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WORKING PAPER

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First Aeronautical Information Management (AIM), Flight Plan (FPL) Error Management and Air Traffic Services Inter-facility Data Communication (AIDC), Meeting (AIM/FPL/AIDC/1)

Tegucigalpa, Honduras, 30 October to 3 November 2017

Agenda Item 11: Safety Risk Analysis

SAFETY MANAGEMENT

(Presented by Secretariat)

EXECUTIVE SUMMARY	
This Working Paper presents Eurocontrol *"Guidance for the implementation of safety management in AIS/AIM in the ECAC region".*	
Action:	Action is presented in Section 1
Strategic Objectives:	• Safety • Air Navigation Capacity and Efficiency •
References:	Eurocontrol "*Guidance for the implementation of safety management in AIS/AIM in the ECAC region*"

1. Introduction

1.1 This Working Paper presents the Eurocontrol "*Guidance for the implementation of safety management in AIS/AIM in the ECAC region*" (**Appendix**) for further discussion during the meeting.

2. Suggested Action

2.1 The Meeting is invited to:

a) Review and analyse the Eurocontrol "*Guidance for the implementation of safety management in AIS/AIM in the ECAC region"; and*

b) Take action as deemed necessary.

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EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION

EUROCONTROL

Guidance for the implementation of safety management in AIS/AIM in the ECAC region

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Abstract

The Aeronautical Information Team (AIT) proposed the development, in collaboration with EUROCONTROL, of a commonly agreed basis for a harmonised European approach to a safety framework applicable to AIS/AIM. The solution proposed and agreed by the AIT in order to ensure a harmonised approach to safety management in AIS/AIM was the implementation of and adherence to the requirements of Article 10(2) of Regulation (EU) No 73/2010.

The AIT requested the FG to continue its activity and, using the existing material, to develop guidance material for the implementation of safety management in AIS/AIM.

Keywords

AIS	AIM	Safety management	Quality management

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The following table identifies all management authorities who have successively approved the present issue of this document.

AUTHORITY	NAME AND SIGNATURE	DATE
Secretary Safety Framework in AIM FG	Alexandre PETROVSKY	29/11/2011
Chairman Safety Framework in AIM FG	Markus FLÜCKIGER	29/11/2011
AIM/SWIM Team Chairman		

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FOREWORD

The efforts of certain AIS/AIM providers to meet the requirements for the development of a safety assessment framework within the AIS/AIM domain have been inadequate and other methods are required in order for these requirements to be met.

This being the case, the Aeronautical Information Team (AIT) proposed the development, in collaboration with EUROCONTROL, of a commonly agreed basis for a harmonised European approach to a safety framework applicable to AIS/AIM. For that purpose, the AIT established the Safety Framework in AIM Focus Group (FG), which was tasked with developing a common harmonised European approach to a safety framework applicable to AIM in the context of the Aeronautical Data Quality Implementing Rule (ADQ IR).

The solution proposed and agreed by the AIT in order to ensure a harmonised approach to safety management in AIS/AIM was the implementation of and adherence to the requirements of Article 10(2) of Regulation (EU) No 73/2010 (ADQ IR):

"The parties referred to in Article 2(2) shall ensure that the quality management system referred to in paragraph 1 of this Article defines procedures to meet the safety management objectives …"

The AIT requested the FG to continue its activity and, using existing material and best practices in safety management, to develop guidance material for the implementation of safety management in AIS/AIM.

In commissioning this guidance material the AIT requested the FG to coordinate its activities with EASA in order to ensure a coherent approach. Despite all the efforts made this coordination was not established. Copies of the final report of the Safety Framework in AIM Focus Group with the proposal to the AIT for a harmonised approach for safety management in AIM were provided to EASA through the members of the EASA working group dealing with the subject matter.

This document is intended for AIS/AIM providers who wish to refer to it as guidance in order to develop and define procedures to meet the safety management objectives required by Regulation (EU) No 73/2010. It is the result of the common efforts of the quality/safety management experts who have made contributions to the Safety Framework in AIM Focus Group. Without their commitment and support, this work would not have come to fruition.

Members of Safety Framework in AIM Focus Group

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1. Introduction

1.1 Overview of the AIS/AIM safety management framework

In recent years, the regulatory environment and the safety culture in the ATM community have dramatically changed, leading ATM to adopt a more formalised approach to safety management. This has been driven by ICAO SARPS and EU regulations, inter alia the following:

- ICAO SARPS: - ICAO Doc 4444 - PANS-ATM
  - ICAO Annex 11
  - ICAO Doc 9859 - Safety Management Manual
- EU requirements:
  - Commission Regulation EC No 2096/2005 laying down common requirements for the provision of air navigation services
- EUROCONTROL Safety Regulatory Requirements (ESARR):

In the main, these regulations address the safety management requirements for the ATM environment and do not specify the extent to which these safety requirements should be applicable to AIS/AIM providers.

1.1.1 Commission Regulation (EC) laying down common requirements for the provision of air navigation services[1]

The efforts of many of the AIS/AIM providers to meet the requirements of this regulation for the development of a safety assessment framework designed for the ATM environment (as the means of compliance for SES certification for AIS/AIM system changes) have been inadequate and other methods are required in order to ensure the provision of timely and high-quality digital aeronautical data taking into account the increasing dependence of the current and future navigation and ATM systems on the data provided by the AIS/AIM providers.

In addition, the requirements for the application of safety management within the AIS/AIM environment have been made dependent on the position of the AIS/AIM provider within the organisational structure of the ANSP.

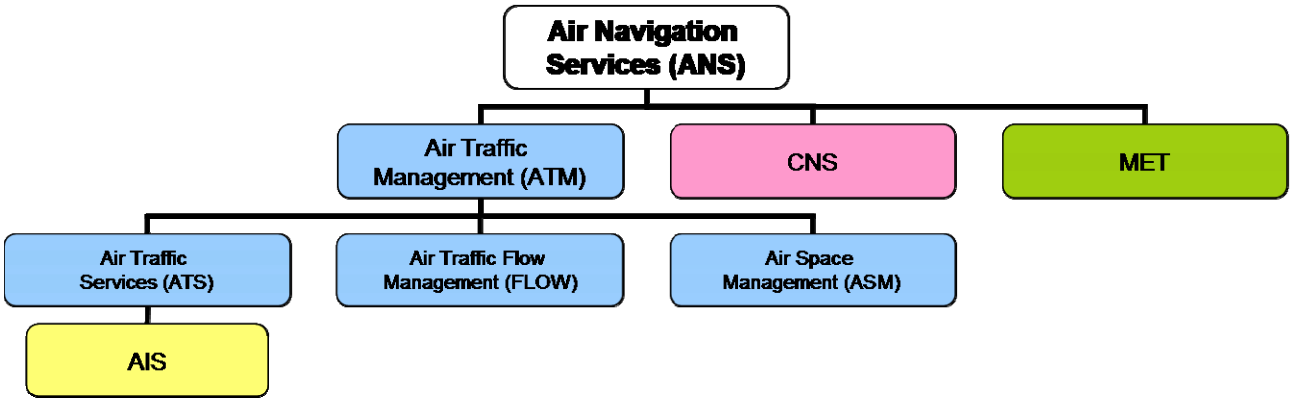


Figure 1: AIS/AIM provider under the managerial control of an ATS provider

[1] EC Regulation No 2096/2005 was repealed on 17 October 2011 and was replaced by Commission Implementing Regulation (EU) No 1035/2011. The content of this section is equally applicable to the new Regulation.

If the AIS/AIM provider is under the managerial control of an ATS provider (see Figure 1) , it is considered to be a supporting service and part of the ATS safety management system (SMS), which means that the AIS/AIM provider is required to comply with the ESARR.

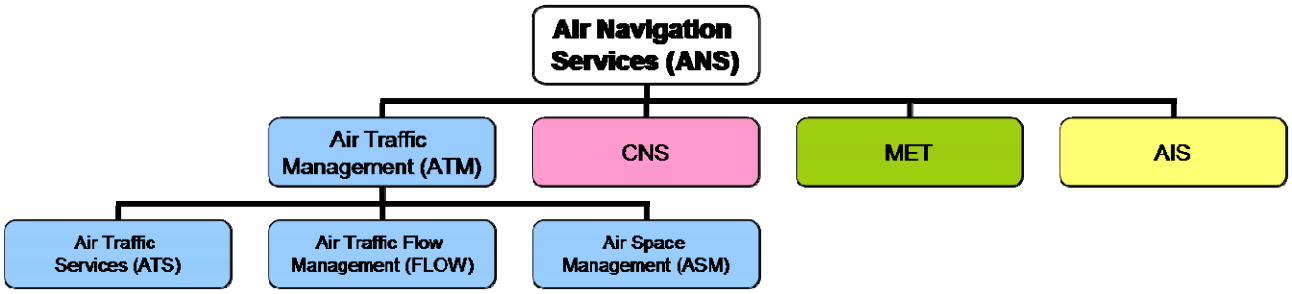


Figure 2: AIS/AIM provider <u>not</u> under the managerial control of an ATS provider

If the AIS/AIM provider is not under the managerial control of an ATS provider, it is regarded as an external service, and the requirements for safety management are less prescriptive. The ATS provider is being required to ensure adequate justification of the safety of an externally provided service (e.g. via service-level agreements). (See Figure 2 and 3)

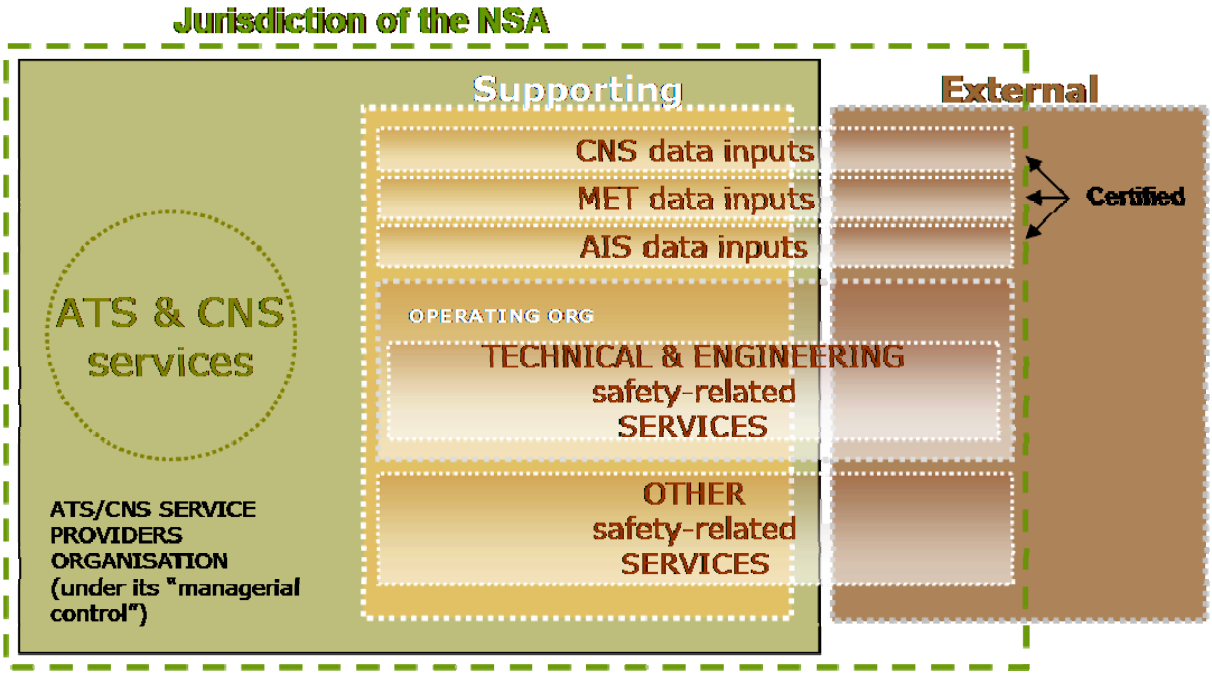


Figure 3: External and supporting services under Regulation (EC) No 2096/2005

1.1.2 CHAIN activity preliminary safety case

Consequently, there is a significant need to assess the safety impact of any change in an AIS/AIM system which influences the provision of such data and to provide clear guidance to AIS/AIM providers on the application of safety management requirements to the AIS/AIM environment. This fact was confirmed by the CHAIN activity during the development of the preliminary safety case and the safety analysis of the upstream aeronautical data chain activities. (See Figure 3)

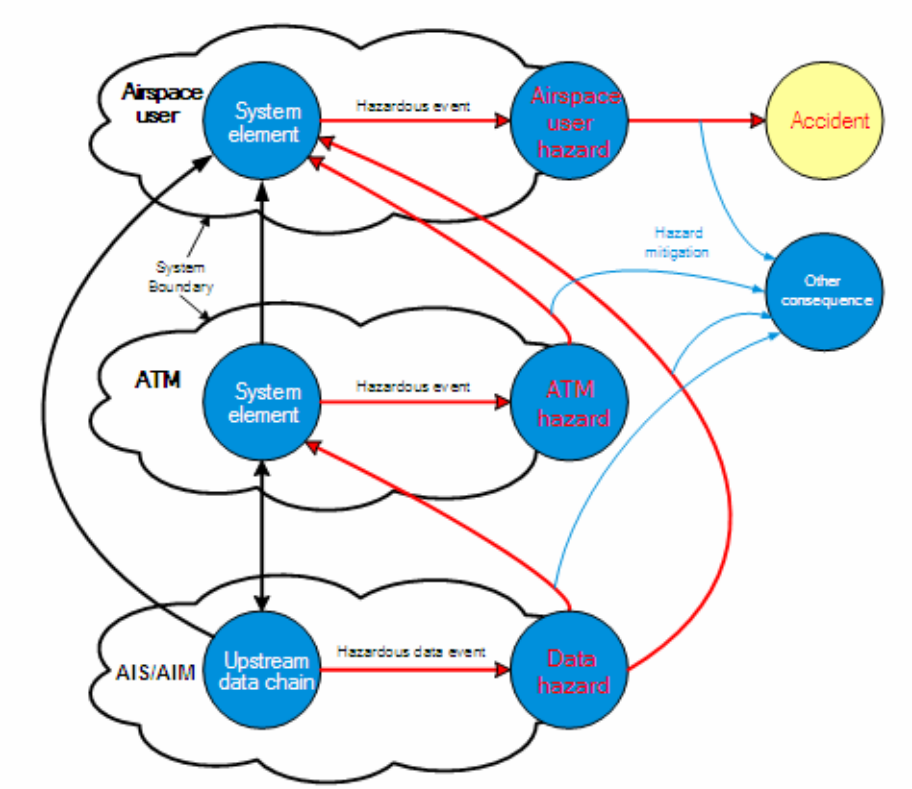


Figure 4: AIS/AIM data hazard model (CHAIN Safety Plan)

1.1.3 EUROCONTROL guidance for implementation of Regulation (EC) No 2096/2005

EUROCONTROL, in Volume II (Aeronautical Information Service Providers) of its guidance material related to Commission Regulation (EC) No 2096/2005 laying down common requirements for the provision of air navigation services, provides some guidance for the implementation of safety requirements in AIS/AIM.

The above-mentioned guidance is limited to the implementation of the quality management system (QMS) in AIS/AIM and the implementation of the safety management requirements for those AIS/AIM providers under the managerial control of an ATS and/or CNS provider. It also suggests establishing an integrated quality and safety management system (IMS) by using mapping between ISO 9001 and ESARR 3. However, it does not provide any guidance to AIS/AIM providers outside the managerial control of an ATS provider, nor does it specify any provisions for safety assessment in the AIS/AIM environment.

1.1.4 Quality management requirements for AIS/AIM

In 1998, ICAO Annex 15 introduced the requirement for implementation and maintenance of a QMS encompassing all functions of an AIS/AIM provider with regard to aeronautical information/data

It also recommends that the AIS/AIM QMS follows the International Organization for Standardization (ISO) 9000 series of quality assurance standards, and is certified by an approved organisation.

In the ECAC area, states agreed a European Convergence and Implementation Plan (ECIP) Implementation Objective (INF 02) to implement ISO 9001:2000 in AIS by the end of 2003.

1.1.5 Regulation (EU) No 73/2010 – aeronautical data quality

In 2010, the European Commission published the requirements on the quality of aeronautical data and aeronautical information for the single European sky (Regulation (EU) No 73/2010). These requirements take into account the previous developments within AIS/AIM, and Article 10 of the Regulation establishes the requirements for quality, safety and security management.

These requirements stipulate the need to define the procedures in the QMS of AIS/AIM providers in order to meet the following safety management objectives, laid down in Annex VII to the Regulation:

1. The safety management objectives shall be:

- to minimise the contribution to the risk of an aircraft accident arising from data errors as far as reasonably practicable,

- to promote awareness of safety around the organisation by sharing lessons arising from safety activities and by involving all staff to propose solutions to identified safety issues and improvements to assist the effectiveness and efficiency of the processes,

- to ensure that a function is identified within the organisation being responsible for development and maintenance of the safety management objectives,

- to ensure that records are kept and monitoring is carried out to provide safety assurance of their activities,

- to ensure improvements are recommended, where needed, to provide assurance of the safety of activities.

2. The achievement of the safety management objectives shall be afforded the highest priority over commercial, operational, environmental or social pressures.

The Regulation further requires that it be ensured that any changes to the existing systems (constituents and associated procedures involved in the origination, production, storage, handling, processing, transfer and distribution of aeronautical data and aeronautical information) or the introduction of new systems are preceded by a safety assessment[2], including hazard identification, risk assessment and mitigation, conducted by the parties concerned.

[2] In Regulation (EU) No 73/2010, the minimum requirements for safety assessment are listed in Article 7(3), Annex I, Annex II and points 1 and 2 of Part A of Annex IV.

1.2 Safety Framework in AIM Focus Group

In view of the above situation, the AIT proposed the development, in collaboration with EUROCONTROL, of a commonly agreed basis for a harmonised European approach to a safety framework applicable to AIS/AIM. For that purpose, the AIT established the Safety Framework in AIM FG, which was tasked with developing a common harmonised European approach to a safety framework applicable to AIM in the context of the ADQ IR.

The FG analysed the quality management standard (ISO 9001) and in particular the mapping between ISO 9001 and the safety management system (ESARR 3 - as an example of an SMS) and agreed that the application of the quality management system (ISO 9001) in AIS/AIM would cover most of the requirements for a safety management system for AIS/AIM. However, given the increased reliance of the navigation and ATM systems on digital data supplied by AIS/AIM, there are certain important safety requirements which are not dealt with by the QMS.

The FG subsequently made a comparison of the requirements for the quality management system (ISO 9001) encompassing the safety management objectives laid down in Regulation (EU) No 73/2010 with the requirements for the safety management system (ESARR 3 - as an example of an SMS). This comparison demonstrated that the requirements of Regulation (EU) No 73/2010 fully address the safety requirements related to AIS/AIM which are not covered by the quality management standard (ISO 9001).

The FG reviewed several possible options for a harmonised approach to the safety framework applicable to AIS/AIM (e.g. extension of existing ATS safety regulations to AIS/AIM) and identified their advantages and disadvantages. The solution proposed and agreed by the AIT in order to ensure a harmonised approach to safety management in AIS/AIM was the implementation of and adherence to the requirements of Article 10(2) of Regulation (EU) No 73/2010:

"The parties referred to in Article 2(2) shall ensure that the quality management system referred to in paragraph 1 of this Article defines procedures to meet the safety management objectives …"

1.3 Relationship between a QMS and an SMS

Since that there were various developments and implementations of the safety management systems within the European ANSP, it was felt important to describe within this guidance material the various possibilities for cohabitation of the QMS and SMS within one organisation.

1.3.1 Common features of and differences between QMS and SMS

Both an SMS and a QMS are parts of the management system of an organisation and help the overall organisational goals to be achieved. An SMS addresses only one aspect of the organisation's operations (safety), whereas a QMS assesses all the organisation's operations, including its administration processes.

The principles of quality management are used by senior management to guide an organisation towards improved performance. The safety management principles ensure that safety levels are maintained and, where possible, improved.

A QMS provides assurance for the management of quality by means of a process method – PDCA (Plan-Do-Check-Act). An SMS provides assurance of safety, by identifying, preventing and controlling the safety hazards existing in an operation.

Both a QMS and an SMS require:

- planning: a set of policies, objectives and strategies which state what the organisation aims to achieve;
- implementation: a set of procedures which describe the processes required to implement the management system and the processes required to achieve and ensure quality or safety;

- monitoring: the organisation must carry out objective audits in order to determine whether the QMS/SMS has been effectively implemented;
- improvement: corrective actions and continuous improvement

Both SMS and QMS activities are conducted to check compliance with standards (or targets) and procedures, to detect problems and to facilitate the identification of solutions and improvements.

A QMS provides a structured and standardised approach for processes and procedures, enabling the SMS to identify hazards and keep safety risks under control. The relationship therefore allows an SMS to operate as planned and make improvements to prevent or mitigate deviations when they occur.

A QMS, however, cannot by itself “assure safety”, because a QMS does not have the function of identifying and controlling safety risks which might to occur during QMS-compliant operations. The integration of an SMS into a QMS significantly enhances the possibility of achieving safety goals.

Establishing a complementary relationship between an SMS and a QMS leads to the complementary contribution of each system to the attainment of the organisation’s safety goals. Figure 4 depicts the relationship between an SMS and a QMS and Table 1 demonstrates the common features of and differences between an SMS and a QMS.

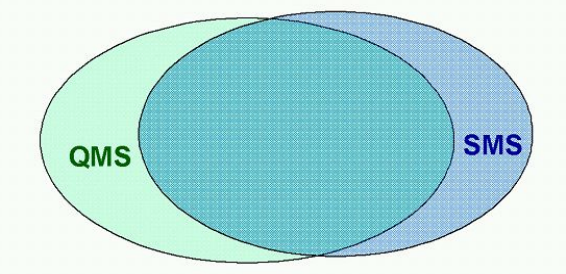


Figure 5: Relationship between a QMS and an SMS

SMS	QMS
Safety occurrences	Control of non-conforming products
Safety surveys	Monitoring and measurement, audit
Safety records	Documentation requirements
Management	Management
	Customer focus
	Resource management
	Product realisation

Risk assessment and mitigation	
Lesson dissemination	

Table 1: Common features of and differences between a QMS and an SMS

1.3.2 Integration of a QMS with an SMS

Although Regulation (EU) No 73/2010 clearly prescribes the inclusion of the safety objectives in the QMS, it is felt that it is useful to list all possible approaches to integration of a QMS with an SMS, taking into account the quality and safety management systems already existing at ANSP level in Europe.

There are three possible options when developing SMSs and QMSs.

a) Separation

Under this approach, two different systems are established for QMS and SMS. The QMS and the SMS collaborate on a case-by-case basis. Within this approach, the development of completely separate systems is needed. Coordination and communication between the two systems is not explicitly defined, but forms part of the general organisation process of coordination and communication.

b) Collaboration

Under this approach, common subjects might be partly dealt with in a shared manner. The SMS is usually for new or additional threats to safety, whilst the QMS prevents any erosion of safety. Thus the SMS is more proactive and the QMS more reactive. SMS looks ahead for safety problems, ensuring that they are addressed before an incident occurs, whilst QMS checks what has not been done and corrects non-conformances so that old problems do not recur.

c) Inclusion

Under this approach, either the SMS is incorporated in the QMS, or QMS elements are included in the SMS. Common subjects might be dealt with as one or in a shared manner. Two variants are possible.

The first takes account of the existence of the QMS in the organisation. The SMS is added on top of the QMS. Under this approach, safety is managed as an attribute of quality. All SMS principles, objectives, procedures and processes are included in the existing QMS elements.

The second variant envisages the inclusion in the SMS of certain useful QMS elements and techniques together with others which are mandatory for the quality requirements of the environment concerned.

The principle of integrating an SMS into a QMS entails the addition of relative risk management requirements where risk management is needed in the following four QMS processes: management responsibility, resource management, operation and improvement. Consequently, the management goals will be upgraded from “stable quality” to “assured safety”.

1.3.3 Possible approach towards the inclusion of safety management in the AIS/AIM QMS

Taking into account the existing implementations of the SMS at some AIS/AIM providers, the following possible approaches are proposed in order to integrate safety management into the QMS and link it to the ANSP’s SMS

1) In an AIS/AIM provider which is not under the managerial control of the ATS provider, safety management can be:

- either part of the existing QMS, in which case the existing QMS processes are extended and the "upgraded version" could for example be described in the AIS/AIM provider's quality manual,
- or part of the existing SMS, in which case the existing SMS processes are extended and the "upgraded version" could for example be described in the AIS/AIM provider's or ANSP's safety management manual.

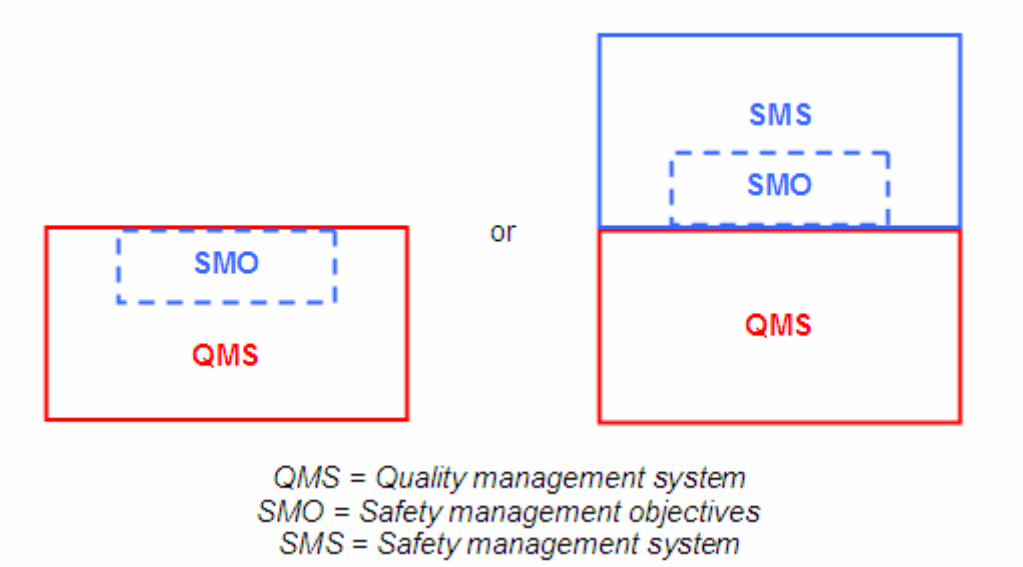


Figure 6: Relationship between safety and quality management in an AIS/AIM provider where AIS/AIM <u>is not</u> under the managerial control of the ATS provider

2) In an AIS/AIM provider where AIS is under the managerial control of the ATS provider, safety management is part of the SMS, in which case the existing SMS processes are extended and the "upgraded version" could for example be described in the ATMP's or ANSP's safety management manual.

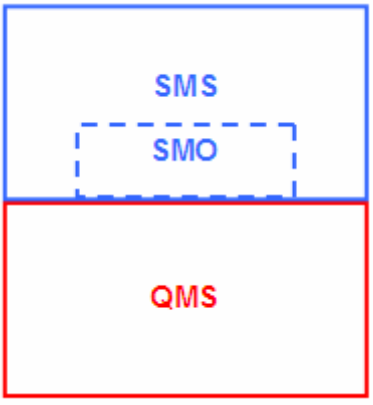


Figure 7: Relationship between safety and quality management in an AIS/AIM provider where AIS/AIM is under the managerial control of the ATS provider

1.4 Aim of the document

This document is intended for AIS/AIM providers who wish to refer to it as guidance in order to develop and define procedures to meet the safety management objectives required by Regulation (EU) No 73/2010.

Although it attempts to be exhaustive, it is restricted by local peculiarities such as institutional and organisational arrangements or national legislative frameworks that cannot be envisaged in such a generic document (e.g. where the SMS of an ANSP includes the AIS/AIM providers). On the other hand, depending on the size of the AIS/AIM provider, it may be too extensive.

Consequently, those AIS/AIM providers wishing to use this material as a basis will need to take into account their local environment when developing their safety management procedures.

In practical terms, this document aims to provide AIS/AIM providers with:

- practical guidance on what should form part of their procedures in order for them to meet the safety management objectives; and
- examples and illustrative material which can readily be adapted for use in their safety documentation.

These are the proposed steps to be followed in the implementation of the safety management procedures:

a) Identification of the “customised” requirements which need to be met:
   - National requirements (both laws and NSA requirements)
   - Local culture
   - ANSPs’ and AIS/AIM providers’ own goals and ambitions

b) Drafting or redrafting of the procedures

c) Internal review including, where required/desired, consultation of staff representatives

d) Consultation with the NSA as required

e) Formal adoption by top management

f) Publication

g) Communication

h) Training

i) Implementation through required plans (to be elaborated by the safety function)

j) Verification by means of safety surveys (internal process)

1.5 Document outline

The structure of this document is based broadly around the continuous improvement loop recommended in the literature on management systems (Figure 7). It comprises of several components which are closely interrelated and cannot be implemented and applied in isolation and should include:

- Safety policy
- Safety planning and organisation
- Safety achievement
- Safety assurance
- Safety promotion

Each chapter provides references to the relevant requirements from EU Regulation No 73/2010.

For the sake of readability this document omits all similar content and requirements to be found in the QMS requirements.

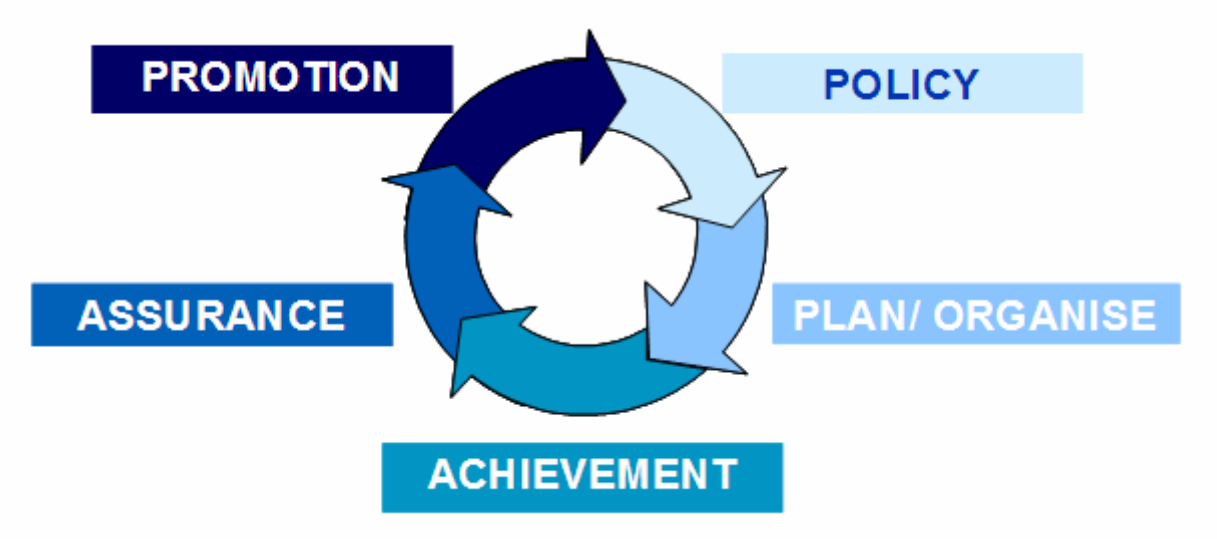


Figure 8: Typical continuous improvement loop in a management system

2. Safety policy

2.1 Requirement source

Commission Regulation (EU) No 73/2010 of 26 January 2010

laying down requirements on the quality of aeronautical data and aeronautical information for the single European sky

Article 10

1. Without prejudice to Regulation (EC) No 2096/2005, the parties referred to in Article 2(2) shall implement and maintain a quality management system covering their aeronautical data and aeronautical information provision activities, in accordance with the requirements laid down in Annex VII, Part A.

2. The parties referred to in Article 2(2) shall ensure that **the quality management system** referred to in paragraph 1 of this Article **defines procedures to meet the safety management objectives** laid down in Annex VII, Part B and the security management objectives laid down in Annex VII, Part C.

3. The parties referred to in Article 2(2) shall ensure that any changes to the existing systems referred to in the first subparagraph of Article 2(1) or the introduction of new systems are preceded by a safety assessment, including hazard identification, risk assessment and mitigation, conducted by the parties concerned.

4. During that safety assessment, the requirements referred to in Article 7(3), Annex I, Annex II and points 1 and 2 of Part A of Annex IV shall be considered as safety requirements and shall be taken into consideration, as a minimum.

ANNEX VII PART B Safety management objectives

1. The safety management objectives shall be:

— to minimise the contribution to the risk of an aircraft accident arising from data errors as far as reasonably practicable,

— to promote awareness of safety around the organisation by sharing lessons arising from safety activities and by involving all staff to propose solutions to identified safety issues and improvements to assist the effectiveness and efficiency of the processes,

— to ensure that a function is identified within the organisation being responsible for development and maintenance of the safety management objectives,

— to ensure that records are kept and monitoring is carried out to provide safety assurance of their activities,

— to ensure improvements are recommended, where needed, to provide assurance of the safety of activities.

2. The achievement of the safety management objectives shall be afforded the highest priority over commercial, operational, environmental or social pressures.

2.2 Purpose, form and content of the safety policy for AIS/AIM

The safety policy of an AIS/AIM provider must cover all the safety management objectives laid down in Part B of Annex VII to Regulation (EU) No 73/2010.

This policy must define the AIS/AIM provider's fundamental approach to the management of safety and must confirm its commitment at all levels to the fulfilment of its mission statements. It is the first important milestone when implementing safety management objectives that define the value of safety in the overall business and performance of the AIS/AIM provider.

The safety policy should set the general direction and aspirations for the establishment of safety management and improved safety performance in the AIS/AIM provider organisation.

The safety policy should take the form of a statement of the AIS/AIM provider's approach to achieving acceptable or tolerable safety and should describe the generic approaches on which the management of safety is built and operated.

The safety policy could form part of the quality policy or be a separate policy in the case of a separate safety management system.

A typical safety policy document would consist of a policy statement reflecting the AIS/AIM provider's individual approach to the management of safety. This would be further expanded to include a number of basic safety management principles to be followed, such as **commitment to safety, safety priority, safety responsibility, planning for safety, safety management, safety standards, safety achievement, safety assurance and safety promotion.**

2.3 Basic safety management principles

The commitment to safety principles should typically include a statement about the commitment of the AIS/AIM provider's senior management to ensuring that all aspects of service provision meet the safety management objectives defined in Part B of Annex VII to Regulation (EU) No 73/2010. At the same time the AIS/AIM provider's senior management should undertake to provide the necessary resources for the effective management of safety.

The safety responsibility principle requires all of the AIS/AIM provider's staff to have individual responsibility for their own actions with regard to safety, and requires the management to be responsible for the safety performance of the organisation.

Clear and correctly allocated safety accountabilities and responsibilities are a prerequisite for achieving the organisation's safety objectives and for implementing effective management of safety and an effective safety improvement process. The responsibilities/accountabilities should be specified in the relevant job/task description and manuals.

Planning for safety is an important prerequisite for proactive safety management implementation. It allows the AIS/AIM provider's safety performance to be defined and strategies, approaches and concrete plans to be identified for the achievement of an acceptable or tolerable level of safety of the services provided. It allows the organisation's safety objective to be defined, and the necessary means and resources for their achievement to be identified.

The safety achievement principle is an essential domain for the management of safety and should comprise a set of organisational arrangements, processes and systematic actions (e.g. risk assessment, error reporting and investigation, etc.) to be deployed in order to enable the AIS/AIM provider's safety management objectives to be achieved.

The safety assurance principle should specify means, processes, procedures and resources to demonstrate compliance with the safety requirements and deliver the evidence required about the level of safety achieved (e.g. safety surveys, safety records, etc.). Also, the safety assurance methods used by an AIS/AIM provider should support the identification of safety problems and the establishment of recommendations for safety improvement. The objective of this principle is to implement dedicated surveillance and documenting procedures and processes in order to ensure that the risks are being properly managed.

The safety promotion principle covers the means, processes and procedures that allow for communication of safety matters among operational personnel and AIS/AIM provider management. It ensures that safety lessons and key messages are disseminated throughout the AIS/AIM provider organisation, that the communication of safety matters is encouraged and that changes are systematically made in order to improve safety.

2.4 Safety activities and deliverables

The safety policy should be written and documented under the authority of the senior level of management of the AIS/AIM provider, approved by the state's regulator (if required) and communicated to all staff of the AIS/AIM provider.

A properly communicated safety policy is a prerequisite for the creation and development of a positive safety culture within the AIS/AIM provider.

The safety policy should be disseminated within the AIS/AIM provider's organisation as widely as possible, by means of internal communication channels, safety awareness workshops, internal briefings, induction training, etc.

The ultimate goal of communicating the safety policy within the AIS/AIM provider organisation should be that the AIS/AIM provider's personnel are aware of:

- the scope of the document;
- the importance of the management of the safety objectives;
- the goals of the safety policy and the management of safety;
- the principles of the management of safety;
- the need for safety management objectives to be afforded the highest priority over commercial, operational, environmental or social pressures.

An AIS/AIM provider should set up a procedure to design a genuine safety policy document and to periodically review it with a view to updating it as necessary. The revisions are required in order to ensure that the policy is aligned with the organisation's strategic objectives, continuous improvement and evolution. The policy also needs to be consistent with other policies, and its content should not contradict other policies of the organisation.

The following table summarises actions and responsibilities in relation to the safety policy.

Safety activities/ deliverable(s)	Person responsible for initiative/ production	AIS/AIM safety function involvement	Addressee(s)	Records	Endorsement approval
Safety policy Production, review and signature	AIS/AIM top management	Support	All staff	Quality (Safety) Management Manual	CEO
Posters	Safety Manager	Dissemination	All staff	n/a	n/a
Communication initiatives	AIS/AIM provider senior management, Safety Manager	Support	All staff	Activity report	Safety department

Table 2: Summary of actions and responsibilities in respect to the safety policy

2.5 Examples of safety management policies

2.5.1 Safety policy of a small ANSP where AIS forms part of the ANSP safety management system

SLOVENIA CONTROL SAFETY POLICY

The overall safety policy of the ANSP SLOVENIA CONTROL in the Republic of Slovenia is as follows:

1. The implementation of the SMS at SLOVENIA CONTROL is endorsed by the most senior level of management within the organisation.
2. SLOVENIA CONTROL operates with the highest level of safety, even if this imposes restrictions on airspace capacity.
3. SLOVENIA CONTROL has decided that the ongoing procedures for the future are continuous improvement of the implemented SMS and achievement of the improved safety levels of the services provided.
4. The SLOVENIA CONTROL ATM and SMS are subject to a process of continuous safety improvement.
5. The main goal is to ensure safe and reliable operation of Slovenian ANS without causing traffic delays, incidents or any other problems to air traffic. SLOVENIA CONTROL is one of the leading ANSPs in Europe in terms of safety, reliability and overall quality of service. Safety is integrated into the organisations ANS.
6. Safety in operations is monitored mainly by operational monitoring of the SMS and supervisory system, with its corrective and preventive actions. All interventions in the operational system must be systematically planned by the managers responsible.
7. SLOVENIA CONTROL advocates a non-punitive safety policy in order to maintain and provide a good safety culture and reporting system.
8. The SMS of SLOVENIA CONTROL reflects the above overall safety policy and is traceable from the policy statements through principles, responsibilities and procedures. The policy statements define the fundamental approach to safety management to be adopted by SLOVENIA CONTROL.

The safety policy includes the following policy statements:

1. Safety objective

SLOVENIA CONTROL's safety objective is to minimise the service provision contribution to the risk of any aircraft accident/incident to as low a level as is reasonably practicable, whilst providing an expeditious service to air traffic.

Note: Where risk is concerned, there is no such thing as absolute safety. "As low as reasonably practicable" means that risk in a particular activity can be balanced against the time, cost and difficulty of taking measures to avoid risk. The greater the risk is to safety, the more reasonable it is to make substantial efforts to reduce that risk. It therefore goes without saying, that hazards must be identified and the risk assessed before a judgement can be made regarding their tolerability.

2. Safety management

SLOVENIA CONTROL adopts an explicit, proactive approach to systematic safety management in the ANS. Safety management is based on the following principles:

- The approach is management-led.
- The scope is organisation-wide.

- Everyone is aware of safety.
- Everyone is responsible.
- The philosophy is prevention.
- The theme is continuous improvement.

3. Safety responsibility

- Everyone has an individual responsibility for the safety of their own actions, and managers are accountable for the safety performance of the activities for which they have responsibility.
- Accountability for safety belongs to all levels of management, and the attainment of satisfactory performance requires the commitment and participation of all members of the organisation.
- The Director General is responsible for fostering the basic motivation, so that everybody develops an awareness of safety.

The SLOVENIA CONTROL Safety Manager is responsible for the provision of the safety management system.

- Where risks are identified and improvements become necessary, the Director General is responsible for ensuring that the appropriate measures are performed swiftly in the divisions concerned.
- Everybody within SLOVENIA CONTROL should be made aware of the consequences of mistakes and strive to avoid them

4. The priority of safety

The SLOVENIA CONTROL safety policy statements are such that the achievement of satisfactory level of safety is afforded as the highest priority when assessing commercial, operational, environmental or social pressures.

Rationale: The safety management system should clearly address and resist misjudged business pressures. Conversely, the SMS should ensure that safety is not used to inappropriately support commercial, financial, environmental or other decisions which have little real safety significance

5. Safety standards and compliance

SLOVENIA CONTROL has a safety policy statement which commits it, as a minimum, to compliance with all appropriate safety standards and requirements.

6. Externally supplied products and services

SLOVENIA CONTROL has a safety policy statement which commits it to ensuring that the safety assurance processes used by its external suppliers meet its own safety management standards and safety requirements.

Rationale: A safety assessment requires input from all phases of a product or service development. For externally supplied products or services, the external supplier must accept and comply with the organisation's safety and SMS requirements.

2.5.2 An ANSP which combines safety, quality and business statements

NAVIAIR, DENMARK

NAVIAIR is the service provider in Denmark. In its safety policy, it declares that its provision of ATS in Denmark must ensure increased safety, efficiency and regularity, to the satisfaction of users and employees, in such a way that growth is secured for customers.

POLICY STATEMENT

"NAVIAIR's provision of ATS in Denmark shall be provided with increased safety, efficiency and

regularity, for the satisfaction of the users and the employees, in such a way that the growth for the customers is secured."

PRINCIPLES

Priority, assessment, improvement, competency, SMS, activities

3. Organisation for the management of safety in AIS/AIM

3.1 Requirement source

Commission Regulation (EU) No 73/2010 of 26 January 2010

laying down requirements on the quality of aeronautical data and aeronautical information for the single European sky

Article 10

1. Without prejudice to Regulation (EC) No 2096/2005, the parties referred to in Article 2(2) shall implement and maintain a quality management system covering their aeronautical data and aeronautical information provision activities, in accordance with the requirements laid down in Annex VII, Part A.

2. The parties referred to in Article 2(2) shall ensure that **the quality management system** referred to in paragraph 1 of this Article **defines procedures to meet the safety management objectives** laid down in Annex VII, Part B and the security management objectives laid down in Annex VII, Part C.

3. The parties referred to in Article 2(2) shall ensure that any changes to the existing systems referred to in the first subparagraph of Article 2(1) or the introduction of new systems are preceded by a safety assessment, including hazard identification, risk assessment and mitigation, conducted by the parties concerned.

4. During that safety assessment, the requirements referred to in Article 7(3), Annex I, Annex II and points 1 and 2 of Part A of Annex IV shall be considered as safety requirements and shall be taken into consideration, as a minimum.

ANNEX VII PART B Safety management objectives

1. The safety management objectives shall be:

— to minimise the contribution to the risk of an aircraft accident arising from data errors as far as reasonably practicable,

— to promote awareness of safety around the organisation by sharing lessons arising from safety activities and by involving all staff to propose solutions to identified safety issues and improvements to assist the effectiveness and efficiency of the processes,

— to ensure that a function is identified within the organisation being responsible for development and maintenance of the safety management objectives,

— to ensure that records are kept and monitoring is carried out to provide safety assurance of their activities,

— to ensure improvements are recommended, where needed, to provide assurance of the safety of activities.

2. The achievement of the safety management objectives shall be afforded the highest priority over commercial, operational, environmental or social pressures.

3.2 Purpose and objective

The purpose of the safety management function in the AIS/AIM provider organisation is to ensure the development and maintenance of the safety management objectives defined by EU Regulation No 73/2010.

The objective of the safety management function in AIS/AIM is to provide and maintain the framework and allocate the necessary resources for effective and proactive safety management that will enable the AIS/AIM provider to meet its safety objectives.

3.3 Safety management function in the AIS/AIM provider

A safety management function in the AIS/AIM provider should include in general:

- an entity (or entities – depending on the size of the organisation) responsible for the development, implementation and maintenance of the safety management objectives, defining the safety accountabilities and responsibilities and developing the processes and procedures of the AIS/AIM provider for the management of safety,
- personnel with safety responsibilities.

3.3.1 The key features and responsibilities of the safety management function in the AIS/AIM provider

Independence	the function needs to be independent of line management and should ensure the connection with the SMS of the ANSP (where appropriate)
Communication	the communication skills must be a key feature for the function. It is most important that the function establishes communication lines throughout the AIS/AIM provider. Communication should be open on all levels
Knowledge	the function needs to have comprehensive knowledge of safety in the AIS/AIM provider and be able to answer any questions that arise
Verification and validation	the function should be a place where the rest of the AIS/AIM provider can go to for verification and validation of assessments, investigations and surveys on the processes

The function should efficiently cover every aspect of the AIS/AIM provider and should be responsible for:

- the development, implementation and maintenance of the safety management objectives,
- the definition of the safety accountabilities and responsibilities, and
- the development of the processes and procedures for the management of safety.

3.3.2 Safety manager independence and establishment of clear safety accountability and responsibility

Several important considerations must be taken into account by the AIS/AIM providers when establishing this safety management objective:

- **to appoint a safety manager** - an independent and credible member of the management team, who, irrespective of other duties, has the responsibility and authority to supervise and maintain safety management processes and procedures, but also to develop and support the implementation of such processes and procedures on initial deployment of the safety management objectives.

The safety manager must be wholly independent of the executive management of the AIS/AIM provider and be responsible direct to the same senior manager as all the executive managers are. If this cannot be achieved in a very small organisation, then credible evidence must be supplied that safety management responsibilities are carried out independently and free of any responsibility to another manager for any other job function.

• **to establish clear safety accountabilities and responsibilities for all personnel involved in safety-related tasks** - this includes unambiguous definition and allocation of accountabilities and responsibilities for all matters of operational safety.

Note: Responsibility and accountability are closely related concepts. Safety responsibility is delegated within the area of job responsibilities, provided such delegation is documented. Safety accountabilities define to whom the responsible person needs to demonstrate the satisfactory discharge of their safety responsibilities.

3.3.3 Safety accountability

The accountability for safety in the AIS/AIM provider lies with the line management that owns the risk, and the overall accountability lies of course with the CEO. However, everybody is responsible for the specific job they are employed to do. The difference between accountability and responsibility can be difficult to understand, and in some languages there is just one word for both concepts. But if you are accountable for something, you are legally responsible for it, and can be held legally accountable, which means you can be punished by the law.

The safety director/safety manager and the safety department are support staff for the line management and are not accountable or responsible for the safety of the organisation. It is those who own the risk who are responsible for safety and that should always be the line management.

Principal accountabilities for the safety director/safety manager would be:

• to promote and support development of the safety management objectives. Therefore, somebody needs to be assigned to do the job, and that would in most circumstances be the safety manager,

• to establish a communication framework within the AIS/AIM provider which facilitates effective safety management, i.e. clear lines of top-down and bottom-up communication on safety between the safety manager, line managers, senior management and line personnel,

• to allocate the appropriate resources to safety management, consistent with the organisation's safety policy, ensuring that appropriate funding is available for the necessary technical infrastructure, process maintenance, human resources and personnel training,

• to ensure the appropriate training and competency assessment for all personnel assigned safety management tasks.

There is no single solution for the establishment of a coherent safety management structure. The size of the organisation, its mission, complexity of operations, operating environment and its organisational safety culture will all influence the structure and functioning of its safety management system.

Any changes to the organisational structure should be assessed to determine whether or not they might affect safety responsibilities and accountabilities. Any necessary amendments to previous responsibilities and accountabilities should be properly documented.

3.4 Example of the safety manager job description

A sample job description for a Safety Manager is provided in ICAO Doc 9859 "Safety Management Manual" and has the following outline:

• Overall purpose

• Dimensions

- Nature and scope
- Qualifications
- Authority

4. Safety achievement

4.1 Requirement source

Commission Regulation (EU) No 73/2010 of 26 January 2010

laying down requirements on the quality of aeronautical data and aeronautical information for the single European sky

Article 10

1. Without prejudice to Regulation (EC) No 2096/2005, the parties referred to in Article 2(2) shall implement and maintain a quality management system covering their aeronautical data and aeronautical information provision activities, in accordance with the requirements laid down in Annex VII, Part A.

2. The parties referred to in Article 2(2) shall ensure that the quality management system referred to in paragraph 1 of this Article defines procedures to meet the safety management objectives laid down in Annex VII, Part B and the security management objectives laid down in Annex VII, Part C.

3. The parties referred to in Article 2(2) shall ensure that **any changes to the existing systems** referred to in the first subparagraph of Article 2(1) **or the introduction of new systems are preceded by a safety assessment, including hazard identification, risk assessment and mitigation, conducted by the parties concerned.**

4. During that safety assessment, the requirements referred to in Article 7(3), Annex I, Annex II and points 1 and 2 of Part A of Annex IV shall be considered as safety requirements and shall be taken into consideration, as a minimum.

ANNEX VII PART B Safety management objectives

1. The safety management objectives shall be:

— to minimise the contribution to the risk of an aircraft accident arising from data errors as far as reasonably practicable,

— to promote awareness of safety around the organisation by sharing lessons arising from safety activities and by involving all staff to propose solutions to identified safety issues and improvements to assist the effectiveness and efficiency of the processes,

— to ensure that a function is identified within the organisation being responsible for development and maintenance of the safety management objectives,

— to ensure that records are kept and monitoring is carried out to provide safety assurance of their activities,

— to ensure improvements are recommended, where needed, to provide assurance of the safety of activities.

2. The achievement of the safety management objectives shall be afforded the highest priority over commercial, operational, environmental or social pressures.

4.2 Purpose and scope of safety achievement to manage safety in AIS/AIM

Safety achievement in AIS/AIM is the result of processes and/or methods applied to attain the safety requirements stipulated by the EU Regulation No 73/2010. It should comprise of several components:

- Competency (section 4.3)
- Safety assessment (section 4.4)
- (Safety-) occurrence reporting and investigation (section 4.5)
- Management of safety documentation (section 4.6)
- Control of external services (section 4.7)

4.2.1 Safety as a function of data quality

The management of safety relies on a spectrum of organisational arrangements, methods and processes to manage proactively the risk.

It was previously recognised that the major safety risk in AIS/AIM is to introduce erroneous data in the data chain that might affect the safety of operations. Therefore by ensuring that the quality of data produced by the AIS/AIM satisfies the established requirements for its intended use it will mitigate that risk and all the safety activities should concentrate on achieving this objective.

Accordingly the objective of safety achievement in AIS/AIM is to ensure that data are of a quality in accordance with their intended use and their criticality. ICAO (reference 3) has defined three criticality categories: critical data, essential data and routine data. High-quality data guarantee a high safety standard

To ensure data quality for the whole data chain, AIS/AIM providers have to fulfil the requirements laid out in Article 6 of Commission Regulation (EU) No 73/2010. The quality of data can be characterised by using the following quality attributes (this list is not exhaustive and the AIS/AIM providers could identify additional quality attributes which might affect the safety):

Attribute	Definition (if available)
Accuracy	A degree of conformance between the estimated or measured value and the true value
Resolution	A number of units or digits to which a measured or calculated value is expressed and used
Integrity	A degree of assurance that an aeronautical data and its value has not been lost or altered since the data origination or authorized amendment
Consistency	A degree of assurance that aeronautical data across redundant or distributed databases is in synch with each other (equivalent).
Assurance level	The level of assurance that data is made available to the next intended user prior to its effective start date/time and not removed before its effective end date/time
Traceability	Ability to trace the history, application or location of what which is under consideration
Timeliness	The degree of assurance that aeronautical data is available when it is required
Currency	The degree to which aeronautical data represents reality from the required point in time i.e. the state of information of being up-to-date or not outdated.
Plausibility	The degree of assurance that aeronautical data is seemingly valid and correct
Format	The organisation of information according to preset specifications. A defined

	way of coding information adhering to a given data model for storage or transfer
Completeness	…
…	

Table 3: Examples of data quality attributes and their possible definitions

To ensure data quality, a clear definition and corresponding requirements for each of the attributes should be defined by an AIS/AIM provider in accordance with the existing ICAO SARPS and disseminated within the organisation (examples which may be used are provided in Table 3). The clear definition will help to fulfil compliance with requirements and provide a safe service. It is recommended that reference be made to definitions in the ADQ IR and / or ICAO SARPS.

The fulfilment of all these requirements must be verified and validated.

Element		Accuracy	Integrity	Timeliness	Format	Publication Resolution
Runway Threshold	Lat/Long	1m surveyed	Critical	AIRAC	AIXM	1/100 sec

Table 4: Example of requirements for quality attributes

4.3 Competency

It should be ensured by a set of organisational arrangements that all staff involved throughout the aeronautical data chain are adequately trained and have the necessary skills, competency and authorisation to perform the range of data processing tasks they are assigned to. This could be supported by:

- Establishing a minimum set of skills and competencies for staff acting in the aeronautical data chain;
- Establishing processes to ensure that each member of staff responsible for tasks in the provision of aeronautical data or information has been briefed or trained and retains the acquired knowledge and skills;
- Retaining a sufficient level of qualified and competent staff;
- Ensuring that shortfalls are identified and mitigated;
- Implementing a continuous training process.

Note: Staff training and competency will be addressed in the DAL Specification (reference 16). If the specification is released, it will be possible to refer to the objectives in the DAL specification document concerning staff training and competency. Additionally an AIS/AIM provider could consult the ICAO AIM Training Manual (reference 5) to support its training and competency process.

4.4 Safety Assessment

The objective of the safety assessment in AIS/AIM is to provide a proactive mechanism for identifying potential hazards and finding a way of controlling risks associated with degradation and decrease of data quality. The AIS/AIM provider should ensure that the safety assessment is undertaken prior to implementation of any change potentially affecting safety and data quality, in order to demonstrate that the change meets an acceptable level of safety and quality attributes.

4.4.1 Scope of the safety assessment

As a minimum the impact of the change on the following elements should be addressed in a safety assessment as shown in the diagram below:

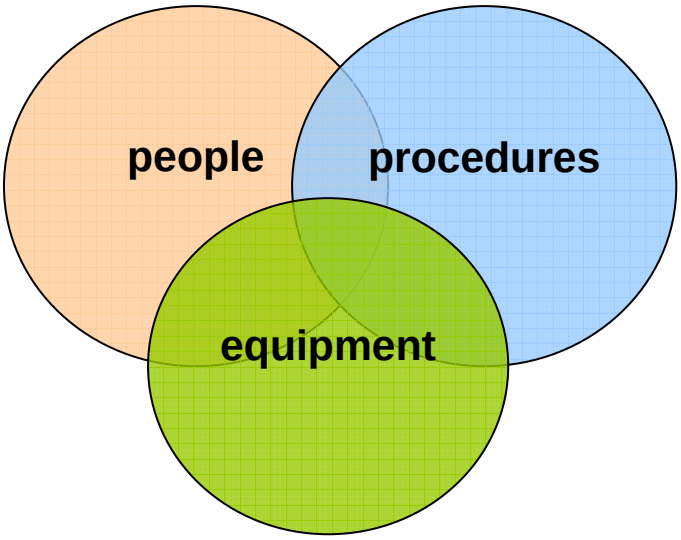


Figure 9: Scope of safety assessment[3]

An AIS/AIM provider can also choose to take account of the following in the safety assessment:

- information interface
- existing data
- data quality attributes
- ...

4.4.2 Basis for the safety assessment

The following non-exhaustive pre-requisites for the safety assessment process should be specified within the initial set-up of the management of safety:

• data quality attribute requirements	should characterise a data quality attribute. Ideally at least one measurable value should be defined for each quality attribute, e.g. an accuracy of 1 m, meta-data availability, CRC value.
• quality assurance processes	describe the mechanism for verification of compliance with the data quality attributes requirements. During the assessment it should be checked whether a change has an impact on the measurement of data and/or whether new checks are required.
• existing safety assessment procedures	describe the mechanism of the safety assessment processes
• documented safety management processes	provide the same information to all parties involved.
• …	

[3] Operational environment (area) could also have an impact on the safety assessment and might be addressed in safety assessment

This list is not exhaustive and should be adjusted to the needs of each organisation.

The pre-requisites above are constants which should be specified before the first safety assessment, driven by a change, is performed. (This does not mean that they cannot be adjusted whenever necessary) They serve as the static basis for the assessment process. During an assessment, it should be checked whether the change has any effect on the pre-requisites above, e.g. whether a change has a negative impact on compliance with a certain data quality attribute requirement; a serious impact would be if a data quality attribute requirement were no longer to be fulfilled.

This basis can also serve to validate the assessment results using data collected in the operational system after the change was implemented.

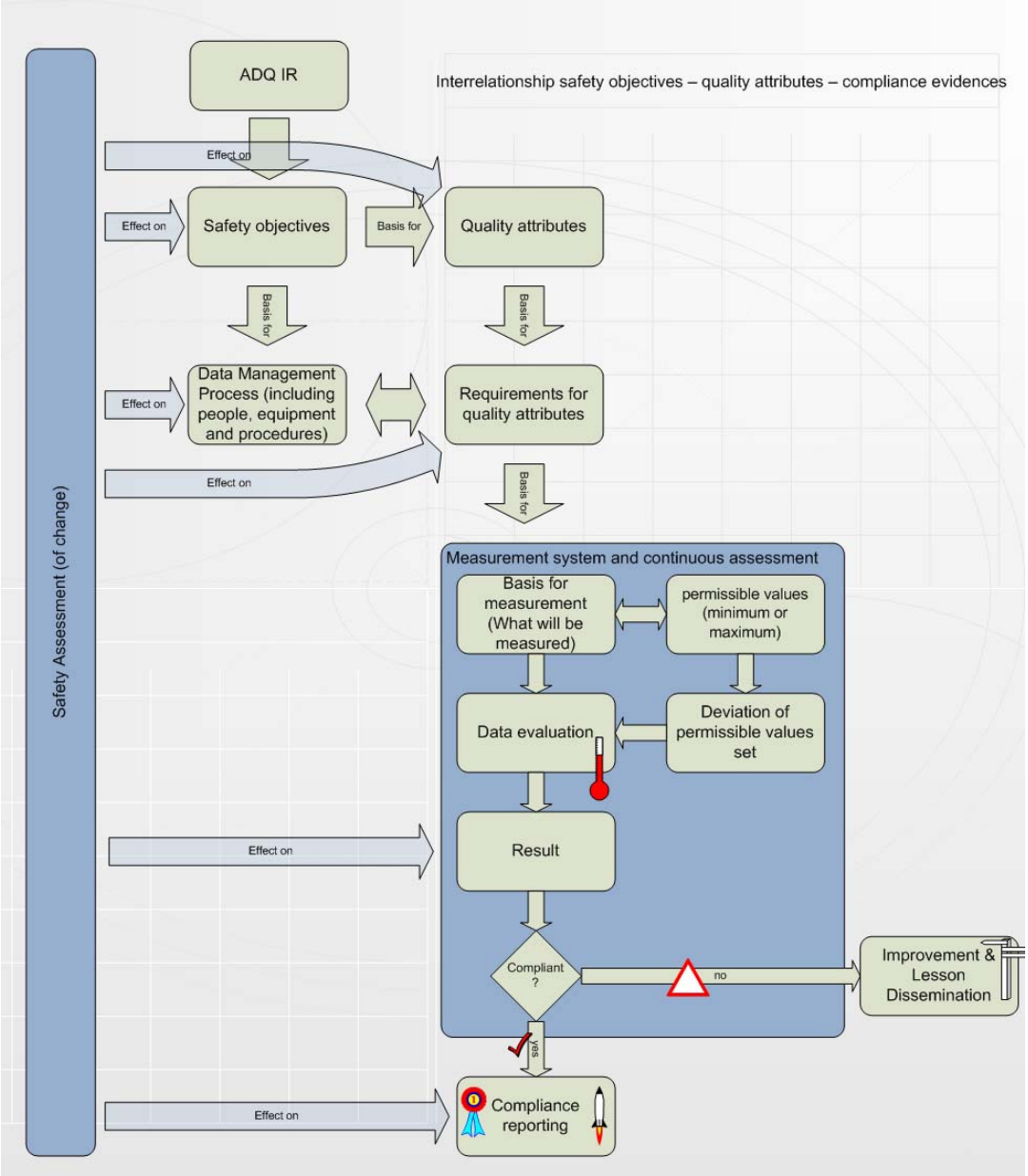


Figure 10: Flow chart describing possible concept to be addressed in the safety assessment processes and showing some of the existing interdependencies (measurement, evidence and safety assessment...)

The following elements should be defined based on the above pre-requisites and shall be set up individually for each safety assessment:

- scope of the change

- system boundaries
- checklist of elements possibly affected by the change
- …

As mentioned above, this list is not exhaustive and should be adjusted to the organisations needs.

A cross reference matrix could be used to identify the elements affected by the change.

Example: If a procedure is changed, then it should be checked whether there is any interference with data quality attributes and whether interdependencies exist.

	Equipment	**Procedures**	**People / Roles**	**Information interface**	**Existing data**	**...**
Integrity						
Consistency						
Accuracy						
Resolution						
Assurance Level						
Traceability						
Timeliness						
Plausibility						
Completeness						
Format						
Currency						
Format						
...						

Table 5: Example of a cross reference matrix to identify elements affected by the change and interdependencies

While every organisation has its own assessment methods, the safety assessment should consist of the following process steps:

- Identification of what may be affected by the change (processes, equipment, quality attributes, people ...), including the scope and definition of the change and all relevant uses for the aeronautical data item or dataset (the example in 4.8.1 provides a template used for identification of hazards in the ATM systems; this template could be adapted to reflect the AIM environment)
- Conduct hazard identification and analysis, including the identification of likelihood and severity of potential hazards and possible interdependencies (e.g. brainstorming, simulation, task analysis, scenario driven analysis etc.).
- Assessment of risks (identification whether the risk is acceptable or not and who has the authority to decide)
- Specify mitigation measures (e.g. applying the DAL requirements (reference 16) as a good practice can support mitigation of some risks, though this will not be exhaustive)
- Implement and put into effect mitigation measures which should be supported by the management

- Check that mitigation measures are effectively implemented (e.g. through the safety key performance indicators) and if they introduce any new hazard.

Note: Examples of two assessment templates used in ATM are provided in 4.8.1

It is important to note that the safety assessments in AIS/AIM cannot be conducted solely by the operational personnel of AIS/AIM or solely by the safety experts. It is therefore of paramount importance to ensure that the safety assessment in AIS/AIM is conducted by the operational personnel of AIS/AIM and is supported by safety experts.

Though not required by the ADQ IR, it is possible and recommended to extend the task of the safety assessment and to apply it in the static state of the system (i.e. without a change in the system) on a regular basis to be able to manage day-to-day operational risks (see safety survey in 5.3).

4.4.3 Safety Key Performance Indicators

In order to be able to verify quality attributes it is recommended that key performance indicators which are based on requirements for each of the quality attributes be defined and that limits be specified.

Accordingly, each quality attribute should be linked to (a) requirement(s). Requirements should be defined in such a way that compliance with the requirements can be measured. Compliance should be expressed in terms of limits (i.e. targets, warning and action limits should be specified).

Adherence to the limits defined should be evaluated permanently and evidence for maintaining compliance with the requirements should include a statement that the required level of quality attributes has been met. If deviations are observed, occurrence reporting, investigation, reporting and lesson dissemination should be initiated.

By using such a measuring system, information about the safety situation can be obtained and thus we can speak in terms of “safety key performance indicators”. As a prerequisite, the requirements for data quality attributes should be in line with safety objectives and the criticality of the data (see references 3 and 17). This means that the higher the criticality of a certain datum is, the more demanding should be the related requirements and accordingly the targets, warning and action limits.

The safety key performance indicators should be evaluated and maintained in terms of changes even if no mitigation measures for the change have been specified, e.g. in order to ensure that a change does not degrade data quality.

4.5 (Safety) Occurrence Reporting and Investigation

4.5.1 (Safety) Occurrence Reporting

A reporting system is a set of organisational arrangements and systematic actions designed to facilitate the collection of information on actual (potential) safety deficiencies and to ensure lesson dissemination inside the AIS/AIM provider’s organisation. It should lead to a more systematic visibility of (safety-) occurrences and their causes and will act as an effective contribution to data quality. The reporting system should be based on trust, ensure confidentiality and follow a non-punitive policy (“just culture”), which it is recommended should become an integral component of the safety policy (see Chapter 2 Safety policy)

The focus of (safety) occurrences reporting will be on:

- Data items
- Data errors
- Data processing (input, maintenance, withdrawal and deletion of data)
- Data attributes, linked requirements and targets, warning and action limits

- Failures or malfunctions of the system
- ...

The occurrence reporting procedure should include:

- A definition of reported elements, e.g.:
  - Inability to provide AIM service
  - Failure of Communication function
  - Failure of Data Processing and Distribution function
  - AIM system security
  - ...
- A voluntary reporting system, encouraging personnel to report atypical situations which they believe have significance for safety, e.g. unusual occurrences, unusual system behaviour, etc.
- Definition of the systems and channels available for reporting, e.g. written reports, automated reporting mechanisms (logged technical system data).
- Definition of the responsibilities in (safety) occurrence reporting
- Definition of reporting rules.

Note: AIS/AIM providers may consult the Eurocontrol Generic Safety Management Manual (EGSMM) (reference 18) for further information and adapt it to the needs of their AIS/AIM provider organisation.

4.5.2 Investigation

The purpose of investigation in AIS/AIM activities is to prevent (safety) occurrences concerning aeronautical data themselves and (safety) occurrences which may lead to hazards where aeronautical data are used. This includes the gathering and analysis of information, the drawing of conclusions, including the determination of causes and, where appropriate, the making of (safety) recommendations.

Therefore investigation procedure should include:

- A definition of the investigation procedure, including rules, where investigation needs to be carried out
- Key roles and responsibilities should be defined (e.g. notifier, investigator, safety manager, contributors ...)
- Procedures for factual data gathering
- A (safety) occurrence analysis procedure and risk assessment, taking into account previous occurrences
- A link to lesson dissemination and improvement procedures
- Remedial actions and follow-up recommendations
- Attention to human factors (focusing on data handling)
- A feedback mechanism (to the reporter and persons affected by occurrence/investigation)

Note: AIS/AIM providers may consult the EGSMM (reference 18) for further information and adapt it to the needs of their organisation.

4.6 Management of safety documentation

Safety documentation is maintained and collected by AIS/AIM providers to demonstrate to all stakeholders that procedures are well defined and that operations have been and continue to be undertaken in a safe manner.

The main goal of documentation and records management is to guarantee access, accuracy, exactness, reliability, security and quick availability of all useful information.

The tasks involved in meeting these objectives concern the definition, organisation and implementation of rules in relation to:

- document identification
- document drawing-up and presentation
- document verification
- document authorisation
- document distribution
- document evolution and updating
- document filing

Safety records are archived for the purpose of making further reference to them. Reference means:

- Elaborating statistical data, e.g. for safety monitoring purposes; and
- Establishing cross references between the various types of records such as use of safety occurrence records to support safety assessments.

The meaningful use of records as described above can be achieved only provided the data stored are appropriately maintained. Additional information is provided in Chapter 5.5 Safety Assurance of this guidance document and the EGSMM (reference 18).

4.7 Control of external services

Safety and quality assurance procedures used by external suppliers should satisfy the AIS/AIM provider’s internal safety and quality standards and safety objectives, because shortfalls could erode the acceptable level of quality attributes.

Therefore the AIS/AIM provider should ensure an adequate level of quality attributes within those activities that fall within management of safety and external inputs. Relevant services should be identified and assessed to maintain an appropriate level of quality attributes within the organisation.

A major goal should be:

- To decide which external services in terms of data originators are relevant in terms of the level of quality attributes
- To determine the required level of quality attributes, and
- To achieve and maintain those levels

The AIS/AIM provider should ensure that incoming data fulfil the quality and safety objectives defined in the ADQ IR. This could be supported by audits and formal arrangements specifying requirements which address the data originator and ensure the appropriate level of quality attributes.

The obligation to control external services should not be restricted to changes but should be an ongoing continuous process.

In the case of a 'standalone' AIS/AIM provider, a special care should be taken in addition of the effect of the external providers of other services such as power supply, telecoms, IT, training etc.

4.8 Examples

4.8.1 Template for safety assessment of ATM operational changes

This section provides two examples of templates used in ATM for conducting hazard identification and analysis. Although these templates could not be used directly in AIS/AIM and should be transposed to the AIS/AIM environment, they provide an example of the possible material to be re-used by the AIS/AIM providers. The full text of the templates and explanatory material in provided in "Safety Assessment Made Easier" (ref 19).

EXAMPLE TEMPLATE
SAFETY ASSESSMENT OF ATM OPERATIONAL CHANGES

A. Title	
Key Words	

B. Identification				
Reference:		Version:		Date:
Nature of Assessment				
	Initial		Update of Assessment Reference:	
	Site-Specific		Global	
	Unique		Re-useable	

C. Change Leader	
Name:	Job Title: Head of Safety Assessment

D. Description			
Date and Duration of Change			
From:	To:		Permanent
Location of Change			
Description of Change			
Reason for Change			
Concept of Operation			

E. Transfer to Operations				
Transition Phase required?		Yes		No
Additional risk reduction measures required during transition phase?		Yes		No
Specification of transition phase risk reduction measures				
Summary Details: See Section P				
Reversion Possible?		Yes		No

L. Scope, Interfaces and Boundaries of Change	
Criteria	Points
1. Number of External Interfaces / Parties Impacted	
0 = up to 2 2 = 3 or 4 4 = 5 or more	
2. Operational Functions Directly Impacted	
0 = Alerting Service 2 = Flight Information Service, Airspace Management, Flow & Capacity Management, Sequencing & Metering, Coordination & Transfer 4 = Tactical Separation, Collision Avoidance	
3. Scope of Change	
0 = Small (change limited to one procedure or operational task) 2 = Medium (Change impacts several procedures) 4 = Large (Global impact or impact uncertain)	
4. Impact on ATCO Working Methods	
0 = Small (Information notice only) 2 = Medium (Briefing and/or specific training) 4 = Large (Significant training required)	
5. Impact on Pilot Working Methods	
0 = Small (Information through NOTAM/AIC/AIRAD only) 2 = Medium (Briefing and/or specific training) 4 = Large (Significant training required)	
6. Existing Experience with Similar Change	
0 = Limited or no experience -2 = Experience with a similar change in a similar environment -4 = Recent experience with a similar change in the current operational environment	
Justification for Type 1 Assessment	
12 points or more = Type 1 Assessment Less than 12 points = Type 2 Assessment	

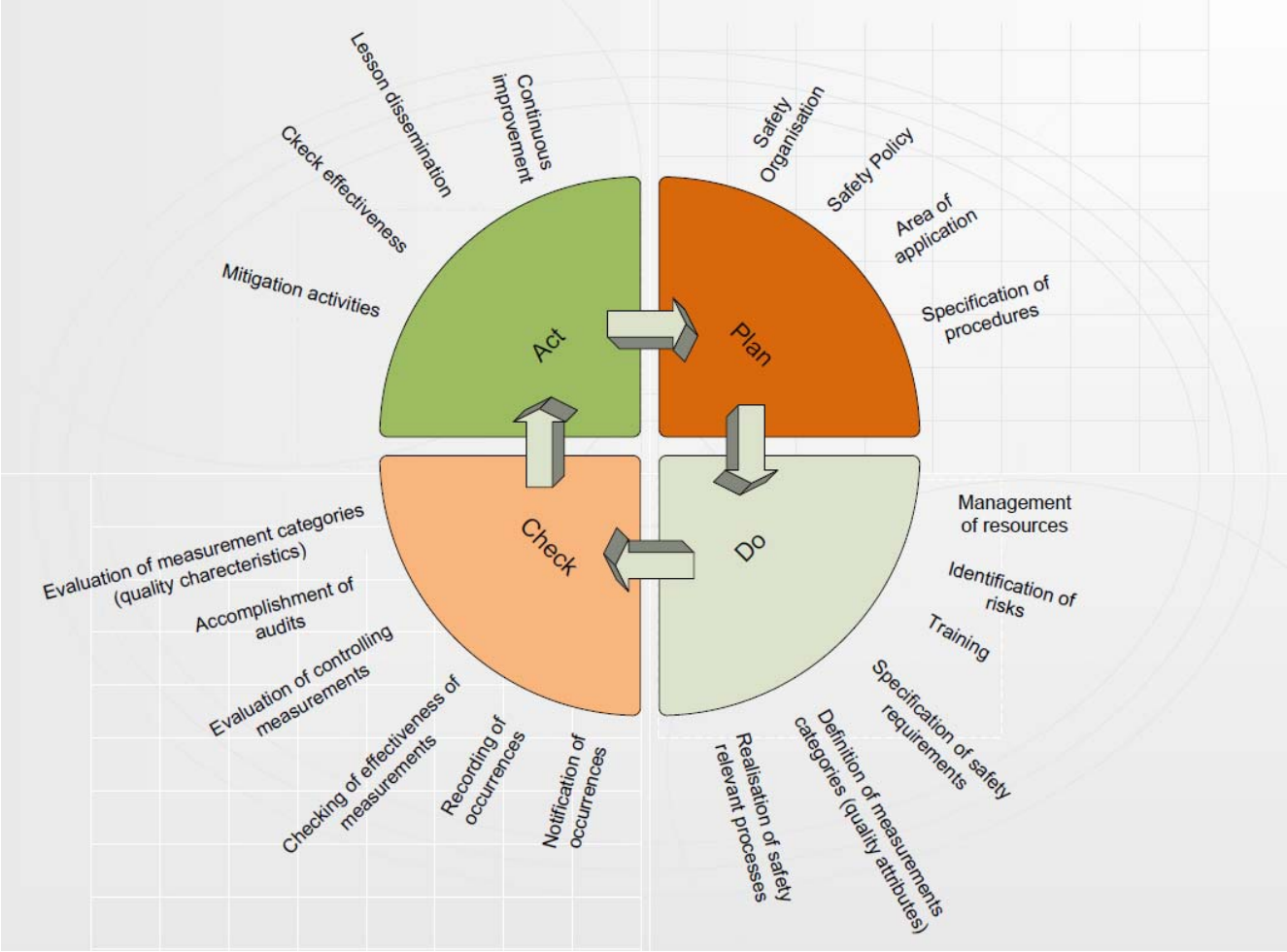
N. Risk Assessment and Mitigation	
Participants	
Name	Appointment

Proposed Techniques			
	Brainstorming		Simulation
	Change/Deviation Analysis		Task Analysis
	Time Sequence Diagrams		Hot-Spots Analysis
	Scenario Driven Analysis		HAZOPS
	Failure Modes Effects Analysis		Fault Tree Analysis
	Others (Define)		

	Name Box	B	C	D	E	F	G	H	I	J	K	L
1	**Safety considerations**											
2	**Environment description/gap analysis**							**current operations**	**future operations (OCD-ORD)**	**Gap**	**impact on safety assessment**	**training gap**
3	1.	equipment										
4		1.1	communications									
5	CHANGE		1.1.1	air-ground								
6				1.1.1.1	microwave link							
7				1.1.1.2	land lines							
8				1.1.1.3	satellite							
9				1.1.1.4	remote transmitters							
10				1.1.1.5	data-link							
11				1.1.1.6	frequencies							
12				1.1.1.7	radio coverage							
13				1,1,1,8	HMI							
14	CHANGE		1.1.2	ground-ground								
15				1,1,2,1	telephone							
16				1,1,2,2	HMI							

4.8.2 Safety management elements in the continuous improvement process

An example of the development of an AISP for inclusion of various safety management elements in the continuous improvement process.



5. Safety assurance

5.1 Requirement source

Commission Regulation (EU) No 73/2010 of 26 January 2010

laying down requirements on the quality of aeronautical data and aeronautical information for the single European sky

Article 10

1. Without prejudice to Regulation (EC) No 2096/2005, the parties referred to in Article 2(2) shall implement and maintain a quality management system covering their aeronautical data and aeronautical information provision activities, in accordance with the requirements laid down in Annex VII, Part A.

2. The parties referred to in Article 2(2) shall ensure that **the quality management system** referred to in paragraph 1 of this Article **defines procedures to meet the safety management objectives** laid down in Annex VII, Part B and the security management objectives laid down in Annex VII, Part C.

3. The parties referred to in Article 2(2) shall ensure that any changes to the existing systems referred to in the first subparagraph of Article 2(1) or the introduction of new systems are preceded by a safety assessment, including hazard identification, risk assessment and mitigation, conducted by the parties concerned.

4. During that safety assessment, the requirements referred to in Article 7(3), Annex I, Annex II and points 1 and 2 of Part A of Annex IV shall be considered as safety requirements and shall be taken into consideration, as a minimum.

ANNEX VII PART B Safety management objectives

1. The safety management objectives shall be:

— to minimise the contribution to the risk of an aircraft accident arising from data errors as far as reasonably practicable,

— to promote awareness of safety around the organisation by sharing lessons arising from safety activities and by involving all staff to propose solutions to identified safety issues and improvements to assist the effectiveness and efficiency of the processes,

— to ensure that a function is identified within the organisation being responsible for development and maintenance of the safety management objectives,

— to ensure that records are kept and monitoring is carried out to provide safety assurance of their activities,

— to ensure improvements are recommended, where needed, to provide assurance of the safety of activities.

2. The achievement of the safety management objectives shall be afforded the highest priority over commercial, operational, environmental or social pressures.

5.2 Purpose and scope of safety assurance

The purpose of safety assurance is:

- to provide information on the state of activities as regards safety,
- to confirm conformance with an SMS and/or safety management objectives,

- to detect changes which may suggest an element is approaching a point at which acceptable standards of safety can no longer be met,
- to record the state and results of processes,
- to obtain a basis for and help determine corrective actions.

The above-mentioned outputs from safety assurance processes are provided to:

- the staff,
- the management,
- the regulator.

Safety assurance is needed for all activities related to the processing of aeronautical data that fall within the AIS/AIM provider's responsibility and encompasses aeronautical data and information interfaces, people, procedures and equipment.

5.3 Legal requirements on safety assurance

Usually, safety assurance in safety management systems (e.g. the SMSs used by ANSPs that fulfil the common requirements for the provision of air navigation services) comprises:

- safety surveys,
- safety monitoring,
- safety records.

The ADQ IR does not require the organisation to carry out safety surveys. It requires the organisation to have a quality management system that will (inter alia) set up a quality assurance programme containing procedures designed to verify that all operations are being conducted in accordance with applicable requirements, standards and procedures, including the relevant requirements of the ADQ IR. The abovementioned verification can be conducted by means of internal quality audits which could also identify good practices for internal dissemination.

However, the other parts of safety assurance (safety monitoring and safety records) apply to the data process that has to fulfil the requirements stated in Article 6 of the ADQ IR.

Furthermore, the AIS/AIM provider should monitor achievement of the safety management objectives set out in Part A of Annex VII to the ADQ IR (in time, the safety management objectives may incorporate new objectives which will have to be achieved and monitored). This "safety management review" could be a part of a quality management system review.

5.4 Safety monitoring

5.4.1 Methods

Safety-related activities can be monitored either in the course of the process (directly) or after the process has been carried out (by reviewing the results of the processes). In the case of the former, the monitoring can be continuous or regular. In the case of the latter, the AIS/AIM automated systems (with manual or automatic input) can provide for useful recording of both the progress of processes and their results.

5.4.2 Outputs

The outputs of safety monitoring are:

- records of the processes and their results,
- error reports

The creation of **records of the processes and their results** should follow the procedures of the QMS of the AIS/AIM provider (e.g. analysis of data). The records form one of the inputs for preventive actions, i.e. the action to eliminate the causes of potential errors.

Error reporting should follow the procedures of the QMS of the AIS/AIM provider (e.g. control of the non-conforming products). The procedure for error reporting should be owned by the AIS/AIM Safety function. Error reporting, measurement and corrective actions must fulfil the requirements of Part F of Annex IV to the ADQ IR and follow the procedures as described in the (Safety) Occurrence Reporting and Investigation section of the safety achievement chapter.

The information from these sources should be recorded (see the chapter on safety records below) and used to improve the safety of the associated activities. It can be used either as it is or as an input into the indicator values.

5.4.3 Indicators and targets for safety monitoring

Indicators[4] used for safety monitoring are parameters that express the state or the progress of a process with regard to safety. Indicators can be qualitative or quantitative.

One possible way of setting up quantitative indicators for safety monitoring is described in Chapter 4.4.3: Measurable quality attribute requirements, including targets, warning and action limits, serve as quantitative safety key performance indicators.

Indicators should prompt the management system to closer scrutiny, leading to corrective action. The safety of the activity cannot be managed by indicators alone. Their role is simply to point out the more complex issues in AIS/AIM.

Indicators should refer to the safety aspect of data. An example of this is the number of errors in respective data items.

The data for the indicator should be gathered continuously and reviewed periodically. The data could also be used in a system safety assessment.

The actual value of an indicator is compared to its desired value (or range of values), i.e. a target. Missing the target is a sign to the management system that an analysis of the process should be carried out and that corrective action should be taken.

Choosing a good indicator (or set of indicators) for a particular process makes safety monitoring more effective. As regards the data process, the indicators used for managing the process in a QMS could also be used for safety monitoring.

5.5 Safety records

5.5.1 The role of safety records

The safety management processes should be supported by records. The aim is similar to that of quality management, i.e. to offer availability, accuracy and traceability of the evidence. Using the procedures of QMS in safety management (e.g. control of records, continual improvement, analysis of data, monitoring and measurement, etc.) can be to an AIS/AIM provider's advantage, as there is no need to build a separate record control system.

[4] The term "indicator" is a general term, used in this chapter for simplicity. It is for the AIS/AIM provider to decide whether they prefer other, more specific terms, e.g. "safety key performance indicator", "safety indicator" or "safety performance indicator".

5.5.2 Requirements related to safety records

An AIS/AIM provider's safety management processes should:

- specify safety records,
- specify the form which safety records are to take,
- determine the responsibilities and roles with regard to safety records.

5.5.3 Examples of safety records

Examples of the safety records relevant to AIS/AIM activities are:

- error reports, feedback and rectification mechanisms (established and operated in accordance with the requirements laid down in Part F of Annex IV),
- safety assessment reports,
- AIS/AIM personnel training records,
- maintenance records (AIS/AIM equipment),
- statistical safety-related records,
- records of corrective actions (if a finding has a safety aspect)
- "safety management reviews" (as part of a management review),
- occurrence reports to the ANSP related to the aeronautical data errors,
- evidence pertaining to aeronautical data and aeronautical information in Part B of Annex IV to the ADQ IR.

5.5.4 Responsibilities related to safety records

Responsibility for managing records should be established and known for each record. The control of records, their identification and traceability should be defined in the AIS/AIM provider's QMS. Responsibility does not always have to lie with the AIS/AIM provider (for instance, occurrence reports are likely to be stored in the ANSP's reporting system and serve as a basis for occurrence investigation, which may be outside the scope of the AIS/AIM provider). However, there should be provisions in place between the AIS/AIM provider and the record-keeper to enable the AIS/AIM provider to make use of the recorded evidence, e.g. to obtain feedback, take corrective action, etc.

Conversely, the AIS/AIM provider should inform other parts of the ANSP if safety records contain information which is of importance outside the AIS/AIM. The procedures for two-way communication should be established, ideally between the ANSP's Safety Manager and the AIS/AIM's Safety function.

5.6 Example of indicators in safety monitoring

The indicators used for safety monitoring should express the safety aspect of the process – see the example below:

Indicators "B" and "C", used in a QMS, express the safety aspect of the process for issuing NOTAMs as follows:

$$C = 100 * B/A$$

Where:

A - number of NOTAMs issued,

B - number of NOTAMs issued containing an error,

C - percentage of NOTAMs issued containing an error.

However, the indicator “A” does not express the safety aspect in itself.

6. Safety promotion

6.1 Requirement source

Commission Regulation (EU) No 73/2010 of 26 January 2010

laying down requirements on the quality of aeronautical data and aeronautical information for the single European sky

Article 10

1. Without prejudice to Regulation (EC) No 2096/2005, the parties referred to in Article 2(2) shall implement and maintain a quality management system covering their aeronautical data and aeronautical information provision activities, in accordance with the requirements laid down in Annex VII, Part A.

2. The parties referred to in Article 2(2) shall ensure that **the quality management system** referred to in paragraph 1 of this Article **defines procedures to meet the safety management objectives** laid down in Annex VII, Part B and the security management objectives laid down in Annex VII, Part C.

3. The parties referred to in Article 2(2) shall ensure that any changes to the existing systems referred to in the first subparagraph of Article 2(1) or the introduction of new systems are preceded by a safety assessment, including hazard identification, risk assessment and mitigation, conducted by the parties concerned.

4. During that safety assessment, the requirements referred to in Article 7(3), Annex I, Annex II and points 1 and 2 of Part A of Annex IV shall be considered as safety requirements and shall be taken into consideration, as a minimum.

ANNEX VII PART B Safety management objectives

1. The safety management objectives shall be:

— to minimise the contribution to the risk of an aircraft accident arising from data errors as far as reasonably practicable,

— to promote awareness of safety around the organisation by sharing lessons arising from safety activities and by involving all staff to propose solutions to identified safety issues and improvements to assist the effectiveness and efficiency of the processes,

— to ensure that a function is identified within the organisation being responsible for development and maintenance of the safety management objectives,

— to ensure that records are kept and monitoring is carried out to provide safety assurance of their activities,

— to ensure improvements are recommended, where needed, to provide assurance of the safety of activities.

2. The achievement of the safety management objectives shall be afforded the highest priority over commercial, operational, environmental or social pressures.

6.2 General

Safety promotion plays a supporting, yet important, role in achieving effective control of safety risks during service delivery. It is one of the major components of safety management and is an important enabler for continuous safety improvement. Safety promotion provides the means for AIS/AIM organisations to help minimise the safety risks. Safety promotion can help ensure that the right environment actively supports an individual or organisation to freely identify areas where their policies, procedures or processes may have gaps.

Safety promotion supports safety culture communication and dissemination of lessons learned, and is an important enabler to the continuous improvement process. The safety promotion process includes all efforts to modify equipment, procedures, attitudes and behaviour aimed at improving safety.

Safety promotion has four main elements, notably:

- Safety training
- Safety communication
- Safety lesson dissemination
- Safety improvement

6.3 Safety training

AIS/AIM providers develop and maintain a safety training programme to help ensure that staff are trained and competent in the area of safety. This means that processes and procedures which ensure that staff are trained and competent to perform their duties with safety in mind are in place. The scope of the safety training should be appropriate to the individual's involvement in the safety management processes and should be adapted to fit the needs and complexity of the organisation. The provision of appropriate training to all staff, regardless of their level in the organisation, is an indication of management's commitment to an effective safety management system. This also encourages open communication of safety issues not only among AIS/AIM staff, but also with the AIS/AIM provider's management.

The safety training and education may consist of the following processes:

- a process to identify safety training requirements;
- a process that measures the effectiveness of training;
- initial job-specific training incorporating safety management; and
- refresher safety training.

All AIS/AIM staff should receive safety awareness training regarding:

- safety management roles and responsibilities;
- safety policy;
- safety management objectives;
- safety achievement;
- safety assurance;
- safety promotion.

6.4 Safety communication

Safety communication is an important enabler for improved safety performance. Therefore, an AIS/AIM provider should, as part of its safety promotion activities, develop and maintain formal means for safety communication in order to:

- ensure that all staff are fully aware of the management system;
- convey safety-critical information;
- explain why particular safety actions are taken; and
- explain why safety procedures are introduced or changed.

Safety communication could take various forms. The means of safety communication could include:

- safety bulletins, safety notices, newsletters, magazines and e-mail distribution lists;
- briefings, meetings, seminars and workshops;
- refresher training;
- websites, intranet and online fora.

Safety communication also encompasses the promotion of safety-related documentation and safety procedures within the AIS/AIM organisation.

6.5 Safety lesson dissemination

The objective of safety lesson dissemination is to make available to the AIS/AIM provider's staff the knowledge gained from experience, and to promote its use to improve the safety of the services provided.

Lessons learned should be communicated across all relevant areas of the organisation, thus ensuring that benefits from lessons learned are realised by all areas and that the impact is recognised across the business.

To minimise the safety risks associated with the increasing volume and complexity of AIS/AIM activities, AIS/AIM providers must adopt and apply a proactive safety management practice. Lesson dissemination is one of the attributes of the proactive and modern approach to managing safety. It encompasses the sharing of best practices and safety lessons learned through the exchange of safety information (e.g. recommendations arising out of investigations/surveys). The source of information could also be outside the organisation and might not even come from within the aviation field.

The safety communication process should be used for lesson dissemination across all relevant staff in the AIS/AIM organisations. This may promote the involvement of the AIS/AIM staff in proposing solutions to operational hazards and may enable the staff to suggest different perspectives of methods for safety improvement.

The processes to be established for lesson dissemination are:

- collection of lessons - a systematic process to collect lessons arising from safety investigations, and other safety activities;
- dissemination of lessons to staff - lessons learned are passed to all staff concerned. Various dissemination methods could be used, such as presentations, reports, audio-visual tools, safety publications, etc.;
- incorporation into training activities - relevant information from lessons learned should be used to improve the training programmes and contents.

6.6 Safety improvement

AIS/AIM providers should actively encourage staff to identify and report safety issues and to submit safety improvement proposals. These proposals, if adequate, should be implemented within the AIS/AIM organisations.

Processes and methods should be introduced to facilitate reporting and the submission by staff of proposals for safety improvements. A systematic way of dealing with proposals should also be defined. The originator should receive feedback on the decision and actions taken on the proposals.

ANNEX A – REFERENCES AND ABBREVIATIONS

A.1 REFERENCES

The following documentation was used in the preparation of this Guidance and could be useful for further reference.

Ref.	Issuing Body	Title	Edition
1.	ICAO	Document 9859 - Safety Management Manual (SMM)	1st Edition, 2006
2.	ICAO	Annex 11 – Air Traffic Services	13th Edition 2001
3.	ICAO	Annex 15 – Aeronautical Information Services	13th Edition incorporating Amendment 36
4.	ICAO	Document 4444 – Procedures for Air Navigation Services Air Traffic Management	15th Edition 2007
5.	ICAO	AIS/AIM Training Guidance Manual	Draft version, AIS AIMSG/4
6.	ISO	ISO 9001 - Quality management systems -- Requirements	2008
7.	EUROCONTROL	ESARR 3 - Use of Safety Management Systems by ATM Service Providers	Edition 1.0 July 2000
8.	EUROCONTROL	EAM 3/GUI 4 Mapping between ISO 9001:2000 and ESARR 3	Edition 1.0 May 2004
9.	EUROCONTROL	ESARR 4 - Risk Assessment and Mitigation in ATM	Edition 1.0 April 2001
10.	EUROCONTROL	ESARR 6 – Software in ATM Functional Systems	Edition 2.0 May 2010
11.	EUROCONTROL	CHAIN/0135 - CHAIN preliminary safety case	Edition 0.4 October 2006
12.	EUROCONTROL	CHAIN/025 - CHAIN Safety Plan	Edition 1.2 September 2005
13.	EUROCONTROL	European Convergence and Implementation Plan	
14.	EUROCONTROL	AIT33 WP6 Safety Framework in AIM FG report	September 2010
15.	EUROCONTROL	Draft EUROCONTROL Guidelines Supporting Implementation of ADQ IR	Preliminary edition April 2010
16.	EUROCONTROL	Draft EUROCONTROL Specification for Data Assurance Levels	0.16a 1 July 2010
17.	EUROCONTROL	Draft EUROCONTROL Specification for Data Quality Requirements	0.9a 1 July 2010
18.	EUROCONTROL	EUROCONTROL Generic Safety Management Manual (EGSMM)	1st Edition 2 October 2009
19.	EUROCONTROL	“Safety Assessment Made Easier”	1.0 15 January 2010
20.	EU	Commission Regulation (EC) No 2096/2005 of 20 December 2005 laying down common requirements for the provision of air navigation services	20 December 2005 Repealed on 18 October 2011
21.	EU	Commission Regulation (EC) No 668/2008 of 15 July 2008 amending Annexes II to V to Regulation	15 July 2008

		(EC) No 2096/2005 laying down common requirements for the provision of air navigation services, as regards working methods and operating procedures	
22.	EU	Commission Regulation (EC) No 1315/2007 of 8 November 2007 on safety oversight in air traffic management and amending Regulation (EC) No 2096/2005	8 November 2007
23.	EU	Commission Regulation (EC) No 482/2008 Software safety assurance system to be implemented by air navigation service providers and amending Annex II to Regulation (EC) No 2096/2005	30 May 2008
24	EU	Commission Regulation (EU) No 73/2010 of 26 January 2010 laying down requirements on the quality of aeronautical data and aeronautical information for the single European sky	27 January 2010
25	EU	Commission Implementing Regulation (EU) No 1035/2011 laying down common requirements for the provision of air navigation services and amending Regulations (EC) No 482/2008 and (EU) No 691/2010	17 October 2011

A.2 ABBREVIATIONS

The following abbreviations are used in this Guidance.

Abbreviations	Meaning
ADQ IR	Aeronautical Data Quality Implementing Rule
AIS/AIM	Aeronautical Information Services / Aeronautical Information Management
AIT	Aeronautical Information Team
ANS	Air Navigation Services
ANSP	Air Navigation Services Provider
ATM	Air Traffic Management
ATMP	Air Traffic Management Provider
ATS	Air Traffic Services
CEO	Chief Executive Officer
CNS	Communication Navigation Surveillance
DAL	Data Assurance Levels
DQR	Data Quality Requirements
EASA	European Aviation Safety Agency
EC	European Community
ECAC	European Civil Aviation Conference
ECIP	European Convergence and Implementation Programme
EGSMM	EUROCONTROL Generic Safety Management Manual
ESARR	EUROCONTROL Safety Regulatory Requirement

EU	European Union
FG	Focus Group
ICAO	International Civil Aviation Organization
IMS	Integrated Management System
ISO	International Organization for Standartization
NOTAM	Notice to Airmen
NSA	National Supervisory Authority
PDCA	Plan – Do – Check - Act
QMS	Quality Management System
SARPS	Standards and Recommended Practices
SES	Single European Sky
SMO	Safety Management Objectives
SMS	Safety Management System

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