# United Kingdom Overseas Territories Aviation Circular

**OTAC 139-33**
**171-11**
**172-18**
**175-3**
**176-8**

# AIS to AIM Transition

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## GENERAL

Overseas Territories Aviation Circulars are issued to provide advice, guidance and information on standards, practices, and procedures necessary to support Overseas Territory Aviation Requirements. They are not in themselves law but may amplify a provision of the Air Navigation (Overseas Territories) Order or provide practical guidance on meeting a requirement contained in the Overseas Territories Aviation Requirements.

## PURPOSE

This OTAC provides a comprehensive breakdown of the necessary steps for the transition such that a gap analysis can be conducted, an individual roadmap can be developed, and the transition conducted efficiently by all parties that are subject to the AN(OT)O.

## RELATED REQUIREMENTS

This Circular relates to:

- OTAR Part 139 Certification of Aerodromes
- OTAR Part 171 Aeronautical Telecommunication Services
- OTAR Part 172 Air Traffic Service Organisation Requirements
- OTAR Part 175 Aeronautical Information Services
- OTAR Part 176 Instrument Flight Procedure Approval

## CHANGE INFORMATION

First issue

## ENQUIRIES

Enquiries regarding the content of this Circular should be addressed to Air Safety Support International at the address on the ASSI website www.airsafety.aero or to the appropriate Overseas Territory Aviation Authority.

## CONTENTS

## 0. Glossary of Terms

### Aeronautical Chart

A representation of a portion of the Earth, its culture and relief, specifically designated to meet the requirements of air navigation.

### Aeronautical Data

A representation of aeronautical facts, concepts, or instructions in a formalised manner suitable for communication, interpretation of processing.

### Aeronautical Information

Information resulting from the assembly, analysis, and formatting of aeronautical data.

### Aeronautical Information Circular (AIC)

A notice containing information that does not qualify for the origination of a NOTAM or for inclusion in the AIP, but which relates to flight safety, air navigation, technical, administrative, or legal matters.

### Aeronautical Information Management (AIM)

The dynamic, integrated management of aeronautical information services – safety, economically and efficiently – through the provision and exchange of quality-assured digital aeronautical data collaboration with all parties.

### Aeronautical Information Publication (AIP)

A publication issued by or with the authority of a State and containing aeronautical information of a lasting character essential to air navigation.

### Aeronautical Information Service (AIS)

A service established within the defined area of coverage responsible for the provision of aeronautical data and the aeronautical information necessary for the safety, regularity, and efficiency of air navigation.

### Aeronautical Information Regulation and Control (AIRAC)

Signifying a system aimed at advance notification, based on common effective dates, or circumstances that necessitate significant changes in operating practices.

### Air Navigation Services (ANS)

Services provided to air traffic during all phases of operations including air traffic management (ATM), communication, navigation, and surveillance (CNS), meteorological services for air navigation (MET), search and rescue (SAR) and aeronautical information services (AIS).

### Air Navigation Service Provider (ANSP)

Any public or private entity providing air navigation services for general air traffic.

**Audit**

A systematic, independent, and documented process for obtaining evidence and evaluating it objectively to determine the extent to which requirements and audit criteria are fulfilled.

**Authoritative Source**

A State Authority or an organisation formally recognised by the State authority to originate and/or publish data which meets the data quality requirements as specified by that State.

**Competency**

A dimension of human performance that it used to reliably predicted successful performance on the job.

**Cyclic Redundancy Check (CRC)**

A mathematical algorithm applied to the digital expression of data that provides a level of assurance against loss or alteration of data.

**Database**

One or more files of data so structured that appropriate applications may draw from the files and update them.

**Data accuracy**

A degree of conformance between the estimated or measured value and the true value.

**Data completeness**

The degree of confidence that all the data needed to support the intended use is provided.

**Data format**

A structure of data elements, records and files arranged to meet standards, specifications, or data quality requirements.

**Data Integrity (assurance level)**

A degree of assurance that an aeronautical data and its value have not been lost or altered since the origination or authorised amendment.

**Data Item**

A single attribute of a complete data set, which is allocated a value that defines its current status.

**Data Origination**

The creation of a new data item with its associated value, the modification of the value of an existing data item or the deletion of an existing data item.

**Data Originator**

Person(s) authorised to originate aeronautical information and data on behalf of the ‘Authorised Source’.

**Data Product**

Data set or data set series that conforms to a data product specification.

**Data Product specification**

Detailed description of a data set or a data set series together with additional information that will enable it to be created, supplied to, and used by another party.

**Data Quality**

A degree or level of confidence that the data provided meets the requirements of the data user in terms of accuracy, resolution, and integrity.

**Data Set**

Identifiable collection of data

**Data Set Series**

Collection of data sets sharing the same product specification.

**Data timeliness**

The degree of confidence that the data is applicable to the period of its intended use.

**Data traceability**

The degree that a system or a data product can provide a record of the changes made to that product and thereby enable an audit trail to be followed from the end-user to the originator.

**Data Validation**

The process of ensuring that data meets the requirements for the specified application or intended use.

**Data Verification**

The evaluation of the output of an aeronautical data process to ensure the correctness and consistency with respect to the inputs and applicable data standards, rules and conventions used in that process.

**Digital NOTAM**

A data set that contains the information included in a NOTAM in a structured format which can be fully interpreted by an automated computer system without human interpretation.

**Extensible Mark-up Language (XML)**

A version of SGML that allows design of a customised mark-up language, used to allow for easy interchange of documents and data on the World Wide Web or between software components.

**Geospatial**

Information that identifies where particular features are in relation to the earth’s surface.

**Integrated Aeronautical Information Package**

A package that consists of the following elements:

- Aeronautical Information Publication (AIP) including amendments
- Supplements to the AIP
- NOTAM and the pre-flight bulletins
- Aeronautical Information Circulars
- Checklists and valid NOTAMs

**Integrity**

A degree of assurance that a data item and its value have not been lost or altered since the data originator or authorised amendments.

**Inspection**

An examination of specific activities, products or services of an aviation licence, certificate, approval, or authorisation holder (or applicant) performed by civil aviation inspectors to confirm compliance with requirements for the licence, certificate, approval, or authorisation already issued (or being issued) by the State.

**Metadata**

A set of data that describes and gives information about other data.

**Notice to Airmen (NOTAM)**

A notice distributed by means of telecommunication containing information concerning the establishment, conditions or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations.

**Quality Assurance**

Part of quality management focused on providing confidence that quality requirements will be fulfilled.

**Quality Control**

Part of the quality management focused on fulfilling quality requirements

**Quality Management System (QMS)**

Coordinated activities to direct and control an organisation with regard to quality.

**Unified Modelling Language (UML)**

UML is an ISO Standard for modelling objects and a refinement of earlier Oriented Design and Object-Oriented Analysis methodologies.

## 1. Introduction

The 2016 – 2030 ICAO Global Air Navigation Plan (ICAO Doc 9750) presents planning guidance to facilitate States and Industry in the transition to safer and improved services in a globally harmonised approach. This is reflected in regional ICAO plans.

The Global Air Navigation Plan explicitly includes Aeronautical Information (AIS) where the coordinated transition is essential to preserve uniformity in the collection and distribution of aeronautical information, in the interest of the safety, regularity, and efficiency of international civil aviation. The Global Air Navigation Plan states that the transition of AIS should have commenced and to be completed by 2026. Therefore, a plan of action, or a 'roadmap', should be devised internally to ensure this has been successfully delivered within this timeframe.

The objective is for Aeronautical Information Management (AIM) to be implemented by Industry as stated in the SARPs and PANS of ICAO Annex 15 and PANS-AIM ICAO Doc-10066. This material has been incorporated as requirements for acceptable means of compliance in accordance with Air Navigation (Overseas Territories) Order (AN(OT)O.

The transition to AIM involves disparate organisations such as AIS providers, Aerodrome Data Originators (e.g. survey companies) and Data Houses (i.e. FMS coding). It is therefore essential that all parties progress the transition towards the same target date otherwise the benefits or the functionality of AIM may not be realised.

This OTAC provides a comprehensive breakdown of the necessary steps for the transition such that a gap analysis can be conducted, an individual roadmap can be developed, and the transition conducted efficiently by all parties that are subject to the AN(OT)O.

## 2. Applicability

This OTAC is to be used by:

| | |
|---|---|
| **Regulatory organisations** | Dealing with the safety oversight aspects of AIS / AIM |
| **AIS / AIM providers** | Tasked with setting up, organising, and managing the operations of AIS / AIM. |
| **Aeronautical data originators** | Tasked with providing the aeronautical data and aeronautical information to the AIS / AIM provider. |

## 3. Reference Documents

### ICAO Annexes

- Annex 4 – Aeronautical Charts
- Annex 11 – Air Traffic Services
- Annex 14 – Aerodromes
- Annex 15 – Aeronautical Information Services

### ICAO Documents

- Doc 7030 - Regional Supplementary Procedures
- Doc 7383 – AIS Provided by States
- Doc 8126 – AIS Manual
- Doc 8168 – PANS-OPS
- Doc 8697 – Aeronautical Chart Manual
- Doc 9377 – Coordination between ATS, AIS and MET Services
- Doc 9613 – PBN
- Doc 9674 – WGS-84 Manual
- Doc 9839 – QMS for AIS
- Doc 9905 – RNP Authorisation Required (AR)
- Doc 9906 – QA Manual
- Doc 9991 – AIM Training Manual
- Doc 10066 – PANS AIM

### OTAR

- OTAR Part 175 Aeronautical Information Services
- OTAR Part 176 Instrument Flight Procedure Approval

### ISO

- 8601 – Data elements and interchange formats – Information interchange – Representation of dates and times.
- 9000 – Quality Management Systems
- 19101 – Geographic information – Reference model
- 19104 – Geographic information – Terminology
- 19108 – Geographic information – Temporal schema
- 19109 – Geographic information – Rules for application schema
- 19110 – Geographic information – Feature cataloguing schema
- 19115 – Geographic information – Metadata
- 19131 - Geographic information – Data product specification

## 4. Development of a QMS for AIM

In addition to specifying the quality requirements for aeronautical data, Annex 15 requires States to introduce a quality system to implement quality management at each of the function stages of originating (or collecting), collating or assembling, editing, formatting, storing, publishing, and distributing aeronautical information. Annex 15 also recommends that this requirement be met by establishing a quality management system that complies with ISO 9001. Appendix 0 provides a template that can be used as a proposal document, and also as a framework for the development of the QMS for AIM.

### 4.1. Programme Initiation

| Item | Description | Guidance | Checklist |
|---|---|---|---|
| 1 | Having an AIM strategy, which is approved by senior management. | Commitment by senior management. | |
| 2 | Briefing / seminars / workshops to familiarise senior management with QMS in general and related to ISO regulations and guidelines | For QMS to be successful it should ideally be a part of the organisation's culture. Therefore, it will need multiple briefings / seminars in different sized groups and formats to embed it. | |
| 3 | Development of the quality policy | Review he existing quality policy and amend for AIM. | |
| 4 | Development of the quality objectives | Review the existing quality objectives and amend for AIM. | |
| 5 | Communicate the quality policy and quality objectives to all AIS/ AIM staff | Devise a communication plan, the key milestones when this will be presented to staff, and the format in which this will be done. | |
| 6 | Define the initial roles and responsibilities of the quality manager | Determine the roles and responsibilities and decide how this will be resourced. | |
| 7 | Appoint a quality manager | Ensure appropriate resource allocation based on this commitment. | |
| 8 | Arrange for ISO training of the quality manager | Initial or refresher ISO 9001 (QMS) / ISO 27001 (information security) training. | |

## 4.2. Planning Phase

### 4.2.1. Project Implementation Team

| Item | Description | Guidance | Checklist |
|---|---|---|---|
| 1 | Define roles and responsibilities of the project implementation team members | Ensure appropriate resource allocation based on this commitment. | |
| 2 | Create the project implementation team | Ensure appropriate resource allocation based on this commitment. | |
| 3 | Brief the project implementation team on the goals and the purpose of QMS, the QMS implementation project and the role of ISO | Utilise the material in the earlier stages of 4.1.1, 4.1.2 4.1.3 and 4.1.4 and 4.1.5. | |
| 4 | Arrange for ISO training of all team members and staff. | Initial or refresher ISO 9001 (QMS) training. Initial or fresher training on ISO 27001 (Information Security). | |
| 5 | Assign tasks with specific outcomes and deadlines to the team members | Ensure appropriate resource allocation based on this commitment. | |

### 4.2.2. Gap analysis

| Item | Description | Guidance | Checklist |
|---|---|---|---|
| 1 | List the working groups of AIM and its organisational structure. | Show how the organisational structure of each working group relates to the others and how the AIM working group relate to working group outside of AIM. This may be represented best as a flow chart. | |
| 2 | List the activities performed within each working group. | Ensure adhoc activities including activities outside of job descriptions that are being fulfilled. | |
| 3 | List the processes involved in each of the activities listed, the inputs and outputs of each process and the sequences of the processes. | Describe where inputs are derived from outputs of previous processes and where outputs are linked to succeeding processes. | |
| 4 | List the customer requirements (including standards and regulations) and the requirements of other working groups in AIM. | Note where processes are still needed to meet requirements.<br><br>Note where processes need to be improved or changed in order to be effective. | |
| 5 | List the procedures used in each of the processes | Note where procedures are undocumented or non-existent | |
| 6 | List the roles and responsibilities of each person involved. | Note the differences between actual responsibilities and those documented in the job descriptions, as well as the lack of documented responsibilities. | |
| 7 | List the skills and competencies needed to perform the duties and responsibilities described above. | Note where tasks are not carried out because of a lack of training. | |
| 8 | List existing documentation on all of the above. | This documentation maybe in many forms, such as flow charts, procedures, checklists, forms, job descriptions, manuals, or style guides. | |

#### 4.2.3. Completion of planning items and project proposal

| Item | Description | Guidance | Checklist |
|---|---|---|---|
| 1 | Determine the deliverables for the QMS project | Document the key deliverables, ensuring dependencies are recorded. | |
| 2 | Develop a schedule of target dates | There should be some flex built into the target dates. Dependencies should be noted. In addition, the team should be aware of the 2026 ICAO implementation date. | |
| 3 | Draw up a list of resources required | Internal resources, external resources, and other costs. | |
| 4 | Complete the project proposal to senior management | Ensure senior management commitment. | |

#### 4.2.4. Approval of the implementation project

| Item | Description | Guidance | Checklist |
|---|---|---|---|
| 1 | Review project proposal with the quality manager | Ensure all material required for decision making purposes are centrally recorded. | |
| 2 | Approve the implementation project as proposed or negotiate changes | Note any changes for record keeping purposes. | |
| 3 | Commit the resources necessary to carry out the implementation project as approved. | Ensure senior management commitment. | |

### 4.3. Design Phase

#### 4.3.1. Development of procedures and documentation

| Item | Description | Guidance | Checklist |
|---|---|---|---|
| 1 | Create document templates for procedures, instructions, forms, checklists, job descriptions and any other documentation to be developed for the QMS | Review existing documentation, identify where new procedures may need to be created. | |
| 2 | Develop and produce all necessary procedures and documentation | Review existing documentation, identify where new procedures may need to be created. | |

# 5. AIS / AIM Technical Competencies of Personnel

The AIS / AIM technical competencies identify the link between the objectives of the organisation, those of personnel and compliance with the relevant standards.

## 5.1. Data and Information Management

### 5.1.1. Pre-Data Processing

| Topic | Performance Criteria | Standard | Check Item |
|---|---|---|---|
| 1 | Receive and record data | Local procedures | |
| 2 | Evaluate whether the raw data is from an authorised source | ICAO Annex 15, Chap. 7, and Appendix 1; Local procedures, Doc 8126 | |
| 3 | Evaluate whether the data meets the protection requirements | Local procedures | |
| 4 | Identify if there is a need for translation of the raw data | ICAO Doc 9713 | |
| 5 | Analyse the appropriateness of the data | Local procedures | |
| 6 | Verify the quality of the raw data | ICAO Annex 15, Chap. 3; Local procedures | |
| 7 | Analyse the data for completeness, coherence, and ambiguity | Local procedures | |
| 8 | Identify any discrepancies, duplications, and misinterpretations of the data | ICAO Annex 15, Chap. 4 to 7 | |
| 9 | Execute corrective action | Local procedures | |
| 10 | Coordinate with data sources | Local procedures | |
| 11 | Receive external data | Local procedures | |

### 5.1.2. Process Data

| Topic | Performance Criteria | Standard | Check Item |
|---|---|---|---|
| 1 | Perform storage of raw data | Local procedures | |
| 2 | Assess the impact of the data on existing publications, the significance and complexity of the data, and its temporality | Local procedures | |
| 3 | Coordinate with other relevant parties | Local procedures | |
| 4 | Select the means of publication | Local procedures | |
| 5 | Schedule the publication process, taking into consideration the main milestones, proposed publication / effective date and the AIRAC cycle | ICAO Annex 15 and Local procedures, Doc 8126 | |
| 6 | Perform calculations e.g. data conversations | Local procedures | |
| 7 | Apply appropriate data formatting rules | Local procedures | |
| 8 | Enter data into application | Local procedures | |
| 9 | Assemble statistical data | Local procedures | |
| 10 | Make data available | Local procedures | |

### 5.1.3. Operate Database

| | Performance Criteria | Standard | Check Item |
|---|---|---|---|
| 1 | Apply database maintenance operations | Local procedures | |
| 2 | Identify faults in the operation of the database and apply fault reporting procedures | Local procedures | |
| 3 | Operate the database | Local procedures | |

### 5.1.4. Produce Data Sets / Files

| | Performance Criteria | Standard | Check Item |
|---|---|---|---|
| 1 | Select the required data (internal and external sources) | Local procedures | |
| 2 | Compile data sets / file (e.g. terrain and obstacle, PIB, List of Valid NOTAM etc) | ICAO documents and / or Local procedures | |
| 3 | Coordinate with other authorities as necessary | Local procedures | |
| 4 | Verify data sets/ file | Local procedures | |
| 5 | Obtain approval | Local procedures | |
| 6 | Make data sets / files available | Local procedures | |

### 5.1.5. Maintain Data / Information and Library

| | Performance Criteria | Standard | Check Item |
|---|---|---|---|
| 1 | Maintain external publication (e.g. AIP) | Annex 15 and local procedures | |
| 2 | Maintain external data (static and/or dynamic) | Local procedures | |
| 3 | Maintain records | Local procedures | |

## 5.2. Static Data Output

### 5.2.1. Generate AIP / AIP Amendment

| | Performance Criteria | Standard | Check Item |
|---|---|---|---|
| 1 | Prepare content (text, tables, diagrams, and other elements) | ICAO Annex 15, Doc 8126, Local procedures | |
| 2 | Coordinate with other authorities as necessary | Local procedures | |
| 3 | Translate text into appropriate language | Local procedures | |
| 4 | Verify content | Local procedures | |
| 5 | Obtain approval of text | Local procedures | |
| 6 | Compile and verify content (text, charts, and other elements) | Local procedures | |
| 7 | Obtain approval of compiled product | Local procedures | |
| 8 | Make AIP / AIP Amendments available (paper and/or electronic form) | Annex 15 Section 3.3. ICAO (use of internet) and local procedures | |

### 5.2.2. Generate AIP Supplement

| | Performance Criteria | Standard | Check Item |
|---|---|---|---|
| 1 | Prepare content (text, tables, diagrams, and other elements) | Local procedures | |
| 2 | Coordinate with other authorities as necessary | Local procedures | |
| 3 | Translate text into appropriate language | Local procedures | |
| 4 | Verify content | Local procedures | |
| 5 | Obtain approval of text | Local procedures | |
| 6 | Compile and verify content (text, charts, and other elements) | Local procedures | |
| 7 | Obtain approval of compiled product | Local procedures | |
| 8 | Make AIP Supplement available (paper and/or electronic form) | Annex 15 Section 3.3, ICAO Doc 9855, and Local procedures | |

### 5.2.3. Generate Aeronautical Information Circulars (AIC)

| | Performance Criteria | Standard | Check Item |
|---|---|---|---|
| 1 | Prepare content (text, tables, diagrams, and other elements) | Local procedures | |
| 2 | Coordinate with other authorities as necessary | Local procedures | |
| 3 | Translate text into appropriate language | Local procedures | |
| 4 | Verify content | Local procedures | |
| 5 | Obtain approval of text | Local procedures | |
| 6 | Compile and verify content (text, charts, and other elements) | Local procedures | |
| 7 | Obtain approval of compiled product | Local procedures | |
| 8 | Make AIC available (paper and/or electronic form) | Annex 15 Section 3.3, ICAO Doc 9855, and Local procedures | |

### 5.2.4. Produce Charts

| | Performance Criteria | Standard | Check Item |
|---|---|---|---|
| 1 | Prepare charts | Local procedures | |
| 2 | Coordinate with other authorities as necessary | Local procedures | |
| 3 | Translate elements into appropriate language | Local procedures | |
| 4 | Verify content | Local procedures | |
| 5 | Obtain approval of chart | Local procedures | |
| 6 | Make charts available (paper and/or electronic form) | Local procedures | |

## 5.3. Dynamic Data output

### 5.3.1. Generate NOTAM

| | Performance Criteria | Standard | Check Item |
|---|---|---|---|
| 1 | Prepare content (number, series, Q Line, E Field, etc) | Annex 15 Chap 5, ICAO Doc 8126 | |
| 2 | Coordinate with other authorities as necessary | Local procedures | |
| 3 | Translate text into appropriate language | Local procedures | |
| 4 | Verify content | Local procedures | |
| 5 | Make NOTAM available | Annex 15 Chap 5.3, ICAO Doc 8126 | |

### 5.3.2. Generate Checklists of Valid NOTAM

| | Performance Criteria | Standard | Check item |
|---|---|---|---|
| 1 | Prepare checklist of Valid NOTAM | Local procedures | |
| 2 | Coordinate with other authorities as necessary | Local procedures | |
| 3 | Verify content | Local procedures | |
| 4 | Make checklist of Valid NOTAM available | Annex 15 Chap 5.3, ICAO Doc 8126 | |

### 5.3.3. Generate SNOWTAM

| | Performance Criteria | Standard | Check Item |
|---|---|---|---|
| 1 | Prepare SNOWTAM | Annex 15 Chap 5 ICAO Doc 8126 | |
| 2 | Coordinate with other authorities as necessary | Local procedures | |
| 3 | Verify content | Local procedures | |
| 4 | Make SNOWTAM available | Annex 15 Chap 5.3 ICAO Doc 8126 | |

#### 5.3.4. Generate ASHTAM

| | Performance Criteria | Standard | Check Item |
|---|---|---|---|
| 1 | Prepare ASHTAM | Annex 15 Chap 5<br>ICAO Doc 8126 | |
| 2 | Coordinate with other authorities as necessary | Local procedures | |
| 3 | Verify content | Local procedures | |
| 4 | Make ASHTAM available | Annex 15 Chap 5.3<br>ICAO Doc 8126 | |

### 5.4. Additional Products

#### 5.4.1. Generate Additional Products

| | Performance Criteria | Standard | Check Item |
|---|---|---|---|
| 1 | Prepare additional products (e.g. business products, VFR flight guide) | Local procedures | |
| 2 | Coordinate with other authorities as necessary | Local procedures | |
| 3 | Verify content | Local procedures | |
| 4 | Obtain approval | Local procedures | |
| 5 | Make additional products available | Local procedures | |

### 5.5. Pre and Post Flight Information

#### 5.5.1. Pre-Flight Information

| | Performance Criteria | Standard | Check Item |
|---|---|---|---|
| 1 | Provide or make available pre-flight information e.g. AIP, PIB etc | Annex 15, Doc 8126, and local regulations | |

### 5.5.2. Post-Flight Preparation

| | Performance Criteria | Standard | Check Item |
|---|---|---|---|
| 1 | Receive and process data / information from other sources | Annex 15, Doc 8126, and local regulations | |
| 2 | Process post-flight data queries | Local procedures | |
| 3 | Distribute post-flight information to the appropriate authority | Local regulations and procedures | |

## 5.6. ARO

### 5.6.1. Process FPL

| | Performance Criteria | Standard | Check Item |
|---|---|---|---|
| 1 | Receive and process FPL proposal | Local procedures | |
| 2 | Verify FPL for compliance with format and data conventions, and for completeness and accuracy | Local procedures | |
| 3 | Receive, create and process associated / supplementary messages | Local procedures | |
| 4 | Execute corrective action | Local procedures | |
| 5 | Transmit FPL, including to any regional processing systems | Local procedures | |

### 5.6.2. Coordination Activities

| | Performance Criteria | Standard | Check Item |
|---|---|---|---|
| 1 | Assist the pilot in the pre-flight and post-flight phase | Local procedures | |
| 2 | Coordinate with ATS | Local procedures | |
| 3 | Coordination with Search and Rescue Coordination Centre | Local procedures | |
| 4 | Coordinate with other organisations | Local procedures | |

## 6. Functional Oriented and Process Oriented Organisations

The table below outlines the key differences between a functional and a process-oriented organisation. It is generally easier for a process-oriented organisation to adapt to AIM implementations compared to functional oriented organisations.

| | **Structure** | **Output** |
|---|---|---|
| **Functional oriented Organisations** | Organisational structure is dependent on core AIS tasks. | Output is based on end products (e.g. AIP production, aeronautical chart production etc.) |
| **Process oriented Organisations** | Organisational structure is dependent on the end-to-end process. | Output is based on aeronautical data itself and the flow of the data. |

# 7. Guidance on the Transition from a Functional to a Process Oriented Organisation

Developing a process-oriented organisation to support the transition to higher levels of data-oriented approaches within AIM.

## 7.1. Awareness

| | Criteria | Description | Check Item |
|---|---|---|---|
| 1 | Primary aviation law and regulatory framework for AIS providers | Become familiar with the regulatory framework for the provision of aeronautical information services as well as the responsibilities of the AIS provider. | |
| 2 | Industry standards: quality management system implementation | Become familiar with the industry standards for the effective implementation of the QMS: the latest ISO 9000 series of standards. See more detail in Appendix 0. | |
| 3 | QMS Implementation for AIS providers | Obtain a thorough understanding of the application of QMS to AIS processes including:<br>a) The benefits of a process-oriented management system that encompasses all AIS functions.<br>b) The general requirements of the ISO 9000 series of standards, and the evaluation of what is applicable to the AIS domain.<br>c) AIS personnel expectations towards the use of QMS. | |
| 4 | Process Mapping | a) Identify the aeronautical processes to be mapped.<br>b) Determine the boundaries of the aeronautical data processes.<br>c) Determine the sequence and steps of the aeronautical data processes.<br>d) Identify all the activities associated with the aeronautical data processes.<br>e) Gather process facts (what, who, when, where) from personnel.<br>f) Create a process map by converting all the factual information into a mal (e.g. visualise the aeronautical data process through a flow chart). | |

### 7.2. Organisational Setup

| | Criteria | Description | Check Item |
|---|---|---|---|
| 1 | Determine the organisational set-up of the AIS organisation | a) Choose, if possible, an organisational setup that is based on process-oriented approach as defined by a QMS.<br>b) Identify the various modes of operation, based on the nature of the data and information provided.<br>c) Identify if additional non-AIS functions are performed by the AIS provider, such as tasks related to the ARO function. | |

### 7.3. Planning for Implementation

| | Criteria | Description | Check Item |
|---|---|---|---|
| 1 | Define the AIS provider environment | a) Determine internal and external responsibilities of the AIS organisation.<br>b) Satisfy the relevant requirements, needs and expectations of the end-users.<br>c) Communicate, whenever practicable, with the user community to ensure continuous alignment with their requirements. | |
| 2 | Define the scope, objectives, and policies for the AIS provider | a) Determine the scope, boundaries, and applicability of the AIS management system considering the internal and external context and user requirements.<br>b) Establish objectives and policies for the provision of AIS based on the State regulatory framework. | |
| 3 | Determine processes and the sequences of processes in the AIS organisation | a) List the functional groups of an AIS organisation and identify how these functional groups related to each other.<br>b) Identify how the AIS functional groups related to functional groups outside the AIS organisation (aeronautical data originators).<br>c) Identify the activities that are performed by each AIS functional group.<br>d) Identify the processes associated with the activities performed by each AIS functional group.<br>e) Identify the main input and output of these processes and their sequences.<br>f) Identify when the output of preceding processes is an input for the succeeding ones.<br>g) List the requirements (based on the regulatory framework) for each AIS functional group and link the processes to the requirements; if non-AIS functions (such as ARO) are also performed by an AIS organisation, list their requirements, and link them to the corresponding processes. | |

| | | | |
|---|---|---|---|
| | | h) Identify the procedures that are needed to implement the listed processes. | |
| 4 | Define the AIS resources that take ownership and process accountability and provide the required documentation | a) List the roles and responsibilities of AIS personnel involved. Note the differences between actual responsibilities and those documented in job descriptions, as well as the lack of documented responsibilities.<br>b) List the competencies needed to perform the duties with their associated description and performance criteria.<br>c) Note where tasks cannot be carried out because of a lack of training.<br>d) List existing documentation such as flow charts, procedures, checklists, forms, job descriptions and manuals. | |
| 5 | Define the interfaces, risks, and activities within the process | a) Define the required outputs and inputs of the AIS processes.<br>b) Determine the risks to conformity of products, services, and end user satisfaction if unintended outputs are delivered.<br>c) Determine the activities, measures and inherent controls required to transform the inputs into the desired output.<br>d) Determine and define the sequence of interaction of the activities within the process.<br>e) Determine how each activity will be performed. | |
| 6 | Determine the monitoring and measurement requirements | Identify the validation necessary to assure effectiveness and efficiency of the processes and systems. Considering such factors as:<br>a) Monitoring and measuring criteria<br>b) Performance reviews<br>c) Users' satisfaction<br>d) Supplier performance<br>e) On time delivery and lead times<br>f) Process costs<br>g) Incident frequency<br>h) And other measures of conformity with requirements. | |

### 7.4. Execute Implementation

| | Criteria | Description | Check Item |
|---|---|---|---|
| 1 | Execute Implementation | a) Ensure the effective implementation of the process identified during the planning phase<br>b) Identify any gaps in the processes used to manage the quality framework and update as needed. | |

### 7.5. Monitor Implementation

| | Criteria | Description | Check Item |
|---|---|---|---|
| 1 | Monitor implementation | a) Ensure the availability of information necessary to support the operation and monitoring of these processes.<br>b) Measure, monitor and analyse these processes, and implement action necessary to achieve planned results and continual improvement.<br>c) Maintain appropriately documented information necessary to provide confidence of conformity to the processes and resulting product. | |

## 8. Key Objectives During the Transition from AIS to AIM

The table below outlines how AIS, AIM and SWIM rather than being discrete separate initiatives can be thought of as a continuum of improvement.

| | Description | Check Item |
|---|---|---|
| **AIS** | 1. Collection, verification and validation of aeronautical data and aeronautical information.<br>2. Provision of high-quality aeronautical information service.<br>3. Supply of information and data which is accurate and consistent.<br>4. Consistent updating of all required aeronautical information products and services.<br>5. Timely provision of quality-assured aeronautical information products and services. | |
| **AIM** | 6. Provide for timely updates of the database and monitor the validity and quality of the aeronautical information.<br>7. Ingest and integrate data from a variety of different data originators.<br>8. Manage temporality of aeronautical data and aeronautical information to ensure that all related products are always up to date.<br>9. Log all data activities and maintain metadata assuring traceability.<br>10. Provide visualisation tools for displaying geo-referenced data on digital maps and aerial photographs for verification and validation purposes.<br>11. Provide users with definable workflows, rules, and templates to facilitate assembly of the aeronautical information products and services.<br>12. Ensure that the aeronautical information products and services are equally accessible by humans and<br>13. computer systems, through specific digital formats for capturing and processing the information. | |
| **SWIM** | 14. Permit access by authorised users only through a suitable authentication service provided over the internet.<br>15. Provide rapid responses to user requests for information.<br>16. Be a data-centric system not related to any particular products; instead, the system should store aeronautical information as digital data sets that are accessible at any time within the various stages of production and distribution.<br>17. Use open standards that are publicly available and have various rights of use associated with them.<br>18. Use interoperable services that can be implemented and reused in multiple separate systems.<br>19. Improve the processes, which currently involve lengthy timescales and are not comparable to other highly automated procedures. | |

# 9. Guidance on the Transition from AIS to AIM

The following elements do not need to be implemented sequentially, as some of these elements need to be implemented in line with others. However, failing to implement steps may adversely impact the transition from AIS to AIM.

## 9.1. Phase 1 – Consolidation

This phase is seen as the pre-requisite for the transition from AIS to AIM (implementation of the current SARPS).

| Topic | Description | Details | Check Item |
|---|---|---|---|
| **ARIC Adherence Monitoring** | Investigate the AIRAC adherence to ensure compliance | Defined in Annex 15, AIRAC defines common dates and an associated standard aeronautical information publication procedure for States. This is to allow for the updating of information in electronic systems like Flight Management Systems (FMS) and Air Traffic Control (ATC) systems. It is essential, for both efficiency and safety, that Pilots, Air Traffic Controllers, Air Traffic Flow Managers, Flight Management Systems and Aviation charts have the same data sets. | |
| **Monitoring of Annexes differences** | Monitoring of States' difference to Annex 4 and Annex 15 | Differences to ICAO SARPS need to be clearly defined in the AIP of the state under GEN 1.7 as defined in ICAO 8126, chapter 5, section 5.8. | |
| **WGS-84 Implementation** | Target of 100% of coordinates in the AIP and charts using WGS-84 reference system is achieved. | The requirement to use a common horizontal, vertical, and temporal reference system is essential to facilitate the exchange of data between different systems | |
| **Quality** | Quality Management | Quality management measures will be re-enforced to ensure the required level of quality of the aeronautical information. In order to assist States in the implementation of an efficient quality management system. | |

### 9.2. Phase 2 – Going Digital

This will support a number of initiatives including:

a) Data-driven processes for the production of the current products.

b) Introduction of structured digital data from databases into AIS/ AIM processes.

c) Introduction of highly structured databases and tools such as GIS for visualising electronic terrain and obstacle datasets.

d) Implementation of the aeronautical information conceptual mode (AICM).

| Topic | Description | Details | Check Item |
|---|---|---|---|
| **Data Quality Monitoring** | Investigate the quality of data between Data Originators and Aeronautical Information Service Providers measured against the ICAO Annex requirements | A quality management system should be implemented to define all activities relating to processing and publication of aeronautical information in procedures and documents. For example, using the ISO 9000 series of quality assurance standards as a way to demonstrate that a QMS is in place which meets requirements. | |
| **Data Integrity Monitoring** | Investigate data integrity from the originator, through the data process chain to eventual publication. | Implementing and maintaining traceable, controlled, and auditable processes in compliance with ICAO Annex 15 requirements for data quality with a focus on data integrity. | |
| **Integrated Aeronautical Information Database** | Database must be able to exchange information based on the Aeronautical Information Exchange Model (AIXM) using the Aeronautical Information Conceptual Model (AICM) as reference so that the information can be exchanged with other aeronautical databases. | The design of such a database will not be instructed because local technical or functional requirements must be considered. | |
| **Unique Identifiers** | Data, received by AIS, should receive a unique identifier when the data is processed and stored in the AIS database. Data should already receive a unique | The aeronautical database should be able to use the cyclic redundancy check (CRC) mechanism as defined in ICAO Annex 15 during the transfer of data to guarantee that the unique identifiers are not corrupted during this process. | |

| | | | |
|---|---|---|---|
| | identifier when the aeronautical data is entered in the data chain by the original data provider, e.g. surveyor, PANS-OPs designer. That unique identifier shall be carried through all subsequent processes. | | |
| **Aeronautical Information Conceptual Model** | Have a reference to the latest Aeronautical Information Conceptual Model (UML) and the associated AIXM XML schema and have an internal model of change management for updating the integrated Aeronautical Information Database through the version changes. | Consistency is essential for interoperability. New models will allow for more structured information to be exchanged, and so it is important the systems keep up-to-date and that these happen under effective change management procedures. | |
| **Electronic AIP** | eAIP must exist in two states as a printable document and one that can be viewed by web browsers. | An Electronic AIP (eIAP) should be generated as a HTML version of the AIP which consists of a set of XML files. The application used to create the eAIP must be able to create it in accordance with the eAIP specification. | |
| **Terrain** | Requirement for the compilation and provision of terrain data set. | Establishment of a digital elevation model (DTM) or digital surface model (DSM) which meets the ICAO Annex 15 requirement for terrain data. | |
| **Obstacles** | Requirement for the compilation and provision of obstacle data available in AIXM format and that a GIS (geographical information system) be able to display the information visually. | Controlling and monitoring of obstacles in the vicinity of an aerodrome. It should also indicate the four areas (Areas 1, 2, 3 and 4) as specified in Annex 15, chapter 10 and clearly define the process of approval of the obstacle. | |

| | | | |
|---|---|---|---|
| **Aerodrome Mapping** | Requirement for aerodrome data to be made available in AIXM format and that a GIS (geographical information system) be able to display the information visually. | Traditional aerodrome charts to be complemented by structured aerodrome mapping data that can be imported into electronic displays. This would be describing:<br><br>• The spatial layout of an airport<br>• The geometry of features (e.g. runaways, taxiways, buildings) described as points, lines, and polygons.<br>• Further information characterising the features and their functions which are stored as attributes (e.g. surface type, name/object identifier, runway slope). | |

### 9.3. Phase 3 Information Management

This will support a number of initiatives including:

a) Enabling AIM functions to address the new requirements of the Global ATM Operational concept in a net-centric information environment.

b) Transfer of information in the form of digital data based on the established databases.

c) Aeronautical data exchange model ensuring interoperability between all systems.

| Topic | Description | Details | Check Item |
|---|---|---|---|
| **Aeronautical Data Exchange** | Understanding the syntax of the aeronautical data (AIXM) to be exchanged in terms of the field names and types is essential for interoperability. | The content of the mode will be driven by the aeronautical information conceptual model (UML) and by the requirements coming from technology choices. There is a need to balance innovation with the need for protecting investments. | |
| **Communication Network** | Networks utilising Internet Protocols for the transmission and dissemination of aeronautical data and information should be implemented. | More data will be exchanged on ground networks and the current data will be exchanged in a form that will require more bandwidth. Networks utilising Internet Protocols would ensure the safety and security of information through the establishment of network security mechanisms and firewalls. See Appendix 4 for more detail. | |
| **Aeronautical Information Briefing** | Digitalising the traditional paper based pre-flight NOTAM briefing and expanding it to include other aeronautical information / data elements such as | Fine tuning of the current NOTAM format by selection criteria to improve the selectivity of the information presented to pilots in the pre-flight information bulletin. | |

| | | | |
|---|---|---|---|
| | charts and other graphical products as well as metrological and charts. This also includes using systems that have the capability to filter data. | | |
| **Training** | The training of personnel for the new requirements on skill and competencies for AIM in addition to those for AIS. | Training requirements for AIS staff must be expanded to include the new requirement of AIM technical areas including databases, AIXM, XML, HTML, CSS, and information security etc | |
| **Agreements with Data Originators** | Service Level Agreements (SLA's). The SLA package is a series of interrelated elements to facilitate the establishment of agreements between aeronautical data originators and the Aeronautical Information Services. | High dependency on information exchange, and the SLA requirement is a means to ensure compliance with agreement. See Appendix 1 for more information. | |
| **Interoperability with Meteorological Products** | The implementation of WXXM would ensure that data in products like METAR / SPECI / TAF / SIGMET is exchanged in digital forms in accordance with a globally interoperable information exchange model, which will use XML and GML. Exchanging this data over the internet. | Meteorological information is essential in the compilation of pilot briefings. This will require that meteorological data be made available in a similar format to the aeronautical data that uses open standards (XML and GML) for the implementation of table-driven data validation built into the data exchange mechanism. | |

| | | | |
|---|---|---|---|
| **Electronic Aeronautical Charts** | Implementation of AIXM, a dataset of GML and XML aeronautical, terrain and obstacle data can be interpreted by systems to produce a graphical representation of the applicable data. Exchanging the data over the internet. | Provides electronic aeronautical charts based on digital databases and the use of geographic information systems (GIS). | |
| **Digital NOTAM** | A dataset of AIXM / XML encoded NOTAM that can be exchanged through multiple types of media and systems for the updating (temporary or permanent) of 'published' / stored data. | The digital NOTAM will provide dynamic aeronautical information to all stakeholder with an accurate and up-to-date common representation of the aeronautical environment in which flights are operated. | |

## 10. Oversight Activities for the regulatory organisation to facilitate AIM implementation

| Implementation Step | Associated Activities | Further guidance | Check Item |
|---|---|---|---|
| Establish a State regulatory framework for aeronautical data quality | Transpose SARPS to the State's regulatory framework.<br><br>Define the obligations and requirements of all parties into national regulations.<br><br>*Note: transitioning to AIM means to broaden the scope of a regulatory framework to include not only requirements for AIS organisations but also for all parties contributing to the aeronautical data quality.* | Doc 9082, ICAO's Policies on Charges for Airports and Air Navigation Services.<br><br>Doc 9161, Manual on Air Navigation Services Economics. | |
| Establish a national strategy for aeronautical data quality | Align the intention of all involved parties to a common strategy for implementing AIM.<br><br>Achieve a common agreed understanding between all involved parties on the national strategy for implementing AIM.<br><br>Determine the roles and responsibilities for each involved party.<br><br>Plan the tasks of each involved party in the implementation of AIM. | Doc 9082, ICAO's Policies on Charges for Airports and Air Navigation Services.<br><br>Doc 9161, Manual on Air Navigation Services Economics. | |
| Establish and perform surveillance activities for aeronautical data quality implementation in the State | Determine the surveillance activities for aeronautical data quality.<br><br>Perform surveillance activities for aeronautical data quality. | Doc 9734, Safety Oversight Manual | |

## 11. Automation

The entire data chain, from data origination, processing, to production and distribution is supported by systems that are characterised by various degrees of automation.

| | Description | Check Item |
|---|---|---|
| **Level 0 – Manual** | The data and information are mostly handled manually, assisted by stand-alone software or applications. This level is characterised by distributed sources, the manual generation and maintenance of aeronautical data products that are provided in paper or electronic format and supported by manual validation processes. | |
| **Level 1 – Data Centric** | Characterised by a data-centric architecture, automated origination and detection of changes, and electronic and digital products. | |
| **Level 2 – Automated Workflow** | The automation allows for an automated workflow from data origination, to processing and distribution to the next intended users. Its characteristics are a data-centric architecture, an automated collection of data from the originator (with a digital transfer of data between originator and AIS), seamless processing, and the provision of aeronautical information as digital products. At this level, the workflow is automated which can help improve with safety, efficiency, and cost of the entire data process. | |
| **Level 3 – Full AIM Integration** | A highly automated AIM system and full AIM integration and thereby supports the transition to SWIM. It is characterised by a single authoritative source (central database), service-oriented architecture (SOA), web services and applications, and the ability of the end users to query and retrieve the information, including creating user-defined requests. In a fully integrated AIM environment, aeronautical information is accessible to the entire aviation community who can retrieve the information in real time through web services and applications. | |

## 12. Data Format

AIM solutions uses the data itself, as a data set, or the data directly to create the products, which allow for more dynamic (changeable) products and data exchange. Therefore, the data format is essential for the successful delivery of AIM.

The AIXM Change Control Board (CCB) has a responsibility to maintain and to evolve the AIXM Specification as necessary for enabling States to comply with the ICAO global and regional requirements for the provision of aeronautical information, in the context of the evolution towards digital AIM and SWIM.

| | Description | Check Item |
|---|---|---|
| **Data Model (UML)** | The AIXM model uses UML for documenting the data set specification, Aeronautical Information Conceptual Model (AICM). Changes to the AICM / UML are implemented through the AIXM CCB. | |
| **Data Coding Format (XML)** | XML defines a set of rules for encoding documents in a format that is both human-readable and machine-readable for transmissions over the internet of the aeronautical data. | |
| **Application Schema (XML Schema)** | The XML schema is used to describe and validate the structure of the content of XML aeronautical data. | |

For the latest information https://aixm.aero should be consulted.

## 13. Components of an AIM System

Outlining the main steps between data input to service provision of an AIM system

| | Description | Check Item |
|---|---|---|
| **Data Input** | AIM system should be capable of ingesting aeronautical data and aeronautical information in a standardised format directly into the system from accredited sources. For information received on paper, the system provides a digitisation function with verification and validation mechanisms to assure data is entered without errors. See Appendix 2 for more details on errors handling and reporting. | |
| **Core Processing System** | Enter, modify, and delete aeronautical data. Verify and validate the data. Assemble and store the data. Translate, extract, and format the data. Provide data visualisation capabilities to enable the validation of geographical referenced aeronautical data information by superimposing it on top of geographical maps. It should support workflow management to control and automate data processes and provide system logs of all interactions with the data (e.g. origination, update, verification, and validation) using metadata for traceability. | |
| **Data Storage** | Data storage is organised to facilitate generation of aeronautical information products and services. Also, it ensures data quality by storing the data and associated metadata as long as its required and enables traceability to its originator. A contingency plan should be in place which is complete, high-level loss of service or disaster recovery strategy. It requires dependable data backup, restoration, and recovery procedures to prevent data loss, and to cope with hardware failures, operating system failures and application unavailability.<br><br>Data should be stored in accordance with information security and data protection best practice. Special care should be taken when ingesting data to make sure that it is quality controlled, and security controlled when received from authorised sources. See Appendix 4 for more detail. | |

| | | |
|---|---|---|
| **Data product preparation** | Different aeronautical information products and services are generated with production subsystems using data from the central data storage by selecting extracting and formatting the data according to the data product specification. These could include:<br>(a) AIP production and editing sub-system<br>(b) Charting sub-system<br>(c) NOTAM and metrological information publication sub-system<br>(d) Sub-system to produce digital data set<br><br>The system should be configurable such that it is possible to choose how information is presented to a specific group of users, or what kind of information they have access to. | |
| **Service provision** | The system provides services for distribution of the aeronautical information products and services. The services should be based on TCP / IP protocol and the type of service depends on the representation of the information (e.g. https for electronic AIP, Open Geospatial Consortium OGC web services for geographical information).<br><br>Information security best practices should be followed throughout the end-to-end process, and with additional focus on public facing web applications, data exchange (including APIs) and data import as potential high-risk areas. See Appendix 2 for more detail. | |

# 14. Non-Conforming Data and Information

## 14.1. Non-Conforming Products

There should be a procedure for dealing with data and information that does not conform to the required standards. This should be done by having a method of identifying such information so that it cannot be inadvertently published.

| Step | Action | Check Item |
|---|---|---|
| 1 | Record non-conformities | |
| 2 | Determine the cause of non-conformity | |
| 3 | Determine actions required to prevent re-occurrence of non-conformities | |
| 4 | Advise originator | |
| 5 | Implement corrective action | |
| 6 | Filing records created after corrective action taken | |

### 14.2. Error-tracking

When an error is detected in a component of the IAIP.

| Step | Action | Check Item |
|---|---|---|
| 1 | Confirm the error and raise an ETF (Error Tracking Form) | |
| 2 | Register the ETF | |
| 3 | Analyse the safety aspects associated with the error and determine if NOTAM or other action is appropriate | |
| 4 | Initiate corrective action as a NOTAM or AIP SUP and process through the NOTAM officer / NOF | |
| 5 | Attach a copy of the NOTAM requested / Draft AIP SUP to this form | |
| 6 | Analyse the cause of the error | |
| 7 | Discuss the error with officer responsible | |
| 8 | Determine the remedial action | |
| 9 | Brief AIM Manager as necessary | |
| 10 | Initiate change action when required | |
| 11 | Amend or establish procedures as required to strength processes | |
| 12 | Sign-off the EFT when completed | |
| 13 | File the completed form | |

### 14.3. Preventive action

Good error analysis should identify where necessary the preventative action required to ensure the error does not re-occur.

| Step | Action | Check Item |
|---|---|---|
| 1 | Collate information relating to non-conformities, error tracking forms and customer complaints / suggestions | |
| 2 | Determine causes of non-conformity | |
| 3 | Determine what action is necessary to prevent non-conformities reoccurring | |
| 4 | Determine and implement corrective action | |
| 5 | Record and file results of action taken | |

### 14.4. Change Procedures

Suggestions should be encouraged to improve the quality system. However, it should be noted that changes to the AIM system itself should be done through effective change management procedures.

| Step | Action | Check Item |
|---|---|---|
| 1 | Register the suggestion | |
| 2 | Determine course of action to be taken | |
| 3 | Advice provided to the originator | |
| 4 | Record filled | |

## 15. Continuous Improvement Plan

Planning and implementing an AIM system means understanding and prioritising the required improvements, but once implemented it should also consider the approach to continual improvement of the AIM system.

| | | Description | Check Item |
|---|---|---|---|
| **1** | **Process Improvement** | At the core of the AIM system are the functional processes to maintain and process data, and to use that data to generate consistent output. Functional processes improvement may encourage the introduction of a centralised database, automated workflow management, task management, change controls etc. | |
| **2** | **System Improvement** | The introduction of new technologies, including hardware, software and applications for automating tasks, help improve the quality of information.<br><br>Security software minimises the damage caused by unintentional or malicious updates to databases by unauthorised users, while improved telecommunication technologies provide easier or faster access to data and improve both its accuracy and timeliness.<br><br>A test system should be used that is designed to be identical, or as close to possible to the production (real) system which allows for testing of configuration changes before implementing them in the production system.<br><br>Parallel operations may be required in running the old and the new system for a period of time. The switch may then be made at a specific point in time, or stepwise transition be made, meaning that individual processes progressively transition to the new operational environment. | |
| **3** | **Data Design Improvement** | The introduction of standard information conceptual and exchange models facilitates data storage and exchange. This includes processes for managing the data schema update. | |
| **4** | **Policy and Procedure Improvement** | Improvement in policies and procedures help ensure quality processes, develop appropriate guidance and training for usage of the automated tools, and also support the identification and selection of adequate personnel to manage the automated systems. | |

## Appendix 0 – QMS for AIM template

## Project Proposal

## Implementation of a QMS For Aeronautical Information Services (AIS)

## [Name of State]

## 1. Introduction

## 2. Objective

## 3. Scope

## 4. Benefits

## 5. Programme description

## 5.1 Planning of the QMS

## 5.2 Design of the QMS

## 5.3 Deployment and testing of the QMS

## 5.4 Final adjustment and internal audit

## 6. Project Plan

## 7. Project Team

## 8. Resources

## 9. Deliverables

## 10. References

## 1. Introduction

ICAO Annex 15 – Aeronautical Information Services requires that States introduce a quality system to implement quality management at each function stage performed by the aeronautical information service.

Furthermore, it is recommended in Annex 15 that the quality system be in conformity with the International Organisation for Standardisation (ISO) 9000 series of quality assurance standards and that it be certified by an approved organisation.

## 2. Objective

This proposal outlines the project to implement a QMS within the AIM of [state]. The objectives of the projects are to comply with the ICAO provision and [add specific objectives].

## 3. Scope

The programme described will implement a QMS [for all activities or specify] performed by all [working groups] and [all locations] that contribute to AIM in [state].

## 4. Benefits

The implementation and operation of quality measures in the form of a QMS will bring improvements in quality, efficiency, and reliability with subsequent enhancement to productivity, safety, and service levels.

## 5. Programme Description

The programme tasks can be broken down into following four principal phases:

1) Planning of QMS requirements in the AIM working groups

2) Design of the QMS

3) Deployment and testing of the QMS

4) Final adjustment and audit for ISO certification

### Planning of the QMS

The objective of this phase is to establish, in relation to each of the AIM products and services:

a) the activities and organisational relationships

b) the processes involved

c) the requirements

d) the necessary procedures to affect the processes identified and fulfil the requirements

e) the duties and responsibilities and the associated skills and competencies required

f) the necessary documentation

### Design of the QMS

In this phase it is necessary to:

a) create new procedures as required and to ensure consistency with existing ones

b) write all documentation

c) develop training plans

d) plan for certification by audit

The key to this phase will be developing and producing the necessary documentation

### Deployment and testing of the QMS

As the QMS develops, the procedures need to be issued / applied and the system must be implemented in such a manner that the process can be tested and checked for correct functioning. Discrepancies will be dealt with by corrective action and follow-up action procedures.

### Final adjustment and internal audit

The final phase represents the on-going working QMS which will be operated for a period of time before the internal audit. This provides an opportunity for fine tuning of the QMS elements. The timescales for this adjustment phase may extend beyond the internal audit date in order to accommodate any corrective action issues that may arise from the internal audit.

## 6. Project Plan

The following is a schedule of the programme, showing a proposed total implementation timescale of [number] workdays.

| Document Type | Information Planning | Content Development | Implementation | Evaluation and review | Revision | Workdays | Target Dates |
|---|---|---|---|---|---|---|---|
| Quality manual | | | | | | | |
| Quality objectives | | | | | | | |
| Requirements | | | | | | | |
| Processes | | | | | | | |
| Procedures | | | | | | | |
| Quality records | | | | | | | |
| Instructions | | | | | | | |
| Document templates | | | | | | | |
| Checklists | | | | | | | |
| Forms | | | | | | | |
| Job descriptions | | | | | | | |
| Etc | | | | | | | |
| Training plan | | | | | | | |
| Audit plan | | | | | | | |
| Total number of workdays | | | | | | | |

## 7. Project Implementation Team

The following staff members are proposed to form the project implementation team. An assessment of the effort required of each staff member is included.

| Project Implementation team | | | |
|---|---|---|---|
| Name | Role | Skills/ Department represented | Estimated effort required |
| | | | |
| | | | |
| | | | |
| | | | |

## 8. Resources

### Internal

The following is an estimate of the effort required for the specified tasks, the majority of which can be provided internally.

| Internal effort | |
|---|---|
| Task | Estimated effort (workdays) |
| Process analysis | |
| Procedure development | |
| Documentation development | |
| Documentation control and other records | |
| QMS training | |
| Internal auditor training | |
| etc | |

### External

Some external support is recommended to assist with correct interpretation of the ISO 9000 QMS requirements and to ensure that the project implementation team is kept on track for compliance.

| External effort | | |
|---|---|---|
| Task | Estimated effort (workdays) | Cost |
| Interpretation of requirement against standard ISO 9001:2008 | | |
| QMS awareness training | | |
| Internal auditor training | | |
| Pre-registration audit | | |
| Etc | | |

## 9. Deliverables

The project objective is to establish a QMS that meets the requirement of the ISO 9001 standard. The following are considered to be essential elements for this process:

- Quality manual
- Documented procedures
- Quality records
- Etc

## 10. References

### ICAO Annexes

- Annex 4 – Aeronautical Charts
- Annex 11 – Air Traffic Services
- Annex 14 – Aerodromes
- Annex 15 – Aeronautical Information Services

### ICAO Documents

- Doc 7030 - Regional Supplementary Procedures
- Doc 7383 – AIS Provided by States
- Doc 8126 – AIS Manual
- Doc 8168 – PANS-OPS
- Doc 8697 – Aeronautical Chart Manual
- Doc 9377 – Coordination between ATS, AIS and MET Services
- Doc 9613 – PBN
- Doc 9674 – WGS-84 Manual
- Doc 9839 – QMS for AIS
- Doc 9905 – RNP Authorisation Required (AR)
- Doc 9906 – QA Manual
- Doc 9991 – AIM Training Manual
- Doc 10066 – PANS AIM

### OTAR

- OTAR Part 175 Aeronautical Information Services
- OTAR Part 176 Instrument Flight Procedure Approval

### ISO

- 8601 – Data elements and interchange formats – Information interchange – Representation of dates and times.
- 9000 – Quality Management Systems
- 19101 – Geographic information – Reference model
- 19104 – Geographic information – Terminology
- 19108 – Geographic information – Temporal schema
- 19109 – Geographic information – Rules for application schema
- 19110 – Geographic information – Feature cataloguing schema
- 19115 – Geographic information – Metadata
- 19131 - Geographic information – Data product specification

[include any other additional national laws and/or regulations if applicable]

## Appendix 1

### Service Level Agreement

A Service Level Agreement (SLA) is a (negotiated) contract between a service provider and its customers that defines the services provided, the indicators associated with these services, acceptable and unacceptable service levels, liabilities on the part of the service provider and the customer, and the actions to be taken in specific circumstances.

### SLA Data Provision Agreement Template

[name of entity receiving the aeronautical data and aeronautical information]

(hereinafter “The AIS”)

And

[name of entity receiving the aeronautical data and aeronautical information]

(hereinafter “The Data Originator”)

1. INTRODUCTION

1.1 SCOPE

This data provision agreement sets out the terms and conditions for the supply of aeronautical data and aeronautical information (hereinafter collectively as “data”) by [organisation name] (hereinafter “the Data Originator”) to the Aeronautical Information Service [organisation name] (hereinafter “the AIS”)

1.2 PARTIES TO THE AGREEMENT

The parties to this agreement, and their responsibilities are as follows:

| **Party** | **Official address** | **Legal representative** | **Responsibilities** |
|---|---|---|---|
| The Data Originator: [name of entity providing the aeronautical data and aeronautical information] | | | The Data Originator shall provide the Data to the AIS in accordance with this agreement |
| The AIS: [name of entity receiving the aeronautical data and aeronautical information] | | | The AIS shall receive the Data in accordance with this agreement. |

## 1.3 REGULATORY REQUIREMENTS

The following ICAO and national documents specify the regulatory requirements for the origination, collection, handling, storage, processing, transfer, and distribution of the Data:

- Annex 4 – Aeronautical Charts
- Annex 5 – Units of Measurement to be Used in Air and Ground Operations
- Annex 11 – Air Traffic Services
- Annex 14 – Aerodromes
- Annex 15 – Aeronautical Information Services
- Procedures for Air Navigation Services – Aircraft Operations – Volume II (PANS-OPS Doc 8168)
- Procedures for Air Navigation Services – ICAO Abbreviations and Codes (PANS-ABC Doc 8400)
- Procedures for Air Navigation Services – Aeronautical Information Management (PANS-AIM, Doc 10066)
- [update list to reflect all applicable ICAO and national regulations]

## 1.4 Entry into Force and Termination

1.4.1 This Agreement is valid from [enter start date] to [enter end date]

*alternatively*

1.4.1 This Agreement shall enter into force on the data of the later signature of the Parties and shall remain in force until terminated. This Agreement may be terminated by written agreement between the Parties, or by written advance notice of [add time period, e.g. x months] prior to termination by either Party.

## 1.5 DEFINITIONS AND CONVENTIONS

1.5.1 For the purposes of this agreement, the definitions in Annex 15 – Aeronautical Information Services and Procedures for Air Navigation Services – Aeronautical Information Management (PANS-AIM, Doc 10066) shall apply, including the following definitions:

a) ‘Agreement’ refers to this Data Provision Agreement.

b) ‘Data’ collectively refers to the aeronautical data and aeronautical information that the Data Originator is responsible to provide to the AIS under the terms of this Agreement.

c) ‘Data Originator’ refers to the legal entity responsible for the provision of aeronautical data and aeronautical information as set out in the terms of this Agreement.

d) ‘AIS’ refers to the legal entity responsible for receiving the aeronautical data and the aeronautical information as set out in the terms of this Agreement.

e) ‘Parties’ refer to the Data Originator and the AIS.

1.5.2 For the purposes of this agreement, the parties shall apply the following date and time conventions:

a) Co-ordinated Universal Time (UTC) as described in Annex 5 – Units of Measurement to be Used in Air and Ground Operations, Attachment D.

b) The procedures for writing the date and time in all-numeric form as described in Annex 5 – Units of Measurement to be Used in Air and Ground operations, Attachment E.

# 2. DATA PROVISION SERVICE

## 2.1 SERVICE DESCRIPTION

2.1.1 The Data Originator shall provide the Data to the AIS, incorporating all data items listed in Attachment A to this Agreement.

2.1.2 In case the Data Originator provides complete aeronautical features (e.g. runway threshold) to the AIS, Attachment A shall describe all individual data elements that compose the aeronautical feature (e.g. latitude and longitude shall be listed separately).

2.1.3 The Data shall be provided in accordance with the data quality requirements described in Attachment A to this Agreement.

2.1.4 The Data shall be provided within the date and time limits described in Attachment B to this Agreement.

2.1.5 The Data shall be provided together with the metadata items described in Attachment C to this Agreement.

2.1.6 The Data shall be transferred between the Parties by the means described in Attachment D to this Agreement.

2.1.7 The Data shall be provided in accordance with the data exchange format described in Attachment E to this Agreement.

## 2.2 DATA MANAGEMENT

2.2.1 The Data Originator shall follow the recommendations of Annex 15 – Aeronautical Information Services, Chapter 6.2 concerning the advance notice of changes to the Data (for ATS providers refer to Annex 11 – Air Traffic Services, paragraph 2.22.4 and for aerodrome operations refer to Annex 14 – Aerodromes, Volume I, paragraph 2.13.4)

2.2.2 The Data Originator shall be responsible for the timely provision of the Data. The Data Originator accepts that the Data shall be subject to validation and verification by the AIS and that, if queries arise, this may delay final acceptance and hence publication in the aeronautical information product.

2.2.3 The Data Originator shall be responsible to submit the Data in sufficient time to meet the AIRAC publication cycle. The Data Originator acknowledges that if the Data is not provided on time, the Data shall not be released for publication. In exceptional circumstances, a NTOAM may need to be issued, if deemed necessary.

2.2.4 The Data Originator shall be responsible to maintain the validity of the Data. The Data Originator shall provide updates to the Data whenever required by [organisation name], national regulations, or whenever a change is made that requires an update of the Data.

2.2.5 The Data Originator shall be responsible for documenting any changes made to the Data.

2.2.6 if any third party is involved in the origination of the Data, or parts of the Data, the Data Originator shall remain responsible to ensure that the third party documents any changes made to the Data.

## 2.3 DEMONSTRATING COMPLIANCE

2.3.1 The Data Originator shall ensure that the Data is originated and processed in accordance with international best practices and guidelines, namely:

- ICAO Doc 8168 Procedures for Air Navigation – Aircraft Operations
- ICAO Doc 974 World Geodetic Systems – 1984 (WGS084) Manual
- **[update list to reflect all applicable standards, specifications, guidance material…]**

## 2.4 DATA ERRORS OR INCONSISTENCIES

2.4.1 In the event of the AIS discovering a data error or inconsistency in the Data, and provided that the Data is still subject to validation and verification by the AIS prior to publication and distribution, the AIS shall **[describe the actions to be taken by the AIS when discovering a data error or inconsistency during validation and verification prior to the publication or distribution]**

2.4.2 In the event of the Data Originator receiving a notification from the AIS that the Data, which is subject to validation and verification by the AIS prior to publication or distribution, contained a data error or inconsistency, the Data Originator **shall [describe the actions to be taken by the Data Originator when notified that the Data contains a data error or inconsistency detected during the validation and verification prior to publication or distribution]**

2.4.3 In the vent of the AIS discovering a data error or inconsistency in the Data, and provided that the Data has already been published or distributed, the AIS shall **[describe the actions to be taken by the ASI when discovering a data error or inconsistency after publication or distribution]**

2.4.4 In the event of the Data Originator receiving a notification from the AIS that the Data, which has already been published or distributed, contained a data error or inconsistency, the Data Originator shall **[describe the actions to be taken by the Data Originator when notified that the Data contains a data error or inconsistency detected after publication or distribution]**

## 2.5 CONTINGENCY

2.5.1 In the event that the Data Originator cannot guarantee the continuity of the provision of the Data, the Data Originator **shall [describe the actions to be taken by the Data Originator when the Data Originator cannot guarantee the continuity of the provision of the Data].**

2.5.2 In the event that the Data Originator cannot guarantee the continuity of the provision of the Data, the AIS shall **[describe the actions to be taken by the AIS when the Data Originator cannot guarantee the continuity of the provision of the Data].**

2.5.3 In the event that the AIS cannot guarantee the continuity of receipt and processing of the Data, the AIS shall **[describe the actions to be taken by the AIS when the AIS cannot guarantee the continuity of receipt and processing of the Data].**

2.5.4 In the event that the AIS cannot guarantee the continuity of receipt and processing of the Data, the Data Originator shall **[describe the actions to be taken by the Data Originator when the AIS cannot guarantee the continuity of the receipt and processing of the Data].**

# 3. PROCEDURAL PROVISIONS

## 3.1 ENTIRE AGREEMENT

3.1.1 This Agreement forms the entire agreement and understanding of the Parties and supersedes all previous agreements whether written or oral between the Parties, including any previous agreement or understanding varying or extending the same. There are no further or other agreements or understandings, written or oral, in effect between the Parties with respect to the scope of this Agreement.

3.1.2 Any amendments and modifications to this Agreement may be made at any time by written agreement by both Parties

## 3.2 LIAISON

3.2.1 The Data Originator shall appoint an Accountable Manager and the AIS shall appoint an Accountable Manager for the implementation and operation of this Agreement. These nominated managers will act as points of contact for all issues regarding the implementation and operation of this Agreement.

3.2.2 The Data Originator Accountable Manager and the AIS Accountable Manager shall have the authority to take decisions regarding the operations and distribution of the Data on behalf of their respective organisations. All communications between the parties regarding the implementation and operation of this Agreement shall be coordinated by these managers.

3.2.3 The Accountable Manager and their respective administrative contacts are:

| Party | Accountable Manager | Administrative Contact |
|---|---|---|
| **[Insert Data Originator details here]** | **[Insert Primary Contact details here, including name, job title, address, telephone, and email]** | **[Insert Administrative Contact details here, including name, job title, address, telephone, and email]** |
| **[Insert AIS Details here]** | **[Insert Primary Contact details here, including name, job title, address, telephone, and email]** | **[Insert Administrative Contact details here, including name, job title, address, telephone, and email]** |

| **Data Originator Accountable Manager:** | **AIS Accountable Manager:** |
|---|---|
| Name: | Name: |
| Title: | Title: |
| Date: | Date: |
| Signature: | Signature: |

## Attachment A

Aeronautical Data and Aeronautical information to be provided

**Example:**

Refer to Procedures for Air Navigation Services – Aeronautical Information Management (PANS-AIM, Doc 10066), Appendix 1:

- Table A1-1 Aerodrome data
- Table A1-2 Airspace data
- Table A1-3 ATS and other route data
- Table A1-4 Instrument flight procedure data
- Table A1-5 Radio navigation aids/systems data
- Table A1-6 Obstacle data
- Table A1-7 Geographic data
- Table A1-8 Terrain data
- Table A1-9 Data types
- Table A1-10 Information about national and local regulation, services and procedures

## Attachment B

Timeliness Requirements

### Example 1

The timely submission of the Data shall be made in accordance with the requirements indicated in ICAO Annex 15 – Aeronautical Information Services, Chapter 6.

### Example 2

On initial provision of the Data, or where the Data is subject to a planned update, the following minimum Data submissions periods apply:

Aeronautical information Products

a) AIP amendments – xxx days in advance
b) AIP supplements – xxx days in advance
c) Aeronautical Information Circulars (AIC) – xxx days in advance
d) NOTAM – as required

Aeronautical charting products

a) En-route chart – xxx days in advance
b) Instrument approach chart – xxx days in advance
c) World Aeronautical chart – xxx days in advance
d) The Aeronautical chart – xxx days in advance
e) Standard Departure chart – xxx days in advance
f) Standard Arrival chart – xxx days in advance
g) Etc

Digital data sets

a) Aerodrome / heliport data – xxx days in advance
b) Airspace data – xxx days in advance
c) ATS and other routes data – xxx days in advance
d) Instrument flight procedures data – xxx days in advance
e) Etc

### Example 3

The data shall be provided in accordance with the timeliness given in the production and publication calendar of the aeronautical information product.

## Attachment C

Metadata Requirements

Example:

The Data shall include, as a minimum, the following metadata items:

a) the names of the organisation or entities providing the data set
b) the date and time when the data set was provided
c) period of validity of the data set
d) any limitations with regard to the use of the data set

## Attachment D

Data Distribution

Example 1

All Data shall be transferred between the Parties through distribution in digital format via electronic transfer or direct input into the AIM system.

Example 2

All Data shall be transferred between the Parties via email through:

a) use of designated email addresses
b) the Data is provided in an attached file
c) copy and paste actions or the retyping of the Data is avoided
d) receipt of the Data is confirmed to the Data Originator
e) the Data is encrypted with a digital data error detection technique, such as a hash function or CRC

## Attachment E

Data Exchange Format

Example 1

The Data shall be transferred in accordance with the AIXM xx XML Schema

Example 2

The Data shall be transferred in CSV format, in accordance with the data catalogue [insert the name and version of the data set specification]

## Appendix 2

The below provides an overview of good practices Principles, and references to the associated standards and guidance for Information / Cyber Security.

### 1. Managing Security Risks

### 1.1 Governance

The organisation has appropriate management policies and processes in place to govern its approach to the security of critical systems.

#### a) Board Direction

Effective organisational security management led at board level and articulated clearly in corresponding policies.

#### b) Roles and Responsibilities

Organisation has established roles and responsibilities for the security of critical systems at all levels, with clear and well understood channels for communicating and escalating risks.

#### c) Decision Making

Senior level Accountability for the security of critical systems, and delegate decision-making authority appropriately and effectively. Risks to critical systems are considered in the context of other organisational risks.

#### d) Further Guidance

ISO / IEC 27001:2017
ISO / IEC 27002:2013
ISA / IEC 62443-2-1
NIST SP800-53
NIST SP800-82

### 1.2 Risk Management

The organisation takes appropriate steps to identify, assess and understand security risks to the critical systems supporting the operation of essential functions. This includes an overall organisational approach to risk management.

#### a) Risk Management Process Assurance

Confidence in the effectiveness of the security of technology, people, and processes relevant to critical systems.

#### b) Further Guidance

ISA / IEC 62443 1-1
ISA/ IEC 62443 2-1
NIST SP800-30
NIST SP800-37
NIST SP800-39
NIST SP800-82
CyBOK Risk Management and Governance Knowledge Area

### 1.3 Asset Management

Everything required to deliver, maintain, or support critical systems is determined and understood. This includes data, people, and systems, as well as nay supporting infrastructure (such as power or cooling).

#### a) Further Guidance

ISO / IEC 55001:2019
ISO / IEC 27002:2013
ISA 62443-1-1
NIST SP800-82
NIST SP800-53

### 1.4 Supply Chain

The organisation understands and manages security risks to critical systems supporting the operation of essential functions that arise as a result of dependencies on external suppliers. This includes ensuring that appropriate measures are employed where third party services are used.

#### a) Further Guidance

ISO / IEC 27002:2013
ISO / IEC 27036-2
ISO / IEC 27036-3
ISA / IEC 62443-2-1
NIST SP800-53
NIST SP800-37

## 2. Protecting Against Cyber Attacks

### 2.1 Function Protection Policies and Processes

The organisation defines, implements, communicates, and enforces appropriate policies and processes that direct its overall approach to security critical systems and data that support operation of essential functions.

#### a) Policy and Process Development

Develop and continue to improve a set of cyber security and resilience policies and processes that manage and mitigate the risk of adverse impact on the critical system.

#### b) Policy and Process Implementation

Successfully implemented security policies and processes and can demonstrate the security benefits achieved.

#### c) Further Guidance

ISO / IEC 27001:2017
ISO / IEC 27002:2013
ISO / IEC 22301:2019
ISA / IEC 62443-1-1
NIST SP800-53
NIST SP800-82

## 2.2 Identity and Access Control

The organisation understands, documents, and manages access to critical systems supporting the operation of essential functions. Users (or automated functions) that can access critical data or critical systems are appropriately verified, authenticated, and authorised.

### a) Identity Verification, Authentication and Authorisation

Robustly verify, authenticate, and authorise access to the critical systems

### b) Device Management

Fully know and have trust in the devices that are used to access your critical systems and data.

### c) Privileged User Management

Closely manage privileged user access to critical systems supporting the essential functions.

### d) Identity and Access Management (IdAM)

Assure good management and maintenance of identity and access control for your critical systems.

### e) Further Guidance

ISO / IEC 27001: 2019
ISO / IEC 27002:2013
NIST SP800-53
NIST SP800-82
CyBOK Authentication, Authorisation and Accountability Knowledge Base

## 2.3 Data Security

Data stored or transmitted electronically is protected from actions such as unauthorised access, modification, or deletion that may cause an adverse impact on critical systems. Such protection extends to the means by which authorised users, devices and systems access critical data necessary for the operation of critical systems. It also covers information that would assist an attack, such as design details of critical systems.

### a) Understanding Data

Having a good understanding of data important to the operation of the critical systems where it is stored, where it travels and how unavailability or unauthorised access, modifications or deletions would impact the critical systems. This also applies to third parties storing or accessing data important to the operation of critical systems.

### b) Data in Transit

Protecting the transit of data is important to the operation of the critical system. This includes the transfer of data to third parties.

### c) Stored Data

Protecting stored data is important to the operation of the critical system.

**d) Mobile Data**

Protecting data important to the operation of the critical system on mobile devices.

**e) Media / Equipment Sanitisation**

Appropriately sanitise media and equipment holding data critical to the operation of the critical system.

**f) Further Guidance**

ISO / IEC 27002:2013
ISO / IEC 62443-1-1
ISO / IEC 62443-2-1
ISA / IEC 62443-3-3
NIST SP800-53
MIST SP800-82

**2.4 System Security**

Critical systems and technology critical for the operation of essential functions are protected from cyber-attack. An organisational understanding of risk to the critical system informs the use of robust and reliable protective security measures to effectively limit opportunities for attackers to compromise networks and systems.

**a) Secure by Design**

Design security into the critical system. Minimise their attack surface and ensure that the operation of the critical system should not be impacted by the exploitation of any single vulnerability.

**b) Secure Configuration**

Securely configure critical systems

**c) Secure Management**

Manage the organisation’s critical system to enable and maintain security

**d) Vulnerability Management**

Manage known vulnerabilities in the critical system to prevent adverse impact.

**e) Further Guidance**

ISO / IEC 27002: 2013
ISA / IEC 62443-1-1
ISA / IEC 62443-2-1
ISA / IEC 62443-3-3
NIST SP800-53
NIST SP800-82

### 2.5 Resilient Networks and Systems

The organisation builds resilience against cyber-attacks and system failure into the design, implementation, operation, and management of critical systems.

#### a) Resilience Preparation

Prepare to restore the operation of the critical system following adverse impact.

#### b) Design for Resilience

Design critical systems to be resilient to cyber security incidents. Critical systems are appropriately segregated, and resource limitations are mitigated.

#### c) Backups

Hold accessible and secured current backups of the data and information needed to recover operation of the critical system.

d) Information References

ISO / IEC 27002:2013
ISO / IEC 27035-3
ISO / IEC 62443-1-1
NIST SP800-53
NIST SP800-82

### 2.5 Staff Awareness and Training

Staff have appropriate awareness, knowledge, and skills to carry out their organisational roles effectively in relation to the security of critical systems supporting the operation of essential functions.

#### a) Cyber Security Culture

Develop and pursue a positive cyber security culture.

#### b) Cyber Security Training

The people who support the operation of the critical system are appropriately trained in cyber security. A range of approaches to cyber security training, awareness and communication are employed.

#### c)) Further Guidance

NCSC 10 Steps: User Education and Awareness
ISO / IEC 27001:2019
ISO/IEC 27002:2013
ISO/IEC 62443-2-1
NIST SP800-53
NIST SP800-82

## 3. Detecting Cyber Security Events

### 3.1 Security Monitoring

The organisation monitors the security status of the networks and systems supporting the operation of critical systems in order to detect potential security problems and to track the ongoing effectiveness of protective security measures.

#### a) Monitoring Coverage

The data sources included in the monitoring allow for timely identification of security events which might affect the operation of the critical system.

#### b) Security Logs

Hold log data securely and grant read access only to accounts with business need. No employee should ever need to modify or delete log data within an agreed retention period, after which it should be deleted.

#### c) Generating Alerts

Evidence of potential security incidents contained in the monitoring data is reliably identified and triggers alerts.

#### c) Identifying Security Incidents

Contextualise alerts with knowledge of the threat and the systems to identify those security incidents that require some form of response.

#### d) Monitoring Tools and Skills

Monitoring staff skills, tools and roles, including any that are outsourced, should reflect governance and reporting requirements, expected threats and the complexities of the network or system data they need to use. Monitoring staff have knowledge of the critical systems they need to protect.

#### e) Further Guidance

NCSC Introduction to logging for security purposes
NCSC 10 steps: Monitoring
CREST – Cyber Security Monitoring Guide
ISO / IEC 27002: 2019
ISO / IEC 27002:2013
ISO / IEC 27035:1-3
ISA / IEC 62443-2-1

### 3.2 Proactive Security Event Discovery

The organisation detects, within critical systems, malicious activity affecting, or with the potential to affect, the operation of essential functions even when the activity evades standard signature-based security prevent/detect solutions (or when standard solutions are not deployable).

#### a) System Abnormalities for Attack Detection

Define examples of abnormalities in systems behaviour that provides practical ways of detecting malicious activity that is otherwise hard to identify.

**b) Proactive Attack Discovery**

Use an informed understanding of more sophisticated attack methods and of normal system behaviour to monitor proactively for malicious activity.

**c) Further Guidance**

ISO / IEC 27001:2019
ISO / IEC 27002:2013
ISO / IEC 227035-3
ISA/ IEC 62443-2-1
NIST SP800-53

**4. Minimising the Impact of Cyber Security Incidents**

**4.1 Response and Recovery Planning**

There are well-defined and tested incident management processes in place, that aim to ensure continuity of essential functions in the event of system or service failure. Mitigation activities designed to contain or limit the impact of compromise are also in place.

**a) Response Plan**

An up-to-date incident response plan that is grounded in a thorough risk assessment that takes account of the essential functions and covers a range of incident scenarios.

**b) Response and Recovery Capability**

The capability to enact an incident response plan, including effective limitation of impact on the operation of the critical systems. During an incident, have access to timely information on which to base the response decisions.

**c) Testing and Exercising**

The organisation carries out exercises to test response plans, using past incidents that affect the organisation (and others), and scenarios that draw on threat intelligence and risk assessments.

**d) Further Guidance**

NCSC 10 Steps: Incident Management
ISO / IEC 27035 (all)
ISO / IEC 22301:2019
ISO / IEC 27002:2013
NIST SP800-61
NIST SP800-53
NIST SP800-82

### 4.2 Lessons Learnt

When an incident occurs, steps are taken to understand its root causes and to ensure appropriate remediating action is taken to protect against future incidents.

#### a) Incident Root Cause Analysis

When an incident occurs, steps must be taken to understand its root causes and ensure appropriate remediating action is taken.

#### b) Using Incidents to Drive Improvement

The organisation uses lessons learned from incidents to improve security measures.

#### c) Further Guidance

NCSC 10 Steps: Incident Management
ENISA Good Practice for Incident Management Guide
ISO / IEC 27035:2-3
ISO/ IEC 22301:2019
ISO/EC 27001:2019
ISO / IEC 27002:2013
NIST SP800-61
NIST SP800-53