



ICAO

Doc 9839

Manual on the Quality Management System for Aeronautical Information Services

First Edition, 2022



Approved by and published under the authority of the Secretary General



| ICAO

Doc 9839

Manual on the Quality Management System for Aeronautical Information Services

First Edition, 2022

Approved by and published under the authority of the Secretary General

INTERNATIONAL CIVIL AVIATION ORGANIZATION  **Documents**
Document Sharing Hub

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

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

First Edition, 2022

Doc 9839, *Manual on the Quality Management System for Aeronautical Information Services*

Order Number: 9839

ISBN 978-92-9265-892-2 (print version)

© ICAO 2022

All rights reserved. No part of this publication may be reproduced, stored in a
retrieval system or transmitted in any form or by any means, without prior
permission in writing from the International Civil Aviation Organization.

AMENDMENTS

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

RECORD OF AMENDMENTS AND CORRIGENDA

[illegible][illegible]

FOREWORD

The guidance material contained in this manual has been developed to assist States in the planning and implementation of quality management system (QMS) for aeronautical information services (AIS) to fulfil the requirement in Annex 15 — *Aeronautical Information Services* for States to introduce QMS. This manual contains key elements to provide States with an understanding of the requirements for QMS. Its purpose is to support States in implementing and maintaining a QMS encompassing all functions of an AIS organization. The objective is to provide the next intended users with the necessary assurance that the distributed aeronautical data and aeronautical information satisfy the predefined data quality requirements, which are contained in the *Procedures for Air Navigation Services — Aeronautical Information Management* (PANS-AIM, Doc 10066).

Annex 15 and PANS-AIM (10066) recommend that the International Organization for Standardization (ISO) 9000 series of quality assurance standards be used when developing QMS for AIS. The methodology and concepts described in this manual are derived from ISO 9001:¹ 2015 — *Quality Management Systems — Requirements* and ISO 9000:2005 — *Quality Management Systems — Fundamentals and Vocabulary*. It should be noted, however, that ISO 9000 certification does not automatically mean that the QMS is encompassing all functions of an AIS organization.

Comments on this manual, particularly with respect to its application and usefulness, are appreciated. These comments will be taken into consideration in the preparation of subsequent editions. Comments concerning this manual should be addressed to:

The Secretary General
International Civil Aviation Organization
999 Robert-Bourassa Boulevard
Montréal, Quebec, Canada H3C 5H7

¹ The ISO 9000 family of quality management systems is a set of standards to help organizations ensure they meet customer and other stakeholder needs within statutory and regulatory requirements related to a product or service. These standards are not specific to any one industry and can be applied to organizations of any size.

CONTENTS

	<i>Page</i>
Glossary	ix
Chapter 1. Introduction	1-1
1.1 Background	1-1
1.2 Need for quality aeronautical data and aeronautical information	1-1
1.3 Need for quality management system	1-1
Chapter 2. Quality and safety management systems	2-1
2.1 Relationship between quality and safety management systems	2-1
2.2 Safety management system	2-2
2.3 Quality management system	2-3
Chapter 3. Context of the aeronautical information services provider	3-1
3.1 Understanding the AISP and its context	3-1
3.2 Understanding the needs and expectations of stakeholders	3-1
3.3 Determining the scope of the quality management system	3-1
3.4 Quality management system and its processes	3-2
Chapter 4. Leadership	4-1
4.1 Leadership and commitment	4-1
4.2 Quality policy	4-1
4.3 Organizational roles, responsibilities and authorities	4-2
Chapter 5. Planning	5-1
5.1 Actions to address risks and opportunities for improvement	5-1
5.2 Quality objectives	5-1
5.3 Planning of change	5-1
Chapter 6. Support	6-1
6.1 Resources	6-1
6.2 Competence	6-1
6.3 Awareness	6-2
6.4 Communication	6-2
6.5 Documented information	6-3
6.6 Control of documents	6-5
6.7 Control of records	6-5

Chapter 7. Operations	7-1
7.1 Operational planning and control.....	7-1
7.2 Requirements for aeronautical information products and services	7-2
7.3 Design and development of aeronautical information products and services	7-2
7.4 Control of externally-provided processes, products and services.....	7-2
7.5 Production and service provision.....	7-2
7.6 Release of aeronautical information products and services	7-3
 Chapter 8. Performance evaluation	 8-1
8.1 Monitoring, analysis and evaluation	8-1
8.2 Internal audit.....	8-1
8.3 Audit schedules	8-1
8.4 Process auditing approach	8-2
8.5 Audit structure	8-2
8.6 Certification and third-party audit	8-3
8.7 Management review	8-3
 Chapter 9. Improvement	 9-1
9.1 Continuous improvement.....	9-1
9.2 Nonconformity and corrective action	9-1
 Appendix A. Quality policy	 App A-1
Appendix B. Implementation plan.....	App B-1
Appendix C. List of documents to be maintained and retained	App C-1
Appendix D. Error/non-conformance investigation template	App D-1
Appendix E. Change management template	App E-1

GLOSSARY

ACRONYMS AND ABBREVIATIONS

AIM	Aeronautical information management
AIP	Aeronautical information publication
AISP	Aeronautical information service provider
AIS	Aeronautical information services
ANS	Air navigation services
ATM	Air traffic management
ATS	Air traffic service
CNS	Communications, navigation and surveillance
MET	Meteorological services
PDCA	Plan-Do-Check-Act
QMS	Quality management system
RNP	Required Navigation Performance
SAR	Search and rescue
SARPs	Standards and Recommended Practices
SMS	Safety management system
SWIM	System-wide information management

REFERENCES

Definitions for quality management are in Annex 15. The provisions related to QMS can be found in:

- a) Annex 3 — *Meteorological Service for International Air Navigation*;
- b) Annex 4 — *Aeronautical Charts*;
- c) Annex 15 — *Aeronautical Information Services*, Chapter 3;
- d) *Procedures for Air Navigation Services — Aeronautical Information Management* (PANS-AIM, Doc 10066), Chapter 3 — *Quality Management* and Appendix 1 — *Aeronautical Data Catalogue*;
- e) *Aeronautical Information Services Manual* (Doc 8126, Part I — *Regulatory Framework for Aeronautical Information Services*, 3.2.4); and
- f) *Quality Assurance Manual for Flight Procedure Design* (Doc 9906, Volume 1 — *Flight Procedure Design Quality Assurance System*).

Definitions for safety management are in Annex 19. The provisions related to SMS can be found in:

- a) Annex 19 — *Safety Management*; and
- b) *Safety Management Manual*, 4th edition (Doc 9859).

Chapter 1

INTRODUCTION

1.1 BACKGROUND

1.1.1 Annex 15 — *Aeronautical Information Services*, Chapter 3 — *Aeronautical information management*, 3.6, defines the Standards and Recommended Practices (SARPs) applicable to the quality management system (QMS) for the provision of aeronautical information services (AIS). The Standard provides that the QMS encompassing all functions of an AIS organization shall be implemented and maintained to provide users with the necessary assurance that the distributed aeronautical data and aeronautical information satisfy the predefined data quality requirements.

1.1.2 Integrated and responsive global air traffic management (ATM) systems are dependent on quality information. The *Procedures for Air Navigation Services — Aeronautical Information Management* (PANS-AIM, Doc 10066) provides a framework for the delivery of uniform AIS with the implementation of harmonized procedures in a system-wide information management (SWIM) environment.

1.1.3 This manual provides guidance on the implementation of the QMS to direct and control the activities required for the provision of AIS in a SWIM environment to support ATM operations. It also ensures the safety oversight authorities that the implementation of the QMS encompasses all necessary functions and responsibilities of the AIS organization, thereby improving the trust between the regulator and the aeronautical information service provider (AISP).

1.2 NEED FOR QUALITY AERONAUTICAL DATA AND AERONAUTICAL INFORMATION

1.2.1 Quality aeronautical data and aeronautical information are critical for area navigation, required navigation performance (RNP), airborne computer-based navigation systems and data link systems.

1.2.2 The provision of quality assured aeronautical information products and services should be carried out in a standardized presentation, since there is an inherent need to fulfil the requirements of the next intended users. Customers in the AIS domain are the next intended users of aeronautical data and aeronautical information, such as pilots, air traffic controllers, flight planning organizations, etc..

1.2.3 Data quality specifications have evolved to include requirements for accuracy, resolution, integrity, traceability, timeliness, completeness and format of aeronautical data and aeronautical information. These data quality specifications are found in Annex 15, Chapter 3, 3.2.

1.2.4 Non-compliant and corrupted aeronautical data and aeronautical information can potentially affect the safety of air navigation.

1.3 NEED FOR QUALITY MANAGEMENT SYSTEM

1.3.1 Annex 15 requires States to introduce the QMS to provide users assurance and confidence in the quality of aeronautical data and aeronautical information throughout the aeronautical data chain, from origination to distribution. The roles, responsibilities, competencies and associated knowledge, skills and attitudes required for the performance of each function within the AIS are identified in the QMS.

1.3.2 The introduction of the QMS offers benefits such as risk-based thinking, effective communication, better understanding and improved control over processes.

1.3.3 The QMS is based on process approach¹ principles to manage and control processes, the interactions between processes and the inputs and outputs that are required to meet customer and regulatory requirements. Processes² and procedures³ provide structure in the work environment and promote quality and safety. Widely communicated, accepted and utilized processes ensure consistency in delivering of aeronautical information products and services.

1.3.4 Policies, processes and procedures, including the use of metadata, ensure that aeronautical data and aeronautical information is traceable to the source and allows anomalies to be detected and corrected.

1.3.5 Once the AISP establishes the quality policy and objectives, the following information is included as a minimum as part of the QMS:

- a) scope of QMS;
- b) overarching processes;
- c) roles and responsibilities;
- d) work instructions, operating procedures and guidance material;
- e) training plans;
- f) formal internal and external arrangements and agreements;
- g) compliance observations; and
- h) continuous monitoring and performance metrics.

1.3.6 An AISP must monitor compliance with the QMS and may elect to have the system certified under a quality management standard. An external certification organization will carry out conformity audits over the certificate validity period. For example, ISO 9001: 2015 — *Quality Management Systems — Requirements* certification is a means to assure that the implemented QMS is compliant with the requirements of the quality standard. It should be emphasized, however, that ISO 9000 certification does not automatically mean that the QMS is encompassing all functions of an AIS organization. The AIS safety oversight authorities are therefore required to have inspectors trained in QMS perform an appropriate assessment of the QMS to ensure that the implementation meets the purpose of the standards.

¹ A process approach is a management strategy to control and improve interrelated processes.

² A process is a set of interrelated or interacting activities to transform inputs into consistent outputs.

³ A procedure is a prescribed way of undertaking a process or part of a process, whereas a process is a set of interrelated or interacting activities to transform inputs into consistent outputs.

Chapter 2

QUALITY AND SAFETY MANAGEMENT SYSTEMS

2.1 RELATIONSHIP BETWEEN QUALITY AND SAFETY MANAGEMENT SYSTEMS

2.1.1 Annex 15 and PANS-AIM, Doc 10066, describe a State's responsibilities for the provision of aeronautical information products and services and require the AISP to implement a QMS. However, some of the aeronautical data and aeronautical information managed by the AISP are safety critical, such as Required Navigation Performance Authorization Required Approach (RNP AR APCH) waypoints that provide precise navigation to avoid terrain, or runway threshold coordinates that provide runway alignment for instrument approaches for low visibility or zero visibility operations. For this reason, implementing a safety management system (SMS) as well as a QMS would help with managing the identified safety risks regarding the processing of safety critical aeronautical data and aeronautical information.

2.1.2 A balanced SMS and QMS enable the AISP to realize safety obligations and provide quality control of aeronautical information products and services.

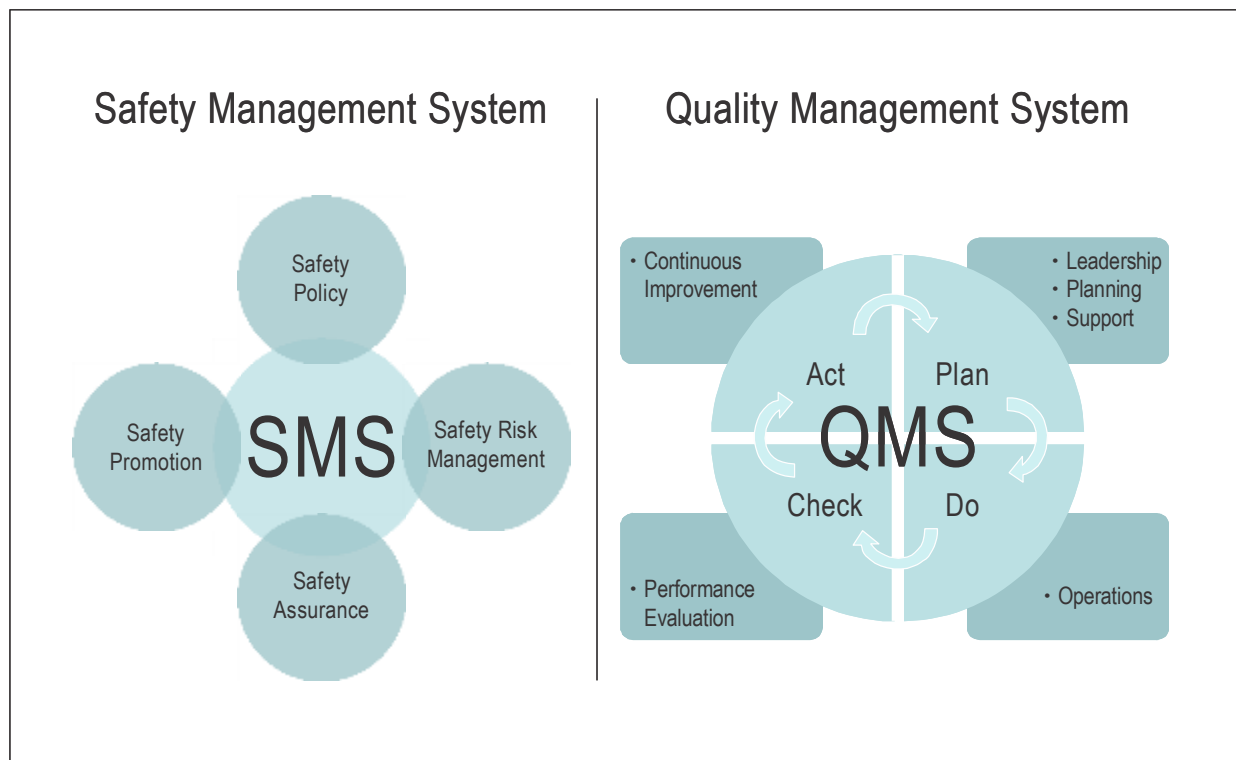


Figure 2-1. The SMS and QMS objectives

2.1.3 The management and delivery of aeronautical data and aeronautical information should provide quality assured aeronautical information products and services. An SMS is based on safety objectives and determination of risk, whereas quality is defined in terms of data requirements and customer requirements. Safety management and quality management are complementary and should work closely together to achieve assurances towards the overall goals of aviation safety.

2.1.4 The following paragraphs (2.2 and 2.3) describe the main components of SMS and QMS, and how these can be applied within an AIS organization, as either integrated or standalone but complementary management systems. However, this does not necessarily imply that the AISP should implement a standalone SMS within its organization. Air navigation services (ANS) consist of multiple and different kinds of services, namely air traffic service (ATS), AIS, communications, navigation and surveillance (CNS), meteorological information service (MET) and search and rescue (SAR), which are all related to safety of air navigation. Implementation of an SMS for each of these services could be a burden for States, with some services making it difficult to follow all components of SMS, such as the coordination of an emergency response plan. Annex 19 — *Safety Management* requires States to ensure the implementation of an SMS only for air traffic services that requires integrating safety risk management of its ANS-related services.

2.2 SAFETY MANAGEMENT SYSTEM

2.2.1 Recognizing and managing safety risks is critical to organizations that provide safety-critical products and services, such as an AIS organization. The AISP needs to identify hazards and establish processes for continually assessing and controlling the risk that may be associated with those hazards. Safety risk management processes establish formal methods for identifying hazards, controlling and continually assessing risks throughout the lifecycle of aeronautical data and aeronautical information. Safety risk management should be integrated into processes that control the AISP's activities. It ensures that organizational processes, procedures and behaviours related to aeronautical data and aeronautical information management do not negatively affect safety.

2.2.2 A safety management system is defined by four components, namely:

- a) safety policy;
- b) safety risk management;
- c) safety assurance; and
- d) safety promotion.

2.2.3 Table 2-1 provides a framework describing the four SMS components and responsibilities within a State. The SMS establishes a commitment to continually improve safety by defining policies, processes, procedures and competent AIS technical personnel needed to meet safety goals within the aeronautical information domain.

Table 2-1. SMS components and responsibilities within a State

<i>SMS Component</i>	<i>State</i>	<i>AISP</i>
Safety Policy	National Legislation	- Annexes and SARPs - Directives
Safety Risk Management	National Directives	- Operational Controls - Documentation
Safety Assurance	Independent Oversight	- Operation Procedures - Competency Assurance - Monitoring
Safety Promotion	- International Collaboration - Transparency	- Training - Collaboration

2.2.4 An AISP should consider the following with respect to safety management processes and procedures:

- a) **SMS awareness training:** To ensure that AIS technical personnel are aware of the SMS implementation and requirements;
- b) **Safety communication:** To ensure that AIS technical personnel are aware of the SMS to a degree commensurate with their roles and responsibilities; and
- c) **Hazard identification:** To ensure that AIS technical personnel effectively identify and assess safety risks associated with identified hazards.

2.3 QUALITY MANAGEMENT SYSTEM

2.3.1 A QMS offers the ability to exercise control over processes and procedures for the provision of aeronautical information products and services. The AISP defines quality objectives that are focused on the standardized quality requirements of the next intended user of aeronautical products and services. A QMS should apply throughout the entire aeronautical data chain from origination of data to the distribution of products and services to the next intended user.

2.3.2 Data origination may be performed outside of a State AISP; however the scope of the QMS applies to all AISP activities (including the collection, processing, and distribution) of the entire aeronautical data chain.

2.3.3 The Plan-Do-Check-Act (PDCA) cycle shown in Figure 2-2 is a useful tool applicable to the QMS and its processes and can be defined as follows:

- Plan:** Determine what needs to be done and how it should be done (see Appendix B for an example of an implementation plan);
- Do:** Implement the planned activities;
- Check:** Monitor the effectiveness of processes implemented; and
- Act:** Take action to improve the performance of the QMS.