complies with the aerodrome's regulations and other applicable standards, its organizational requirements and documented processes and procedures, and is effective.

ANNEXES

Annex 1
Risk Assessment Matrix and Risk Tolerability Examples

EXAMPLE #1 FROM COPENHAGEN AIRPORTS

Probability / Severity of consequence		Extremely improbable Should never happen (once every 100 years)	Improbable Unlikely to happen, but cannot be entirely excluded (once every 25 years)	Remote Can be expected to happen (once every 10 years)	Probable Can happen several times a year	Frequent Can happen several times a month
A Catastrophic	Conditions that could lead to an accident, loss of aircraft or loss of many human lives as a result of being onboard the aircraft. For example: • aircraft collision with fixed obst acles such as buildings in start/landing • aircraft collision with mobile obst acles such as vehicles during takeoff/landing	6	7	8	9	10
B Hazardous	Conditions that could lead to a significant reduction in air traffic safety, significant structural damage to the aircraft and/ or severe/fatal injury as a result of being onboard the aircraft. For example: • exit runway during takeoff/landing at high speed • collision with fixed/mobile obst acles on runway or at high speed exits • hard braking or avoiding action dur ing takeoff/landing	5	6	7	8	9
C Major	Conditions that could lead to a large reduction of aviation safety, minor structural damage to the aircraft and/ or personal injury as a result of being onboard the aircraft. For example: • collision with fixed/mobile obstacles on maneuvering area, apron, but not runway area • hard braking or avoiding action on runway area or at high speed exits • late aborted landing	3	4	5	6	7
D Minor	Conditions that could lead to slight reduction of aviation safety, operational limitations, the use of emergency procedures and/ or a minor discomfort for the occupants. For example: • collision with fixed/mobile obstacles on stand • hard braking or avoiding action on either maneuvering area, apron or stand, but not runway area	2	3	4	5	6
E Negligible	Conditions of minimal impact on aviation safety.	1	2	3	4	5

Table 12: Safety risk assessment matrix and tolerability matrix

Red risk
Unacceptable risk: the risk cannot be accepted. Further mitigation measures must be established and implemented so that the risk can be reduced.

Orange risk
Undesirable risk: the risk may only be accepted under exceptional cases. A prerequisite is to establish further mitigation measures to reduce the risk to an ALARP (As Low As Reasonably Practical) level. Orange risk should only be approved by the aerodrome's Chief Operating Officer.

Yellow risk
Tolerable risk: the risk may not be readily accepted. The aerodrome should strive to establish further mitigation measures to reduce the risk. Yellow risk should only be approved by the Director of Traffic and Airside Operations.

Green risk
Acceptable risk: the risk can be accepted without introducing further mitigation measures. Green risk should be approved by the Airside Safety Department Manager.

EXAMPLE #2 FROM TAOYUAN INTERNATIONAL AIRPORT

Risk probability	Risk severity				
	A Catastrophic	B Hazardous	C Major	D Minor	E Negligible
5 Frequent	• Car accident				
4 Occasional		• Run across aircraft • FOD	• Violate holding position marking/marker • Violate airside traffic sign • Run across apron • Speeding	• Smoking at Non-smoking area • Chewing betel	
3 Remote	• Collide with aircraft	• Damage aerodrome facility • Mis-operation of equipment or vehicle • No immediate reporting	• No wheel-stoppers • Driving while driver's permit is suspended	• Illegal parking • Off warning beacon or head light	
2 Improbable		• Disobedience • Enter maneuvering area • without permission • Drunk driving	• Driving without driver's permit	• No driver's permit taken along for inspection • No safety vest	
1 Extremely improbable					

Table 13: Safety risk assessment matrix

Severity Definitions

		Consequence			
		People	**Assets**	**Environment**	**Reputation**
SEVERITY	**5 = Negligible**	• No injuries	• No damage • Minor technical delay	• No impact	• No loss of public confidence
	4 =Minor	• First Aid injury or • No disability or lost time	• Technical delay or • Ground equipment inoperable or • Aircraft (ACFT) grounded causing Operator to incur relatively minimal costs	• Release Contained	• May be lowered but public finds situation acceptable
	3 =Moderate	• Lost time injury or • Passenger injured (broken bones) • No disability	• Technical delay or • Ground equipment inoperable or • Ground equipment damaged ACFT or • ACFT grounded causing Operator to incur substantial costs	• Small (< 50 Gallons) release – Uncontained	• Significantly lowered with high profile media coverage
	2 =Major	• Disability or • Severe injuries	• Major technical delay or • Ground equipment inoperable or • Ground equipment caused major damage to ACFT causing delays to return ACFT to service or • ACFT grounded causing Operator to incur substantial costs	• Moderate (> 50 Gallons but < 100 Gallons) release – Uncontained	• Shaken to the point where significant numbers of the public will not fly on a particular aircraft or airline
	1 = Catastrophic	• Fatal injuries to personnel or passenger • Public exposed to life threatening hazard	• Loss of ACFT • Loss of equipment	• Large (> 100 Gallons) release – Uncontained	• Shaken to the point where significant numbers of the public will not use airport

Table 14: Severity classification scheme

Likelihood Definitions

Likelihood (Probability)		
SAAS Likelihood Definitions	Qualitative words used by FAA	Value
Has happened more than five times at airport **(has occurred frequently)**	FREQUENT	A
Has happened more than once at airport or more than once in industry **(has occurred infrequently)**	PROBABLE	B
Has happened once at airport or once in industry **(has occurred)**	REMOTE	C
Heard of in industry **(has occurred rarely)**	EXTREMELY REMOTE	D
Never heard of in industry **(not known to have occurred)**	EXTREMELY IMPROBABLE	E

Table 15: Probability classification scheme

Risk Matrix

Risk Assessment Matrix										
Consequence				Likelihood		Severity				
People	Assets	Environment	Reputation			5	4	3	2	1
						Negligible	Minor	Moderate	Major	Catastrophic
No Injury or Health Effects	No Damage	No Effects	No Impact	A	**Frequent** (Has happened more than five times at airport)	L5	M13	H20	H22	H25
Minor Inquiry or Health Effects	Minor Damage	Minor Effects	Minor Impact	B	**Probable** (Has happened more than once at airport or in industry)	L4	M12	M15	H21	H24
Moderate Injury or Health Effects	Moderate Damage	Moderate Effects	Moderate Impact	C	**Remote** (Has happened once at airport or once in industry)	L3	L8	M14	M17	H23
Major Injury or *PTD	Major Damage	Major Effects	Major Impact	D	**Extremely Remote** (Heard of in industry)	L2	L7	L10	M16	M19
Fatalities	Catastrophic Damage	Catastrophic Effects	Catastrophic Impact	E	**Extremely Improbable** (Never heard of in industry)	L1	L6	L9	L11	M18
*PTD = Permanent Total Disability				Low Risk: Acceptable Risk		Medium Risk: Acceptable Risk		High Risk: Unacceptable Risk		

Table 16: Safety risk assessment matrix

Figure 21: Safety risk tolerability matrix

EXAMPLE #4 FROM FEDERAL OFFICE FOR CIVIL AVIATION, SWITZERLAND

Severity class	Definition	Examples
A Catastrophic	– accident – equipment destroyed – loss of aircraft – multiple deaths	– mid air collision between aircraft – collision between aircraft and/or other object during take off or landing
B Hazardous	– a large reduction in safety margins / no safety barriers remaining – the outcome is not under control – major equipment damage – serious or fatal injury to a number of people	– runway incursion (category A and B, significant potential, extreme action to avoid collision) – aborted take-off / landing on a closed or engaged runway – take off / landing incidents, such as undershooting or overrunning – Controlled Flight Into Terrain is only marginally avoided – large fuel puddle near the aircraft while passengers are on board
C Major	– serious incident or accident – significant reduction in safety margins – serious equipment damages – injury to persons	– runway incursion (category C and 0, ample time and distance, no potential for a collision) – collision with obstacle on apron / parking position (hard collision) – employee falling down from height – near Controlled Flight Into Terrain – missed approach with ground contact of the wing ends during the touch down
D Minor	– nuisance, operations limitations – minor incident – small damages to aircraft, vehicles or objects	– unauthorised access of airspace – hard braking during taxiing – damage due to jet blast (objects) – expendables are laying around the stands – collision between maintenance vehicles on service road – breakage of drawbar during pushback {damage to the A/C) – slight excess of MTOW – aircraft is rolling into PAX-bridge (slight collision) – forklift is tilting
E Not significant	– non-significant consequences – circumstances which may lead to a non significant reduction of safety and no immediate effect on safety	– increase in work load for the crew during taxiing – slight increase of braking distance – hoarding is tumbling down because of strong wind – cart losing baggage

Table 17: Severity classification scheme

Frequency class[3]	Meaning	Definition
5 Frequent	Likely to occur many times (has occurred frequently)	more frequent than once in a year (>1/y)
4 Reasonably probable	Likely to occur some times (has occurred infrequently)	once in a year to once in 1 0 years (1 – 0.1/y)
3 Remote	Unlikely to occur (has occurred rarely)	once in 10 years to once in 100 years (0.1 – 0.01/y)
2 Extremely remote	Very unlikely to occur (not known to have occurred)	once in 100 years to once in 1000 years (0.01 – 0.001/y)
1 Extremely improbable	Almost inconceivable that the event will occur	less than once in 1'000 years (<0.001/y)

Table 18: Probability classification scheme

Frequency		Hazard Matrix				
frequent	5	high priority				
reasonably probable	4					
remote	3			mean priority		
extremely remote	2					
extremely improbable	1					low priority
Severity		A	B	C	D	E
		catastrophic	hazardous	major	minor	not significant

Table 19: Safety risk tolerability matrix

High priority: urgent mitigation measures may be necessary and an in-depth risk analysis should be performed.

Mean priority: If the mitigation measures are obvious and adequate, they should be implemented. An in-depth risk analysis should be performed, if it is necessary for decision making.

Low priority: no risk analysis is necessary. The hazard should be further monitored.

EXAMPLE #5 FROM INCHEON AIRPORT

Code	Severity	Criteria	
5	Very high	Harm to persons	Occurrence of death(over 10 people)
		Harm to property	Loss of 10 billion Won or more(USD 9,000,000 ~)
		Airport operations	Airport Closure or suspension
4	High	Harm to persons	Occurrence of death(1~9 people)
		Harm to property	Loss of one billion ~ 10 billion Won (USD 900,000 ~ 9,000,000)
		Airport operations	Runway Closure(over 24hrs), Taxiway, Ramp Closure(over 72hrs)
3	Middle	Harm to persons	Serious Injury
		Harm to property	Loss of 100 million ~ one billion Won(USD 90,000 ~ 900,000)
		Airport operations	Runway Closure(under 24hrs, Taxiway, Ramp Closure(under 72hrs)
2	Low	Harm to persons	Injury requiring over 4 weeks for cure
		Harm to property	Loss of 10 million ~ 100 million Won(USD 9,000 ~ 90,000)
		Airport operations	Flight delay(three hours over) or cancelation
1	Very low	Harm to persons	Injury requiring less than 4 weeks for cure
		Harm to property	Loss of less than 10 million Won(USD 9,000)
		Airport operations	Nothing

Table 20: Severity classification scheme

Code	Probability	Criteria
5	Very high	Likely to occur within 1 month
4	High	Likely to occur within 1 year
3	Middle	Likely to occur within 5 years
2	Low	Likely to occur within 20 years
1	Very low	Unlikely to occur within 20 years

Table 21: Probability classification scheme

Risk assessment of Incheon Airport

Probability \ Severity	Very low 1	Low 2	Middle 3	High 4	Very high 5
Very high 5	Middle (5)	High (10)	High (15)	Very high (20)	Very high (25)
High 4	Middle (4)	Middle (8)	High (12)	Very high (16)	Very high (20)
Middle 3	Low (3)	Middle (6)	High (9)	High (12)	High (15)
Low 2	Low (2)	Middle (4)	Middle (6)	Middle (8)	High (10)
Very low 1	Low (1)	Low (2)	Low (3)	Middle (4)	Middle (5)

Risk tolerability matrix of Incheon Airport

Level of risk		Criteria for acceptability of risk	Criteria for management
16~25	Very high	Unacceptable	It is required to be eliminated or reduced to be acceptable.
9~15	High		It is required to be eliminated or reduced to be acceptable.
4~8	Middle	Acceptable	It is acceptable. When necessary, further action is required.
1~3	Low		No further action is required.

Table 22: Risk assessment and tolerability matrices

Annex 2
Hazard Register Examples

Hazard register

A hazard register may be developed in a number of ways. It may be best to start the process from a higher-level approach and then drill down further into specific sub-elements.

For example, from a physical perspective, hazards may be initially identified geographically in relation to critical on-airport assets or infrastructure and potential failures of such assets or infrastructure (e.g. terminals, manoeuvring area, apron, or other areas or facilities at the aerodrome). The register could also relate to the activities conducted within such areas and by whom. So an overlay both of physical hazards (relative to location) and the activities (processes) conducted within them could then be developed. The impacts on other areas would also need to be considered.

As new hazards are identified through proactive and reactive processes, they should be added to the hazard register. When hazards are identified through the SMS, they may be eliminated or mitigated through corrective-action plans. In some cases, especially where hazards identified in the register are being mitigated but not eliminated, these corrective-action plans may result in the creation of an aviation programme or task, or creation of a function. These programmes, tasks, and functions form the basis of the safety critical tasks/functions list, which should be subject to ongoing scrutiny.

GTAA SMS HAZARD REGISTER - CURRENT

HAZARD SUBTYPE	HAZARD TYPE	HAZARD LEVEL	OWNER	SAFETY RISK PROFILE	APPROACH	LANDING	TAXI IN	GATING	GROUND OPERATIONS	PUSH BACK	TAXI OUT	TAKE OFF	DEPARTURE	OTHER
AIRCRAFT PARKING	A/C parked at wrong gate	1		1.182				X						
	A/C parked unsafely/improperly	1		0.452				X						
INJURY	Airside employee injury - GTAA	1		0.313					X	X				
	Airside employee injury as a result of interaction with GTAA infrastructure- non-GTAA	1		NEW in 2015					X	X				
	Airside non-GTAA employee injury (OTHER)	1		NEW in 2015					X	X				
SPILLS	Any fuel spills (ACFT or GSE related)	1		0.487					X					
COLLISIONS	Collision - Aircraft/Aircraft	1			X	X	X	X	X	X	X	X	X	
	Collision - Aircraft/Bridge or Structure	1		0.070	X	X	X	X	X	X	X	X	X	
	Collision - Aircraft/Equipment	1		0.000			X	X	X	X	X			
	Collision - Aircraft/Vehicle	1		0.000			X	X	X	X	X			
	Collision - Vehicle/Equipment/Bridge/Building	2		4.588				X	X	X				
AIRCRAFT/VEHICLE CUTOFF	Cut off - aircraft/vehicle - HIGH RISK	2		0.070			X	X		X	X			
	Cut off - aircraft/vehicle - MED RISK	2		0.348			X	X		X	X			
	Cut off - aircraft/vehicle - LOW RISK	1		1.217			X	X		X	X			
	Cut off - aircraft/vehicle - UNDETERMINED	1		0.591			X	X		X	X			
AIRCRAFT DAMAGE	Damage to aircraft by vehicle/equipment/bridge	2		1.008			X	X	X	X	X			
DEICING	De-Icing related	1		0.000					X					
DRONE	Drone activity	1		NEW in 2015	X	X	X				X	X	X	

Figure 22: Hazard register used at Toronto Pearson International Airport

ID	Area	Work process or activity	Hazard description	Airside safety related consequences	Current argument (existing mitigation measures)	Severity	Probability	Risk	Further mitigation measures to be added	Severity	Probability	Risk	Argument
	Specify the location where the hazard is present	*Describe activity or process related to the hazard*	*Which hazards are related to the work process, activity and/or area*	*Describe worst credible consequences that can be caused by the hazard*	*Describe the current mitigation measures and assumptions that are used to assess the current risk*	*Assess severity and probability and conclude risk level, based upon current arguments*			*Describe new mitigation measures required to eliminate or reduce the current risk*	*Assess severity and probability and conclude risk level after new mitigation measures*			*Explain the reasons for the conclusion of the final risk level*
1	Service road behind stand	Aircraft push-back	Driver oversees push-back start	Vehicle collision with aircraft, which can lead to aircraft damage, personal injury and vehicle damage	- Airside driving course - Push-back tractor turns flashes on 30 seconds before push-back starts	D (Minor)	I (Frequent)		Signalman stops traffic before push-back starts.	D (Minor)	II (Probable		The new mitigation measure will significantly reduce the probability of vehicle driving behind aircraft under puch-back, but will not reduce the severity if collision happens.

Figure 23: Hazard register used at Copenhagen Airports

Hazard id	Type of operation or activity	State Generic Hazard	Identify specific components of the hazard	Identify associated Risk(s)	Current measures to reduce risk(s) and risk index	Further action to reduce risk and resulting risk index	Responsibility
01/2007	Airside operations	Working in proximity to aircraft	Hit by aircraft / vehicle FOD High Noise level	Loss of life / injury Damage to aircraft engine / airframe High frequency noise induced deafness Risk index : 4B Risk tolerability : Unacceptable under the existing circumstances	1. Use of high visibility jackets by all staff Risk index : 3B Risk tolerability : Risk control/ mitigation requires management decision	A. FOD check of Ramp area by designated crew members prior to aircraft movement B. Use of ear plugs / Defenders by all workers Risk index : 1B Risk tolerability : Acceptable after review of the operation	1. Duty Manager A. Shift Supervisor B. Duty Manager
02/2007							

Figure 24: Hazard register used at Keflavik Airport

Date	Hazard No.	Hazard	Location	Potential Consequences	Risk Rating Prior to Control Measures	Expected Risk Rating After Control Measures	Responsibility for Action	Review Date	Closed Out Date

Figure 25: Example of hazard register presented in ACRP Report 1 Safety Management Systems for Airports

Hazard table

(1) System element	Remarks
Ground handling	

(2) Document history			
Version	**Date**	**Authors**	**Remarks**
0.1	30.05.2008	CF/MOL	First draft

(3) Subsystem	(4) Location	(5) HN°	(6) Hazard	(7) EN°	(8) Event	(9) f	(10) S	(11) Remarks
Embark / disembark	Parking position X to Y	1	Docking the boarding bridge	a	Strike against A/C	5	D	
Load / unload with a loader (pallets, containers)	Parking position X to Y	2	Working at height	a	Employee falls down	4	C	
		3	Lifting the platform	a	Employee is jammed	3	C	
		4	Moving towards A/C	a	Collision with A/C	4	D	

Figure 26: Hazard register presented in Guide for Hazard Identification and Assessment from Federal Office for Civil Aviation, Switzerland, May 2009

Annex 3
Accident/Incident Reporting Form Examples

Means for accident/incident reporting

EXAMPLE #1 PAPER-BASED INCIDENT REPORT FORM USED AT TORONTO PEARSON INTERNATIONAL AIRPORT

Toronto Pearson

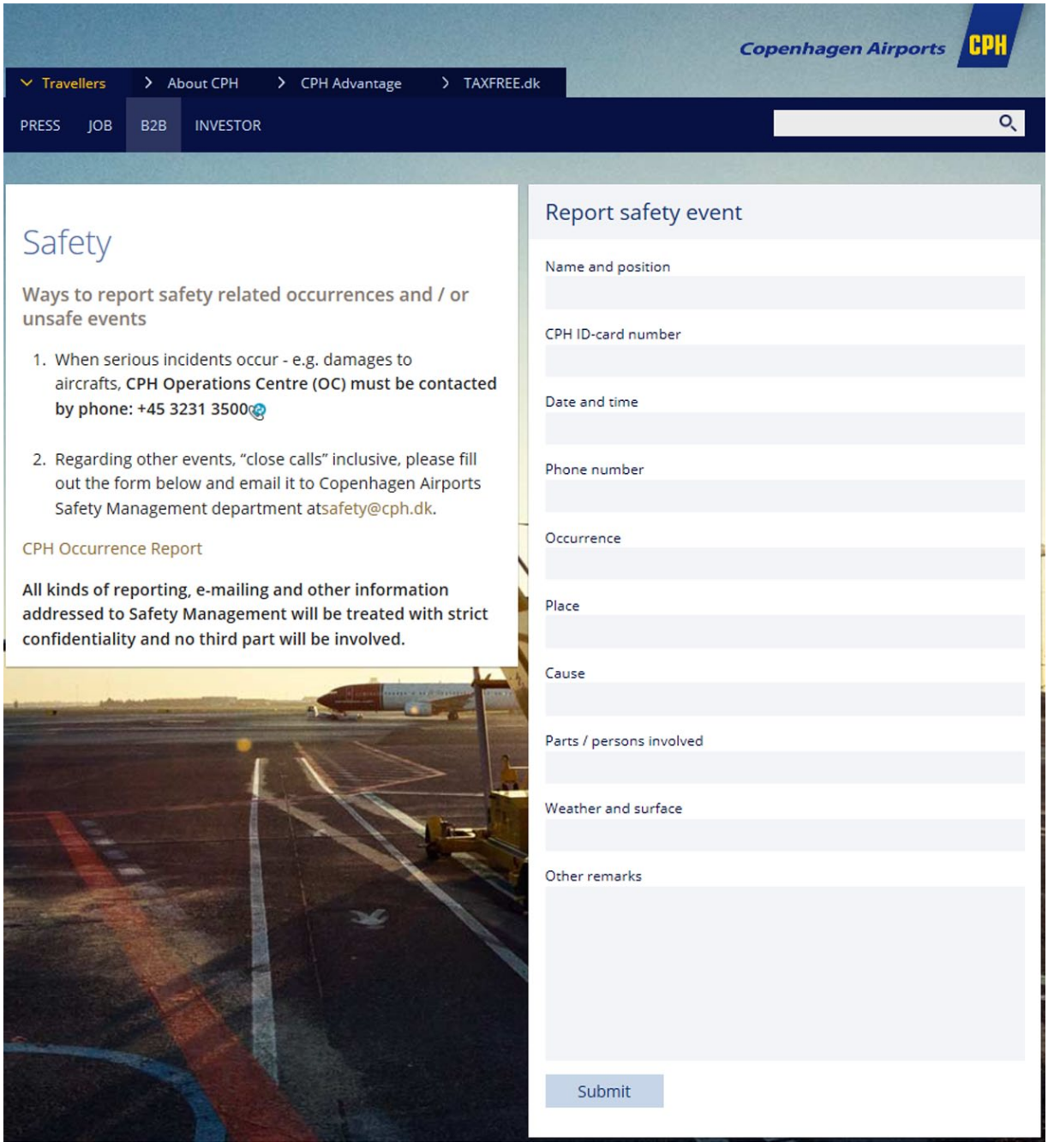
INCIDENT REPORT

IMPORTANT: File the report per the following naming convention:
M05 – GTAA Incident Report – *CODES event number – yyyy-mm-dd*
Save the report and then file at this link or email ZZG-SEMS or ZZG-Safety Management Systems

Report Writer Title(TAR,GSR, etc)			**Report #:**	
Report Type (check all that apply)	▫ Safety ▫ Property Damage	▫ Security ▫ Personal Injury	▫ Environment	▫ GTAA employee involved ▫ Other:_____
Location	▫ Terminal 1 ▫ Other: _____	▫ Terminal 3	▫ Airside	▫ Groundside ▫ Infield
Personal Injury	Name:			Date of Birth:(YYYY,MM,DD)
	Address:			Phone#: (xxx)xxx-xxxx
	Flight Information	ARRIVED ☐ DEPARTED ☐	Flight#	
	Clothing/Shoes/Eyewear/Mobility Aid:			
Property Damage	EQUIPMENT DAMAGE	☐	TYPE OF EQUIPMENT	
	FACILITY DAMAGE	☐	FACILITY IMPACTED	
	AIRCRAFT DAMAGE	☐	TYPE & REGISTRATION #	
	VEHICLE DAMAGE	☐	INSURANCE VEHICLE PLATE # DRIVER'S LICENCE #	
	OTHER (DESCRIBE)	☐		
	DRIVER'S NAME:		RAIC #:	AVOP #:
Description (Provide a detailed description of the event, hazard or concern. Use additional paper if needed)				
Occurrence Date: (YYYY,MM,DD)		**Time:**	**CODES Event:**	
Immediate actions (Please advise of any immediate actions taken, if any)				
Recommendations				

A09 – Incident Report – 2012-04-03 – V05

EXAMPLE #2 ONLINE INCIDENT REPORT FORM USED AT COPENHAGEN AIRPORTS



Annex 4
Change Risk Assessment Examples

Change Risk Assessment

EXAMPLE #1 MANAGEMENT OF MINOR CHANGE

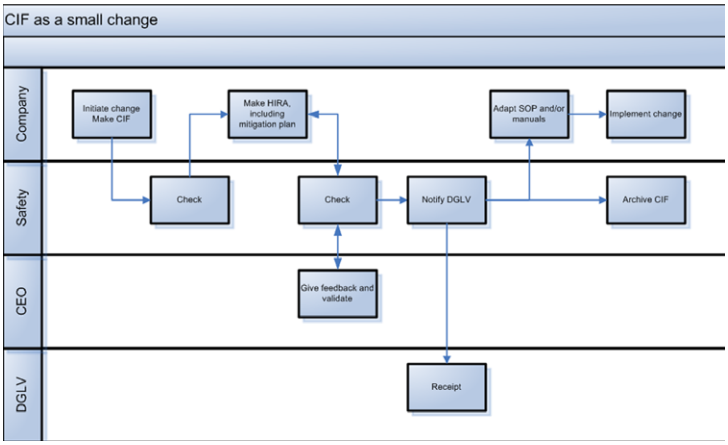


Figure 27: Change process for minor change used at Brussels Airport

Level 1: Threat/Hazard Identification Risk Assessment (T/HIRA)

Project/Business Owner:
Project Title:
Brief Summary:
Date:

	Area Impacted by Proposed Change				
	Facility	Equipment	Level of Service	Personnel	Process (Policy, Standard, Procedure)
Hazard Type					
Injury					
Property Damage					
Communication Failure (Internal)					
Communication Failure (External)					
Environmental Impact					
Loss of use of Facility					
Regulatory Non-Compliance					

Each column above represents an area that may be impacted by the proposed change and each row represents a potential safety hazard that could present itself.

Step 1: Mark Yes under each area impacted by proposed change
Step 2: Assess each area impacted by proposed change for each hazard type.
Where potential impact exists (likely or unlikely) mark Yes.
Step 3: Count the total number of Yes's. Where the total is:

1-2	Low Impact	Level 2 T/HIRA Not Required
3-4	Medium Impact	Level 2 T/HIRA Strongly Recommended.
5+	High Impact	Level 2 T/HIRA Required.

Figure 28: Change form used for minor change at Toronto Pearson International Airport

EXAMPLE #2 CHANGE FORM USED FOR MAJOR CHANGE AT BRUSSELS AIRPORT

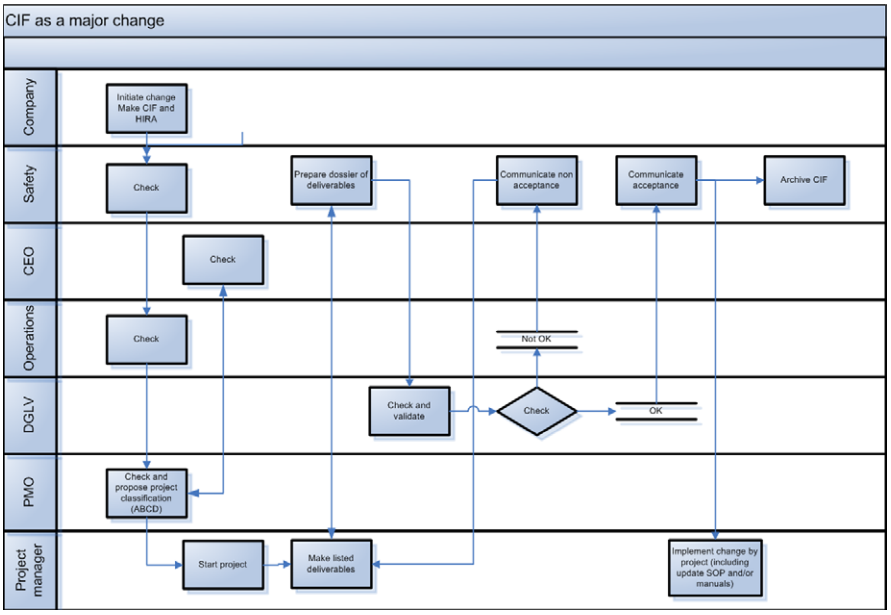
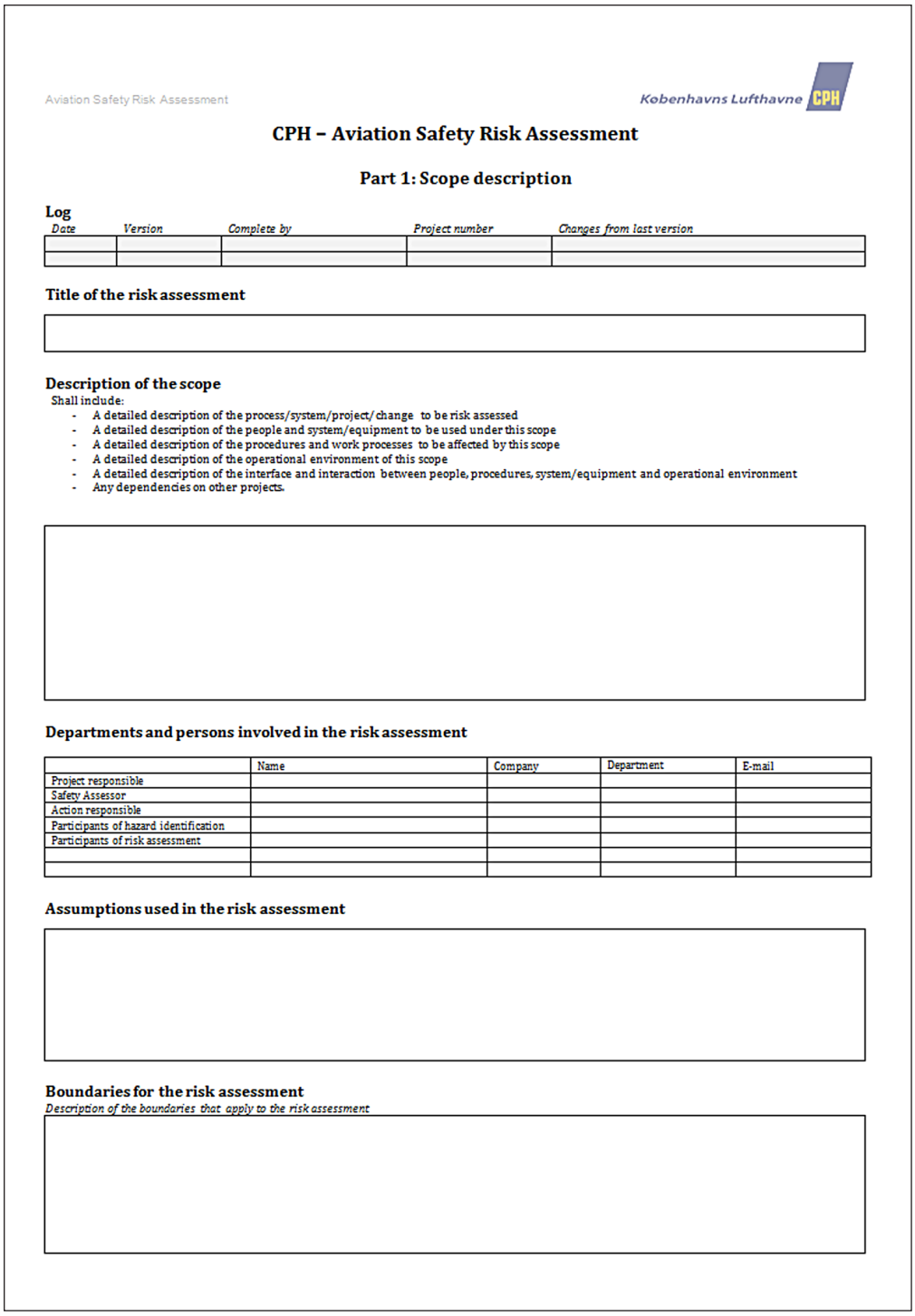


Figure 29: Management of Major Change



Københavns Lufthavne CPH

CPH – Aviation Safety Risk Assessment

Part 1: Scope description

Log

Date	*Version*	*Complete by*	*Project number*	*Changes from last version*

Title of the risk assessment

Description of the scope

Shall include:

- A detailed description of the process/system/project/change to be risk assessed
- A detailed description of the people and system/equipment to be used under this scope
- A detailed description of the procedures and work processes to be affected by this scope
- A detailed description of the operational environment of this scope
- A detailed description of the interface and interaction between people, procedures, system/equipment and operational environment
- Any dependencies on other projects.

Departments and persons involved in the risk assessment

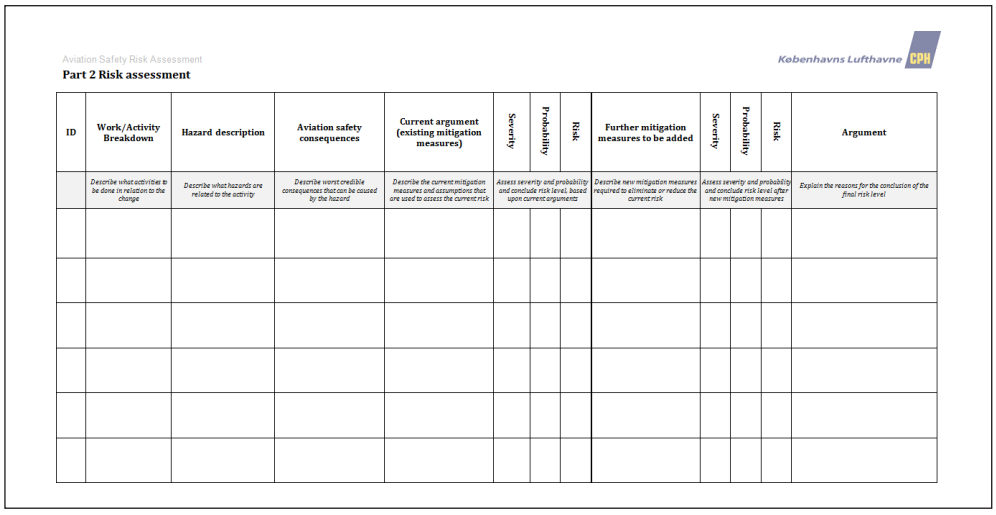
	Name	Company	Department	E-mail
Project responsible				
Safety Assessor				
Action responsible				
Participants of hazard identification				
Participants of risk assessment				

Assumptions used in the risk assessment

Boundaries for the risk assessment

Description of the boundaries that apply to the risk assessment

Figure 30: Change form used for major change used at Copenhagen Airports – Part 1



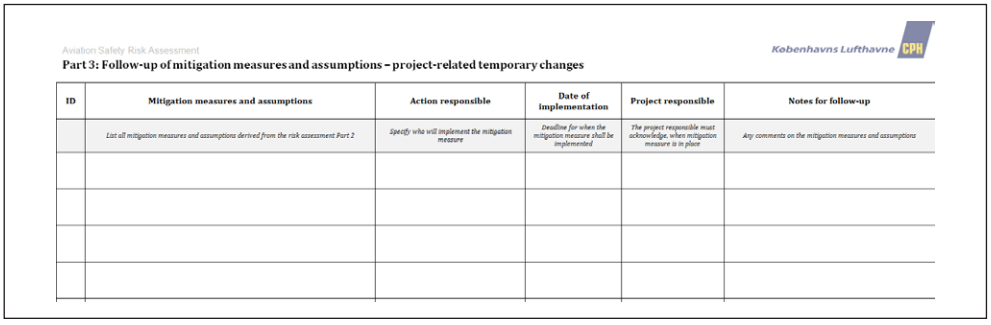
Aviation Safety Risk Assessment

Københavns Lufthavne CPH

Part 2 Risk assessment

ID	Work/Activity Breakdown	Hazard description	Aviation safety consequences	Current argument (existing mitigation measures)	Severity	Probability	Risk	Further mitigation measures to be added	Severity	Probability	Risk	Argument
	Describe what activities to be done in relation to the change	*Describe what hazards are related to the activity*	*Describe worst credible consequences that can be caused by the hazard*	*Describe the current mitigation measures and assumptions that are used to assess the current risk*	*Assess severity and probability and conclude risk level based upon current arguments*			*Describe new mitigation measures required to eliminate or reduce the current risk*	*Assess severity and probability and conclude risk level after new mitigation measures*			*Explain the reasons for the conclusion of the final risk level*

Figure 31: Change form used for major change used at Copenhagen Airports – Part 2



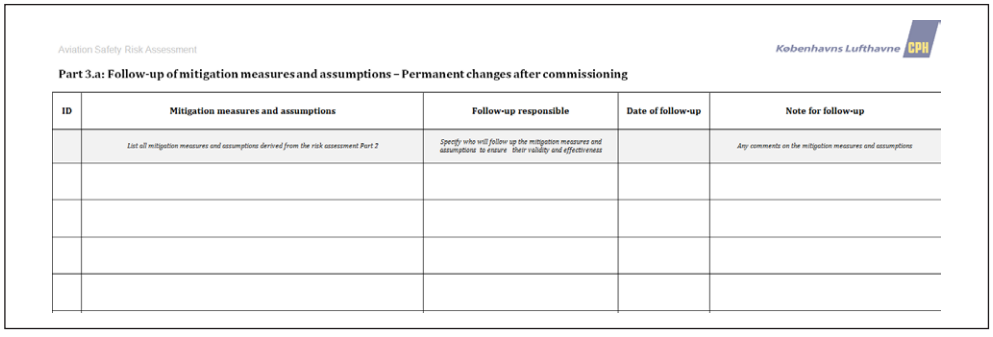
Aviation Safety Risk Assessment

Københavns Lufthavne CPH

Part 3: Follow-up of mitigation measures and assumptions – project-related temporary changes

ID	Mitigation measures and assumptions	Action responsible	Date of implementation	Project responsible	Notes for follow-up
	List all mitigation measures and assumptions derived from the risk assessment Part 2	*Specify who will implement the mitigation measure*	*Deadline for when the mitigation measure shall be implemented*	*The project responsible must acknowledge, when mitigation measure is in place*	*Any comments on the mitigation measures and assumptions*

Figure 32: Change form used for major change used at Copenhagen Airports – Part 3



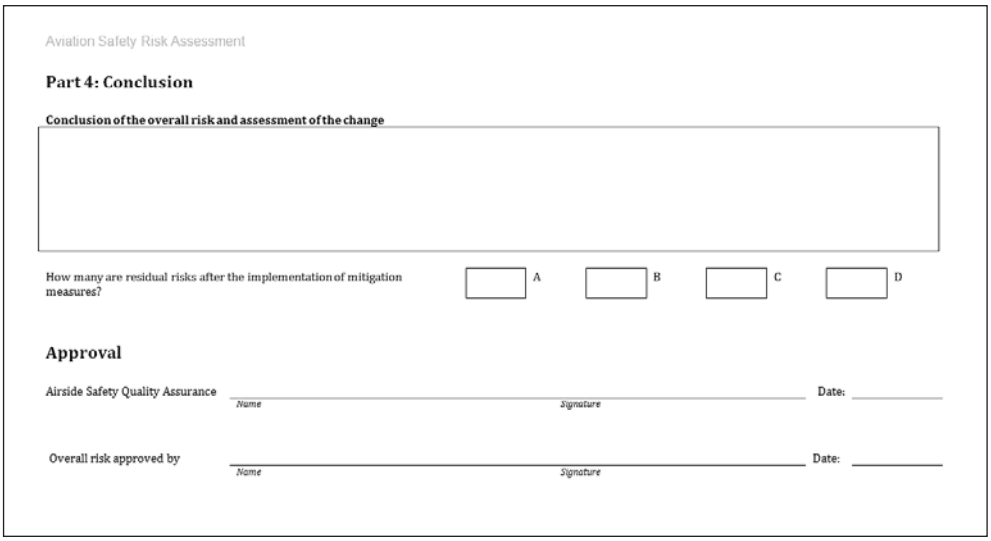
Aviation Safety Risk Assessment

Københavns Lufthavne CPH

Part 3.a: Follow-up of mitigation measures and assumptions – Permanent changes after commissioning

ID	Mitigation measures and assumptions	Follow-up responsible	Date of follow-up	Note for follow-up
	List all mitigation measures and assumptions derived from the risk assessment Part 2	*Specify who will follow up the mitigation measures and assumptions to ensure their validity and effectiveness*		*Any comments on the mitigation measures and assumptions*

Figure 33: Change form used for major change used at Copenhagen Airports – Part 3.a



Aviation Safety Risk Assessment

Part 4: Conclusion

Conclusion of the overall risk and assessment of the change

How many are residual risks after the implementation of mitigation measures? ☐ A ☐ B ☐ C ☐ D

Approval

Airside Safety Quality Assurance _____ Date: _____
Name *Signature*

Overall risk approved by _____ Date: _____
Name *Signature*

Figure 34: Change form used for major change used at Copenhagen Airports – Part 4

AIRPORTS COUNCIL INTERNATIONAL

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