INTERNATIONAL CIVIL AVIATION ORGANIZATION

WESTERN AND CENTRAL AFRICAN OFFICE

REPORT ON

AFI AIS/MAP SIP SEMINAR/WORKSHOP

ON QUALITY SYSTEMS AND AUTOMATION

(Dakar, 11 – 13 October 2005)

(This report has no official status and is not subject to any formal action by ICAO)

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History of the Seminar

i-1. **Introduction**

i-1.1 The AFI AIS/MAP SIP Seminar/workshop on Quality Systems and Automation, organized under the aegis of ICAO was convened in the ASECNA Conference room, ASECNA Headquarters, 32-38 Avenue Jean Jaures, Dakar, Senegal.

i-1.2 The Seminar/Workshop was officially opened by Mr. H. Cissé, A/ICAO Regional Director, WACAF Office.

i-1.3 The main objectives of the Seminar/workshop were to :

- increase the level of awareness by AIS/MAP service providers regarding the need for, and application of the SARPs contained in Annex 15 and Annex 4;
- accelerate the implementation of quality systems supporting AIS/MAP across the region;
- provide a forum for open discussions relating to AIS matters of mutual interest between service providers and users;
- provide a forum for AIS/MAP users to articulate their specific needs and requirements, and
- provide a forum where technological advancements and enhancements in the field of AIS/MAP can be displayed and demonstrated.

i-2 **Attendance**

i-2.1 The Seminar was attended by 60 participants from 20 Contracting States and 4 International Aviation Agencies, ASECNA, Eurocontrol, Jeppesen and the Roberts FIR Secretariat.

i-2.2 The list of participants is at Appendix A.

i-3 **Officers, Organization and conduct of the Seminar/Workshop**

i-3.1 To encourage free discussions and an open exchange of opinions, the seminar/ workshop was conducted informally and without an appointed chairman.

i-3.2 Mr. G. Baldeh, Regional Officer, AIS/MAP of the ICAO Regional Office, Dakar, served as Secretary of the Seminar/Workshop. The Seminar/Workshop was moderated by Mr. A. Pavlovic, Chief AIS/MAP, ICAO HQ, Montreal and was assisted by Mrs. Deslandes Marie-France, ATM expert of Euro-Control and Mr. Werner Kurz, Jeppesen Director of International Aviation Affairs in Germany.

i-3.3 Mrs. M-F Deslandes, Aeronautical Information Management (AIM) expert Eurocontrol made a presentation in response to the AIS/MAP Workshop/Seminar objective to “provide briefings relating to International directions and advances being made in the field of AIS/MAP”. The presentation was supported by an information paper and provided an overview of Eurocontrol activities towards the implementation of AIM with a particular emphasis on those activities relating to the Workshop/Seminar Agenda Items 3.“ Measures to improve AIS/MAP Services”, 4. “AIS Automation and Planning for an integrated Regional AIS System”, 5. “Quality Management System for AIS/MAP Services”, and 6. “AIS role with the Global ATM.

i.3.4 In his welcoming address at the opening of the Seminar/Workshop, Mr. Cissé expressed his satisfaction with the participation in the Seminar/Workshop (and referred to the objectives of the aeronautical information service which is to ensure the flow of information necessary for the safety, regularity and efficiency of international air navigation). He stated that in spite of the economic hardships affecting most States in the region, such participation highlighted the importance attached by Contracting States on the subject to be discussed and urged the participants to ensure that appropriate follow-up action is taken by their respective authorities to implement the findings of the Seminar/Workshop. Mr. Cissé highlighted that the role and importance of aeronautical information/data changed significantly with the implementation of area navigation (RNAV), required navigation performance (RNP) and airborne computer-based navigation systems.

i-3.5 The main reference documents for the Seminar/Workshop were:

Annex 15 – (noting Amendments 30, 31, 32 and 33 to Annex 15 – Aeronautical Information Services included new provisions in the areas of quality management of AIS and automated aeronautical information systems and require that Contracting States take all the necessary measures to introduce one properly organized quality system).

Annex 4 - (noting the new provisions in amendments 50, 51, 52 and 53 to Annex 4 (Aeronautical charts) with emphasis on aeronautical data quality requirements related to the charting resolution and integrity).

Aeronautical i*nformation Service manual (Doc. 8126)*
AFI ANP (Doc. 7474 – Volume 1)
AFI FASID (Doc.7474 – Volume 2)

i.3.6 Series of Discussion papers and Information papers were presented in the form of a video projection.

i-3.7 **Working languages**

i-3.7.1 English and French were the working languages of the Seminar/Workshop. Translation and simultaneous interpretation services were provided by two freelance interpreters.

i-4 **History of the Seminar/Workshop**
i-4.1 **Agenda**

The Seminar/Workshop adopted at its opening session the following agenda.

Item 1: Status of implementation of ICAO provisions ;
Item 2: User requirements for aeronautical information;
Item 3: Measures to improve AIS/MAP services;
Item 4: AIS Automation and planning for an Integrated Regional AIS System.
Item 5: Quality management System for AIS/MAP Services;
Item 6: AIS role within the Global ATM ;
Item 7: The Findings of the Seminar/Workshop.

Report on Agenda Item 1

Agenda Item 1 : Status of Implementation of ICAO Provisions

1.1 The first working session of the Seminar/Workshop started on 11 October 2005 following the opening statement by Mr. H. Cissé, the then Acting ICAO Regional Director for the Western and Central African office who emphasized on the objectives of the aeronautical information services which is to ensure the flow of information necessary for the safety regularity and efficiency of international air navigation.

1.2 Under Agenda Item 1 a), the RO AIS/MAP, Secretary and Coordinator of the Seminar/Workshop, presented a paper on the status of implementation of ICAO Provisions in the AIS/MAP field and the new approach to AIS Automation in the AFI Region with a view to ensuring progressive implementation of automated AIS systems for States which have not yet introduced automation within their Aeronautical Information Services.

1.3 The Seminar/Workshop reviewed the status of implementation of ICAO provisions concerning the integrated Aeronautical Information package, Aeronautical Information Regulation and Control (AIRAC), Pre-flight and Post-flight information, Aeronautical Charts, Notification of differences from ICAO, Annexes 4 and 15, SARPS and the AFI FASID AIS Tables.

1.4 The Seminar/Workshop noted that the ability to view AIP components electronically is becoming increasingly available, especially as the use of the Internet increases. This avoids the necessity to maintain and distribute paper copies. It also allows the user to perform electronic searches for the information of particular interest.

1.5 The Seminar/Workshop noted the current provisions of Annex 4 (tenth edition) which include specifications for six mandatory charts which are:

a) Aerodrome Obstacle Chart – ICAO Type A ;
b) Precision Approach Terrain Chart – ICAO for Categories II and III;
c) En-route Chart – ICAO ;
d) Instrument Approach Chart – ICAO
e) Aerodrome Chart – ICAO ;
f) World Aeronautical Chart – ICAO 1:1000,000.

1.6 Considering the need expressed by most aircraft operators and AIS users, the Seminar/Workshop noted that there is a top priority requirement for the updating of the Instrument Approach Charts, Aerodrome Obstacle Charts, Aerodrome Chart and Precision Approach Terrain Chart (for runways Categories II and III).

Report on Agenda Item 2

Agenda Item 2 : User Requirements for Aeronautical Information

2.1 Under this agenda item, the Seminar/Workshop reviewed the user requirements for aeronautical information as presented by charts/documents/navigation databases producing agencies represented by Jeppesen.

2.2 The Seminar/Workshop was informed that the objectives of AIS was stipulated in Annex 15, Chapter 1 which states : "Introduction : Ensure the flow of Aeronautical Information necessary for the safety, regularity and efficiency of international civil aviation" ; and Annex 15 standard 3.1.1.2 which states: "Each Contracting State shall take all necessary measures to ensure that Aeronautical information it provides is adequate, of required quality and timely.

2.3 The Seminar/Workshop was further informed that over many decades, navigation technology and operational requirements did not change much from 1933 – 1962 – 1982. For decades, operational requirements and the provision of Aeronautical Information by State AIS offices was going hand in hand and did not create problems due to the following reasons:

- Navigation was based on conventional navaids on the ground ;
- Relative accuracy was sufficient for pilots;
- The primary medium for aeronautical information in the cockpit was charts.
- Aeronautical Information published by AIS offices meet the charting requirements ;
- The amount of Aeronautical Information and the number of changes was large but still manageable with manual processes ;
- impact of late information was less significant;
- Data quality and integrity could be achieved with manual processes along the entire data chain ;
- Data resolution was of lesser importance.

2.4 However, the Seminar/Workshop noted that the aviation world has changed with the first Flight Management System (FMS) on-board of aircraft and for FMS operations, navigation databases became very important. It was noted that presently, almost all worldwide procedures are available in databases and charts are no longer the only tool for navigation. Since pilots rely on-board navigation databases, information has been expanding rapidly and the impact of late information is very high if aircraft operation depends on FMS and on-board navigation databases.

2.5 The Seminar/Workshop was briefed that satellite based RNAV procedures will gradually replace conventional procedures and that relative accuracy would no longer be sufficient due to the following requirement for performance based operation :

- Future aircraft operation and navigation will be based on defining performance requirements in the form of RNP values;
- ICAO has endorsed the concept of Required Navigation Performance (RNP) which is a statement of the aircraft navigation performance defined in terms of accuracy, integrity, availability and continuity of service necessary for operation within a defined airspace ;

- Efforts of all States must be aimed at providing positioning and navigation data at the required performance level to support the various applications in the ATM requirement.

2.6 The Seminar/Workshop noted the goal of seamless information for AIS from gate to gate for all operational needs. It was also noted that the future has already started with a cockpit technology which is beginning to change from self-contained instruments to software and data-driven integrated graphical situational awareness. The Seminar/Workshop noted the following :

- That paper charts are being replaced by Electronic Flight Bags ;
- That Electronic Flight Bags (EFB) are database driven and is much more than an electronic chart viewer;
- That Aeronautical Databases are already used for terrain, obstacles and Airport Mapping ;
- That new applications define new data requirements.

2.7 The Seminar/Workshop was briefed on the following term of Accuracy, Resolution and Integrity :

a) Accuracy - How close to reality;
b) Resolution – The amount of decimal places
c) Integrity – how good is the data
   - Routine 10 - 3
   - Essential 10 – 5
   - Critical 10 – 8
   - Casual Data (Integrity not important for new).

2.8 Furthermore, Accuracy could be defined as the degree of conformance between the estimated or measured value and the true value. It was also emphasized that Aeronautical Data needs to be published according to the required resolution defined in Annex 15, Appendix 7 on (Attachment to this Report) ICAO Annex 15 also defines the required integrity levels in this Appendix.

2.9 The Seminar/Workshop was informed that Commercial Data Provided must perform quality checks e.g. bearing distance checks for outbound courses; inbound courses, route distance, origin fix latitude and longitude; destination fix latitude and longitude ; en-route identifier; sequence number, navaid or waypoint identifier; boundary code; magnetic variation and station declination. It was also noted that the requirements for the data providers are as follows :

– That all found errors must be reported back to originator.
– If source does not respond, provider can make connections (But – provider now considered originator).
– Responsible authority normally responds but close cooperation and coordination between Air Navigation Service Provider and Commercial Data Provider is essential and needs to be Improved.
– Air navigation service providers must understand they do not respond (or do not respond in time).

2.10 Finally the seminar/workshop noted that ICAO Doc. 8126 para. 2.6.7 specified that there must be an interval of 42 days between the distribution date and the effective date. This allows for a period of up to 14 days distribution time, by the most expeditious means in order for recipients to receive the information at least 28 days in advance of the effective date. In cases where major changes are planned and more advance notice is desirable and practicable, a distribution date of 56 days (or even longer) in advance of the effective date should be used.

Report on Agenda Item 3

Agenda Items 3 Measures to improve AIS/MAP Services

3.1 Under this agenda, the AIS/MAP Seminar was apprised with the sources of the amendment 32 to Annex 15 which arises from the following different sources:

- Conclusion 40/51 of the EANPG/40
- Conclusion 13/51 of the APIRG./13
- Air Navigation Commission.

3.1.1 The Seminar also dealt with the issue of erroneous NOTAM, NOTAM cancellation/subject, check list of valid NOTAM and instructions for the completion of the NOTAM format.

3.2 The Seminar/Workshop was also briefed on matters pertaining to the following scope:
The common reference systems for air navigation which consist of:

a) horizontal reference systems
b) vertical reference systems
c) temporal reference systems.

3.2.1 The horizontal referencing system consist of the following:

a) World geodetic system 1984(WGS-84) to be used as a horizontal reference system
b) WGS-84 updated to include the temporal aspect (tectonic plate motion required for some precise geodetic applications
c) WGS-84(G1150) reference frame which includes plate motion model (considered to be identical to ITRF2000).

3.2.2 The vertical reference system consists of the following:

- Mean Sea Level (MSL) Datum giving the gravity related heights (elevations) to be used as vertical reference system.
- Earth gravitational model-1996 (EGM-96) to be used as the global gravity model.
- Where EGM-96 is inadequate, regional, national or local geod. models to be developed and used.

3.2.3 The temporal reference system consists of the following:

- Gregorian Calendar and coordinated universal time (UTC) to be used as temporal reference system for air navigation.
- ISO 8601 standard prescribes use of the Gregorian Calendar and 24 hour to local or UTC for information interchange.
- ISO 19108 standard prescribes the Gregorian Calendar and UTC for use with geographic information.

3.3 Participants were also briefed by Eurocontol's presentation that air traffic management is increasingly being information driven, which requires access to sufficient, digital , global on-line, real-time, accurate and quality managed aeronautical information. The introduction of structured digital rather than paper media, the automation of AIS/MAP Services and implementation of quality systems in AIS/MAP constitute essential stepping stones towards implementation of aeronautical information management.

3.4 The Seminar/Workshop was also informed that Eurocontrol is actively involved in many initiatives and projects for the implementation of aeronautical information management (AIM) . eg. AIM Strategy, for the years 2000+. AIS AHEAD Programme, European AIS Database (EAD) that implements operationally the Aeronautical Information Exchange Model (AIXM), Controlled Harmonized Aerodrome Information network (CHAIN) and the AIS Agora which is a forum to improve stakeholders (data originators, AIS, aircraft operators, air traffic control and other airspace users) with the ultimate goal of improving the quality of aeronautical information. It was highlighted that participation in the Forum is free of charge on the website.. www.eurocontrol.int/aisagora whilst access is only restricted to registered members. African States AIS Services/Personnel are encouraged to become registered members, hence numerous queries relate to information concerning African States. Moreover, in the interest of global harmonisation, most AIM initiatives and projects deliverables are accessible and downlodable freely from the AIM website www.eurocontrol.int/aim. Eurocontrol's presentation was highly appreciated and is presented as an attachment to this report.

3.5 The Seminar/Workshop was finally briefed on elements in the electronic terrain and obstacle data within the new Chapter 10 and Appendix 8 in Annex 15.

3.5.1 The function of electronic terrain and obstacle data used in combination with aeronautical data, as approximate, shall satisfy user requirements necessary to support the following air navigation applications:

- GPWS and MSAW
- Contingency procedures
- ACFT OPS limitations
- Procedures design
- En-route drift-down
- A-SMGCS
- Chart production
- on board data bases
- Flight simulators
- Synthetic vision
- AD obstacles
- removal/restriction

3.5.2 Electronic terrain and obstacle data shall be collected within the following Data collection Areas:

- Area 1: entire territory of a State
- Area 2: terminal control area (TMA)
- Area 3: aerodrome/heliport
- Area 4: CATII/III operation.

See: *Appendices to this report for data collection areas in the above-mentioned collection areas.*

3.5.3 Under this Agenda, the Seminar/Workshop was briefed on content and structure of terrain database:

- the obstacle data base which consists of digital sets of obstacle data features with vertical significance to adjacent and surrounding features considered hazardous to air navigation;

- the obstacle data which consist of digital representation of vertical and horizontal extent of man-made objects.

3.5.4 Participants were briefed on the Data Product Specifications (DPS) consisting of:

- a comprehensive statement of available terrain and obstacle data sets provided in the form of terrain and obstacle data product specifications (ISO19131);
- DPS evaluated by users to find if product fulfils requirements for its intended use (application).

3.5.5 Finally participants in the Seminar/Workshop were informed that States shall ensure that electronic terrain and obstacle data related to their entire territory are made available in the manner specified in Standard 10.2, 10.3 and 10.4 of Annex 15 (Twelfth Edition) for use by International Civil Aviation.

Thereby, States shall make available :

a) As of 20 November 2008:
terrain and obstacle data according to Area l and, terrain data according to Area 4 specifications.

b) As of 18 November 2010:
terrain and obstacle data according to Areas 2 and 3 specifications.

3.5.6 Participants were also briefed on the sources of Amendment 52 to Annex 4 (Aeronautical Charts), which consists of Recommendations from the visual aids panel VAP/13, the obstacle Clearance Panel (OCP), the joint ICAO and industry controlled flight units terrain (CFIT) Task Force.

3.5.7 Finally the Seminar/Workshop was also briefed on amendment 53 to Annex 4 consisting of new provision emanating from the Twelfth and Thirteenth Meetings of the obstacle clearance panel, the air navigation commission and the Secretariat as per Attachment to this report.

Report on Agenda Item-4

Agenda Item 4: AIS Automation and Planning for an integrated Regional AIS System

4.1 Under this Agenda Item the Seminar/Workshop was briefed by the Regional Officer AIS-MAP Dakar, that a number of AFI States have commenced developing automation of their national AIS and have now reached different levels covering all stages of progress. It was noted that some AFI States are retaining manual services and the implementation of an integrated system must therefore take place in a progressive manner with close liaison between national AIS Centres being cognizant of different starting points and differing requirements.

4.2 The Seminar/Workshop was also briefed on the computerized aeronautical information services (CAIS) system developed by the East Tennessee State University and ICAO.

4.2.1 The CAIS System is result of research done by the East Tennessee State University (ETSU) and ICAO between 2001 and 2002.The research focused on the suitability of existing technologies for making digital aeronautical information globally available.

4.2.2 The projected goals of the CAIS System are described as follows:

- up to date aeronautical information available to any user, anytime, anywhere (3A's);
- Data quality must be ensured;
- the system must be robust and recoverable;
- the system needs to preserve State's autonomy;
- the system cost for the States should be low;
- the system should be as compatible with the existing paper based system as necessary.

4.2.3 The advantages to the approach of the CAIS System are described as follows:

- State autonomy is maintained;
- Based on the concept of data interchange;
- network traffic is minimized;
- the system is expandable;
- the system is modular.

4.3 State Automation Planning processes should be based on the following .

- the principal objective of developing an automated AIS System is to improve, through automation, the overall speed efficiency accuracy and cost effectiveness of the AIS.
- in order to make the system efficient and cost effective, States should:
  - select a simple, flexible and efficient system for electronic storage and retrieval of information;
  - develop methods of providing adequate selectivity of information in accordance with user requirements.

4.3.1 The system should be designed to:

- avoid in compatibilities, divergences and unnecessary duplication of efforts;
- ensure standardized procedures, products and services to end users.

4.3.2 System compatibility:

- some States have already automated their AIS, others are in the process of doing so or in the planning stage.
- to ensure compatibility it is highly desirable that all AIS Systems be automated along the same or similar lines.

4.3.3 Basic principles:

- States should initially automate NOTAM Services within their own AIS, taking into account users requirements.
- National automated AIS System centres should be able to closely cooperate with other AIS in adopting the various elements that will make up an integrated automated AIS System.
- Certain National automated AIS Systems may cooperate with other non-automated AIS Systems to carry out agreed functions within the agreed area.
- Optimum use should be made of available communications and public networks as well as new communication technology for the distribution, exchange and retrieval of aeronautical information.
- ICAO NOTAM Format, containing the necessary quantities to facilitate the sorting and retrieval of NOTAM information in accordance with user requirements, must be exclusively used.
- A system interrogation capability which accommodates different categories of users should be accounted.
- Common, user-friendly, query procedures for the interrogation of NOTAM databases must be used.
- These procedures should be in accordance with user requirements.

4.4 The user requirements were listed as follows:

- availability of the latest PIB of specific type needed (e.g. route of area):

    - provision of information on specific items for given areas required by flight planning services ATS, AIS or other users;
    - availability of NOTAM entered into the system after a specific date-time group;
    - provision of immediate notification capability for items of urgent operational significance.

4.5 Automated pre-flight briefing system should provide the following:

- provide for continuous and timely updating of the system database and monitoring of validity and quality of aeronautical information stored;
- permit access to the system by all interested flight operation personnel and other aeronautical users through a suitable means of telecommunications;
- as required, ensure provision in paper copy form of accessed aeronautical information;
- use access and interrogation procedures based on abbreviated plain language and ICAO location indicators or on a menu driven interface or other appropriate means, as agreed with users;
- provide for rapid response to user request for information.

4.6 The Types of information are listed as follows:

- NOTAM covering the area of service, area of responsibility and area of coverage;
- route type bulletin containing NOTAM relevant to aerodrome/heliport of departure, the planned route based on FIR crossed, the aerodrome heliport of destination, and alternate aerodromes/heliports;
- area type bulletin containing NOTAM relevant to FIR or State;

- aerodrome type bulletin containing NOTAM concerning any or group of aerodromes/heliports;
- immediate notification items;
- checklist of NOTAM by State, FIR and aerodrome/heliport;
- list of NOTAM for a specific period or NOTAM entered into the system after a specific date-time group.

4.7 Harmonized Access of AIS and MET Information were listed as follows:

- To satisfy the needs of the user AIS and MET, Systems should be collocated by two separate terminals, i.e. one for AIS and one for MET;
- When the provision of combined AIS and MET information in a harmonized manner is made available, users should be able to access both AIS and MET information from a common interface, based on the flight plan.

4.8 The NOTAM Code was described as follows:

- NOTAM Code contained in the PANS–ABC (Doc. 8400) is the most comprehensive description of information requiring NOTAM promulgation;
- NOTAM codes constitutes the basis for determination of NOTAM qualifiers traffic, purpose and SCOPE.

4.8.1 The NOTAM Code is used for the following:

- storage and retrieval of information;
- to determine whether a particular item is of operational significance;
- relevance of particular items for various types of flight operators;
- selection of those items of operational significance that require immediate notification.

4.9 The NOTAM selection criteria is described as follows:

- The relationship between NOTAM qualifiers and the NOTAM Code is given in the NOTAM Selection Criteria tables in Doc. 8126, Chapter 6, Appendix B.
- These tables constitute a rationalized version of the NOTAM Code.
- They also provide the English language text to be used in item E) of the NOTAM Format.

4.9.1 The integrated AIS System could be described as follows:

The integrated Systems should be based on the current AIS facilities of participating States with the following structures :

- national automated AIS Systems;
- multinational automated AIS Systems of States providing service to other States, in addition to national service;
- AIS of States that are not or not fully automated.

4.10 The national AIS System is described as follows:

4.10.1 The national system collects appropriate aeronautical information from national sources, processes the information, produces it in the form of a NOTAM, stores it in the national AIS database and makes it available:

- within the State;
- within the region, including an integrated System in accordance with bilateral or multilateral agreements;
- worldwide, in accordance with predetermined arrangements.

4.11 The multinational AIS system is described as follows:

4.11.1 In the multinational AIS System, one or more national AIS systems will in addition to national service, provide service to users in other participating states in accordance with pre-arranged agreements.

4.12 Non-automated AIS

- States not having an automated AIS Systems would have an option to be linked with a national automated AIS System, via an intelligent or non-intelligent remote terminal, resulting from bilateral agreement.

4.13 Regional Automation planning could be described as follows:

- In every regional planning, SARPs and Basic Operational requirements and planning criteria (BORPC), approved by the ANC/Council should be used;
- At the last AFI/7 RAN meeting, planning criteria for an AFI automated integrated AIS systems were developed and included in the AFI ANP;

Report on Agenda Item 5

Agenda Item 5 – Quality Management Systems for AIS/MAP Service

5.1 Under this Agenda Item, the Seminar/workshop was briefed on the role of the AIS as one of the foundation building blocks for the successful transition to a global ATM system at the core of this building block this quality system that will provide quality and timely information to the aviation community. The timelines and integrity of quality aeronautical information/data is a significant enabling activity for the globalisation of ATM. Amendment 29 to Annex 15, introduced the requirements for the implementation of a quality system within the aeronautical information services as of 1 January 1998 as follows:

> "Each contracting State shall take all necessary measures to introduce a properly organised quality system containing procedures, processes and resources necessary to implement quality management at each function stage. The execution of such a quality management shall be made demonstrable for each function stage when required"(Annex 15, Chapter 3 paragraph 3.2.1 refers).

5.2 The Seminar/workshop also noted that paragraph 3.2.2 of Annex 15 recommends also that the quality system established should be in conformity with the International Organization for Standardization (ISO)9001 series of quality assurance standards, and certified by an approved organisation. These international standards specify the requirements for a quality management system where an organization needs:

- to demonstrate its ability to consequently provide products that need customer and applicable regulatory requirements, and
- to address customer satisfaction through the effective application of the systems, including processes for continual improvement and the prevention on non-conformity.

5.3 Quality System and AIS Personnel were listed as follows.

- Skills and knowledge required for each function shall be identified and AIS personnel assigned to perform those functions shall be appropriately trained.
- States shall ensure that AIS personnel possess the skills and competencies required to perform specific assigned functions.

5.4 AIS/MAP Training requirements were listed as follows.

- States must place emphasis on the human component in their quality management programs for AIS/MAP;
- provision of an ICAO training programme by establishing uniform standards for the qualifications and scope of knowledge which must be met by AIS/MAP technical officers worldwide.

5.4.1 The objectives concerning skills and competency management must include:

- identification of the functions to be performed;
- establishment of the knowledge and skills required for each step of the processes;
- assurance that the personnel assigned to those functions have the required knowledge and skills;

- proved competencies to perform those functions.

5.4.2 The Seminar/Workshop was informed that the AIS-MAP training manual has been prepared by the Personnel Licensing and Training (PEL/TRG) section of ICAO with support and input from the Aeronautical Information and Charts (AIS/MAP) Section.

- The second edition of Doc.7192 Part E3 has been developed taking into account the changed conditions and requirements for AIS.
- This document contains training syllabus for AIS/MAP officer consisting of the following:

- Phase I – Common core knowledge

- Aviation specific knowledge requirements; and
- AIS/MAP specific knowledge requirement

- Phase II – AIS/MAP specialisation

- knowledge, skills and performance requirements
- AIS/MAP Aerodrome unit/ARO
- International NOTAM office (NOF)
- AIS/MAP Data base
- AIS/MAP Documentation/Editing/text processing
- Aeronautical Cartography

5.4.3 Issues concerning AIS training were listed as follows.

- An AIS/MAP Officer must complete Phase I and at least one Phase II specialist training course before being assigned to work on the specific position.

5.4.4 Issues concerning AIS Licensing were listed as follows.

- Following completion of AIS Training manual, work on AIS personnel licensing will commence by PEL/TRG ;
- Consideration will be given to propose an amendment to Annex 1 suggesting establishment of licences for specific AIS functions ;
- It will be the ANC's decision to accept or reject the proposal.

Report on Agenda Item 6

Agenda Item 6 – AIS role within the Global ATM

6.1 Under this Agenda Item, the Seminar/workshop was briefed that in the future air traffic management (ATM) system, as described in the operational concept, the aeronautical information service (AIS) plays a critical supporting service role.

6.2 It was also noted that to ensure the cohesion and linkages between different components of the operational concept and accomplish the role of AIS, consideration must be given by AIS to the interchange and management of aeronautical information to be used by different services and users, while taking into account interoperability of existing and future systems.

6.3 It was further noted that to achieve the future ATM objective of making informed collaborative decisions for the most efficient operations and business practices, aeronautical information necessary for the safety, regularity and efficiency of international air navigation must be shared on a system wide basis, must be pertinent and must be available for access by any ATM participant when and where required. To accomplish this, the Secretariat has envisioned a computerized aeronautical information services (CAIS) system concept that:

a) in a three-tier architecture system concept consisting of a database, servers and clients;
b) is a publisher subscriber type system;
c) will maintain AIP information of all States in an electronic format, referred to as an aeronautical data package (ADP); and
d) will promulgate changes to ADP to States and other subscribers in an electronic format (see Appendix).

Findings

1. The Seminar/Workshop encourages all AFI States to endeavour to make every effort for their AIP to be available electronically for briefing purposes at the established aerodrome units.

2. Aeronautical Information Service dependencies.

a) AIS has become a crucial and critical enabler for the implementation of future ATM Systems. The global requirement for precise navigation capability will require high quality (accuracy) resolution and integrity) aeronautical database.

b) For the safe performance of operations, the conducted data has to be published in WGS-84. For future developments, it is essential that electronic storage, provision, update and interrogation of aeronautical databases and charts (including terrain and obstacle information) are implemented.

3. The role and importance of AIS has changed with the implementation of FMS, RNAV, RNP and airborne computer based navigation systems with the following factors:

a) Existing and evolving navigation system required are dependent upon the quality of aeronautical information
b) AIS is one of the foundation blocks for the successful transition to a global ATM System.
c) The timeliness and integrity of quality aeronautical information is a significant enabling activity for the globalization of ATM.
d) Corrupt/erroneous aeronautical information can potentially affect safety.

4. The current status of AIS in the AFI Region has been listed as follows:

a) integrity of aeronautical information is considerably below ICAO requirements;
b) dissemination of aeronautical information is often not timely (this varies significantly from State to State);
c) data accuracy does not always fulfil the requirements for performance based navigation;
d) the same is true for data resolution;
e) works in many AIS Offices is still base on manual processes;
f) quality management systems have not yet been implemented in many States.

5. Integrity of Navigation data base is an important requirement for RNAV operations in accordance with the following factors:

a) need for regulatory requirements for data suppliers to implement quality procedures for data integrity are tremendously high;
b) high data integrity needs to be achieved everywhere in the data base.

6. That RNAV operations depends on WG5-84 coordinates for consistent navigation and if a State is not WG5-84 compliant, it is not consistent with the rest of the world. It should also be noted that GNSS operation is completely based on WGS-84 implementation.

7. Two types of coordinate problems should be noted:

a) coordinate errors place the aircraft in wrong position;
b) in different coordinate system, the aircraft will also miss-align with fixes.

8. The mismatch of coordinate datums have been noted as follows:

a) in the same coordinate system, everything lines up.
b) in different coordinate systems, the approach doesn't aim at runway threshold

9. That the best data in respect of accuracy resolution and integrity does not help if it comes too late.

10. That to cope with the future needs, the entire data chain must be supported by automated processes and rigid quality management systems.

11. For efficient operation of the AIRAC system, AIS services should maintain an effort to liaise with decision planners etc.

a) the immediate changes are the NOTAM-System etc.
b) AIRAC System should be scheduled to the NOTAM System and the rest.

12. That AIS information providers should note that "how and when" the information provided to the users is very important to be noted.

13. The Seminar/Workshop noted, the AIRAC publication system is the best system currently available to the aeronautical community and encourages AIS personnel to work with this system.

14. The Seminar/Workshop noted that within the proposed CAIS System, the ACCB (AIXM Change Control Board) should be controlled by ICAO (being the UN Specialized Aviation Agency) when the AIXM model is chosen for global implementation.

15. The Seminar/Workshop noted that States are eagerly awaiting an ICAO endorsed exchange model of data.

- That very soon the terrain data numbering requirement will move from structural awareness to navigation awareness.

16. Classification of geodetic data:

- that when surveying FIR boundaries States should use the same available data with an effective coordination with all concerned States as recommended by ICAO.
- that States verify in order to harmonized their published data and taking into consideration Annex 15 requirements and the criteria for resolution integrity.
- that data collection should not come from AIS hence they are responsible for data manipulation.

18 The Seminar/Workshop noted that the major challenge of the AFI Region is in the automation of AIS and the eventual development of an integrated AFI Region AIS Automation System.

19 The Seminar/Workshop also noted that ways and means have to be examined to enhance the level of automation within the AFI States aeronautical information services, in order to overcome the deficiencies related to aeronautical information data still processed manually and to guarantee all required quality, availability timeliness of aeronautical information in all context of the global ATM Operational Concept.

20. Regulatory quality system have been described as follows:

- That States maintain a regulatory quality System management for the timely provision of required information/data to the aeronautical information services by each of the States Services associated with aircraft operations.

21 That in accordance with Annex 15 provisions, AFI States, not having done so, are required to take the necessary measures to implement a quality management system within their Aeronautical Information Services in conformity with the ISO 9001 series of standards.

22. ICAO five letter name Cody system:

- That the ICAO Global five letter name Code System data base would be developed and coordinated firstly with the Regional Offices and then with States.

ORGANISATION DE L'AVIATION CIVILE INTERNATIONALE
BUREAU AFRIQUE OCCIDENTALE ET CENTRALE

Appendix-A

AIS/MAP SIP SEMINAR/WORKSHOP ON QUALITY SYSTEMS AND AUTOMATION
SEMINAIRE/ATELIER AIS/MAP SUR LE SYSTEME QUALITE
ET L'AUTOMATISATION DES SERVICES D'INFORMATION AERONAUTIQUE (AIS)
(Dakar, 11 – 13 octobre 2005)

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APPENDIX 8. INFORMATION TO BE NOTIFIED BY AIRAC

(see Chapter 6, 6.1.1)

PART 1

1. The establishment, withdrawal of, and premeditated significant changes (including operational trials) to:

1.1 Limits (horizontal and vertical), regulations and procedures applicable to:

a) flight information regions;

b) control areas;

c) control zones;

d) advisory areas;

e) ATS routes;

f) permanent danger, prohibited and restricted areas (including type and periods of activity when known) and ADIZ;

g) permanent areas or routes or portions thereof where the possibility of interception exists.

1.2 Positions, frequencies, call signs, known irregularities and maintenance periods of radio navigation aids and communication facilities.

1.3 Holding and approach procedures, arrival and departure procedures, noise abatement procedures and any other pertinent ATS procedures.

1.4 Meteorological facilities (including broadcasts) and procedures.

1.5 Runways and stopways.

PART 2

2. The establishment and withdrawal of, and premeditated significant changes to:

2.1 Position, height and lighting of navigational obstacles.

2.2 Taxiways and aprons.

2.3 Hours of service: aerodromes, facilities and services.

2.4 Customs, immigration and health services.

2.5 Temporary danger, prohibited and restricted areas and navigational hazards, military exercises and mass movements of aircraft.

2.6 Temporary areas or routes or portions thereof where the possibility of interception exists.

APPENDIX C. PREDETERMINED DISTRIBUTION SYSTEM FOR NOTAM

(see Chapter 5, 5.3.4.2 and Annex 10, Volume II, Chapter 4, 4.4.14)

1. The predetermined distribution system provides for incoming NOTAM (including SNOWTAM and ASHTAM) to be channelled through the AFTN direct to designated addressees predetermined by the receiving country concerned while concurrently being routed to the international NOTAM office for checking and control purposes.

2. The addressee indicators for those designated addressees are constituted as follows:

1) *First and second letters:*

The first two letters of the location indicator for the AFTN communication centre associated with the relevant international NOTAM office of the receiving country.

2) *Third and fourth letters:*

The letters "ZZ" indicating a requirement for special distribution.

3) *Fifth letter:*

The fifth letter differentiating between NOTAM (letter "N"), SNOWTAM (letter "S"), and ASHTAM (letter "V").

4) *Sixth and seventh letters:*

The sixth and seventh letters, each taken from the series A to Z and denoting the national and/or international distribution list(s) to be used by the receiving AFTN centre.

Note.— The fifth, sixth and seventh letters replace the three-letter designator YNY which, in the normal distribution system, denotes an international NOTAM office.

5) *Eighth letter:*

The eighth position letter shall be the filler letter "X" to complete the eight-letter addressee indicator.

3. States are to inform the States from which they receive NOTAM of the sixth and seventh letters to be used under different circumstances to ensure proper routing.

APPENDIX D. NOTAM FORMAT

(see Chapter 5, 5.2.1)

Priority Indicator	
Address	
Date and time of filing	
Originator's Indicator	

Message Series, Number and Identifier

NOTAM containing new information	..... (series and number/year)	NOTAMN
NOTAM replacing a previous NOTAM	..... (series and number/year)	NOTAMR..... (series and number/year of NOTAM to be replaced)
NOTAM cancelling a previous NOTAM	..... (series and number/year)	NOTAMC..... (series and number/year of NOTAM to be cancelled)

Qualifiers

	FIR	NOTAM Code	Traffic	Purpose	Scope	Lower Limit	Upper Limit	Coordinates, Radius	
Q)		Q							

Identification of ICAO location indicator in which the facility, airspace or condition reported on is located	A)

Period of Validity

From *(date-time group)*	B)		
To *(PERM or date-time group)*	C)		EST* PERM*
Time Schedule *(if applicable)*	D)		

Text of NOTAM; Plain-language Entry (using ICAO Abbreviations)

E)

Lower Limit	F)
Upper Limit	G)
Signature	

*Delete as appropria

INSTRUCTIONS FOR THE COMPLETION OF THE NOTAM FORMAT

1. General

The qualifier line (Item Q) and all identifiers (Items A) to G) inclusive) each followed by a closing parenthesis, as shown in the format, shall be transmitted unless there is no entry to be made against a particular identifier.

2. NOTAM numbering

Each NOTAM shall be allocated a series identified by a letter and a four-digit number followed by a stroke and a two-digit number for the year (e.g. A0023/03).

3. Qualifiers (Item Q)

Item Q) is divided in eight fields, each separated by a stroke. If no entry is to be made in a field, it is not necessary to transmit blanks between the strokes. Examples of how fields are to be filled are shown in the *Aeronautical Information Services Manual* (Doc 8126). The definition of the field is as follows:

1) FIR

a) ICAO location indicator of affected FIR or, if applicable to more than one FIR within a State, the first two letters of the ICAO location indicator of a State plus "XX". The ICAO location indicators of the FIRs concerned shall then be listed in Item A) or indicator of State or non-governmental agency which is responsible for provision of a navigation service in more than one State.

b) If one State issues a NOTAM affecting FIRs in a group of States, the first two letters of the ICAO location indicator of the issuing State plus "XX" shall be included. The location indicators of the FIRs concerned shall then be listed in Item A) or indicator of State or non-governmental agency which is responsible for provision of a navigation service in more than one State.

2) NOTAM CODE

All NOTAM Code groups contain a total of five letters and the first letter is always the letter Q. The second and third letters identify the subject, and the fourth and fifth letters denote the status of the subject reported upon. For combinations of second and third and fourth and fifth letters, insert the ICAO NOTAM codes listed in the PANS-ABC (Doc 8400) or in the NOTAM Selection Criteria contained in the *Aeronautical Information Services Manual* (Doc 8126) or insert one of the following combinations, as appropriate:

a) If the subject is not listed in the NOTAM Code (Doc 8400) or in the NOTAM Selection Criteria (Doc 8126), insert "XX" as the second and third letters (e.g. QXXAK);

b) If the condition of the subject is not listed in the NOTAM Code (Doc 8400) or in the NOTAM Selection Criteria (Doc 8126), insert "XX" as the fourth and fifth letters (e.g. QFAXX);

c) When a NOTAM containing operationally significant information is issued in accordance with Appendix 4 and Chapter 6 and when it is used to announce existence of AIRAC AIP Amendments or Supplements, insert "TT" as the fourth and fifth letters of the NOTAM Code;

d) When a NOTAM is issued containing a checklist of valid NOTAM, insert "KKKK" as the second, third, fourth and fifth letters; and

e) The following fourth and fifth letters of the NOTAM Code shall be used in NOTAM cancellations:

AK : RESUMED NORMAL OPERATION
AL : OPERATIVE (OR RE-OPERATIVE) SUBJECT TO PREVIOUSLY PUBLISHED LIMITATIONS/CONDITIONS
AO : OPERATIONAL
CC : COMPLETED
XX : PLAIN LANGUAGE

3) TRAFFIC

I = IFR
V = VFR
K = NOTAM is a checklist

Note.— Depending on the NOTAM subject and content, the qualifier field TRAFFIC may contain combined qualifiers. For possible combinations refer to the NOTAM Selection Criteria in the Aeronautical Information Services Manual *(Doc 8126).*

4) PURPOSE

N = NOTAM selected for the immediate attention of aircraft operators
B = NOTAM selected for PIB entry
O = NOTAM concerning flight operations
M = Miscellaneous NOTAM; not subject for a briefing, but it is available on request
K = NOTAM is a checklist

Note.— Depending on the NOTAM subject and content, the qualifier field PURPOSE may contain combined qualifiers. For possible combinations refer to the NOTAM Selection Criteria in the Aeronautical Information Services Manual *(Doc 8126).*

5) SCOPE

A = Aerodrome
E = En-route
W = Nav Warning
K = NOTAM is a checklist

Note.— Depending on the NOTAM subject and content, the qualifier field SCOPE may contain combined qualifiers. For possible combinations refer to the NOTAM Selection Criteria in the Aeronautical Information Services Manual *(Doc 8126). If the subject is qualified AE, the aerodrome location indicator must be reported in Item A).*

6) and 7) LOWER/UPPER

LOWER and UPPER limits shall always be filled and shall only be expressed in flight levels (FL). In the case of navigation warnings and airspace restrictions, values entered shall be consistent with those provided under Items F) and G).

If the subject does not contain specific height information, insert "000" for LOWER and "999" for UPPER as default values.

8) COORDINATES, RADIUS

The latitude and longitude accurate to one minute, as well as a three-digit distance figure giving the radius of influence in NM (e.g. 4700N01140E043). Coordinates present approximate centre of circle whose radius encompasses the whole area of influence, and if the NOTAM affects the entire FIR/UIR or more than one FIR/UIR, enter the default value "999" for radius.

4. Item A)

Insert the location indicator as contained in ICAO Doc 7910 of the aerodrome or FIR in which the facility, airspace, or condition being reported on is located. More than one FIR/UIR may be indicated when appropriate. If there is no available ICAO location indicator, use the ICAO nationality letter as given in ICAO Doc 7910, Part 2, plus "XX" and followed up in Item E) by the name, in plain language.

If information concerns GNSS, insert the appropriate ICAO location indicator allocated for a GNSS element or the common location indicator allocated for all elements of GNSS (except GBAS).

Note.— In the case of GNSS, the location indicator may be used when identifying a GNSS element outage (e.g. KNMH for a GPS satellite outage).

5. Item B)

For date-time group use a ten-figure group, giving y month, day, hours and minutes in UTC. This entry is date-time at which the NOTAMN comes into force. In cases of NOTAMR and NOTAMC, the date-time group is actual date and time of the NOTAM origination.

6. Item C)

With the exception of NOTAMC, a date-time group ten-figure group giving year, month, day, hours and minute UTC) indicating duration of information shall be used un the information is of a permanent nature in which case abbreviation "PERM" is inserted instead. If the information timing is uncertain, the approximate duration shall be indic using a date-time group followed by the abbreviation "ES Any NOTAM which includes an "EST" shall be cancelle replaced before the date-time specified in Item C).

7. Item D)

If the hazard, status of operation or condition of facilities be reported on will be active in accordance with a specific ti and date schedule between the dates-times indicated in Items and C), insert such information under Item D). If Item exceeds 200 characters, consideration shall be given providing such information in a separate, consecutive NOTA

Note.— Guidance concerning a harmonized definition Item D) content is provided in Doc 8126.

8. Item E)

Use decoded NOTAM Code, complemented where necess by ICAO abbreviations, indicators, identifiers, designatc call signs, frequencies, figures and plain language. Wh NOTAM is selected for international distribution, English t shall be included for those parts expressed in plain langua This entry shall be clear and concise in order to provide suitable PIB entry. In the case of NOTAMC, a subject ref ence and status message shall be included to enable accur plausibility checks.

9. Items F) and G)

These items are normally applicable to navigation warnings airspace restrictions and are usually part of the PIB entry. Ins both lower and upper height limits of activities or restrictio clearly indicating reference datum and units of measurement

Note.— For NOTAM examples see Doc 8126 and t PANS-ABC (Doc 8400).

APPENDIX E. AERONAUTICAL DATA QUALITY REQUIREMENTS

Table A7-1. Latitude and longitude

Latitude and longitude	Publication resolution	Integrity Classification
Flight information region boundary points	1 min	1×10^{-3} routine
P, R, D area boundary points (outside CTA/CTZ boundaries)	1 min	1×10^{-3} routine
P, R, D area boundary points (inside CTA/CTZ boundaries)	1 sec	1×10^{-5} essential
CTA/CTZ boundary points	1 sec	1×10^{-5} essential
En-route NAVAIDS and fixes, holding, STAR/SID points	1 sec	1×10^{-5} essential
Obstacles in Area 1 (the entire State territory)	1 sec	1×10^{-3} routine
Aerodrome/heliport reference point	1 sec	1×10^{-3} routine
NAVAIDS located at the aerodrome/heliport	1/10 sec	1×10^{-5} essential
Obstacles in Area 3	1/10 sec	1×10^{-5} essential
Obstacles in Area 2	1/10 sec	1×10^{-5} essential
Final approach fixes/points and other essential fixes/points comprising the instrument approach procedure	1/10 sec	1×10^{-5} essential
Runway threshold	1/100 sec	1×10^{-8} critical
Runway end (flight path alignment point)	1/100 sec	1×10^{-8} critical
Runway holding position	1/100 sec	1×10^{-8} critical
Taxiway centre line/parking guidance line points	1/100 sec	1×10^{-5} essential
Taxiway intersection marking line	1/100 sec	1×10^{-5} essential
Exit guidance line	1/100 sec	1×10^{-5} essential
Aircraft stand points/INS checkpoints	1/100 sec	1×10^{-3} routine
Geometric centre of TLOF or FATO thresholds, heliports	1/100 sec	1×10^{-8} critical
Apron boundaries (polygon)	1/10 sec	1×10^{-3} routine
De-icing/anti-icing facility (polygon)	1/10 sec	1×10^{-3} routine

Note.— See Appendix 8 for graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles the defined areas.

Table A7-2. Elevation/altitude/height

Elevation/altitude/height	Publication resolution	Integrity Classification
Aerodrome/heliport elevation	1 m or 1 ft	1×10^{-5} essential
WGS-84 geoid undulation at aerodrome/heliport elevation position	1 m or 1 ft	1×10^{-5} essential
Runway or FATO threshold, non-precision approaches	1 m or 1 ft	1×10^{-5} essential
WGS-84 geoid undulation at runway or FATO threshold, TLOF geometric centre, non-precision approaches	1 m or 1 ft	1×10^{-5} essential
Runway or FATO threshold, precision approaches	0.1 m or 0.1 ft	1×10^{-8} critical
WGS-84 geoid undulation at runway or FATO threshold, TLOF geometric centre, precision approaches	0.1 m or 0.1 ft	1×10^{-8} critical
Threshold crossing height, precision approaches	0.1 m or 0.1 ft	1×10^{-8} critical
Obstacles in Area 2	1 m or 1 ft	1×10^{-5} essential
Obstacles in Area 3	0.1 m or 0.1 ft	1×10^{-5} essential
Obstacles in Area 1 (the entire State territory)	1 m or 1 ft	1×10^{-3} routine
Distance measuring equipment/precision (DME/P)	3 m (10 ft)	1×10^{-5} essential
Distance measuring equipment (DME)	30 m (100 ft)	1×10^{-5} essential
Minimum altitudes	50 m or 100 ft	1×10^{-3} routine

Note.— See Appendix 8 for graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in the defined areas.

Table A7-3. Declination and magnetic variation

Declination/variation	Publication resolution	Integrity Classification
VHF NAVAID station declination used for technical line-up	1 degree	1×10^{-5} essential
NDB NAVAID magnetic variation	1 degree	1×10^{-3} routine
Aerodrome/heliport magnetic variation	1 degree	1×10^{-5} essential
ILS localizer antenna magnetic variation	1 degree	1×10^{-5} essential
MLS azimuth antenna magnetic variation	1 degree	1×10^{-5} essential

Table A7-4. Bearing

Bearing	Publication resolution	Integrity Classification
Airway segments	1 degree	1×10^{-3} routine
En-route and terminal fix formations	1/10 degree	1×10^{-3} routine
Terminal arrival/departure route segments	1 degree	1×10^{-3} routine
Instrument approach procedure fix formations	1/100 degree	1×10^{-5} essential
ILS localizer alignment (True)	1/100 degree	1×10^{-5} essential
MLS zero azimuth alignment (True)	1/100 degree	1×10^{-5} essential
Runway and FATO bearing (True)	1/100 degree	1×10^{-3} routine

Table A7-5. Length/distance/dimension

Length/distance/dimension	Publication resolution	Integrity Classification
Airway segment length	1/10 km or 1/10 NM	1×10^{-3} routine
En-route fix formation distance	1/10 km or 1/10 NM	1×10^{-3} routine
Terminal arrival/departure route segment length	1/100 km or 1/100 NM	1×10^{-5} essential
Terminal and instrument approach procedure fix formation distance	1/100 km or 1/100 NM	1×10^{-5} essential
Runway and FATO length, TLOF dimensions	1 m or 1 ft	1×10^{-8} critical
Runway width	1 m or 1 ft	1×10^{-5} essential
Displaced threshold distance	1 m or 1 ft	1×10^{-3} routine
Clearway length and width	1 m or 1 ft	1×10^{-5} essential
Stopway length and width	1 m or 1 ft	1×10^{-8} critical
Landing distance available	1 m or 1 ft	1×10^{-8} critical
Take-off run available	1 m or 1 ft	1×10^{-8} critical
Take-off distance available	1 m or 1 ft	1×10^{-8} critical
Accelerate-stop distance available	1 m or 1 ft	1×10^{-8} critical
Runway shoulder width	1 m or 1 ft	1×10^{-5} essential
Taxiway width	1 m or 1 ft	1×10^{-5} essential
Taxiway shoulder width	1 m or 1 ft	1×10^{-5} essential
ILS localizer antenna-runway end, distance	1 m or 1 ft	1×10^{-3} routine
ILS glide slope antenna-threshold, distance along centre line	1 m or 1 ft	1×10^{-3} routine
ILS marker-threshold distance	1 m or 1 ft	1×10^{-5} essential
ILS DME antenna-threshold, distance along centre line	1 m or 1 ft	1×10^{-5} essential
MLS azimuth antenna-runway end, distance	1 m or 1 ft	1×10^{-3} routine
MLS elevation antenna-threshold, distance along centre line	1 m or 1 ft	1×10^{-3} routine
MLS DME/P antenna-threshold, distance along centre line	1 m or 1 ft	1×10^{-5} essential

APPENDIX F. TERRAIN AND OBSTACLE DATA REQUIREMENTS

(see Chapter 10)

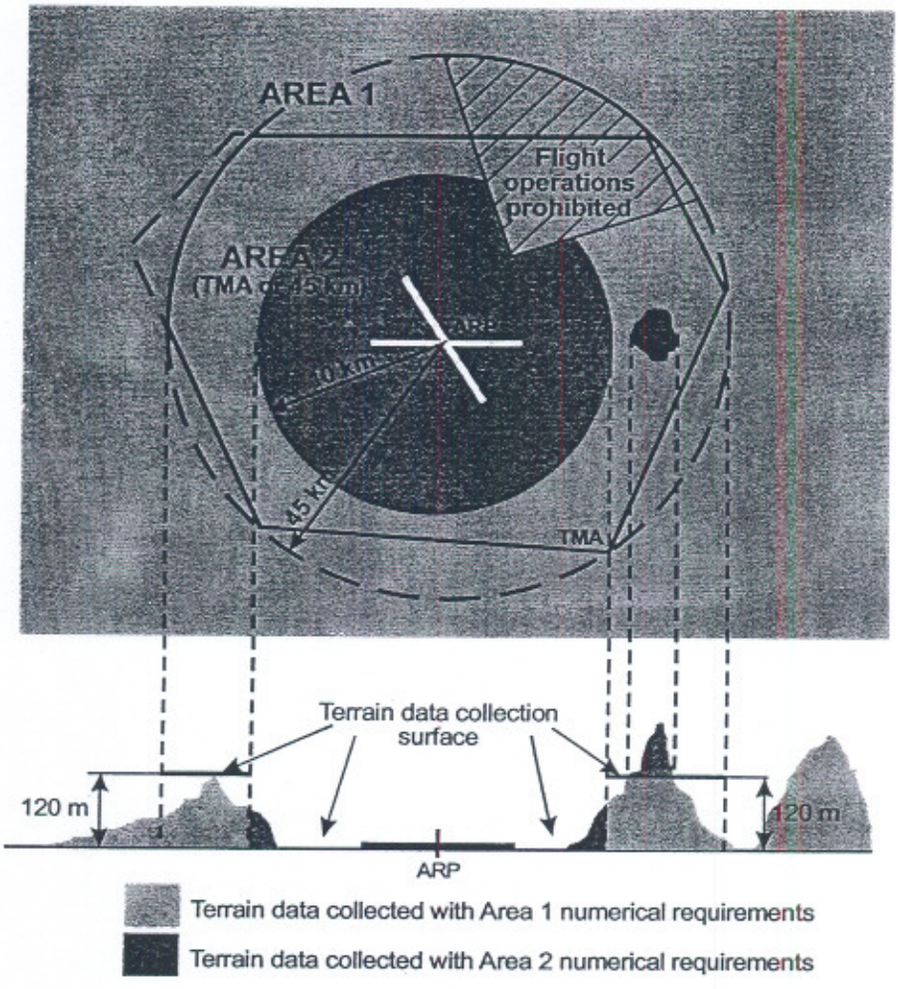

Figure A8-1. Terrain data collection surfaces — Area 1 and Area 2

1. Within the area covered by a 10-km radius from the ARP, terrain data shall be collected and recorded in accordance with the Area 2 numeric requirements.

2. In the area between 10 km and the TMA boundary or 45-km radius (whichever is smaller), data on terrain that penetrates the horizontal pla 120 m above the lowest runway elevation shall be collected and recorded in accordance with the Area 2 numerical requirements.

3. In the area between 10 km and the TMA boundary or 45-km radius (whichever is smaller), data on terrain that does not penetrate the horizon plane 120 m above the lowest runway elevation shall be collected and recorded in accordance with the Area 1 numerical requirements.

4. In those portions of Area 2 where flight operations are prohibited due to very high terrain or other local restrictions and/or regulations, terra data shall only be collected and recorded in accordance with the Area 1 numerical requirements.

Note.— Terrain data numerical requirements for Areas 1 and 2 are specified in Table A8-1.

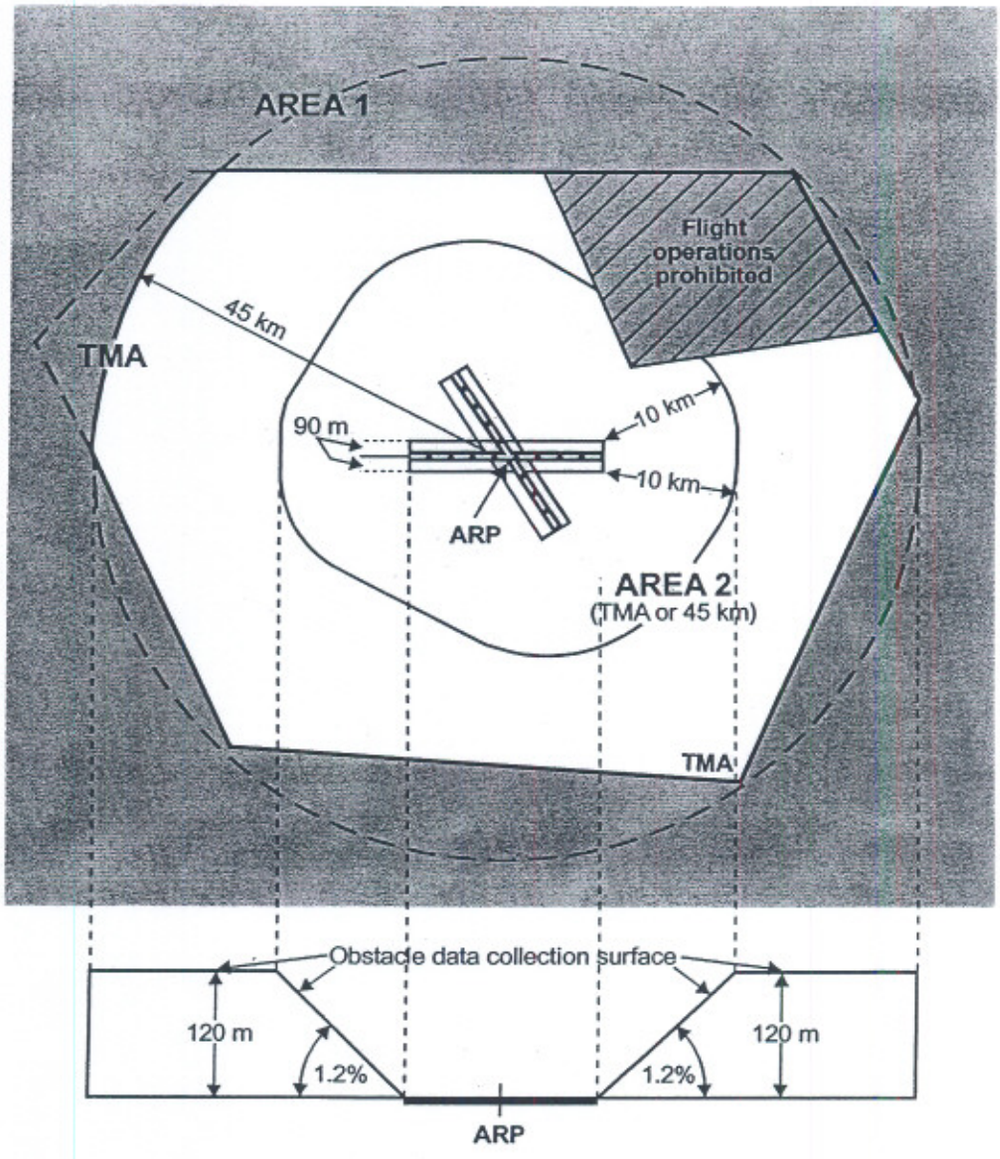

Figure A8-2. Obstacle data collection surfaces — Area 1 and Area 2

1. Obstacle data shall be collected and recorded in accordance with the Area 2 numerical requirements specified in Table A8-2:

   a) any obstacle that penetrates the conical surface whose origin is at the edges of the 180-m wide rectangular area and at the nearest runway elevation measured along the runway centre line, extending at 1.2 per cent slope until it reaches 120 m above the lowest runway elevation of all operational runways at the aerodrome (1.2 per cent slope reaches 120 m at 10 km); in the remainder of Area 2 (between 10 km and the TMA boundary or 45-km radius, whichever is smaller), the horizontal surface 120 m above the lowest runway elevation; and

   b) in those portions of Area 2 where flight operations are prohibited due to very high terrain or other local restrictions and/or regulations, obstacle data shall be collected and recorded in accordance with the Area 1 requirements.

2. Data on every obstacle within Area 1 whose height above the ground is 100 m or higher shall be collected and recorded in the database in accordance with the Area 1 numerical requirements specified in Table A8-2.

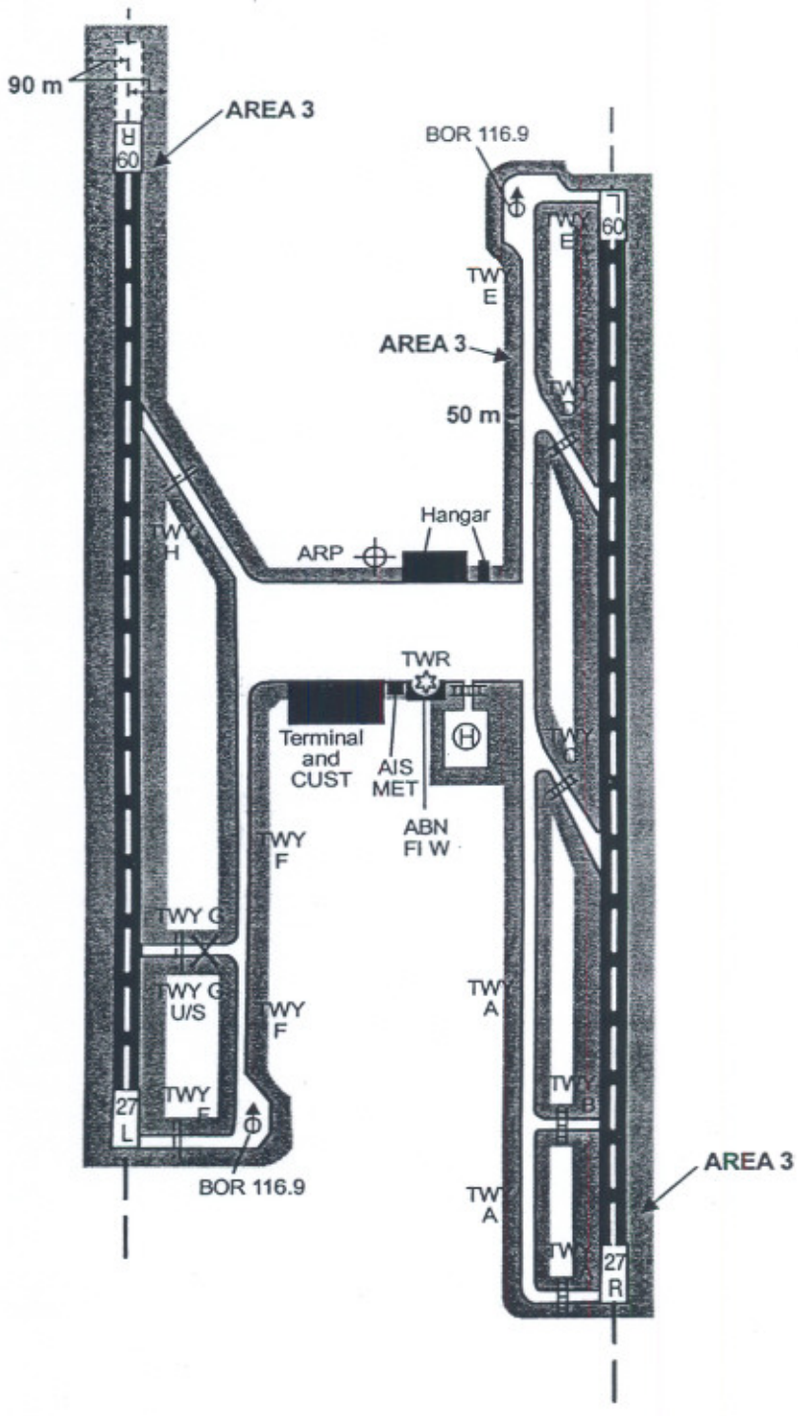

Figure A8-3. Terrain and obstacle data collection surface — Area 3

1. Data on terrain and obstacles that extend more than a half-metre (0.5 m) above the horizontal plane passing through the nearest point on aerodrome/heliport movement area shall be collected and recorded.

2. Terrain and obstacle data in Area 3 shall be collected and recorded in accordance with numerical requirements specified in Table A8-1 a Table A8-2, respectively.

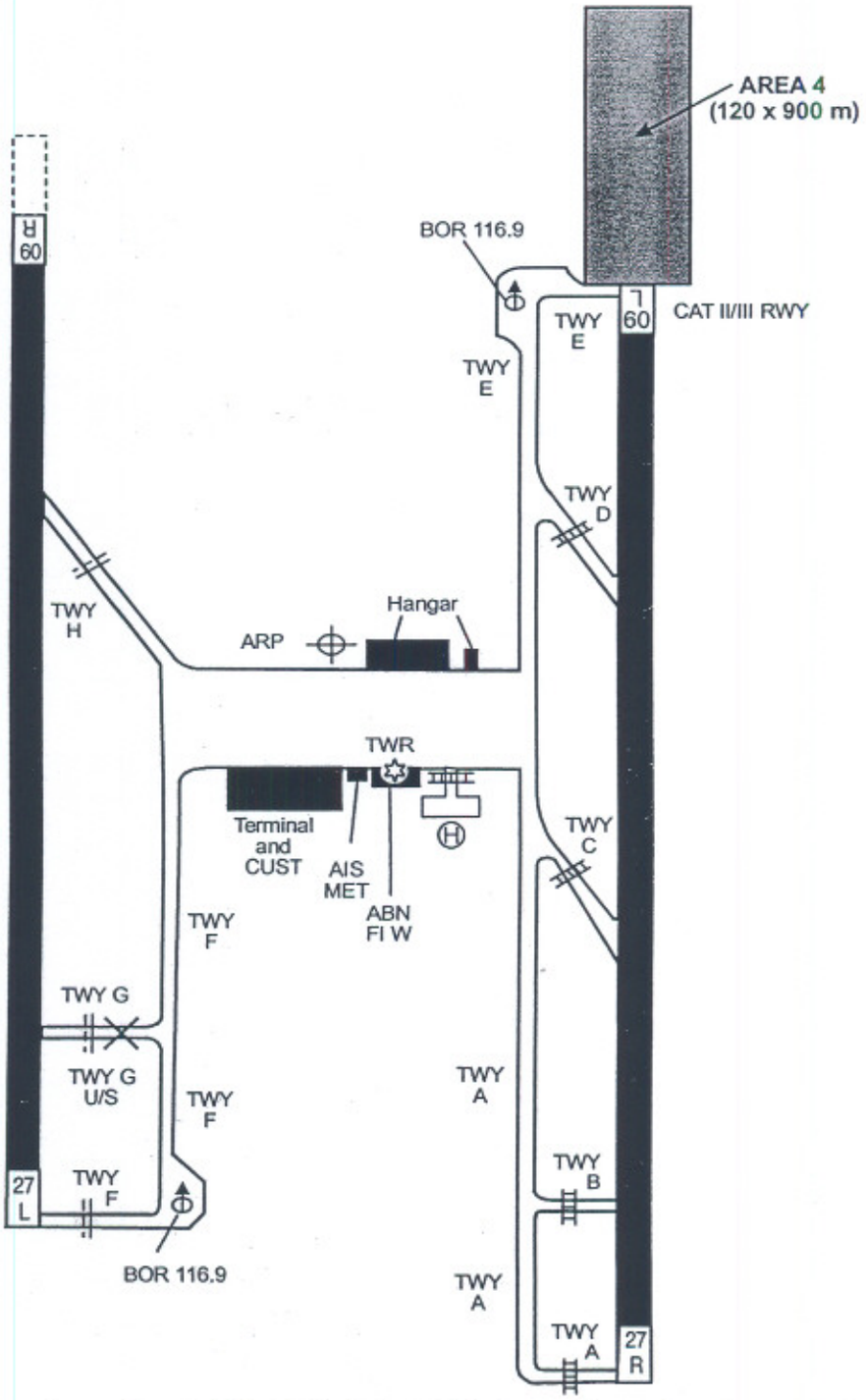

Figure A8-4. Terrain data collection surface — Area 4

Only terrain data shall be collected and recorded in Area 4 in accordance with the numerical requirements specified in Table A8-1.

Table A8-1. Terrain data numerical requirements

	Area 1	Area 2	Area 3	Area 4
Post spacing	3 arc seconds (approx. 90 m)	1 arc second (approx. 30 m)	0.6 arc seconds (approx. 20 m)	0.3 arc seconds (approx. 9 m)
Vertical accuracy	30 m	3 m	0.5 m	1 m
Vertical resolution	1 m	0.1 m	0.01 m	0.1 m
Horizontal accuracy	50 m	5 m	0.5 m	2.5 m
Confidence level (1σ)	90%	90%	90%	90%
Data classification Integrity level	routine 1×10^{-3}	essential 1×10^{-5}	essential 1×10^{-5}	essential 1×10^{-5}
Maintenance period	as required	as required	as required	as required

Table A8-2. Obstacle data numerical requirements

	Area 1	Area 2	Area 3
Vertical accuracy	30 m	3 m	0.5 m
Vertical resolution	1 m	0.1 m	0.01 m
Horizontal accuracy	50 m	5 m	0.5 m
Confidence level (1σ)	90%	90%	90%
Data classification Integrity level	routine 1×10^{-3}	essential 1×10^{-5}	essential 1×10^{-5}
Maintenance period	as required	as required	as required

Table A8-3. Terrain attributes

Terrain attribute	Mandatory/Optional
Area of coverage	Mandatory
Data originator identifier	Mandatory
Acquisition method	Mandatory
Post spacing	Mandatory
Horizontal reference system	Mandatory
Horizontal resolution	Mandatory
Horizontal accuracy	Mandatory
Horizontal confidence level	Mandatory
Horizontal position	Mandatory
Elevation	Mandatory
Elevation reference	Mandatory
Vertical reference system	Mandatory
Vertical resolution	Mandatory
Vertical accuracy	Mandatory
Vertical confidence level	Mandatory
Surface type	Mandatory
Recorded surface	Mandatory
Penetration level	Optional
Known variations	Optional
Integrity	Mandatory
Date and time stamp	Mandatory
Unit of measurement used	Mandatory

Table A8-4. Obstacle attributes

Obstacle attribute	Mandatory/Optional
Area of coverage	Mandatory
Data originator identifier	Mandatory
Obstacle identifier	Mandatory
Horizontal accuracy	Mandatory
Horizontal confidence level	Mandatory
Horizontal position	Mandatory
Horizontal resolution	Mandatory
Horizontal extent	Mandatory
Horizontal reference system	Mandatory
Elevation	Mandatory
Vertical accuracy	Mandatory
Vertical confidence level	Mandatory
Elevation reference	Mandatory
Vertical resolution	Mandatory
Vertical reference system	Mandatory
Obstacle type	Mandatory
Geometry type	Mandatory
Integrity	Mandatory
Date and time stamp	Mandatory
Unit of measurement used	Mandatory
Operations	Optional
Effectivity	Optional

— END —

Appendix- G

AFI AIS/MAP Seminar/Workshop on Quality System and Automation
Dakar, 11-14 October 2005

Information Paper

AERONAUTICAL INFORMATION MANAGEMENT

Presented by the European Organisation for the Safety of Air Navigation
EUROCONTROL[1]

Introduction

Air Traffic Management (ATM), as many other activities, is increasingly being information-driven. It requires access to sufficient, digital, global on-line, real-time, accurate and quality managed Aeronautical Information.

Recognising the importance and the status of Aeronautical Information Management as an essential foundation for present and future ATM – without data of the required quality, safe and efficient ATM cannot be delivered; the ICAO 11th Air Navigation Conference endorsed as one of its recommendation the adoption of a common exchange model as recommended by WP/78 submitted by EUROCONTROL.

Key components of AIM (Aeronautical Information Management) are the provision of information as needed by the ATM environment and its supporting infrastructure and as required by ICAO Annex 15 (Aeronautical Information Services) and ICAO Annex 4 (Aeronautical Charts).

AIM is the successor to Aeronautical Information Services (AIS) and envisages transition from a product centric to a digital information centric service. Its evolution and requirements are within EUROCONTROL the responsibility of the AIM Domain of the European Air Traffic Management Programme (EATM).

Within the context of the global nature of Aeronautical Information, EUROCONTROL recognises that many of its activities, projects in AIS/AIM could have impact on a worldwide basis and so contributing to the global harmonisation and interoperability of Aeronautical Information.

Aim of the Information Paper

In response to the AIS/MAP Workshop/Seminar objective to "provide briefings relating to International directions and advances being made in the field of AIS/MAP", this paper provides an overview of EUROCONTROL activities towards the implementation of AIM with a particular emphasis on those activities relating to the Workshop/Seminar Agenda Items 3. "Measures to Improve AIS/MAP Services", 4. "AIS Automation and Planning for an Integrated Regional AIS System", 5. "Quality Management System for AIS/MAP Services", and 6. "AIS role within the Global ATM".

The concept of Aeronautical Information Management (AIM)

Aeronautical Information Management (AIM) is the term applied to the globally interoperable provision of aeronautical data of the required quality, covering the needs of the present and future ATM system and all phases of flight in a data oriented, holistic way. AIM is a data management concept

[1] **The 35 EUROCONTROL Member States are:** Albania, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, the former Yugoslav Republic of Macedonia, Malta, Moldova, Monaco, the Netherlands, Norway, Poland, Portugal, Romania, Republic of Serbia and Montenegro, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine and the United Kingdom.

incorporating aeronautical information in the widest sense of the expression, covering all data related to the aeronautical environment.

The scope of AIM must incorporate, at high level, the structure, delivery, and the critical nature of all ATM relevant information such as: aeronautical information, meteorological data, flight planning, planned and real-time status of ATM and related systems, and airspace and sector configurations. The full benefit of information management will only be accrued if pertinent information is made available to all appropriate actors of the ATM network; and for the ATM network to function properly, all of this information must be available when and where required. ***"AIM: the right digital Aeronautical Information, at the right place, at the right time"***

The quality of a given information item (such as availability, relevance, accuracy, integrity, timeliness, security, confidentiality, etc) is important and may well be flight critical. In consequence the processing of aeronautical information from origination, through publication to incorporation into an end-user system must be managed throughout. The key to the future is in the provision of digital aeronautical information with interoperability assured through the establishment of commonly agreed mediums for the exchange of such information. Successful information management will depend on the common definition and/or determination of a minimum set of features and attributes established within information model(s), and the establishment of the means to exchange it. This can be enabled through the adoption of platform independent aeronautical information exchange models, to embrace all aspects of aeronautical information.

The introduction of structured digital rather than paper media, the automation of AIS/MAP Services and implementation of Quality Systems in AIS/MAP constitute essential stepping stones (precursors) towards the implementation of AIM.

Progress and developments

EUROCONTROL was and is actively involved in many initiatives and projects for the implementation of AIM. The following are of particular relevance for this AIS/MAP Seminar/Workshop.

Item 3. "Measures to Improve AIS/MAP Services":

- **AIM Strategy:**

The *Aeronautical Information Management Strategy for the Years 2000+* is designed to achieve consensus and coherence on the future evolution of aeronautical information for the next 15 years or so. It provides the high level ***"Strategic vision",*** a clearly defined direction against which EATM AIM stakeholders can formulate their operational, investment and human resource planning. A revised document is entering the approval process in EUROCONTROL and will be made available in due course on request.

- **AIS AHEAD Programme**

Launched in 2000, the now completed AIS AHEAD Programme targeted improvements in Aeronautical Information Services. The programme was structured in 8 projects grouped within three main deliverables "Management Improvement", ''Data Improvements" and "Technical Improvements". The deliverables of the projects related to "Management Improvement" are of particular relevance and can be accessed at www.eurocontrol.int/ais. These are:

- ISO 9000 Workshop Suite – an introduction to ISO 9000 for AIS
- Key Performance Indicators (KPI) deliverable suite
- Common AIS Staff Profiling (CASP) – an AIS/MAP functional model with associated Competencies (knowledge, skills and abilities)

- **Controlled Harmonised Aeronautical Information Network (CHAIN)**

The objective of the recently launched CHAIN activity is to elucidate problems, requirements and responsibilities related to the aeronautical data supply chain and data integrity, in particular. It shall identify best practices, promote potential solutions and encourage improvement actions.

Aeronautical data integrity is a long standing requirement of many ATM Domains. The problem is that data are re-entered manually at various transaction points in the AIS data chain, increasing the risk of introducing errors at each transaction point with a consequent likely safety impact. ICAO has set out specific requirements for data integrity in Annex 15 which are not being fully met by ECAC[2] States. This is an indication that additional support is required to facilitate and improve the compliance with those requirements.
CHAIN's mission is to transform the current error prone data supply chain for aeronautical navigational data into one that provides high quality data through automated processes underpinned by international standards.
It should be noted that at policy level, the European Commission is cognisant of the importance of data integrity within the context of the Single European Sky Interoperability Regulation implementation. It has entrusted EUROCONTROL with a mandate for the development of a draft Implementing Rule on aeronautical data integrity that supplements and strengthens the requirements of ICAO Annex 15 in order to achieve aeronautical information of sufficient quality, for applications such as area navigation.

- **AIS Agora - "Voicing problems, sharing solutions"**

AIS AGORA – the Aeronautical Information Forum is a EUROCONTROL initiative to improve communication amongst the Aeronautical Information Stakeholders (data originators, AIS, aircraft operators, air traffic control and other airspace users) with the ultimate goal of improving the quality of aeronautical information.
The main entry point for AIS AGORA is a freely accessible website www.eurocontrol.int/aisagora that became operational in December 2001. It has more than 2000 professional members from AIS, CAA, ATC, airlines, industry, military and users' organisations. Every day numerous advanced publications, aeronautical information problems and solutions are posted.
Participation in the Forum is free of charge; however access is restricted to only registered members.
African State AIS are encouraged to become registered members, numerous queries relate to information concerning African States.
A EUROCONTROL facilitator ensures that queries are followed up and that all discussions are conducted in a professional way.

Item 4. "AIS Automation and Planning for an Integrated Regional AIS System":

- **Electonic AIP (eAIP)**

The development of the Electronic AIP Specification (eAIP) is a major EUROCONTROL initiative in the drive towards paperless AIS and the potential this has in achieving required integrity of data, enhanced data selection, distribution and reduced costs.
The eAIP Specification and its associated guidance material were developed between the years 2000-2004. It is based on **AIXM** and fully compliant with the ICAO requirements for AIP content and structure, as laid down in ICAO Annex 15. In addition, the eAIP Specification enforces a strict application of the ICAO requirements concerning the AIP structure.
The eAIP Specification has undergone comprehensive testing and validation completed mainly through Pilot implementations. A number of States are already issuing the eAIP, which is also supported and compatible with the EAD.

- **European AIS Database (EAD)**

The European AIS Database is a single reference of validated aeronautical information covering the ECAC area and allowing each State to use this data to provide its AIS services. It is in operations since 6 June 2003. AIS data providers and data users, civil and military, are currently migrating to EAD and using its services.
A movie describing the EAD concept will be shown to the Seminar/Workshop.

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[2] **The 42 European Civil Aviation Conference (ECAC) Member States are:** Albania, Armenia, Austria, Azerbaijan, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Moldova, Monaco, the Netherlands, Norway, Poland, Portugal, Romania,
Republic of Serbia and Montenegro, Slovakia, Slovenia, Spain, Sweden, Switzerland, The former Yugoslav Republic of Macedonia, Turkey, Ukraine, United Kingdom.

OPADD and NSC guidelines

The AIS Team at its recent meeting endorsed a revised Edition 2.0 of the Operating Procedures for AIS Dynamic Data (OPADD) that describe the procedures associated with the creation and management of NOTAM in general within automated systems and guidelines related to the NOTAM Selection Criteria. Both documents give rise to amendment proposals to ICAO Annex 15, Doc. 8126 and Doc. 8400. These amendment proposals will be formally channelled to ICAO via the ICAO EUR/NAT Air Navigation Planning Group in December 2005.

Item 5. "Quality Management System for AIS/MAP Services":

In this area, in addition to the deliverables introduced above with respect to AIS AHEAD, the following deliverables all accessible from www.eurocontrol.int/ais should be noted:

- AIS Data Process and Static Data Procedures – ISO 9000 compliant generic AIS Data Process, the "What" and related Static Data Procedures, the "How";
- AIS QA compendium – a source book of quality improvement initiatives for AIS;
- AIP Audit Assistant – Ms Excel based tool for the systematic auditing of the AIP;
- Data Quality Tool Set – suite of validated calculation software tools;

Item 6. "AIS role within the Global ATM"

The concept of AIM is enshrined in the Global Air Navigation Plan for CNS/ATM Systems. The following work areas of the EUROCONTROL AIM Domain further strive to underpin the implementation of AIM, through standardisation activities, thus broadening the current scope of AIS to support the interoperability required by the Global ATM.

- **AIXM**

The Aeronautical Information Exchange Model (AIXM) has been derived from the Aeronautical Information Conceptual Model (AICM), which provides a formal description of the information/data managed by AIS. AICM was developed starting from the content of the ICAO Annexes (with particular emphasis on Annex 15) but it also takes into consideration the real world, the information of the AIPs and other relevant documents and industry standards, such as the ARINC 424 Specification.

AIXM is implemented and used by an increasing number of stakeholders, which include the EAD, the environment database of the Central Flow Management Unit (CFMU) and a number of national AIS database systems (Slovakia, Switzerland, Norway, France, Czech Republic, etc.). United States Federal Aviation Administration (FAA) and Japan are also migrating to it.

Both AICM and AIXM need a continuous update in order to reflect the changing requirements for aeronautical data. The evolution of the AIXM is controlled by the AIXM Change Control Board (ACCB). Its mission is to "*control the evolution of the AIXM and of related specifications, in order to satisfy the needs of the largest possible number of stakeholders*". Participation includes States (ECAC States, US, Japan, Russia, Australia), EUROCONTROL Agency Units (EAD, CFMU, etc.) and other AIXM stakeholders, mainly industry. It is planned that the management of the ACCB will be undertaken by ICAO when AIXM is incorporated in ICAO documentation.

An AICM/AIXM web based training will be made available globally from the EUROCONTROL Institute of Air Navigation Services Learning Management Server at the end of October 2005. A demonstration of the AICM/AIXM CBT will be made during the Seminar/Workshop.

- **xNOTAM**

NOTAM messages are not sufficiently structured for intelligent machine use. It is not unusual that the content of a database, be it on-board or on the ground, is 'superseded by NOTAM'. The risk is that safety critical, last minute information remains outside of the automated data processing chains on which the ATM system is increasingly dependent.

The main objective of the xNOTAM concept will be to merge "static" and "dynamic" data in single data exchange format in order to describe the underlying data content for intelligent machine use, equally suitable for in-flight and ground systems. The xNOTAM concept is based on the AIXM and is fully backward compatible with the current NOTAM system. The scope of the xNOTAM shall be at least regional (ECAC). A dedicated implementation Programme managed by EUROCONTROL is foreseen to start in 2007. In order to have full benefits a global implementation (through ICAO) could be envisaged.

- **Airport Mapping**

The presentation of geospatial data and other aeronautical information continues to evolve from paper format to electronic media. Although both forms are used, important developments are taking place in terms of electronic charting requirements.
EUROCONTROL has participated in the establishment of requirements for airport mapping, obstacle and terrain databases under the umbrella of the joint EUROCAE WG44 - RTCA SC193 working group. In this context has undertaken the initiative of developing an Aerodrome Mapping Interchange Model (AMXM) and an Aerodrome Mapping Interchange Schema (AMXS), based on the WG44 specifications and using GML (Geography Markup Language) as the foundation. AMXM version 1.1 and AMXS version 1.1 are published in the EUROCONTROL web site at http://www.eurocontrol.int/ais/amdb/index.htm .

- **Global AIS Congress**

A Global AIS Congress will be held on 27-29th June 2006 in the "Palacio de Congresos" in Madrid (AIS Agora release attached).
The origins of the Congress are a clear global recognition of the critical role that aeronautical information will play in the future ICAO Air Traffic Management (ATM) concept. That the requirements for integrity of flight critical data and the scope of aeronautical information required by ATM to ensure interoperability are more demanding than AIS currently provides, and that urgent action is needed to meet these challenges. The objective of the Congress is to bring together originators, processors, publishers, regulators, system designers, service providers and end-users that collectively constitute the global AIS family. Drawing on collective experiences, needs and requirements the Congress will:

- Consider the essential role of AIS in the evolving world of ATM;
- Identify the key drivers for change;
- Explore what must be done to ensure aeronautical information of the right scope and quality is made available;
- At a strategic level, review emerging technologies that will facilitate change in a practical and affordable manner; and
- Outline a roadmap for the evolution of aeronautical information to assist ICAO in the difficult task of leading global change.

In partnership with ICAO, the Congress is being organised by a small but globally reflective consortium (Australia, Canada, China, EUROCONTROL, Japan, South Africa and the United States) and the Congress will be facilitated by EUROCONTROL with very strong support from the Director General Civil Aviation, Spain and AENA, the Air Navigation Service Provider of Spain.
The draft Agenda and venue information are available for consultation on the dedicated Global AIS Congress web site at www.eurocontrol.int/globalais06 .

Conclusion

With a view to improve AIS/MAP services towards the implementation of AIM, EUROCONTROL has been developing over the recent years a wealth of best practice, guideline documents and specifications that it is pleased to share globally for the sake of worldwide harmonisation and standardisation.

Further to the 11th ANC recommendation to adopt a common exchange model, the adoption and implementation of AIM and related models predicates a revision of ICAO Annex 15 (AIS) and Annex 4 (Aeronautical Charts). International standards for aeronautical information requirements and the means by which such information shall be exchanged must be agreed and implemented, on a global basis, to allow a common way to describe the representation and structure and the subsequent regulation of information.

The global nature of ATM requires that global solutions are developed to evolve towards Aeronautical Information Management. The AIS Family needs to work together as a "Global Partnership" to effect this change.

To facilitate this objective, assist ICAO in this endeavour and share on the global scene information upon experiences and potential local requirements originating from all ICAO regions, you are invited to join the "**Global AIS Congress**" that will take place in Madrid on 27-29 June 2006.

Dear AGORA Members,

I am delighted to announce a date for your diaries. ***"A Global AIS Congress"*** will be held on ***27-29th June 2006*** in the "Palacio de Congressos" ***in Madrid***.

The ***origins*** of the Congress are a recognition of the critical role that aeronautical information will play in the future ICAO Air Traffic Management (ATM) concept. The requirements for integrity of flight critical data and the scope of aeronautical information required by ATM to ensure interoperability are more demanding than AIS currently provides.

The ***objective*** of the Congress is to bring together originators, processors, publishers, regulators, system designers, service providers and end-users that collectively constitute the global AIS family, ***in other words YOU***. Drawing on collective experiences, needs and requirements the Congress will:

- Consider the essential role of AIS in the evolving world of ATM;
- Identify the key drivers for change;
- Explore what must be done to ensure aeronautical information of the right scope and quality is made available ;
- At a strategic level, review emerging technologies that will facilitate change in a practical and affordable manner; and
- Outline a roadmap for the evolution of aeronautical information to assist ICAO in the difficult task of leading global change.

In ***partnership*** with ICAO, the Congress is being organised by a small but globally reflective consortium (Australia, Canada, China, EUROCONTROL, Japan, South Africa and the United States) and the Congress will be facilitated by EUROCONTROL with very strong support from the Director General Civil Aviation, Spain and AENA the Air Navigation Service Provider of Spain.

Industry will be invited to exhibit technology, products and services to demonstrate that change is feasible and available today.

The organisers are committed to ensuring the global aviation community is fully engaged in the debate. They recognise that aeronautical information transcends national and regional boundaries. Consequently, the evolution of AIS must be agreed and coordinated on a global scale.

A web site will be opened on Monday 10th October: ***www.eurocontrol.int/globalais06***

Ken REID
Chairman EUROCONTROL AIS Team, on behalf of the Organisers