




**AERONAUTICAL INFORMATION
MANAGEMENT
MANUAL**

First Edition, July 2023


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(iii) FOREWORD

Section 59 of the Civil Aviation Act of Bhutan 2016 empowers the Head of Authority, in this case the Director of Bhutan Civil Aviation Authority (BCAA), to develop Rules and Regulations concerning the use of the airspace, air navigation facilities and services. The Manual of Aeronautical Information Management provides additional standards, procedures, and guidance, which complement the approved regulations BCAR-4 and BCAR-15.

The standards and procedures contained in this document shall be met by the air navigation service providers involved in provision of aeronautical information services within Bhutan. The standards and procedures in this Manual are transposed from the latest edition of Procedures for Air Navigation Services – Aeronautical Information Management (ICAO Doc 10066).

Any difference existing in this Manual and the related ICAO standards and procedures will be notified to the ICAO and the same shall be published in the Aeronautical Information Publication (AIP). This Manual of Aeronautical Information Management hereby supersedes any other manual of Aeronautical Information Management which were published or existed before it. This Manual is a controlled document and the provisions contained herein are subject to change through amendments.




Director

Date: 04/07/2023

DIRECTOR

Bhutan Civil Aviation Authority
Paro : Bhutan

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CHAPTER 1. DEFINITIONS

When the following terms are used in this document, they have the following meanings:

Aerodrome. A defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft.

Aerodrome mapping data (AMD). Data collected for the purpose of compiling aerodrome mapping information.

Note.— Aerodrome mapping data is collected for purposes that include the improvement of the user’s situational awareness, surface navigation operations, training, charting and planning.

Aerodrome mapping database (AMDB). A collection of aerodrome mapping data organized and arranged as a structured data set.

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 formalized manner suitable for communication, interpretation or processing.

Aeronautical fixed service (AFS). A telecommunication service between specified fixed points provided primarily for the safety of air navigation and for the regular, efficient and economical operation of air services.

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 legislative matters.

Aeronautical information management (AIM). The dynamic, integrated management of aeronautical information through the provision and exchange of quality-assured digital aeronautical data in collaboration with all parties.

Aeronautical information product. Aeronautical data and aeronautical information provided either as digital data sets or as a standardized presentation in paper or electronic media. Aeronautical information products include:

- Aeronautical Information Publications (AIP), including Amendments and Supplements;
- Aeronautical Information Circulars (AIC);
- Aeronautical charts;
- NOTAM; and
- digital data sets.

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Note.— Aeronautical information products are intended primarily to satisfy international requirements for the exchange of aeronautical information.

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 aeronautical information necessary for the safety, regularity and efficiency of air navigation.

AIP Amendment. Permanent changes to the information contained in the AIP.

AIP Supplement. Temporary changes to the information contained in the AIP which are provided by means of special pages.

AIRAC. An acronym (aeronautical information regulation and control) signifying a system aimed at advance notification, based on common effective dates, of circumstances that necessitate significant changes in operating practices.

Air defence identification zone (ADIZ). Special designated airspace of defined dimensions within which aircraft are required to comply with special identification and/or reporting procedures additional to those related to the provision of air traffic services.

Air traffic management (ATM). The dynamic, integrated management of air traffic and airspace (including air traffic services, airspace management and air traffic flow management) — safely, economically and efficiently through the provision of facilities and seamless services in collaboration with all parties and involving airborne and ground-based functions.

Application. Manipulation and processing of data in support of user requirements (ISO 19104*).

Area navigation (RNAV). A method of navigation which permits aircraft operation on any desired flight path within the coverage of ground- or space-based navigation aids or within the limits of the capability of self-contained aids, or a combination of these.


Note.— Area navigation includes performance-based navigation as well as other operations that do not meet the definition of performance-based navigation.

ASHTAM. A special series NOTAM notifying by means of a specific format change in activity of a volcano, a volcanic eruption and/or volcanic ash cloud that is of significance to aircraft operations.

Assemble. A process of merging data from multiple sources into a database and establishing a baseline for subsequent processing.

* All ISO Standards are listed at the end of this chapter.

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Note.— The assemble phase includes checking the data and ensuring that detected errors and omissions are rectified.

ATS surveillance service. Term used to indicate a service provided directly by means of an ATS surveillance system.

ATS surveillance system. A generic term meaning variously, ADS-B, PSR, SSR or any comparable ground-based system that enables the identification of aircraft.

Note.— A comparable ground-based system is one that has been demonstrated, by comparative assessment or other methodology, to have a level of safety and performance equal to or better than monopulse SSR.

Automatic dependent surveillance — broadcast (ADS-B). A means by which aircraft, aerodrome vehicles and other objects can automatically transmit and/or receive data such as identification, position and additional data, as appropriate, in a broadcast mode via a data link.

Automatic dependent surveillance — contract (ADS-C). A means by which the terms of an ADS-C agreement will be exchanged between the ground system and the aircraft, via a data link, specifying under what conditions ADS-C reports would be initiated, and what data would be contained in the reports.

Note.— The abbreviated term “ADS contract” is commonly used to refer to ADS event contract, ADS demand contract, ADS periodic contract or an emergency mode.

Automatic terminal information service (ATIS). The automatic provision of current, routine information to arriving and departing aircraft throughout 24 hours or a specified portion thereof:

Data link-automatic terminal information service (D-ATIS). The provision of ATIS via data link.

Voice-automatic terminal information service (Voice-ATIS). The provision of ATIS by means of continuous and repetitive voice broadcasts.

Bare Earth. Surface of the Earth including bodies of water and permanent ice and snow, and excluding vegetation and man-made objects.

Calendar. Discrete temporal reference system that provides the basis for defining temporal position to a resolution of one day (ISO 19108*).

Canopy. Bare Earth supplemented by vegetation height.


Confidence level. The probability that the true value of a parameter is within a certain interval around the estimate of its value.

Note.— The interval is usually referred to as the accuracy of the estimate.

Controller-pilot data link communications (CPDLC). A means of communication between controller and pilot, using data link for ATC communications.

Culture. All man-made features constructed on the surface of the Earth, such as cities, railways and canals.

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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.

Danger area. An airspace of defined dimensions within which activities dangerous to the flight of aircraft may exist at specified times.

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

Data completeness. The degree of confidence that all of 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 has not been lost or altered since the origination or authorized amendment.

Data product. Data set or data set series that conforms to a data product specification (ISO 19131*).

Data product specification. Detailed description of a data set or data set series together with additional information that will enable it to be created, supplied to and used by another party (ISO 19131*).

Note.— A data product specification provides a description of the universe of discourse and a specification for mapping the universe of discourse to a data set. It may be used for production, sales, end-use or other purpose.

Data quality. A degree or level of confidence that the data provided meets the requirements of the data user in terms of accuracy, resolution, integrity (or equivalent assurance level), traceability, timeliness, completeness and format.

Data resolution. A number of units or digits to which a measured or calculated value is expressed and used.

Data set. Identifiable collection of data (ISO 19101*).

Data set series. Collection of data sets sharing the same product specification (ISO 19115*).

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.


Datum. Any quantity or set of quantities that may serve as a reference or basis for the calculation of other quantities (ISO 19104*).

Digital Elevation Model (DEM). The representation of terrain surface by continuous elevation values at all intersections of a defined grid, referenced to common datum.

Note.— Digital Terrain Model (DTM) is sometimes referred to as DEM.

Direct transit arrangements. Special arrangements approved by the public authorities concerned by which traffic which is pausing briefly in its passage through the Contracting State may remain under their direct control.

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Ellipsoid height (geodetic height). The height related to the reference ellipsoid, measured along the ellipsoidal outer normal through the point in question.

Feature. Abstraction of real world phenomena (ISO 19101*).

Feature attribute. Characteristic of a feature (ISO 19101*).

Note.— A feature attribute has a name, a data type and a value domain associated with it.

Feature operation. Operation that every instance of a feature type may perform (ISO 19110*).

Note.— An operation upon the feature type dam is to raise the dam. The result of this operation is to raise the level of water in the reservoir.

Feature relationship. Relationship that links instances of one feature type with instances of the same or a different feature type (ISO 19101*).

Feature type. Class of real world phenomena with common properties (ISO 19110*).

Note.— In a feature catalogue, the basic level of classification is the feature type.

Geodesic distance. The shortest distance between any two points on a mathematically defined ellipsoidal surface.

Geodetic datum. A minimum set of parameters required to define location and orientation of the local reference system with respect to the global reference system/frame.

Geoid. The equipotential surface in the gravity field of the Earth which coincides with the undisturbed mean sea level (MSL) extended continuously through the continents.

Note.— The geoid is irregular in shape because of local gravitational disturbances (wind tides, salinity, current, etc.) and the direction of gravity is perpendicular to the geoid at every point.

Geoid undulation. The distance of the geoid above (positive) or below (negative) the mathematical reference ellipsoid.

Note.— In respect to the World Geodetic System — 1984 (WGS-84) defined ellipsoid, the difference between the WGS-84 ellipsoidal height and orthometric height represents WGS-84 geoid undulation.


Gregorian calendar. Calendar in general use; first introduced in 1582 to define a year that more closely approximates the tropical year than the Julian calendar (ISO 19108*).

Note.— In the Gregorian calendar, common years have 365 days and leap years 366 days divided into twelve sequential months.

Height. The vertical distance of a level, point or an object considered as a point, measured from a specific datum.

Heliport. An aerodrome or a defined area on a structure intended to be used wholly or in part for the arrival, departure and surface movement of helicopters.

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Human factors principles. Principles which apply to aeronautical design, certification, training, operations and maintenance and which seek safe interface between the human and other system components by proper consideration to human performance.

Integrity classification (aeronautical data). Classification based upon the potential risk resulting from the use of corrupted data. Aeronautical data is classified as:

- a) routine data: there is a very low probability when using corrupted routine data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe;
- b) essential data: there is a low probability when using corrupted essential data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe; and
- c) critical data: there is a high probability when using corrupted critical data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe.

International airport. Any airport designated by the Contracting State in whose territory it is situated as an airport of entry and departure for international air traffic, where the formalities incident to customs, immigration, public health, animal and plant quarantine and similar procedures are carried out.

International NOTAM office (NOF). An office designated by a State for the exchange of NOTAM internationally.

Logon address. A specified code used for data link logon to an ATS unit.

Manoeuvring area. That part of an aerodrome to be used for the take-off, landing and taxiing of aircraft, excluding aprons.

Metadata. Data about data (ISO 19115*).

Note.— A structured description of the content, quality, condition or other characteristics of data.

Minimum en-route altitude (MEA). The altitude for an en-route segment that provides adequate reception of relevant navigation facilities and ATS communications, complies with the airspace structure and provides the required obstacle clearance.


Minimum obstacle clearance altitude (MOCA). The minimum altitude for a defined segment of flight that provides the required obstacle clearance.

Movement area. That part of an aerodrome to be used for the take-off, landing and taxiing of aircraft, consisting of the manoeuvring area and the apron.

Navigation specification. A set of aircraft and flight crew requirements needed to support performance-based navigation operations within a defined airspace. There are two kinds of navigation specifications:

Required navigation performance (RNP) specification. A navigation specification based on area navigation that includes the requirement for performance monitoring and alerting, designated by the prefix RNP, e.g. RNP 4, RNP APCH.

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Area navigation (RNAV) specification. A navigation specification based on area navigation that does not include the requirement for performance monitoring and alerting, designated by the prefix RNAV, e.g. RNAV 5, RNAV 1.

Note 1.— The Performance-based Navigation (PBN) Manual (ICAO Doc 9613), Volume II, contains detailed guidance on navigation specifications.

Note 2.— The concept of RNP has been overtaken by the concept of PBN. The term “RNP” is now solely used in the context of navigation specifications that require performance monitoring and alerting, e.g. RNP 4 refers to the aircraft and operating requirements, including a 4 NM lateral performance with on-board performance monitoring and alerting that are detailed in ICAO Doc 9613.

Next intended user. The entity that receives the aeronautical data or information from the aeronautical information service.

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

Obstacle. All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that:

- a) are located on an area intended for the surface movement of aircraft; or
- b) extend above a defined surface intended to protect aircraft in flight; or
- c) stand outside those defined surfaces and that have been assessed as being a hazard to air navigation.

Obstacle/terrain data collection surface. A defined surface intended for the purpose of collecting obstacle/terrain data.

Origination (aeronautical data or aeronautical information). The creation of the value associated with new data or information or the modification of the value of existing data or information.

Originator (aeronautical data or aeronautical information). An entity that is accountable for data or information origination and/or from which the AIS organization receives aeronautical data and information.


Orthometric height. Height of a point related to the geoid, generally presented as an MSL elevation.

Performance-based communication (PBC). Communication based on performance specifications applied to the provision of air traffic services.

Note.— A required communication performance (RCP) specification includes communication performance requirements that are allocated to system components in terms of the communication to be provided and associated transaction time, continuity, availability, integrity, safety and functionality needed for the proposed operation in the context of a particular airspace concept.

Performance-based navigation (PBN). Area navigation based on performance requirements for aircraft operating along an ATS route, on an instrument approach procedure or in a designated airspace.

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Note.— Performance requirements are expressed in navigation specifications (RNAV specification, RNP specification) in terms of accuracy, integrity, continuity, availability and functionality needed for the proposed operation in the context of a particular airspace concept.

Performance-based surveillance (PBS). Surveillance based on performance specifications applied to the provision of air traffic services.

Note.— A required surveillance performance (RSP) specification includes surveillance performance requirements that are allocated to system components in terms of the surveillance to be provided and associated data delivery time, continuity, availability, integrity, accuracy of the surveillance data, safety and functionality needed for the proposed operation in the context of a particular airspace concept.

Portrayal. Presentation of information to humans (ISO 19117*).

Position (geographical). Set of coordinates (latitude and longitude) referenced to the mathematical reference ellipsoid which define the position of a point on the surface of the Earth.

Post spacing. Angular or linear distance between two adjacent elevation points. Precision. The smallest difference that can be reliably distinguished by a measurement process.

Note.— In reference to geodetic surveys, precision is a degree of refinement in performance of an operation or a degree of perfection in the instruments and methods used when taking measurements.

Pre-flight information bulletin (PIB). A presentation of current NOTAM information of operational significance, prepared prior to flight.

Prohibited area. An airspace of defined dimensions, above the land areas or territorial waters of a State, within which the flight of aircraft is prohibited.

Quality. Degree to which a set of inherent characteristics fulfils requirements (ISO 9000*).

Note 1.— The term “quality” can be used with adjectives such as poor, good or excellent.

Note 2.— “Inherent”, as opposed to “assigned”, means existing in something, especially as a permanent characteristic.


Quality assurance. Part of quality management focused on providing confidence that quality requirements will be fulfilled (ISO 9000*).

Quality control. Part of quality management focused on fulfilling quality requirements (ISO 9000*).

Quality management. Coordinated activities to direct and control an organization with regard to quality (ISO 9000*).

Radio navigation service. A service providing guidance information or position data for the efficient and safe operation of aircraft supported by one or more radio navigation aids.

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Required communication performance (RCP) specification. A set of requirements for air traffic service provision and associated ground equipment, aircraft capability, and operations needed to support performance-based communication.

Required surveillance performance (RSP) specification. A set of requirements for air traffic service provision and associated ground equipment, aircraft capability, and operations needed to support performance-based surveillance.

Requirement. Need or expectation that is stated, generally implied or obligatory (ISO 9000*).

Note 1.— “Generally implied” means that it is custom or common practice for the organization, its customers and other interested parties, that the need or expectation under consideration is implied.

Note 2.— A qualifier can be used to denote a specific type of requirement, e.g. product requirement, quality management requirement, customer requirement.

Note 3.— A specified requirement is one which is stated, for example, in a document.

Note 4.— Requirements can be generated by different interested parties.

Restricted area. An airspace of defined dimensions, above the land areas or territorial waters of a State, within which the flight of aircraft is restricted in accordance with certain specified conditions.

Route stage. A route or portion of a route flown without an intermediate landing.

SNOWTAM. A special series NOTAM given in a standard format providing a surface condition report notifying the presence or cessation of hazardous conditions due to snow, ice, slush, frost, standing water or water associated with snow, slush, ice or frost on the movement area.

Station declination. An alignment variation between the zero degree radial of a VOR and true north, determined at the time the VOR station is calibrated.

Terrain. The surface of the Earth containing naturally occurring features such as mountains, hills, ridges, valleys, bodies of water, permanent ice and snow, and excluding obstacles.


Traceability. Ability to trace the history, application or location of that which is under consideration (ISO 9000*).

Note.— When considering product, traceability can relate to:

- *the origin of materials and parts;*
- *the processing history; and*
- *the distribution and location of the product after delivery.*

Note.— The term “verified” is used to designate the corresponding status.

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Validation. Confirmation, through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled (ISO 9000)*. **Verification.** Confirmation, through the provision of objective evidence, that specified requirements have been fulfilled (ISO 9000*).

VOLMET. Meteorological information for aircraft in flight.

Data link-VOLMET (D-VOLMET). Provision of current aerodrome routine meteorological reports (METAR) and aerodrome special meteorological reports (SPECI), aerodrome forecasts (TAF), SIGMET, special air-reports not covered by a SIGMET and, where available, AIRMET via data link.

VOLMET broadcast. Provision, as appropriate, of current METAR, SPECI, TAF and SIGMET by means of continuous and repetitive voice broadcasts.

* ISO Standard

8601 — Data elements and interchange formats — Information interchange — Representation of dates and times

9000 — Quality Management Systems — Fundamentals and Vocabulary

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 cataloging schema

19115 — Geographic information — Metadata

19117 — Geographic information — Portrayal

19131 — Geographic information — Data product specification

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CHAPTER 2. AERONAUTICAL INFORMATION MANAGEMENT

2.1 Information Management Requirements

Management of aeronautical data and aeronautical information shall include the following processes:

- a) collection;
- b) processing;
- c) quality control; and
- d) distribution.

2.1.1 Collection

2.1.1.1 The identification of data originators shall be documented based on the scope of aeronautical data and aeronautical information to be collected.

2.1.1.2 A record of data originators should be maintained.

Note.— Metadata requirements in Chapter 4 specify the information to be recorded for each originator.

2.1.1.3 Each data element to be collected should be mapped to an identified data originator, in accordance with the formal arrangements established between data originators and the aeronautical information service (AIS).

2.1.1.4 The list of aeronautical information subjects and their properties, as contained in Appendix 1 of ICAO PANS-AIM, should be used to establish formal arrangements between the originators and the AIS.

2.1.1.5 Valid codes for the code lists of the aeronautical data properties and sub-properties, as contained in Appendix 1 of ICAO PANS-AIM, should be defined in the formal arrangements between the originators and the AIS.

2.1.1.6 Appendix 1 of ICAO PANS-AIM shall be considered as a reference for aeronautical data and aeronautical information origination and publication requirements.


Note 1.— Appendix 1 of ICAO PANS-AIM presents the scope of data and information that can be collected and maintained by the AIS.

Note 2.— Appendix 1 of ICAO PANS-AIM provides a common language-data description that can be used by data originators and the AIS.

2.1.2 Processing

2.1.2.1 Collected data shall be verified and validated for compliance with data quality requirements.

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Note 1.— Appendix 1 of ICAO PANS-AIM contains aeronautical data attributes and quality requirements (accuracy, resolution and integrity).

Note 2.— Guidance material on the aeronautical data quality requirements (accuracy, resolution, integrity and traceability and protection requirements) may be found in the World Geodetic System — 1984 (WGS-84) Manual (ICAO Doc 9674).

Note 3.— Supporting data quality material in respect of data accuracy, publication resolution, and integrity of aeronautical data, together with guidance material in respect to the rounding convention for aeronautical data, is contained in Radio Technical Commission for Aeronautics (RTCA) Document DO-201A/European Organization for Civil Aviation Equipment (EUROCAE) Document ED-77 — Standards for Aeronautical Information (or equivalent).

Note 4.— Guidance material on the management of aeronautical data quality is included in the Manual on the Quality Management System for Aeronautical Information Management (ICAO Doc 9839).

Note 5.— Verification activities may include:

- a) comparison processes in which data and information are compared with an independent source;*
- b) feedback processes in which data and information are compared between their input and output state;*
- c) processing through multiple independent and different systems, comparing the output of each; this includes performing alternative calculations; and*
- d) processes in which data and information are compared to the originator's request.*

Note 6.— Validation activities may include:


- a) application processes in which data and information are tested;*
- b) processes in which data and information are compared between two different outputs; and*
- c) processes in which data and information are compared to an expected range, value or other business rules.*

2.1.2.2 Automation systems implemented for processing aeronautical data and aeronautical information should ensure traceability of the performed actions.

2.1.3 Quality control

Note — Error-producing faults in the entire process may be mitigated by additional data quality assurance techniques as may be required. These may include application tests for critical data (for example, by flight check); the use of security, logic, semantic, comparison and redundancy checks; digital error detection; and the qualification of human resources and process tools, such as hardware and software

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2.1.3.1 Quality checks should be implemented to ensure compliance with product specifications contained in Chapter 5.

2.1.3.2 When the same data is ~~duplicate~~contained in different aeronautical information products, procedures shall be in place by the service provider to ensure the consistency of the data~~checks should be undertaken.~~

2.1.4 Distribution

(To be developed.)

2.2 Data Integrity Monitoring and Assurance


2.2.1 Data integrity should be assured by employing cryptographic technologies (e.g. hash functions, message authentication codes, asymmetric and symmetric encryption, and digital certificates).

Note.— Guidance material in respect to the processing of aeronautical data and aeronautical information is contained in RTCA DO-200B/EUROCAE ED-76A — Standards for Processing Aeronautical Data.

2.2.2 The ~~technical means~~technique used for data error detection should be based on ~~the use of~~ systematic cycling cyclic codes.

Note.— The means to implement systematic cycling codes include the use of hash functions and cyclic redundancy check (CRC).

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CHAPTER 3. QUALITY MANAGEMENT

3.1 Quality Management System

Note 1.— This section provides general requirements on the quality management system (QMS) related to aeronautical information management (AIM) processes.

Note 2.— Detailed guidance can be found in the Manual on the Quality Management System for Aeronautical Information Management (ICAO Doc 9839).

- 3.1.1 The general requirements for a QMS shall be to:
- a) develop a quality manual that includes the scope of a QMS as applied to AIM processes;
 - b) identify the processes needed for the QMS;
 - c) determine the sequence and interaction of these processes;
 - d) determine criteria and methods required to ensure the effective operation and control of these processes;
 - e) ensure the availability of information necessary to support the operation and monitoring of these processes;
 - f) measure, monitor and analyse these processes, and implement action necessary to achieve planned results and continual improvement; and
 - g) maintain appropriate records that are necessary to provide confidence of conformity of the processes and resulting product.


- 3.1.2 In the framework of the QMS, a user feedback system shall be defined and implemented.

Note 1.— Quality management may be provided by a single QMS or a series of QMS.

Note 2.— The International Organization for Standardization (ISO) 9000 series of quality assurance standards provide a basic framework for the development of a quality assurance programme.

Note 3.— Formal arrangements concerning data quality between the originator and the aeronautical information service (AIS) and between the AIS and the next intended user may be used to manage the aeronautical information data chain.

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~~**3.2 Note 4.— Guidance material concerning a training methodology to ensure the competency of personnel is contained in the Aeronautical Information Management Training Development Manual (ICAO Doc 9991).**~~

3.2 Training management


Note 1.— This section provides general competency-based training and assessment (CBTA) requirements related to aeronautical information management (AIM).

Note 2.— Detailed guidance concerning the CBTA methodology implementation is contained in the Aeronautical Information Services Training Manual (ICAO Doc 9991).

3.2.1 The general requirements for the establishment of processes for CBTA within the context of the established QMS shall be to:

- a) analyse training needs based on requirements (e.g. legislative, regulatory, operational, technical and organizational);
- b) identify required competencies and associated knowledge, skills and attitudes;
- c) design, develop and implement a CBTA programme and associated training material;
- d) train and assess assigned personnel to demonstrate required competencies;
- e) monitor competencies and associated knowledge, skills and attitudes;
- f) evaluate and update training to be consistent with emerging requirements and feedback; and
- a)g) maintain and retain training records.

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CHAPTER 4. AERONAUTICAL DATA REQUIREMENTS

4.1 Data Origination Requirements

- 4.1.1 Data shall be collected and transmitted to the aeronautical information service (AIS) in accordance with the accuracy requirements and integrity classification specified in Appendix 1 of ICAO PANS-AIM.
- 4.1.2 Positional data shall be classified as: surveyed points (e.g. navigation aid positions, runway threshold); calculated points (mathematical calculations from the known surveyed points of points in space, fixes); or declared points (e.g. flight information region boundary points).
- 4.1.3 Geographical coordinates Indicating latitude and longitude shall be determined and reported to the AIS in terms of the World Geodetic System – 1984 (WGS-84) geodetic reference datum.
- 4.1.4 Geographical coordinates that have been transformed into WGS-84 coordinates by mathematical means and whose accuracy of original field work does not meet the applicable requirements contained in Appendix 1 of ICAO PANS-AIM shall be identified.
- 4.1.5 In addition to elevation referenced to the MSL (geoid), for the specific surveyed ground positions, geoid undulation (referenced to the WGS-84 ellipsoid) for those positions specified in Appendix 2 of ICAO PANS-AIM shall also be published.


4.2 Metadata Requirements

The metadata to be collected shall include, as a minimum:

- a) the names of the organizations or entities performing any action of originating, transmitting or manipulating the data;
- b) the action performed; and
- c) the date and time the action was performed.

Note.— ISO Standard 19115 specifies requirements for geographic information metadata.

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CHAPTER 5. AERONAUTICAL INFORMATION PRODUCTS AND SERVICES

5.1 General

- 5.1.1 Aeronautical data shall be provided in accordance with the resolution requirements contained in Appendix 1 of ICAO PANS-AIM.
- 5.1.2 Geographical coordinates whose accuracy does not meet the requirements specified in Appendix 1 of ICAO PANS-AIM shall be identified.
- 5.1.3 The identification of geographical coordinates whose accuracy does not meet the requirements may be made either with an annotation or by explicitly providing the actual accuracy value.
- 5.1.4 In aeronautical information products that are distributed on paper, the identification should be done with an asterisk following the coordinate value concerned.

5.2 Aeronautical information in a standardized presentation

5.2.1 Aeronautical Information Publication (AIP)

5.2.1.1 Contents

- 5.2.1.1.1 The AIP shall contain concise, current information relating to, and arranged under, the subject headings listed in Appendix 2 of ICAO PANS-AIM. This facilitates both the locating of information under a specific heading and the storage/retrieval of the information using automated processing.
- 5.2.1.1.2 If no facilities or services are provided or no information is available for publication in respect of one of the categories of information specified in Appendix 2 of ICAO PANS-AIM, an indication should be given as to which of these circumstances applies (e.g. “NIL” or “Not AVBL”).
- 5.2.1.1.3 When the AIP data set (as specified in 5.3.3.1) is provided, the following sections of the AIP may be omitted and reference to the data set availability shall be provided:
 - a) GEN 2.5 List of radio navigation aids;
 - b) ENR 2.1 FIR, UIR, TMA and CTA;
 - c) ENR 3.1 Lower ATS routes;
 - d) ENR 3.2 Upper ATS routes;
 - e) ENR 3.3 Area navigation routes;
 - f) ENR 3.4 Helicopter routes;

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- g) ENR 3.5 Other routes;
- h) ENR 3.6 En-route holding;
- i) ENR 4.1 Radio navigation aids — en-route;
- j) ENR 4.2 Special navigation systems;
- k) ENR 4.4 Name-code designators for significant points;
- l) ENR 4.5 Aeronautical ground lights – en-route;
- m) ENR 5.1 Prohibited, restricted and danger areas;
- n) ENR 5.2 Military exercise and training areas and air defence identification zone (ADIZ);
- o) ENR 5.3.1 Other activities of a dangerous nature;
- p) ENR 5.3.2 Other potential hazards;
- q) ENR 5.5 Aerial sporting and recreational activities;
- r) **** AD 2.17 Air traffic services airspace;
- s) **** AD 2.19 Radio navigation and landing aids;
- t) **** AD 3.16 Air traffic services airspace; and
- u) **** AD 3.18 Radio navigation and landing aids.

5.2.1.1.4 When the Obstacle Data Set (as specified in 5.3.3.2.2) is provided, the following sections of the AIP may be omitted and a reference to the data set availability shall be provided:

- a) ENR 5.4 Air navigation obstacles;
- b) **** AD 2.10 Aerodrome obstacles; and
- c) **** AD 3.10 Heliport obstacles.

5.2.1.2 General specification

5.2.1.2.1 The issuing State and publishing authority shall be clearly indicated.


5.2.1.2.2 When two or more States jointly provide an AIP, these States shall be clearly indicated.

5.2.1.2.3 Each AIP shall be self-contained and shall include a table of contents. If it is necessary by reason of bulk or for convenience, to publish an AIP in two or more parts or volumes, each of them will indicate that the remainder of the information is to be found in the other part(s) or volume(s).

5.2.1.2.4 Each AIP shall not duplicate information within itself or from other sources.

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- 5.2.1.2.5 An AIP shall be organized in three parts (GEN, ENR and AD), sections and subsections, except when the AIP, or a volume of the AIP, is designed to facilitate operational use in flight, in which case the precise format and arrangement may be left to the discretion of the State provided that an adequate table of contents is included.
- 5.2.1.2.6 Each AIP shall be dated. The date, consisting of the day, month (by name) and year, shall be the publication date or the effective date (AIRAC) of the information.
- 5.2.1.2.7 Charts, maps or diagrams should be used to complement or as a substitute for the tabulations or text of AIP. Where appropriate, charts produced in conformity with ICAO Annex 4 may be used to fulfil this requirement. ~~Guidance material as to the specifications of index maps and diagrams included in AIP is contained in the Aeronautical Information Services Manual (ICAO Doc 8126).~~
- 5.2.1.2.8 When listing locations, the city or town should be given in capital letters followed, where the facility is an aerodrome/heliport or is located at an aerodrome/heliport, by an oblique stroke and the name of the aerodrome/heliport in smaller capital letters or lower case type. Unless otherwise indicated, the list should be in alphabetical order.
- 5.2.1.2.9 The spelling of place names shall conform with local usage, transliterated where necessary into the ISO basic Latin alphabet.
- 5.2.1.2.10 In the indication of the geographical coordinates of a location:
- a) the latitude should be given first;
 - b) symbols for degrees, minutes or seconds should be omitted;
 - c) two digits should always be used in expressing values of less than 10 degrees of latitude;
 - d) three digits should always be used in expressing values of less than 100 degrees of longitude; and
 - e) the letters N, S, E, W should be used to indicate the cardinal points of the compass to the latitude and longitude as appropriate.
- 5.2.1.2.11 When describing periods of activity, availability or operation, the applicable days and times shall be specified.
- 5.2.1.2.12 The units of measurement selected for use in the AIP, e.g. dimensions on aerodromes, distances, elevations or altitudes, should be consistently followed and should adhere to ICAO Annex 5 — Units of Measurement to be Used in Air and Ground Operations.
- 5.2.1.2.13 Index maps and diagrams included in the AIP should comply with the following specifications:
- a) *Base map*: The base map should be an outline map of the area adapted from existing material with general details. Graticules, topography and other details should be as simple as possible. Political subdivisions should be shown and identified. It should be produced in one colour.

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- b) *Sheet size and scale:* The overall dimensions should be 210 mm × 297 mm. If a larger map is required, it should be folded to conform to this size. A uniform scale should be used for all charts produced as a series and other charts where practicable.
- c) *Title and marginal notes:* The title should be shown on the top border and should be as short and simple as possible.
- d) *Colours:* The number of colours used should be kept to a minimum. If more than one colour is used, the colours should offer adequate contrast.
- e) *Symbols:* Symbols should conform, where practicable, to the ICAO chart symbols shown in ICAO Annex 4 — Aeronautical Charts, Appendix 2 of ICAO PANS-AIM. The basic, general purpose symbols for AIP index maps are a filled circle ● and an empty circle ○. Except when the symbols used are self-explanatory, a legend should be provided. For details for which no ICAO symbol has been provided, any appropriate symbol may be chosen provided it does not conflict with an ICAO symbol.

5.2.1.3 Specifications for AIP Amendments

- 5.2.1.3.1 Operationally significant changes to the AIP shall be published in accordance with Aeronautical Information Regulation and Control (AIRAC) procedures and shall be clearly identified by the acronym AIRAC.
- 5.2.1.3.2 When a State has established the regular interval or publication dates for its AIP Amendments, these intervals or publication dates shall be included in the AIP, Part 1 — General (GEN).
- 5.2.1.3.3 New or revised information contained in the AIP shall be identified.
- 5.2.1.3.4 Each AIP Amendment shall be allocated a serial number, ~~which shall be consecutive.~~
- 5.2.1.3.5 Each AIP Amendment shall contain a publication date.
- 5.2.1.3.6 Each AIRAC AIP Amendment shall contain an effective date. When an effective time other than 0000 UTC is used, the effective time shall also be indicated.
- 5.2.1.3.7 When an AIP Amendment is issued, it shall include references to the serial number of the AIP Supplement or the series and number of the NOTAM which has been incorporated into the amendment.
- 5.2.1.3.8 A brief indication of the subjects affected by the amendment shall be given on the AIP Amendment cover sheet.
- 5.2.1.3.9 Each amendment shall include a checklist giving the current date of each loose-leaf page in the AIP, and shall provide a recapitulation of any outstanding manuscript corrections. The checklist shall carry both the page number and date.

5.2.1.4 Specifications for AIP Supplements

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- 5.2.1.4.1 Each AIP Supplement shall be allocated a serial number which shall be consecutive and based on the calendar year. Guidance material on the use of AIP Supplements together with examples of such use is contained in ICAO Doc 8126.
- 5.2.1.4.2 Whenever an AIP Supplement is issued as a replacement of a NOTAM, a reference to the series and number of the NOTAM shall be included.
- 5.2.1.4.3 A checklist of valid AIP Supplements shall be issued at intervals of not more than one month as part of the checklist of NOTAM required by 5.2.5.34 and with distribution as for the AIP Supplements.
- 5.2.1.4.4 Each AIP Supplement page shall show a publication date.
- 5.2.1.4.5 Each AIRAC AIP Supplement page shall show a publication date and an effective date.

5.2.2 Aeronautical Information Circulars (AIC)

- 5.2.2.1 An AIC shall be provided whenever it is desirable to promulgate:
- a) forecasts of important changes in the air navigation procedures, services and facilities provided;
 - b) forecasts of implementation of new navigation systems;
 - c) significant information arising from aircraft accident/incident investigation which has a bearing on flight safety;
 - d) information on regulations relating to the safeguarding of international civil aviation against acts of unlawful interference;
 - e) advice on medical matters of special interest to pilots;
 - f) warnings to pilots concerning the avoidance of physical hazards;
 - g) effect of certain weather phenomena on aircraft operations;
 - h) information on new hazards affecting aircraft handling techniques;
 - i) regulations relating to the carriage of restricted articles by air;
 - j) reference to the requirements of, and publication of changes in, national legislation;
 - k) flight crew licensing arrangements;
 - l) training of aviation personnel;
 - m) application of, or exemption from, requirements in national legislation;
 - n) advice on the use and maintenance of specific types of equipment;

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- o) actual or planned availability of new or revised editions of aeronautical charts;
- p) carriage of communication equipment;
- q) explanatory information relating to noise abatement;
- r) airworthiness directives;
- s) changes in NOTAM series or distribution, new editions of AIP or major changes in their contents, coverage or format;
- t) advance information on the snow plan (see 5.2.2.2);
- u) other information of a similar nature.

5.2.2.2 The snow plan issued under AD 1.2.2 of the AIP shall be supplemented by seasonal information, to be issued well in advance of the beginning of each winter (not less than one month before the normal onset of winter conditions) and shall contain information such as that listed below:

- *a) a list of aerodromes/heliports where snow, slush, ice or frost clearance is expected to be performed during the coming winter:
 - *1) in accordance with the runway and taxiway systems; or
 - *2) planned snow clearing, deviating from the runway system (length, width and number of runways, affected taxiways and aprons or portions thereof);
- *b) information concerning any centre designated to coordinate information on the current state of progress of clearance and on the current state of runways, taxiways and aprons;
- c) a division of the aerodromes/heliports into SNOWTAM distribution lists in order to avoid excessive NOTAM distribution;
- *d) an indication, as necessary, of minor changes to the standing snow plan;
- *e) a descriptive list of clearance equipment;
- *f) a list of what will be considered as the minimum critical snow bank to be reported at each aerodrome/heliport at which reporting will commence.

5.2.2.3 The originating State shall select the AIC that are to be given international distribution.

* This information, or any part of it, may be included in the AIP, if so desired.

- 5.2.2.4 AIC selected for international distribution shall be given the same distribution as for the AIP.
- 5.2.2.5 Distribution of AIC on a national basis is left to the discretion of the originating State concerned.
- 5.2.2.6 Each AIC shall be allocated a serial number which shall be consecutive and based on the calendar year.
- 5.2.2.7 In the event that AIC are provided in more than one series, each series shall be separately identified by a letter (e.g. A 2/02, B 4/02).
- 5.2.2.8 A checklist of AIC currently in force shall be issued at least once a year, with distribution as for the AIC.
- 5.2.2.9 A checklist of AIC provided internationally shall be included in the NOTAM checklist.

5.2.3 Printed products

5.2.3.1 Printed AIP

- 5.2.3.1.1 When the AIP is issued as a printed volume, it should be published in loose-leaf form unless the complete publication is reissued at frequent intervals.
- 5.2.3.1.2 Each AIP issued as a printed volume and each page of an AIP issued in loose-leaf form shall be so annotated as to indicate clearly:
 - a) the identity of the AIP;
 - b) the territory covered and subdivisions when necessary;
 - c) the identification of the issuing State and producing organization (authority); and
 page numbers/chart titles.
- 5.2.3.1.3 The issuing State or the joint issuing States shall be clearly indicated on the cover and in the table of contents.
- 5.2.3.1.4 The normal method of amendment of the printed volume AIP shall be by means of replacement sheets.
- 5.2.3.1.5 New or revised information shall be identified by an annotation against it in the margin. A thick black vertical line or, where the change incorporated covers one line only or a part of a line, a thick black horizontal arrow, is sufficient to identify the change.
- 5.2.3.1.6 Each AIP Amendment page, ~~including the cover sheet~~, shall contain a publication date ~~and/or~~, when applicable, an effective date. The cover sheet shall contain the publication date and, when applicable, an effective date.
- 5.2.3.1.7 When the AIP is provided in more than one volume, each volume shall include a:
 - a) preface;

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- b) record of AIP Amendments;
- c) record of AIP Supplements;
- d) checklist of AIP pages; and
- e) list of current hand amendments.

5.2.3.1.8 When the AIP is published as one volume, the above-mentioned subsections appear only in Part 1 — GEN and the annotation “not applicable” shall be entered against each of these subsections in Parts 2 and 3.

5.2.3.1.9 A system of page numbering adaptable to the addition or deletion of sheets should be adopted. The page number should include:

- a) an identification of the part of the AIP;
- b) the section; and
- c) the subsection, as applicable;

thus creating a separate set of numbers for each subject (e.g. GEN 2.1-3, ENR 4.1-1 or AD 2.2-3).

5.2.3.1.10 A checklist giving the current date of each page in the AIP shall be reissued frequently to assist the user in maintaining a current publication.

5.2.3.1.11 The sheet size should be no larger than 210 × 297 mm, except that larger sheets may be used provided they are folded to the same size.

5.2.3.1.12 When a small number of charts are to be included and chart size is not larger than 210 mm × 297 mm or allows for folding to these dimensions, they should be contained in the AIP. If, on the other hand, there are many charts and they are frequently amended, it may be convenient to place them in a separate volume with a separate subscription service.

5.2.3.1.13 Maps and charts included in the AIP should be paginated in the same manner as other material.

5.2.3.1.14 AIP Supplement pages should be coloured in order to be conspicuous, preferably in yellow.


5.2.3.1.15 AIP Supplement pages should be kept as the first item in the AIP parts. To eliminate the need to continuously refer to the front of the AIP for the required information, the Supplements may be divided into specific parts (e.g. GEN, ENR, AD) for insertion in each AIP part, as necessary.

5.2.3.1.16 AIP Supplement pages shall be kept in the AIP as long as all or some of their contents remain valid.

5.2.3.2 Printed AIC

5.2.3.2.1 Differentiation and identification of AIC topics according to subjects using colour coding should be practised where the numbers of AIC in force are sufficient to make identification in this form necessary.

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5.2.3.2.2 AIC should be colour coded by subject where there are sufficient circulars in force to warrant such identification, e.g.:

- a) white — administrative;
- b) yellow — air traffic control (ATC);
- c) pink — safety;
- d) mauve — danger area map; and
- e) green — maps/charts.

5.2.4 Electronic AIP (eAIP)

Note.— Guidance material for the production and provision of the eAIP is contained in ICAO Doc 8126.

5.2.4.1 When provided, the information content of the eAIP and the structure of chapters, sections and sub-sections shall follow the content and structure of the paper AIP. The eAIP shall include files that allow for printing a paper AIP.

~~5.2.4.2 The production and provision of the eAIP shall be in accordance with ICAO Doc 8126.~~

~~5.2.4.3~~ 5.2.4.2 New or revised information shall be identified either by an annotation against it in the margin or by a mechanism that allows comparing the new/revised information with the previous information.

5.2.4.3 When provided, the eAIP should be available on a physical distribution medium (CD, DVD, etc.) and/or online on the Internet.

Note.— Guidance material on the use of the Internet is contained in Guidelines on the Use of the Public Internet for Aeronautical Applications (Doc 9855).

~~5.2.5 The use of internet shall be in accordance with the Guidelines on the Use of the Public Internet for Aeronautical Applications (ICAO Doc 9855).~~


5.2.6 5.2.5 NOTAM

5.2.5.1 General specifications

5.2.5.1.1 Except as otherwise provided in 5.2.5.1.4 and 5.2.5.1.5, each NOTAM shall contain the information in the order shown in the NOTAM Format in Appendix 3 of ICAO PANS-AIM. Production of NOTAM, SNOWTAM, ASHTAM and pre-flight information bulletin (PIB) shall be in accordance with the guidance contained in ICAO Doc 8126.

5.2.5.1.2 NOTAM text shall be composed of the significations/uniform abbreviated phraseology assigned to the ICAO NOTAM Code complemented by ICAO abbreviations, indicators, identifiers, designators, call signs, frequencies, figures and plain language.

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Note 1.— The ICAO NOTAM Code together with significations/uniform abbreviated phraseology, and ICAO abbreviations, are contained in the Procedures for Air Navigation Services — ICAO Abbreviations and Codes (PANS-ABC, ICAO Doc 8400).

Note 2.— Additional procedures covering the reporting of runway surface conditions are contained in the Procedures for Air Navigation Services — Aerodromes (PANS-Aerodromes, ICAO Doc 9981).

5.2.5.1.3 All NOTAM shall be issued in the English language.

5.2.5.1.4 Information concerning snow, slush, ice, frost, standing water, or water associated with snow, slush, ice or frost on the movement area shall be disseminated by means of a SNOWTAM, and shall contain the information in the order shown in the SNOWTAM Format in Appendix 4 of ICAO PANS-AIM.

Note.— The origin and order of the information is a result of assessment processes and procedures prescribed in the PANS-Aerodromes (ICAO Doc 9981).

5.2.5.1.5 Information concerning an operationally significant change in volcanic activity, volcanic eruption and/or volcanic ash cloud shall, when reported by means of an ASHTAM, contain the information in the order shown in the ASHTAM Format in Appendix 5 of ICAO PANS-AIM.

5.2.5.1.6 When errors occur in a NOTAM, a NOTAM with a new number to replace the erroneous NOTAM shall be issued or the erroneous NOTAM shall be cancelled and a new NOTAM issued.

5.2.5.1.7 When a NOTAM is issued which cancels or replaces a previous NOTAM, the series and number of the previous NOTAM shall be indicated.

5.2.5.1.7.1 The series, location indicator and subject of both NOTAM shall be the same.

5.2.5.1.8 Only one NOTAM shall be cancelled or replaced by a NOTAM.

5.2.5.1.9 Each NOTAM shall deal with only one subject and one condition of the subject.

5.2.5.1.9.1 The combination of a subject and a condition of the subject in accordance with the NOTAM Selection Criteria shall be as per the guidance contained in ICAO Doc 8126.

5.2.5.1.10 Each NOTAM shall be as brief as possible and so compiled that its meaning is clear without the need to refer to another document.

5.2.5.1.11 Each NOTAM shall be transmitted as a single telecommunication message.

5.2.5.1.12 A NOTAM containing permanent information or temporary information of long duration shall carry appropriate AIP or AIP Supplement references.

5.2.5.1.13 Location indicators included in the text of a NOTAM shall be those contained in *Location Indicators* (ICAO Doc 7910).

5.2.5.1.13.1 In no case shall a curtailed form of such indicators be used.

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5.2.5.1.14 Where no ICAO location indicator is assigned to the location, its place name shall be entered in plain language, spelt in conformity with local usage, transliterated, when necessary, into the ISO basic Latin alphabet.

5.2.5.2 NOTAM number and series allocation

5.2.5.2.1 The international NOTAM office shall allocate to each NOTAM a series identified by a letter and a four-digit number followed by a stroke and a two-digit number for the year. The four-digit number shall be consecutive and based on the calendar year.

5.2.5.2.2 Letters S and T shall not be used to identify a NOTAM series.

5.2.5.2.3 All NOTAM shall be divided in series based on subject, traffic or location or a combination thereof, depending on end-user needs. NOTAM for aerodromes allowing international air traffic shall be issued in international NOTAM series.

5.2.5.2.4 If NOTAM are issued in both English and a national language, the NOTAM series shall be organized such that the national language series is equivalent to the English language series in terms of content.

5.2.5.2.4.1 Whenever possible, the national language series should have the same numbering as the English language series to facilitate comparison.

5.2.5.2.5 The content and geographical coverage of each NOTAM series shall be stated in detail in the AIP, section GEN 3.

5.2.5.2.6 Series allocation shall be monitored and, if required, appropriate measures shall be taken to assure that no series reach the maximum possible number of issued NOTAM before the end of the calendar year.

5.2.5.3 Multi-part NOTAM

5.2.5.3.1 When the aeronautical fixed service (AFS) message exceeds the maximum number of characters permissible, the multi-part NOTAM procedure shall be applied, which includes a standard numbering scheme to facilitate the processing of multi-part NOTAMs.

Note.— Guidance for multi-part NOTAM are described in the Aeronautical Information Service Manual (ICAO Doc 8126).


5.2.5.4 NOTAM checklist

5.2.5.4.1 A checklist of valid NOTAM shall be issued as a NOTAM checklist at intervals of not more than one month.

Note.— Omitting a NOTAM from the checklist does not cancel a NOTAM.

5.2.5.4.2 One NOTAM checklist shall be issued for each series.

5.2.5.4.3 A NOTAM checklist shall refer to the latest AIP Amendments, AIP Supplements, data sets and at least the internationally distributed AIC, and, when it is selected, include the checklist of AIP Supplements.

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- 5.2.5.4.4 A NOTAM checklist shall have the same distribution as the actual message series to which it refers and shall be clearly identified as a checklist.

5.3 Digital data

5.3.1 General provisions

- 5.3.1.1 To facilitate and support the use of exchange of digital data sets between data providers and data users, the ISO 19100 series of standards for geographic information should be used as a reference framework.

- 5.3.1.1.1 The use of the ISO 19100 series of standards shall be in accordance with the guidance contained in ICAO Doc 8126.

- 5.3.1.2 A description of available digital data sets shall be provided in the form of data product specifications on which basis air navigation users will be able to evaluate the products and determine whether they fulfil the requirements for their intended use (application).

Note.— ISO Standard 19131 outlines the specifications for geographic data products. This may include an overview, specification scope, data product identification, data content and structure, reference system, data quality, data capture, data maintenance, data portrayal, data product delivery, additional information and metadata.

- 5.3.1.3 The content and structure of digital data sets shall be defined in terms of an application schema and a feature catalogue.

Note.— ISO Standard 19109 contains rules for application schema while ISO Standard 19110 describes the feature cataloguing methodology for geographic information.

- 5.3.1.4 The aeronautical information model used should encompass the aeronautical data and aeronautical information to be exchanged.


- 5.3.1.5 The aeronautical information model used should:

- a) use Unified Modelling Language (UML) to describe the aeronautical information features and their properties, associations and data types;
- b) include data value constraints and data verification rules;
- c) include provisions for metadata as specified in 4.2 and 5.3.2; and
- d) include a temporality model to enable capturing the evolution of the properties of an aeronautical information feature during its life cycle.

- 5.3.1.6 The aeronautical data exchange model used should:

- a) apply a commonly used data encoding format;

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- b) cover all the classes, attributes, data types and associations of the aeronautical information model detailed in 5.3.1.5; and
- c) provide an extension mechanism by which groups of users can extend the properties of existing features and add new features which do not adversely affect global standardization.

Note 1.— The intent of using a commonly used data encoding format is to ensure interoperability of aeronautical data exchange between agencies and organizations involved in the data processing chain.

Note 2.— Examples of commonly used data encoding formats include Extensible Markup Language (XML), Geography Markup Language (GML) and JavaScript Object Notation (JSON).

5.3.1.7 Charts, maps or diagrams should be used to complement digital data sets.

5.3.2 Metadata

Each data set shall include the following minimum set of metadata:

- a) the names of the organization 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; and
- d) any limitations with regard to the use of the data set.

Note.— ISO Standard 19115 specifies requirements for geographic information metadata

5.3.3 Data sets


Note.— A data subject may appear in multiple data sets.

5.3.3.1 AIP data set

Note.— The purpose of the AIP data set is to support the transition of the ATM domain towards the use of digital data sets instead of paper products. Therefore, its scope is defined considering the likelihood that the data contained in this set is being used in digital format by service providers, ATC and instrument flight rules/visual flight rules (IFR/VFR) airspace users.

- 5.3.3.1.1 The AIP data set shall include data about the following subjects, with the properties indicated in brackets being included as a minimum (if applicable):
- a) air traffic services (ATS) airspace (type, name, lateral limits, vertical limits, class of airspace);
 - b) special activity airspace (type, name, lateral limits, vertical limits, restriction, activation);
 - c) ATS route and other route (designator, flight rules);

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- d) route segment (navigation specification, from point, to point, track, length, upper limit, lower limit, minimum en-route altitude (MEA), minimum obstacle clearance altitude (MOCA), direction of cruising level, required navigation performance);
- e) waypoint – en-route (identification, location, formation);
- f) aerodrome/heliport (ICAO location indicator, name, designator IATA, served city, certified ICAO, certification date, certification expiration date, control type, field elevation, reference temperature, magnetic variation, reference point);
- g) runway (designator, nominal length, nominal width, surface type, strength);
- h) runway direction (designator, true bearing, threshold, take off run available (TORA), take-off distance available (TODA), accelerate-stop distance available (ASDA), landing distance available (LDA));
- i) final approach and take-off (FATO) (designation, length, width, threshold point);
- j) touchdown and left-off (TLOF) (designator, centre point, length, width, surface type);
- k) radio navigation aid (type, identification, name, aerodrome/heliport served, hours of operation, magnetic variation, frequency/channel, position, elevation, magnetic bearing, true bearing, zero bearing direction);

Note 1.— The description of the data subjects, together with their properties, data type and applicable data quality requirements, is provided in Appendix 1 of ICAO PANS-AIM.

Note 2.— The AIP data set includes relevant AIP Amendments and AIP Supplements.

5.3.3.1.2 When a property is not defined for a particular occurrence of the subjects listed in 5.3.3.1.1, the AIP data subset shall include an explicit “not applicable” indication.

5.3.3.2 Terrain and obstacle data sets

Note.— Terrain and obstacle data is intended to be used in the following air navigation applications:

- a) *ground proximity warning system with forward looking terrain avoidance function and minimum safe altitude warning (MSAW) system;*
- b) *determination of contingency procedures for use in the event of an emergency during a missed approach or take-off;*
- c) *aircraft operating limitations analysis;*
- d) *instrument procedure design (including circling procedure);*
- e) *determination of en-route “drift-down” procedure and en-route emergency landing location;*
- f) *advanced surface movement guidance and control system (A-SMGCS); and*

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g) *aeronautical chart production and on-board databases.*

The data may also be used in other applications, such as training/flight simulator and synthetic vision systems, and may assist in determining the height restriction or removal of obstacles that pose a hazard to air navigation.

5.3.3.2.1 Terrain data set

5.3.3.2.1.1 A terrain grid shall be angular or linear and shall be of regular or irregular shape. In regions of higher latitudes, latitude grid spacing may be adjusted to maintain a constant linear density of measurement points.

5.3.3.2.1.2 Sets of terrain data shall include spatial (position and elevation), thematic and temporal aspects for the surface of the Earth containing naturally occurring features such as mountains, hills, ridges, valleys, bodies of water, and permanent ice and snow, and exclude obstacles. Depending on the acquisition method used, this shall represent the continuous surface that exists at the bare Earth, the top of the canopy or something in-between, also known as “first reflective surface”.

5.3.3.2.1.3 In terrain data sets, only one feature type, i.e. terrain, shall be provided. Feature attributes describing terrain shall be those listed in Appendix 6, Table A6-1 of ICAO PANS-AIM. The terrain feature attributes listed in Appendix 6, Table A6-1 represent the minimum set of terrain attributes, and those annotated as mandatory shall be recorded in the terrain data set.

5.3.3.2.1.4 Terrain data for each area shall conform to the applicable numerical requirements in Appendix 1 of ICAO PANS-AIM.

5.3.3.2.2 Obstacle data set


5.3.3.2.2.1 Obstacle data elements are features that shall be represented in the data sets by points, lines or polygons.

5.3.3.2.2.2 In an obstacle data set, all defined obstacle feature types shall be provided and each of them shall be described according to the list of mandatory attributes provided in Appendix 6, Table A6-2 of ICAO PANS-AIM. By definition, obstacles can be fixed (permanent or temporary) or mobile. Specific attributes associated with mobile (feature operations) and temporary types of obstacles are annotated in Appendix 6, Table A6-2 of ICAO PANS-AIM as optional attributes. If these types of obstacles are to be provided in the data set, appropriate attributes describing such obstacles are also required.

5.3.3.2.2.3 Obstacle data for each area shall conform to the applicable numerical requirements contained in Appendix 1 of ICAO PANS-AIM.

5.3.3.2.2.4 The obstacle data product specification, supported by geographical coordinates for each aerodrome included within the data set, shall describe the following areas:

- a) Areas 2a, 2b, 2c, 2d;

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- b) the take-off flight path area; and
- c) the obstacle limitation surfaces.

Note.— Area 4 terrain data and Area 2 obstacle data are normally sufficient to support the production of the Precision Approach Terrain Chart — ICAO. When more detailed obstacle data are required for Area 4, these may be provided in accordance with the Area 4 obstacle data requirements specified in Appendix 6, Table A6-2 of ICAO PANS-AIM. Guidance on appropriate obstacles for this chart is given in the Aeronautical Chart Manual (ICAO Doc 8697).

5.3.3.3 Aerodrome mapping data sets

Note 1.— Aerodrome mapping data includes aerodrome geographic information that supports applications which improve the user’s situational awareness or supplements surface navigation, thereby increasing safety margins and operational efficiency. Aerodrome mapping data sets with appropriate data element accuracy support requirements for collaborative decision making, common situational awareness and aerodrome guidance applications are intended to be used, among others, in the following air navigation applications:

- a) position and route awareness including moving maps with own ship position, surface guidance and navigation (e.g. A-SMGCS);
- b) traffic awareness including surveillance and runway incursion detection and alerting;
- c) facilitation of aerodrome-related aeronautical information, including NOTAM;
- d) resource and aerodrome facility management; and
- e) aeronautical chart production.

The data may also be used in other applications such as training/flight simulator and synthetic vision systems.

Note 2.— Aerodrome mapping data is organized and arranged in aerodrome mapping databases (AMDBs) for ease of electronic storage and usage by appropriate applications.


Note 3.— The content of the aerodrome mapping data sets is defined in Radio Technical Commission for Aeronautics (RTCA) Document DO 272D/European Organization for Civil Aviation Equipment (EUROCAE) Document ED 99 — User Requirements for Aerodrome Mapping Information.

Note 4.— Metadata elements applicable to aerodrome mapping data are contained in RTCA DO-291B/EUROCAE ED-119B — Interchange Standards for Terrain, Obstacle, and Aerodrome Mapping Data.

5.3.3.3.1 Aerodrome mapping data — requirements for provision

Aerodrome mapping data should be supported by electronic terrain and obstacle data for Area 3 in order to ensure consistency and quality of all geographical data related to the aerodrome.

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Note 1.— Accuracy and integrity requirements for aerodrome mapping data are contained in Appendix 1 of ICAO PANS-AIM.

Note 2.— Electronic terrain and obstacle data pertaining to Area 3 and aerodrome mapping data may be originated using common acquisition techniques and managed within a single geographic information system (GIS).

Note 3.— The content of the aerodrome mapping data sets is defined in RTCA DO 272D/EUROCAE ED-99D.

5.3.3.4 Instrument flight procedure data set

Note.— The purpose of the instrument flight procedure data set is to support the transition of the ATM domain towards the use of digital data sets instead of paper products. Therefore, its scope is defined considering the likelihood that the data contained in this set is being used in digital format by service providers, ATC and IFR/VFR airspace users.

5.3.3.4.1 The instrument flight procedure data set shall include data about the following data subjects, with the properties indicated in brackets being included as a minimum (if applicable):

- a) procedure (all properties);
- b) procedure segment (all properties);
- c) final approach segment (all properties);
- d) procedure fix (all properties);
- e) procedure holding (all properties); and
- f) helicopter procedure (all properties).

Note.— The description of the data subjects, together with their properties, data type and applicable data quality requirements, is provided in Appendix 1 of ICAO PANS-AIM.

5.3.3.4.2 The instrument flight procedure data set should also cover the data publication requirements contained in the *Procedures for Air Navigation Services — Aircraft Operations (PANS-OPS, Doc 8168), Volume II — Construction of Visual and the Instruments Flight Procedures.*


5.4 Distribution services

5.4.1 General

5.4.1.1 Distribution to the next intended user will differ in the delivery method applied which may either be:

- a) *Physical distribution.* The means by which aeronautical data and aeronautical information distribution is achieved through the delivery of a physical package (e.g. postal services); or

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b) *Direct electronic distribution.* The means by which aeronautical data and aeronautical information distribution is achieved automatically through the use of a direct electronic connection between the AIS and the next intended user.

5.4.1.2 Different delivery methods and data media may require different procedures to ensure the required data quality.

Note.— Further guidance on digital data set distribution can be found in the Manual on System-wide Information Management (SWIM) Concept (ICAO Doc 10039).

5.4.1.3 A checklist of the available data sets, including their effective and publication dates, shall be made available to allow the users to ensure that current data is being used.

5.4.1.4 The checklist of the data sets shall be made available through the same distribution mechanism as is used for the data sets.

5.4.2 NOTAM distribution

5.4.2.1 The AIS shall arrange, as necessary, to satisfy operational requirements for the issuance and receipt of NOTAM distributed by telecommunication.

Note.— Arrangements may be made for direct exchange of SNOWTAM (see Appendix 4 of ICAO PANS- AIM) between aerodromes/heliports.

5.4.2.2 The international exchange of ASHTAM (see 5.2.5.1.6), and NOTAM where States continue to use NOTAM for distribution of information on volcanic activity, shall include volcanic ash advisory centres and the centres designated by regional air navigation agreement for the operation of AFS Secure Aviation Data Information Service (SADIS) and the World Area Forecast System (WAFS) Internet file service (WIFS), and shall take account of the requirements of long-range operations.

5.4.2.3 The exchange of NOTAM between international NOTAM offices and between the international NOTAM offices and multinational NOTAM processing units shall, as far as practicable, cover the needs of operations personnel including flight crew members.


5.4.2.4 A predetermined distribution system for NOTAM transmitted on the AFS in accordance with ICAO Annex 15, 6.3.2.3 shall be used whenever possible, subject to the requirements of 5.4.2.3.

5.4.2.5 The originating State shall, upon request, grant distribution of NOTAM series other than those distributed internationally.

5.5 Pre-flight information services

5.5.1 Geographic coverage for pre-flight information services should be determined and periodically reviewed. In general, the coverage zone should be limited to the flight information region (FIR) within which the aerodrome/heliport is located, the FIR(s) adjacent thereto, and all air route or portion of route flown without an intermediate landing, originating at the aerodrome/heliport and extending beyond the FIR(s) mentioned.

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- 5.5.2 Although NOTAM with purpose “M” are regarded not subject for a briefing but available on request, all NOTAM shall be provided for briefing by default and that content reduction should be at user’s discretion.
- 5.5.3 Automated pre-flight information systems shall be used to make aeronautical data and aeronautical information available to operations personnel including flight crew members for self-briefing, flight planning and flight information service purposes. The aeronautical data and aeronautical information made available shall comply with the provisions of ICAO Annex 15.
- 5.5.4 Self-briefing facilities of an automated pre-flight information system shall provide access to operations personnel, including flight crew members and other aeronautical personnel concerned, for consultation as necessary with the AIS by telephone or other suitable telecommunications means. The human/machine interface of such facilities shall ensure easy access in a guided manner to all relevant information/data.
- 5.5.5 Automated pre-flight information systems for the supply of aeronautical data and aeronautical information for self-briefing, flight planning and flight information service shall:
- a) provide for continuous and timely updating of the system database and monitoring of the validity and quality of the aeronautical data stored;
 - b) permit access to the system by operations personnel including flight crew members, aeronautical personnel concerned and other aeronautical users through suitable telecommunications means;
 - c) ensure provision, in paper copy form, of the aeronautical data and aeronautical information accessed, as required;
 - d) use access and interrogation procedures based on abbreviated plain language and ICAO location indicators, as appropriate, or based on a menu-driven user interface or other appropriate mechanism as agreed between the civil aviation authority and operator concerned; and
 - e) provide for rapid response to a user request for information.

Note.— ICAO abbreviations and codes and location indicators are given respectively in the PANS-ABC (ICAO Doc 8400) and ICAO Doc 7910.

- 5.5.6 Automated pre-flight information systems providing a harmonized, common point of access by operations personnel, including flight crew members and other aeronautical personnel concerned, to aeronautical data and aeronautical information in accordance with 5.5.3 and meteorological information in accordance with 9.4.1 of ICAO Annex 3 — *Meteorological Service for International Air Navigation*, should be established by an agreement between the civil aviation authority or the agency to which the authority to provide service has been delegated in accordance with 2.1.1 c) of ICAO Annex 15 and the relevant meteorological authority.
- 5.5.7 Where automated pre-flight information systems are used to provide the harmonized, common point of access by operations personnel, including flight crew members and other aeronautical personnel concerned, to aeronautical data, aeronautical information and meteorological information, the agency to which the authority to provide service has been delegated in accordance with 2.1.1 c) of ICAO Annex 15 shall remain


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responsible for the quality and timeliness of the aeronautical data and aeronautical information provided by means of such a system.

Note.— The meteorological authority concerned remains responsible for the quality of the meteorological information provided by means of such a system in accordance with 9.4.3 of ICAO Annex 3.

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CHAPTER 6. AERONAUTICAL INFORMATION UPDATES

6.1 Aeronautical information product updates

6.1.1 The same update cycle shall be applied to the Aeronautical Information Publication (AIP) and the digital data sets in order to ensure the consistency of the data items that appear in multiple aeronautical information products.

6.1.2 Specifications for AIP amendments

6.1.2.1 The AIP Amendment regular interval shall be specified in the AIP, Part 1 — General (GEN).

Note.— Guidance material on the establishment of intervals between publication dates of AIP Amendments is contained in the Aeronautical Information Services Manual (ICAO Doc 8126).

6.1.2.2 When an AIP Amendment will not be published at the established interval or publication date, a NIL notification shall be originated and distributed by the NOTAM checklist.

6.1.2.3 Recourse to hand amendments or annotations shall be kept to a minimum.

6.1.2.4 When the AIP is provided in more than one volume, each volume should include separate amendment services.

6.1.3 Specifications for AIP Supplements

6.1.3.1 When an error occurs in an AIP Supplement or when the period of validity of an AIP Supplement is changed, a new AIP Supplement shall be published as a replacement.

Note 1.— The requirements for NOTAM apply when time constraints do not allow sufficient time for the distribution of an AIP Supplement.

Note 2.— Guidance material on the use of AIP Supplements together with examples of such use is contained in the Aeronautical Information Services Manual (ICAO Doc 8126).

6.1.4 Specifications for NOTAM

6.1.4.1 NOTAM should be published with sufficient lead time for the affected parties to take any required action, except in the case of unserviceability, volcanic activity, release of radioactive material, toxic chemicals and other events that cannot be foreseen.

6.1.4.2 NOTAM notifying unserviceability of aids to air navigation, facilities or communication services shall give an estimate of the period of unserviceability or the time at which restoration of service is expected.

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6.1.4.3 At least seven days' advance notice shall be given of the activation of established danger, restricted or prohibited areas and of activities requiring temporary airspace restrictions other than for emergency operations.

6.1.4.3.1 Notice of any subsequent cancellation of the activities or any reduction of the hours of activity or the dimensions of the airspace should be given as soon as possible.

Note.— Whenever possible, at least 24 hours' advance notice is desirable, to permit timely completion of the notification process and to facilitate airspace utilization planning.

6.1.4.4 Within three months from the issuing of a permanent NOTAM, the information contained in the NOTAM shall be included in the aeronautical information products affected.

6.1.4.5 Within three months from the issuing of a temporary NOTAM of long duration, the information contained in the NOTAM shall be included in the AIP Supplement.

6.1.4.6 When a NOTAM with estimated end of validity unexpectedly exceeds the three-month period, a replacement NOTAM shall be issued, unless the condition is expected to last for a further period of more than three months; in this case, an AIP Supplement shall be issued.

6.1.4.7 When an AIP Amendment or an AIP Supplement is published in accordance with AIRAC procedures, a so-called "Trigger NOTAM" shall be originated giving a brief description of the contents, the effective date and time, and the reference number of the amendment or supplement.

6.1.4.7.1 The Trigger NOTAM shall come into force on the same effective date and time as the amendment or supplement and shall remain valid in the pre-flight information bulletin for a period of fourteen days.

6.1.4.7.2 In the case of an AIP Supplement, the Trigger NOTAM shall remain valid for a period of fourteen days.

6.1.4.7.3 In the case of an AIP Supplement that is valid for less than fourteen days, the Trigger NOTAM shall remain valid for the complete validity period of the AIP Supplement.

6.1.4.7.4 In the case of an AIP Supplement that is valid for fourteen days or more, the Trigger NOTAM shall remain valid for at least fourteen days.

Note.— Guidance material for the origination of NOTAM announcing the existence of AIRAC AIP Amendments or AIP Supplements (Trigger NOTAM) is contained in ICAO Doc 8126.

6.1.5 Specifications for digital data updates

6.1.5.1 The update interval for the digital data sets shall be specified in the data product specification.

6.1.5.2 Data sets that have been made available in advance (according to the AIRAC cycle) shall be updated with the non-AIRAC changes that occur between the publication and the effective date.

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