Civil Aviation Safety Authority
of Papua New Guinea

Advisory Circular

AC175-5

Aeronautical Information Management

Initial Issue

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GENERAL

Civil Aviation Authority Advisory Circulars (AC) contain information about standards, practices and procedures that the Director has found to be an Acceptable Means of Compliance (AMC) with the associated rule.

An AMC is not intended to be the only means of compliance with a rule, and consideration will be given to other methods of compliance that may be presented to the Director. When new standards, practices or procedures are found to be acceptable, they will be added to the appropriate Advisory Circular.

PURPOSE

This Advisory Circular provides methods, acceptable to the Director, for showing compliance with the aerodrome certification exposition requirements of Part 175 and explanatory material to assist in showing compliance.

RELATED CAR

This AC relates specifically to Civil Aviation Rule 175.72 Aeronautical Information Management (AIM)

CHANGE NOTICE

There was no previous issue of this AC, consequently no change is in effect.

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CHAPTER 1 – Aeronautical Information Management (AIM)

1.1 Introduction

1.1.1 This AC addresses the change management aspect of the transition from AIS to AIM introducing significant changes in the way aeronautical data and aeronautical information is processed and managed. Even though some of the principles remain the same, AIM is significantly different from traditional AIS. It is important to understand that various parties are affected by this transition. All aspects related to how this transition impacts the different parties are addressed in this AC.

1.2 Parties involved in AIM Implementation

1.2.1 AIM implementation requires a systematic approach by all involved parties, namely:

a) Regulatory body;

b) AIS provider;

c) data originators; and

d) data service providers and integrators.

1.2.2 In addition to the above-mentioned parties, aeronautical information users should also be considered in the AIM implementation process. The ultimate objective of AIM is to offer functional and operational benefits, both tangible and intangible, to the aviation community, including secure online access to aeronautical information products, aeronautical information products used in electronic flight bags, and aeronautical navigation databases used in global navigation satellite systems (GNSS) and flight management systems (FMS).

1.3 Aeronautical information and data exchange models

1.3.1 The aeronautical information model used should:

(1) use Unified Modelling Language (UML) to describe the aeronautical information features and their properties, associations and data types;

(2) include data value constraints and data verification rules;

(3) include provisions for metadata as specified in AIS.AIM.185 and AIS.AIM.210(d); and

(4) include a temporality model to enable capturing the evolution of the properties of an aeronautical information feature during its life cycle.

1.3.2 The aeronautical data exchange model used should:

(1) apply a commonly used data encoding format;

(2) cover all the classes, attributes, data types and associations of the aeronautical information model detailed in (a); and

(3) 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.

1.3.3 The aeronautical exchange model used should comply with the provisions of the Standardization AIXM DB Requirements in the Scope of SID and STAR Chart.

1.4 The management of aeronautical data and aeronautical information

1.4.1 The management of aeronautical data and aeronautical information should include the following:

(1) Collection

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

(ii) A record of data originators shall be maintained.

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

(iv) The list of aeronautical information subjects and their properties, as contained in AC175-6 (Aeronautical Data Catalogue) shall be used to establish formal arrangements between the originators and the AIS.

(v) Valid codes for the code lists of the aeronautical data properties and sub-properties, as contained in AC175-6 (Aeronautical Data Catalogue) shall be defined in the formal arrangements between the originators and the AIS.

(vi) AC175-6 shall be considered as a reference for aeronautical data and aeronautical information origination and publication requirements.

(2) Processing;

(i) Collected data shall be verified and validated for compliance with data quality requirements.

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

(3) Quality Control;

(i) Quality checks shall be implemented to ensure compliance with product specifications contained in this Rule.

(ii) When the same data is duplicated in different aeronautical information products, consistency checks shall be undertaken.

(4) Distribution.

(i) Information shall be distributed in a manner that achieves the needs of the users of the service.

(ii) Detailed specifications concerning the content of each sub-domain are contained in AC175-6.

(iii) Aeronautical data and aeronautical information in each sub-domain may be originated by more than one organization.

(5) Data shall be collected and transmitted to the aeronautical information service (AIS) in accordance with the accuracy requirements and integrity classification specified in AC175-6.

i) 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).

ii) 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.

iii) 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 AC175-6 shall be identified.

iv) 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 AC175-2 shall also be published.

(6) AIS shall ensure that the determination and reporting of aeronautical data is in accordance with the accuracy and integrity classification required to meet the needs of the end-user of the aeronautical data.

i) The order of accuracy for aeronautical data shall be in accordance with its intended use.

ii) The order of resolution of aeronautical data shall be commensurate with the actual data accuracy.

iii) The integrity of aeronautical data shall be maintained throughout the data chain from origination to distribution to the next intended user.

(7) Based on the applicable integrity classification, AIS procedures shall be put in place in order to:

(i) for routine data: avoid corruption throughout the processing of the data;

(ii) for essential data: assure corruption does not occur at any stage of the entire process and include additional processes as needed to address potential risks in the overall system architecture to further assure data integrity at this level; and

(iii) for critical data: assure corruption does not occur at any stage of the entire process and include additional integrity assurance processes to fully mitigate the effects of faults identified by thorough analysis of the overall system architecture as potential data integrity risks.

(8) Traceability of aeronautical data shall be ensured and retained as long as the data is in use.

(9) Timeliness of aeronautical data shall be ensured by including limits on the effective period of the data elements.

(10) Completeness of aeronautical data shall be ensured in order to support its intended use.

(11) The format of delivered aeronautical data shall be adequate to ensure that the data is interpreted in a manner that is consistent with its intended use.

(12) Material to be issued as part of an aeronautical information product shall be thoroughly

checked before it is submitted to the AIS in order to ensure that all necessary information has been included and that it is correct in detail.

(13) AIS shall establish verification and validation procedures which ensure that upon receipt of aeronautical data and aeronautical information, quality requirements are met.

(14) Digital data error detection techniques shall be used during the transmission and/or storage of aeronautical data and digital data sets.

(15) Digital data error detection techniques shall be used in order to maintain the integrity levels as specified in AC175-10.

(16) Automation shall be applied in order to ensure the quality, efficiency and cost-effectiveness of aeronautical information services.

(17) Due consideration to the integrity of data and information shall be given when automated processes are implemented and mitigating steps taken where risks are identified.

(18) In order to meet the data quality requirements, automation must:

(1) enable digital aeronautical data exchange between the parties involved in the data processing chain; and

(2) use aeronautical information exchange models and data exchange models designed to be globally interoperable.

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

1.4 Other states as sources

1.4.1 Although the AIS operated by each State is primarily responsible for the provision of information regarding the facilities and services located within its territory, the exchange of similar information with AIS of other States enables the provision of the pre-flight information service needed by international operations which may traverse those States and information required by related air traffic service units for aircraft in flight.

1.5 Scope and language

1.5.1 The aeronautical data catalogue shall be developed and made available in electronic format as per the ICAO (PANS AIM,ICAO DOC 10066) and provided as part of the procedures for air navigation services – Aeronautical Information Management.

1.5.2 The Aeronautical Data Catalogue (AC175-6) is a general description of the aeronautical Information management (AIM) data scope and consolidates all data that can be collected and maintained by the aeronautical information service (AIS). It provides a reference for aeronautical data origination and publication requirements.

1.5.3 The Aeronautical Data Catalogue provides a means for States to facilitate the identification of the organizations and authorities responsible for the origination of the aeronautical data and aeronautical information. It also provides a common list of terms and facilitates the formal arrangements between data originators and the AIS. It includes data quality requirements applicable from origination through to publication.

1.6 Data attributes and quality requirements

1.6.1 The aeronautical data catalogue (AC175-6) contains aeronautical data attributes and quality requirements (accuracy, resolution and integrity).

1.6.2 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).

1.7 Verification activities

1.7.1 Verification activities may include:

(1) comparison processes in which data and information are compared with an independent source;

(2) feedback processes in which data and information are compared between their input and output state;

(3) processing through multiple independent and different systems, comparing the output of each; this includes performing alternative calculations; and

(4) processes in which data and information are compared to the originator's request.

1.8 Validation activities

1.8.1 Validation activities may include:

(1) application processes in which data and information are tested;

(2) processes in which data and information are compared between two different outputs; and

(3) processes in which data and information are compared to an expected range, value or other business rules.

1.9 Automated systems

1.9.1 Risks of altering the integrity of data and information may be introduced by automated processes in cases of unexpected systems behaviours.

1.10 Additional quality assurance techniques

1.10.1 Error-producing faults in the entire process may be mitigated by additional data quality assurance techniques as may be required.

1.10.2 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.

1.11 Other exchange agreements

1.11.1 The exchange of more than one copy of the elements of aeronautical information products, and other air navigation documents, including those containing air navigation legislation and regulations, should be subject to bilateral agreement between the participating Contracting States and entities.

1.11.2 The procurement of aeronautical data and aeronautical information, including the elements of aeronautical information products, and other air navigation documents, including those containing air navigation legislation and regulations, by States other than Contracting States and by other entities should be subject to separate agreement between the participating States and entities.

1.12 Identification of insufficiently accurate coordinates

1.12.1 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.

1.12.2 In aeronautical information products that are distributed on paper, the identification should be done with an asterisk following the coordinate value concerned.

1.13 Accuracy and integrity classification

1.13.1 Specifications concerning the accuracy and integrity classification related to aeronautical data are contained in AC175-6.

1.14 Order of accuracy

1.14.1 Specifications concerning the order of accuracy (including confidence level) for aeronautical data are contained in AC175-6.

1.15 Data resolution

1.15.1 Aeronautical data shall be provided in accordance with the resolution requirements contained in AC175-6.

1.16 Resolution specifications

1.16.1 Specifications concerning the resolution of aeronautical data are contained in AC175-6.

1.16.2 The resolution of the data contained in the database may be the same or finer than the publication resolution.

1.17 Integrity classification

1.17.1 Specifications concerning the integrity classification related to aeronautical data are contained in AC175-6.

1.18 Limits and effective periods

1.18.1 These limits may be associated with individual data elements or data sets.

1.18.2 If the effective period is defined for a data set, it will account for the effective dates of all of the individual data elements.

1.19 Digital data error detection techniques

1.19.1 Detailed specifications concerning digital data error detection techniques are contained in AC175-10.

1.20 Development of databases and exchange

1.20.1 Guidance material on the development of databases and the establishment of data exchange services is contained in Aeronautical Information Services Manual (ICAO Doc 8126).

1.21 Unexpected system behaviors

1.21.1 Risks of altering the integrity of data and information may be introduced by automated processes in cases of unexpected systems behaviours.

1.22 Systematic cycling codes

1.22.1 The technical means used for data error detection should be based on the use of systematic cycling codes.

1.23 Guidance of processing

1.23.1 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.

1.24 Cyclic redundancy check

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

1.25 Metadata specifications

1.24.2 ISO Standard 19115 specifies requirements for geographic information metadata.