International Civil Aviation Organization
CAR/SAM Regional Planning and Implementation Group (GREPECAS)
Eleventh Meeting of the GREPECAS Aeronautical Information Management Subgroup (AIM/SG/11)
Bogotá, Colombia, 16 - 20 June 2008

Agenda Item 2: Review of the AIM Subgroup Contributory Bodies Reports

2.1 Report of the Third Meeting of the AIM Quality Management Task Force (AIM/QM/TF/3) and follow-up on the initiative to develop an implementation plan for AIM services quality systems.

REPORT OF THE THIRD MEETING OF QUALITY MANAGEMENT TASK FORCE (AIM/QM/TF/3)

(Presented by the Rapporteur)

SUMMARY

This Working Paper resumes the outcomes of the discussions held during the Third Meeting of Aeronautical Information Management Quality Management Task Force (AIS/MAP QM/TF/3). The Task Force formulated 4 Draft Decision and Conclusion which required action from AIM/SG/11.

References:

- Report of the AIS/MAP QM/TF/3 (Antigua, Guatemala, 6-10 August 2007)

1. Introduction

1.1 The Third Meeting of the AIM Quality Management Task Force (AIS/MAP QM/TF/3) was held in Antigua, Guatemala, Guatemala, from 6 to 10 August 2007. The Meeting count with the participation of 20 delegates of 10 States and one International Organization.

2.1 The Task Force approved a Report containing the discussed subjects and 4 Draft Decision/Conclusion submitted for the AIM/SG/11 Meeting's consideration. **Appendix** to this Working Paper includes these Draft Decisions/Conclusions.

2. Review of the AIS/MAP QM/TF Third Meeting

2.1 Under Agenda Item 3 the implementation plan of a quality management system was reviewed (**Attachment 1 to Appendix**) taking into consideration the CAR/SAM States' experience in which the system has been already implemented. The proposed plan has concrete actions and a deadline of 20 months (1 year and 8 months). In this context, Decision 3/1 was taken in order that the said Plan be sent to the AIM Subgroup Secretariat and circulated to States for its application.

2.2 The reference Plan for the AIM concept transition in CAR/SAM Regions was discussed in Agenda Item 5. The Meeting considered necessary that in the Plan configuration all the AIM Subgroup Task Forces will be involved, mainly because of the required automation component and, in this way, it would be more practical for the Subgroup Secretariat to undertake a Regional Strategy to be adopted by CAR/SAM States/International Organizations. To this regard, the Meeting considered appropriate Draft Decision 3/2, in order that each Task Force forward to the AIM Subgroup Secretariat their contributions to achieve the AIM Transition Regional Plan in a compatible manner (**Attachment 2 to Appendix**).

2.3 The AIM human factors were evaluated under Agenda Item 6. Their relation with training and personnel instruction issues in these programmes lead to formulate Draft Decision 3/3, which suggests that **Attachment 3 and 4** to **Appendix** of this Working Paper be transferred to AIM Training Task Force for its consideration. The Guidelines of the application of the human factor principles for AIM was also taken into account (**Attachment 5 to Appendix**) and should be placed as Part 5 of the Guidance Manual for the AIS/MAP Implementation of a Quality Management System in CAR/SAM Regions. As a result a Draft Conclusion 3/4 was formulated.

2.4 The Meeting evaluated, under Agenda Item 7, the specifications of the requirements by the QM/TF (**Attachment 6 to Appendix**) and which might be applied by the any other AIM Subgroup contributory bodies. In this regard, Draft Decision 3/5 was taken in order that the Secretariat disseminate these requirements and taken into account by the Rapporteurs in the planning and development of their tasks.

3. Suggest action

3.1 The Meeting is invited to:

a) take into account the content of this working paper, and
b) adopt the 4 Draft Decision/Conclusion contained in the Appendix of this paper.

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APPENDIX

DRAFT CONCLUSIONS FORMULATED BY THE QM/TF/3 MEETING

DECISION 3/1 IMPLEMENTATION PLAN OF A SYSTEM DE QUALITY MANAGEMENT

That the *Quality Management System Implementation Plan* included in the Appendix to this part of the report **(Attachment 1 to this Working paper)** be sent to the Secretariat of the AIM Subgroup by **30 November 2007** for circulation to the CAR/SAM States with a view to its application.

DRAFT
DECISION 3/2 STRATEGY FOR THE TRANSICIÓN TOWARDS AIM

That the Draft Strategy for the Transition to Aeronautical information management (AIM) in the CAR/SAM Regions presented in the Appendix to this part of the report (**Attachment 2 to this Working paper**) be circulated by the Secretariat of the AIM Subgroup to the other Contributory Bodies so that they may submit their input by **15 April 2007** to the Secretariat, to harmonise the CAR/SAM Regional Transition Plan.

DRAFT
DECISION 3/3 ESTABLISHMENT OF HUMAN FACTORS PRINCIPLES IN THE CAR/SAM AIM

That, in view of its relevance for training matters, the contents of Appendices A and B to this part of the report **(Attachments 3 and 4 to this Working paper)** be transferred to the Aeronautical Information Management Training Task Force (AIM/TRAIN/TF) for its consideration.

DRAFT
CONCLUSION 3/4 GUIDELINES OF THE APPLICATION OF THE HUMAN FACTOR PRINCIPLES FOR AIM

That the CAR/SAM Regions States/Territories/International Organizations, considering the role of human factors in the AIS/MAP adopt and apply the *Guidelines for the Application of Human Factor Principles for AIM* contained in Appendix C to this part of the report **(Attachment 5 to this Working paper)** and the corresponding plan, that will be incorporated as Part 5 of the *Guidance Manual for the Implementation of an AIS/MAP Quality Management System of the CAR/SAM Regions*.

DRAFT
DECISION 3/5 ESPECIFICACIONES DE CALIDAD ELABORADAS POR THE AIM/QM/TF

That the AIM Subgroup Secretariat disseminate to the Rapporteurs of their Contributory Bodies the specifications developed by the AIM/QM/TF that appear in the Appendix to this part of the report **(Attachment 6 to this Working paper)** by **1 November 2007**, so that the Rapporteurs may take those references into account in the development and planning of their new tasks.

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ATTACHMENT 1 TO THE APPENDIX

QUALITY MANAGEMENT SYSTEM IMPLEMENTATION PLAN

Num.	Phases	Activities	Responsible	Year 2007		Year 2008											Year 2009						
				December	January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June	July
1	Preparation	Make a high level proposal in order to obtain managerial support.	Chief AIS																				
		Obtain confirmation of the managerial decision to implement ISO 9001:2000 Standard.	Management /Chief AIS																				
		Designation of the Representative by the Management.	Management / Chief AIS																				
		Activation of the Work Team	Management / Representative																				
		Define the objectives and scope of the project.	Chief AIS																				
		Initial training for the Work Team on quality management system, ISO 9000 Standards Series and Internal Audit.	Chief AIS / Representative																				
2	Planning	Define the documental matrix of the project.	Chief AIS																				
		Define the processs and procedures to be documented.	Chief AIS																				
		Define the quality policy and the objectives.	Chief AIS																				
		Establish a timetable for the development and implementation of each one of the quality management system elements.	Chief AIS																				
		Define and assign the project's resources.	Management / Chief AIS																				
3	Communication and information	Inform and communicate the plans to all the parties involved in the organization.	Chief AIS / Representative																				
		Develop an awareness strategy for all the staff through cycles of conferences and seminars.	Chief AIS / Representative																				
4	Application	Develop a quality, procedures and technical instructions Manual.	Chief AIS / Representative																				
		Training and information to those involved in processes and procedures.	Chief AIS / Representative																				
		Perform modification and adjustments to processes and procedures.	Chief AIS / Representative																				
		Processes and procedures implementation sessions.	Chief AIS / Representative																				
		Act in accordance with the implemented procedures.	Chief AIS																				
		Generation of registers, corrective and preventive actions.	Chief AIS / Representative																				
		Perform internal audits and other measurements in order to measure the efficiency and effectiveness of the processs.	Chief AIS / Representative																				
		Correction of no conformities and apply continuous improvement process.	Chief AIS / Representative																				
5	Certification	Select the certification body.	Management / Chief AIS																				
		Consider conducting a pre-audit.	Management / Chief AIS																				
		Correction of no-conformities.	Chief AIS																				
		Certification audit.	Management / Chief AIS																				
		Obtaining the Certificate.	Management / Chief AIS																				
6	Maintenance	Follow-up to no-conformities and continuous improvement process.	Chief AIS / Representative																				

INTERNATIONAL CIVIL AVIATION ORGANIZATION

ATTACHMENT 2 TO THE APPENDIX

DRAFT STRATEGY FOR THE TRANSITION TO AERONAUTICAL INFORMATION MANAGEMENT (AIM) IN THE CAR/SAM REGIONS

CAR/SAM REGIONAL PLANNING AND IMPLEMENTATION GROUP (GREPECAS)

CONTENTS

DRAFT PROJECT FOR THE TRANSITION TO AERONAUTICAL INFORMATION MANAGEMENT (AIM) IN THE CAR/SAM REGIONS

1. Introduction

Regional plans for the transition to CNS/ATM clearly define how information in ATM is automatically exchanged through a huge, accurate and secure aeronautical database updated in real time and supporting all air navigation services. This new kind of presentation, distribution and exchange of aeronautical information should imply a sensitive and deep change in all the AIS/MAP of the Regions.

To date, AIS/MAP has successfully evolved and has adapted itself to face changes posed by the civil aeronautical technological development. Now, much more deep new challenges arise, both in resources and working methods, and in human resources culture and behaviour. The introduction of automated air-ground systems and trust in accuracy, availability, safety and quality of aeronautical information is conditioning new and significant demands in the provision of AIS/MAP services.

Therefore, aeronautical information has turned into a crucial and critical component of the current and future ATM system, which has to develop to fulfill AIS/MAP service covering all the phases of flight.

This strategy for the gradual implementation of AIM in the Regions was developed in order to identify important requirements and components of a capable and sufficient Aeronautical Information Management to support the demands of CNS/ATM navigation, setting stages to be fulfilled in a gradual manner from 2008 to 2015, including in its development human resources and investment planning.

2. Current Situation of AIS/MAP in the CAR/SAM Regions

AIS/MAP function may be defined as the process of development, storage and distribution of Integrated AIS Documentation. It is a broad process encompassing several semi-automated printed and digital publications, still requiring significant manual intervention, ending in the update of a main document, the AIP, which changes are promulgated by amendments or supplement, both printed and digital in web pages and NOTAM, distributed by the AFTN network that are published, stored and automatically diffused in general through a NOTAM database.

Despite the harmonious operation of AIS, the current situation needs long and rigid periods for the production and distribution of permanent information, and the NOTAMs informing temporary changes of a short length require a long time since its publication is requested by the originators until the NOTAM is transmitted through the AFTN network. Once the valid information in provided, mainly in the pre-flight phase, the other phases of flight are left at a disadvantage with regard to updated information.

Flexibility, update and easy access to aeronautical information in real time are deciding requirements in CNS/ATM and it is clear that the current structure and operation of AIS will be unable to meet these requirements unless its working concepts are developed towards the establishment of AIM.

2.1 Current limitations

The AIS Integrated Documentation Package, as it is known, is a complete product. The “static” permanent information of the AIP is consulted and “dynamic” variations may be included during a relevant period, notifying through NOTAM and Supplements. Although the NOTAM format allows some degree of information filter to the individual requirements, extracting information of a package integrated as a whole links a considerable quantity of manual selection. The "production unit" of the future must be individual data elements, made available by highly automated means for the extraction by the users in any combination, of particular information.

Short duration changes are provided to users through NOTAMs. These do not allow the transmission of wide information nor graphic information, due to limitations in the rules, application, flexibility and length of the message. Consequently, an extended text or graphic information change is promulgated through printed AIP Supplements. Despite the progressive introduction of Aeronautical information automated processes such as NOTAM database, there are transaction points in the production and use of the integrated aeronautical information package requiring several forms of manual action. Such actions inevitably entail the risk of human errors in the transcription, which means that the data integrity factor is more easily exposed to be distorted. Data quality improvement as a whole, with automated systems, is vital to ensure the integrity requirements of aeronautical information, essential as a pre-requirement for navigation strategy.

3. AIS scope

ATM will continue to develop, implement and use new technologies and techniques allowing a more flexible style of airspace use, such systems are and will continue to depend on aeronautical data, the immediate access to high quality aeronautical information will represent an essential component of ATM systems.

The development of systems enabling the global on-line access in real time to aeronautical information with the required quality will be the necessary support of the future ATM system. Obviously, a traditional supply of aeronautical information will be needed temporarily, in parallel to the development of automated systems, and there will be a fusion of textual and graphical spheres, which are now separated.

There is a clear need for having other information categories available. The information to be supplied through this complex databases system will require a progressive fusion of the traditional AIS, MET, FIS, AFTM information allowing a data flow into the ATM system.

Transition to an environment in which aeronautical information is managed on a wide base system is a declared need of the user, including the harmonisation of civil-military information.

The wide exchange throughout the world of aeronautical information is a pre-requirement of AIM; therefore, it will be important to establish global standards and recommended practices in order to originate, store, exchange and distribute information through all the phases of flight.

From this vision, 8 strategic objectives have derived, which in turn have produced 13 actions which will allow the development of this strategy towards AIM.

4. AIM Transition Strategy

4.1 Scope

The scope of this strategy will cover the limits of the FIR of each one of the States in particular.

This document and its eventual development will involve all the areas of AIS/MAP viz, AIS Publications, NOTAM Office and Aeronautical Charts and AD AIS Units, as well as indirectly, other units related with AIS such as: ATS units in general and air navigation high management.

This AIM strategy covers all the phases de flight:

1. Flight planning.
2. Pre- flight departure.
3. Departure
4. During the flight.
5. Arrival
6. Post flight.

4.2 Strategic objectives

The achievement of efficient and uniform handling of aeronautical information and a broad system of information management including all the phases of flight requires the compliance with the following strategic objectives:

4.2.1 Establishment of AIM as the ATM Central Process

This includes the fact that the AIM concept be fully understood and accepted by all as the essential and basic step for ATM, as well as to take actions allowing the expansion of this concept into other neighbouring regions, including the proposal of development of new ICAO procedures (SARPs).

4.2.2 Ensure the Provision of Updated and Quality Aeronautical Information for All the Phases of the Flight

New specifications will be set forth in order to originate, keep and exchange electronic aeronautical information, including information on terrain and obstacles with the necessary accuracy, integrity, safety and confidentiality in view of its implication on flight safety.

4.2.3 Ensure Accessibility to Aeronautical Information during All the Phases of Flight

Although nowadays there is an important volume of available information, most part is concentrated in the pre-flight information service, it is necessary to count with flexible access to this information in any of the phases of the flight.

4.2.4 Transit from Aeronautical Information Products Publication to the Provision of Each Individual Piece of Information of Each One of the Aeronautical Information Elements in Electronic Format

Nowadays, the provision of aeronautical information is based on a group of elements of the AIS integrated documentation, from which users manually extract the relevant aspects. In the AIM strategy, users will be able to extract their own parameters, independently of the element where it is published and to access by automated means to the relevant material to the main reference information, together with the temporary changes will be electronically kept and updated within the same element in which it is published, which will minimize the error potential, even when information is kept in a digital manner, printed information may be provided when the customer so requests.

4.2.5 Adopting Globally Harmonised Procedures, Structures and Databases Contents in a Completely-Digitized Aeronautical Information Environment

In order to achieve it, ICAO shall adopt standard database models ensuring information exchange in a global fashion.

4.2.6 Define the Necessary Human Resources Activities to Ensure the Future AIM Environment

The specialty should provide AIS/MAP personnel with the necessary training to ensure electronic aeronautical information exchange with the required quality.

4.2.7 Resolve the Copyright, Financial, Legal, Organizational and Institutional Aspects Associated with AIM Handling.

4.2.8 Harmonise and Integrate All the Civil-Military Aeronautical Information.

4.3 Strategic Actions

In order to carry out the aforementioned strategic objectives, it is necessary to take actions such as:

4.3.1 Keep and Improve the Quality Management System Implanted and Certified in the AIS/MAP Service

This AIM strategy foresees to ensure the integrity levels of critical, essential and ordinary data for flights as set forth in ICAO Annex 15, which requires an implemented and certified total quality management system.

4.3.2 Planning and Development of the Electronic AIP

Transition to an electronic AIP should be planned and achieved in an appropriate period although the replacement shall be a replica of the current format, from which temporary updates to aeronautical information will be made.

4.3.3 Review the Current NOTAM Concept, Due to the Fact that AIM will allow Automatic Access to the Databases

The future of NOTAMs needs to be considered in view of:

- The current format does not allow the exchange of digital data.
- The current NOTAMs publication and distribution time in the AIS does not comply with the information immediacy requirements required in AIM.
- The new system will allow handling data within the document itself where it is published and its update is in real time, on-line.

4.3.4 Study, Plan and Manage Availability in Digital Format of Data on Terrain and Obstacles, as well as Electronic Aeronautical Charts and Chart Databases

Data on terrain and vertical obstacles should be available and support all the phases of flight, especially the landing phase and post-flight phase, as the sole publication of obstacles near the RWY we count with today is insufficient for the growing needs of the industry, according to ICAO recommendations.

4.3.5 Define the Scope, Nature and Display Methods of Aeronautical Information, taking into account Modifications and New Requirements

Modified display methods include considering how aeronautical charts may be incorporated into digital data with text information. Upgrades in hardware, software and telecommunications have provided tools that increase speed and entry accuracy, performance and delivery of geo-spatial data. Note should be taken of the increasing use of the graphic display of information. Virtually, all information on-board will be electronically sustained, with graphical monitors. A new important aspect will be the automated exchange of aeronautical information during the flight and the necessary specifications to develop this purpose.

Geographical Information Systems (GIS) and spatial databases will provide the basis for these activities, with the associated benefits of accuracy, reliability, update and quality systems.

4.3.6 Diversify and Expand the Access Means for Aeronautical Information Auto-Briefing

Access to aeronautical information is performed mainly from AD AIS units, through an aeronautical information package specifically printed for each flight, a situation that hardly benefits information access flexibility, nor does it provide real-time update. It is necessary to provide options for the crew member, like creating auto-briefing stations at the airports allowing in-situ access to information in any phase of the flight.

4.3.7 Planning and Implementation of Training on Transition to AIM and, in Parallel, Provision of Training on Traditional AIS Service While Both Cases Coexist

4.3.8 Foster AIS Personnel License Granting and Perform a Study and Application of Requirements for Hiring New Personnel

AIS evolution to AIM will occur during a period with present and future work styles, operations and procedures in parallel, until the personnel in the future ceases to be involved in the provision of detailed daily information products in the traditional way. In the following years, AIS/MAP will need to undertake training of existing personnel and to adopt these new skill requirements to be considered when

hiring new personnel. The AIS profile project shall be developed to provide trained personnel and this methodology should be applied to future skills required for hiring. Stress should be laid on:

- Ensuring the quality and specialization in the traditional AIS service while both coexist.
- Planning training on introduction and transition to AIM.
- Studying and application of new profile requirements for hiring AIS/MAP personnel.
- Fostering license granting or other formal means for evaluating and accepting AIS personnel.

4.3.9 Plan a Harmonious Structure of the AIS/MAP Service in AIM Environment, as well as the Link with Other Specialties within ATM

The change of mind and working methods that will necessary be required by AIM service should be studied, planned and implemented in a gradual fashion, in order to ensure the harmonious and efficient transition including the period when AIS and AIM will coexist in parallel.

4.3.10 Identify and Resolve the Legal and Financial Aspects Concerning Data Origin, Exchange and Operation

Problems such as the following should be solved:

- Legal (information copyright, command and responsibility in a shared information environment);
- Institutional (regulatory aspects of shared information);
- Business (information aspects on the cost of the related efficiency, recovery cost and financial results in general);
- Organizational (mechanisms for regulations, documents and responsibilities of all the persons handling information).

4.3.11 Undertake the Extended Development of AIXM and AICM for the Adoption of a Global Database

Aeronautical information will be obtained from many originators and will be kept in a network of globally-distributed databases. A requirement of the development of the databases and other aeronautical information systems is the need for a uniform model of aeronautical information. There is an initial version of an Aeronautical Information Conceptual Model (AICM), and consequently an Aeronautical Information Exchange Model (AIXM) was developed, both necessary to count with information in any database, without taking into account structure or language to communicate with other banks.

4.3.10 Identify the Need for Amendment of ICAO SARPs, as the Requirement to Achieve the Objectives through ICAO Mechanisms

Specification, maintenance and progressive enhancement of the AICM/AIXM models are critical for the transition of AIS to AIM and it is essential to make relevant efforts to achieve the adoption by ICAO of a common data exchange model. This work shall also take into account additional identified information categories required to serve the future ATM system.

4.3.11 Planning the Harmonisation of the Civil-Military Part

The concept of flexible use of airspace requires availability of aeronautical information for all the airspace users and the use of common and compatible exchange systems. The military aspects will continue to be a matter of sovereignty for each one of the States, but actions ensuring interoperation among both civil-military environments and automated systems.

4.4 Contribution of the Actions to the Strategic Objectives

The following table shows the contribution of the strategic actions to each strategic objective.

Strategic actions	Strategic objectives							
	1	2	3	4	5	6	7	8
1-Keep and improve the implemented and certified quality management system in the AIS Service.	x	x		x	x			
2-Planning and development of the electronic AIP.	x	x	x	x	x			
3-Review the current NOTAM concept, in view that AIM will allow automatic access to databases.	x	x	x	x	x			
4-Study, plan and manage the availability in digital format of data on terrain and obstacles, as well as electronic aeronautical charts chart databases.	x	x	x	x	x			
5-Define the scope, nature and display methods of aeronautical information taking into account modifications and new requirements.	x	x	x	x	x			
6-Diversify and expand the access means for aeronautical information auto-briefing.	x	x	x	x				
7-Planning and implementation of training for transition to AIM and in parallel provide training on traditional AIS service while both coexist in parallel.	x					x		
8-Foster granting licenses to AIS personnel and perform study and application of requirements for hiring new personnel.	x					x		
9-Plan a harmonious structure of AIS service in an AIM environment as well as the link with other specialties within ATM.	x						x	
10-Identify and resolve the legal and financial aspects concerning data origin, exchange and operation.	x						x	
11-Undertake the extended development of AIXM and AICM for the adoption of a global database.	x	x	x	x				
12-Identificar the need for amendment of ICAO SARPs, as the requirement to achieve the objectives through CAO mechanisms.	x		x	x				
13-Plan the harmonisation of the civil and military part.	x	x	x					x

Strategic Objectives:

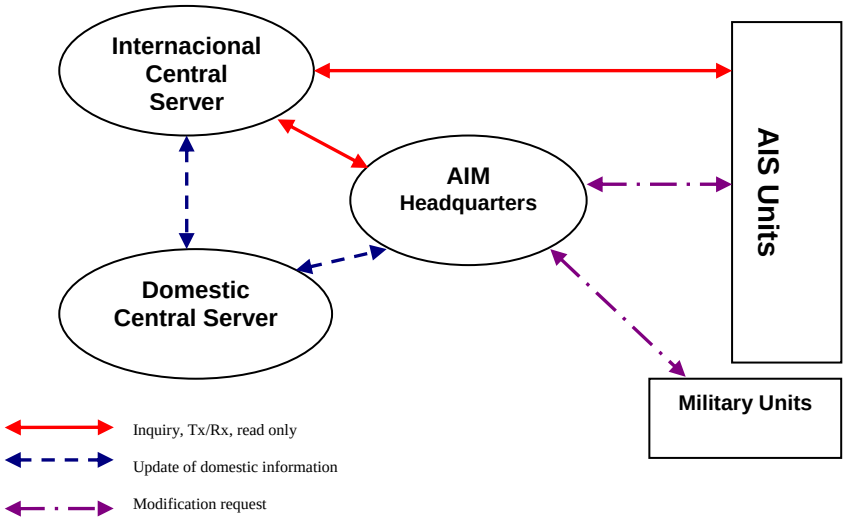
1-Establish AIM as the central process of ATM.
2-Ensure the provision of updated and quality aeronautical information for all the phases of flight.
3-Ensure access to aeronautical information during all the phases of flight.
4-Trasit from aeronautical information products publication to the provision of each piece of information individually of each one of the aeronautical information elements in electronic format.
5-Adopt procedures, structures and contents of harmonised databases on a global basis in a completely-digitized aeronautical information environment.
6-Define the necessary human resources activities to ensure the future AIM environment.
7-Resolve the copyright, financial, legal, organizational and institutional aspects associated with AIM handling.
8-Harmonise and integrate all the civil-military aeronautical information.

4.5 AIM Implementation Timetable in the CAR/SAM Regions

The following table describes the implementation timetable of the strategic actions for the implementation of AIM in the CAR/SAM Regions.

Strategic actions	2008	2009	2010	2011	2012	2013	2014	2015
1-Keep and improve the implemented and certified quality management system in the AIS Service.								
2-Planning and development of the electronic AIP.								
3-Review the current NOTAM concept in view that AIM will allow automatic access to databases.								
4-Study, plan and manage the availability in digital format of data on terrain and obstacles, as well as electronic aeronautical charts and chart databases.								
5-Define the aeronautical information scope, nature and display methods taking into account modifications and new requirements.								
6-Diversify and expand the access means for aeronautical information auto-briefing.								
7-Planning and implementation of training for the transition to AIM and in parallel, provide training on the traditional AIS service while both coexist.								
8-Foster granting licenses to AIS personnel and implement the study and application of requirements for hiring new personnel.								
9-Plan a harmonious structure of the AIS service in an AIM environment as well as the link with other specialties within ATM.								
10-Identify and resolve the legal and financial aspects on origin, exchange and operation of data.								
11-Undertake the extended development of AIXM and AICM for the adoption of a global database.								
12-Identify the need for amendment of ICAO SARPs, as the requirement to achieve the objectives through ICAO mechanisms.								
13-Plan the harmonisation of the civil and military part.								

4.6 Aeronautical Information Exchange Link



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ATTACHMENT 3

STRUCTURE OF A SAFETY AWARENESS COURSE AND HUMAN FACTORS

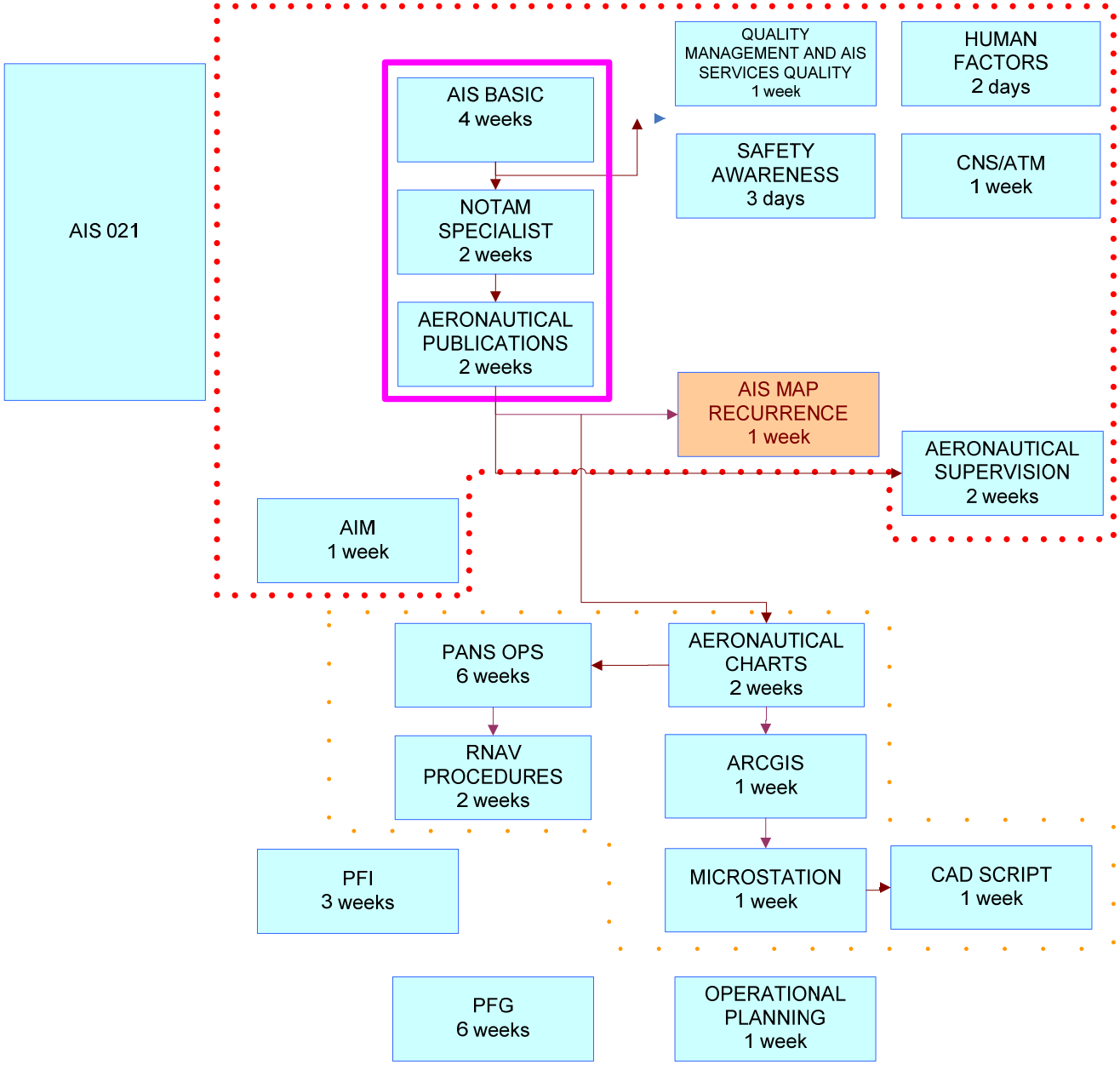
Duration: 1 week, 40 school hours

Application requirements: To have minimum six months developing AIS activities and high school diploma or its equivalent.

1. Administration Resources for AIS/MAP (ARM).
   - *Introduction.*
   - *Importance of Human Factors.*
   - *ARM. Basic Concept.*
   - *Operational Environment.*
   - *Incidental knowledge.*
   - *Communication.*
   - *Information management.*
   - *Interpersonal skills.*
   - *Work administration.*
   - *Decision making.*
   - *ARM concept evolution.*

2. Safety management
   - *General concepts.*
   - *Safety management.*
   - *ICAO Documents, standards and recommended practices on the issue.*

ATTACHMENT 4
AIS BASIC SCREEN TRAINING OF THE
INSTITUTO CENTROAMERICANO DE CAPACITACION AERONÁUTICA, ICCAE



ATTACHMENT 5

GUIDELINES FOR THE APPLICATION OF HUMAN FACTOR PRINCIPLES FOR AIM

INDEX

1. INTRODUCTION

This part of the Manual Guide for the application of the principles of human factors in AIM of the CAR/SAM Regions has been developed to provide Guides for the States regarding the applications of human factors as part of the operational requirements, especially those connected with quality requirements in the processing, certification, training, publication and distribution of aeronautical information data.

Ever since the beginning of aviation, human error has been considered as the principal factor of accidents and incidents. Human factors concern people in their work and life environments as well as their relationships with machinery, equipment and procedures.

Aeronautical information technicians currently use many IT systems for the processing of aeronautical information; therefore, they should be highly conscious of the great responsibility and high sensitivity to carry out the task with quality and efficiency.

Doc 7192-AN/857, Part 3 –Personnel of the Services of Aeronautical Information ICAO sets forth the Module to instruct AIS/MAP personnel on the fundamental aspects of human factors and defines Management of Resources for Aeronautical Information Services and Aeronautical Charts (ARM).

Within the ARM concept, the human element is the most flexible, adaptable and valuable part of the aviation system, but it is also the most vulnerable one to influences that may adversely affect its performance.

2. OBJECTIVE

Establish the concept of Human Factor Principles within Aeronautical Information Management (AIM).

3. DOCUMENTS OF REFERENCE

- ICAOs Instruction Manual on Human Factors Doc. 9683 AN/950.
- Document 7192-AN/857, Part 3 – Personnel of the Aeronautical Information Services– ICAO
- ICAOs Circular 247-AN/148.
- ICAOs Circular 249-AN149.
- Circular 302-AN.
- Manual Guide for the Introduction of a Quality Management System for AIS/MAP of the CAR/SAM Regions, Part 2 – AIS/MAP Quality Manual.
- Manual Guide for the Introduction of a Quality Management System for AIS/MAP of the CAR/SAM Regions, Part 4 - Selection, Competence, Formation and Reclassification for AIS personnel.
- ISO 9000:2000 Norm –Foundations and Vocabulary
- ISO 9001:2000 Norm –Quality Management System. Requirements.

4. DEFINITIONS AND MEANING OF ABBREVIATIONS

4.1 Definitions

Efficiency: Obtain required results without difficulty or excessive effort by the operator.
Efficacy: Have fulfilled the objective.
Ergonomics: Study of the efficiency of the persons in his/her work environment.
Security: Minimum risk of accidents.

4.2 Meaning of Abbreviations

ARM Management of Resources for Aeronautical Information Services and Aeronautical Charts.

5. APPLICATION OF THE PRINCIPLES RELATED WITH HUMAN FACTORS

Are the principles that are applied to the design, content, processing and distribution of aeronautical information, certification, instruction and aeronautical operations that seek to establish a secure interphase between human components and of other kind of the AIM system, considering the human factor.

To that end the existence of a perfect human being – technology interphase is needed to carry out tasks and functions in which a high efficiency and efficacy is expected to obtain excellent quality.

5.1 Concept

Human factors are defined as a multidisciplinary field devoted to the optimisation of human performance so that human mistakes will not be repeated, consequently reducing them in air operations.

It has been called “human centred automation”, which is an IT concept that means automation designed towards the cooperative work with human operators in search of objectives.

Human element is the most flexible, adaptable and valuable part of the aeronautical system, but at the same time it is the most vulnerable one to influences that might negatively affect its behaviour. Nobody, whether he/ she is a Project designer, mechanic, administrator, comptroller, AIS Technician, or pilot may not always be able to perform his/her job to perfection. Thus, it is important to become aware of the role one is playing to avoid making mistakes.

5.2 Objective of Human Factors

Its objective is the efficacy and the efficiency of the system for air security and the well-being of the individual.

Efficiency: to obtain the required results without difficulty or excessive effort from the operator.
Security: Minimum mistake in the processing of aeronautical information.
Motivation: Adaptation of the human being to his environment (Work Environment).

So that the AIS/MAP personnel fulfil its objectives within the aeronautical activity:

- Must be trained and up-dated with the aeronautical information processing.
- Work with responsibility and efficiency while processing and providing the correct aeronautical data/information for the safety of users.

5.3 Human Performance

Since human factor is the main ingredient of air accidents, the International Civil Aviation Organisation (ICAO) through the study of mankind has, as objective, to avoid human error, therefore, it has deemed it important to take into consideration human capacities and limitations that have repercussions in the security and efficacy of air operations. With these concepts they may affect different areas such as Aeronautical Information Services which answer to the need of foreseeing mistakes and to raise the operational safety margin.

5.3.1 Physical Factors

Are all the physical factors that affect human beings, such as:

- Sicknesses.
- Injuries or deficiencies.
- Physiological
- Environmental factors: pressure, temperature, humidity, etc.
- Individual factors: resistance to cold, heat, fatigue, sleeping habits.

5.3.2 Biological Factors

- Sicknesses.
- Injuries or physiological deficiencies.

5.3.3 Psychological Factors

Personality features, which are less tangible and more difficult to understand:

- Perception; is the capacity to understand the environment through the senses, it takes time to become aware that even the sense in which you rely the most (sight), is not efficient in special circumstances (visual illusions).
- Labour Motivation and Satisfaction, this is a highly important factor, especially for work participation. One must feel satisfied when carrying out labours with the same or even great persistence.
- Emotion; human being is emotional by nature. This may affect an answer before particular circumstances.
- Indulgence is confidence in excess.
- Self-discipline, which is an important element to achieve objectives within a work team.

5.4 Faults in Human Factors

Due to constant technological progress, faults in main equipment or mistakes of operational personnel are rarely the fundamental cause of imperfections in the defences related with system security. Instead, said imperfections are a consequence of that fault in human decision making that is produced, basically, in the management spheres.

Faults, such as the following ones, may be considered:

- Active faults: are the mistakes and violations which have an immediate adverse effect, generally related with operational personnel such as AIS Technicians.
- Latent faults: are the decisions or measures whose consequences may remain latent for a long time.

5.5 Work Environment

Is part of ergonomics (the efficiency of the persons in the work place), the performance and human behaviour within the system (human being).

Performance and interaction with pilots, operations personnel, air traffic controllers, the authorities and services in charge of providing gross data information to AIS, AIS Office of other States and the utilization of automated systems will depend on:

- Arrangement of all of the up-dated aeronautical information.
- Having an adequate place to provide aeronautical information, through dialogue, without interferences (one thing is being said and due to a distraction another thing is said).
- Having enough space.
- Furniture must be well placed.
- Equipment working in optimal conditions.
- Adequate illumination system.
- Interpersonal relationships.

5.6 Situational Awareness

Means to have the perception of what is going on, comprehension of what is going on and prevision of what may happen. It is the ability to absorb information in a dynamic environment, evaluate and process information, anticipate the contingencies and start the needed and appropriate action.

5.6.1 Indications of the Loss of Situational Awareness

- Real loss of that which is perceived;
- Non-fulfilment in procedures;
- Violation of standardised processes, and
- Sensations of alarm.

5.6.2 To Avoid the Loss of Situational Awareness:

- Complete briefings;
- Comply with standardised procedures;
- Team work, and
- Effective communication and feedback.

5.6.3 What to Consider

- Pay attention to the correct information at the precise moment;
- If something seems not to be well, say it;
- Beware of boredom;
- Habits are hard to break;
- Expect for something to happen, this reduces Situational Conscience;
- Have concrete objectives and times to carry out a task;
- Reliable systems are not always correct;
- Automation has its secrets, and
- Distraction has diverse forms.

5.6.4 Situational Awareness ...to know or not to know?

- What do others know that I need to know?
- What do I know that others need to know?
- What is it that none of us know and that we should know?

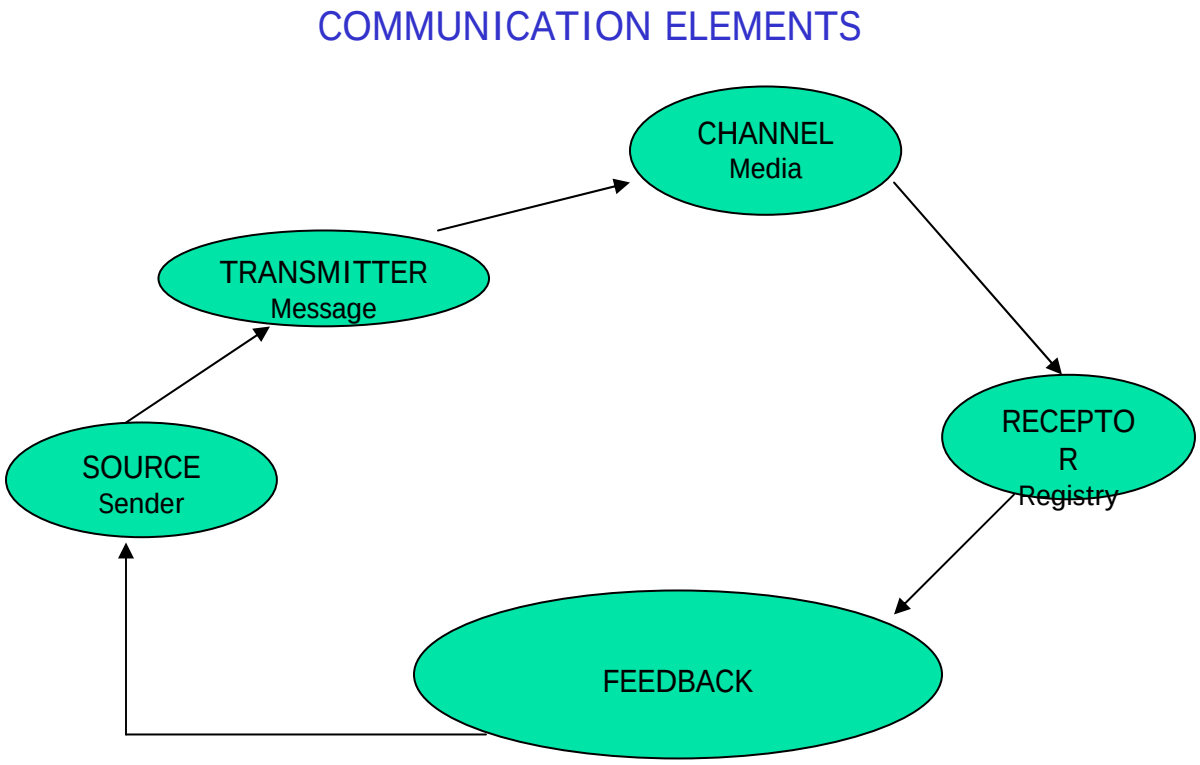
5.7 Communications

The AIS/MAP technician is an important part of the aeronautic information centre, he/she continuously receives and disseminates information and is the link with the flight operations personnel, crew members, units, etc.

5.7.1 Communication Objective:

- It is vital in our development.
- Its purpose is to keep us in touch with others.
- A message must be transmitted with precision for a good understanding.
- The effect of communication is given by the clarity with which the message is transmitted.
- It has mediate and immediate effects.

5.7.2 Communication Elements



5.7.2.1 Efficacy of the Sender

- Communication abilities.
- Attitudes.
- Level of knowledge.
- Socio-cultural system.

5.7.2.2 Efficacy of the Message

- Transmission capacity.
- Exactly express what one wants to be understood.
- Use common signs.
- Awaken the attention of the receptor.

5.7.2.3 Efficacy of the Channel

- The channels humans use are their senses.
- The more senses used, the most effective will the communication be.

5.7.2.4 Efficacy of the Receptor

- Communication abilities.
- His/her attitudes.
- His/her knowledge level.
- Socio-cultural system.

5.7.3 Defective Communication

- Distortion of the communication.
- Perception.
- The unconscious.

5.7.3.1 Distortion of the Communication

- What the sender believes he/she is saying.
- What is actually being said.
- What the receptor listens to.
- What the receptor thinks he/she listens to.
- What the receptor says he/she understood.
- What the sender thinks the receptor has said he/she has understood.

5.7.3.2 Perception

- Our image of the World is really our image.

5.7.3.3 The unconscious

- It is a factor that may subtly distort communication.
- It depends on the perception that one has of reality at that moment.

5.8 Handling of Information

One of the main responsibilities of the AIS/MAP Technician is to keep aeronautical information essential for the air navigation security, therefore provide it in a correct and timely manner to the final user. The AIS/MAP Technician will require analysing a great amount of information in real time and deciding which information is pertinent for its publication and distribution.

5.9 **Interpersonal or Human Relationships**

The Management of Resources for Aeronautical Information Services and Aeronautical Charts (ARM) concentrates attitudes in the AIS/MAP Technician and their effects, among others are:

- Team work
- Motivation
- Equal work, training conditions, etc.
- Existence of a good communication (Chief-Operator-User)
- Demonstrate the advantages of keeping a pleasant and relaxed environment.

5.10 Work Administration

Factors such as environment and working space of the AIS Technician are necessary elements to reduce or hinder its efficiencies. It is important to determine factors related with the work facilitation or decrease of work and the way in which working conditions may be modified to reduce to its minimum the decrease of performance. Even when one has a high degree of motivation, it is evident that a continuous working activity may lead to a reduction of the capacity for the adequate performance of the assigned functions.

The following aspects must be analysed:

- Fatigue, shifts, sleep, insomnia, motivation, fear and panic.

5.11 Effective Decision Making

With the influence of internal factors such as: conflict resolution, assertiveness and defense of self-opinion, the AIS/MAP Technician assumes an important role within the operational environment. This role in work administration and situational conscience support the effective functioning of the service of aeronautical information. It is required that the AIS/MAP Technician applies abilities for problem solution, including the following:

- Determination of the competence needs.
- Knowledge of available resources for the parties involved in decision making.
- Apply an effective strategy for problem solving that help with decision making.
- Avoid mistake situations in the process of production of integrated documentation.

6. AIM AUTOMATION

6.1 Objective

It is a manufacturing system designed for using the machine’s capacity to carry out specific tasks that are performed by human beings.

Every aeronautical information database, NOTAM, obstructions evaluation database, aeronautical charts, are considered as elements of a total aeronautical information system.

Compile, validate, process, store, recover, keep, analyse, disseminate AIS/MAP data automatically and exactly with the minimum human intervention, constitutes automation.

AIM automation must be used in a correct way so that it contributes to the efficiency, the security, to diminish the amount of mistakes and to increase reliability. The AIS/MAP Technician is infallible and his/her fault may equally be unpredictable. Thus, a mode of detention or rectification is needed as part of the AIM automated system.

6.2 Automation Limitations

Human functions within Aeronautical Information Management (AIM) must be clearly described. It must be kept in mind that certain limitations must be overcome, which include:

- **Human Competence**: systems may fail; therefore the system must maintain the security, though, not necessarily the efficiency. The AIS/MAP Technician will have the capacity to apply his/her practical knowledge, even though it implies a greater work load.
- **Work Load**: keep within a normal range, since little work leads to boredom, lack of attention.
- **Satisfaction**: is what the individual feels due to the work he/she carries out. Automation may diminish effort and tension in tasks, but it may also cause a loss of satisfaction for a work done when eliminating part of the work carried out. This is related to problem solving, decision making and planning..
- **The User**: must know how trustworthy the system is. The AIS/MAP Technician must know which are his/her tasks to be carried out, either manually or by an automated system.

6.3 Attributes of Closed Automation in the Human Being

The goal of automation is to help the AIS/MAP Technician to carry out task with security and in an efficient way. An automated system should have some attributes such as:

- Must be accountable: it means that the system must always keep the AIS/MAP Technician informed of his/her decision and must have the capacity to explain them whenever he/she is required to do so.
- Must be predictable; automation must be designed so that it seems and it is predictable for the operator, in such a way that a failure condition from a normal functioning is easily identifiable.
- Must be adaptable; automation must be conformed in agreement with the user's needs and preference; it is common that the technological process is equated with an increased complexity.
- Must be flexible; an appropriate option group of control and direction must exist to make the operators' job flexible, taking into consideration that operators have various experiences and diverse cognitive styles.
- Must be reliable; any system that is not presented in a reliable manner or which seems to behave in an erroneous way, will cause apprehension and mistrust.
- Must be informative; information delivered by the systems is of great importance both to participate in the task as to provide the user with it.
- Must be resistant to mistakes; which implies that it may be within certain margins of action and these may be represented through simple procedures to be able to reduce human mistake to the minimum.
- Must be tolerant to mistake; they must be put into practice during the design and use of the equipment. Therefore, the problem consists in developing a system that takes into consideration human capacity as well as its limitations.

7. FACTORS THAT MAY AFFECT THE AIS TECHNICIAN DECISION MAKING IN AN ADVERSE WAY

7.1 Environment Surroundings

It has been proved that the environment or surrounding is a very important factor for the good performance and a greater efficiency. However, we may determine that factors may adversely affect decision making, and they may be:

- **Vital stress**: that may be produced due to adverse processes that are present in the life of a person (divorce, death of a family member, etc.).
- **Environmental stress**: includes adverse effects that may affect human beings (temperature, humidity, noise, pressure, illumination, etc.).
- **Cognitive stress**: concerns the cognitive exigencies (mental) of the task, properly said.

7.2 Ergonomic issues

For there to be an efficient performance of the AIS/MAP Technician, he/she must consider:

- Design of the working space.
- Harmonisation of furniture and equipment.
- Efficient automated systems.

7.3 Medications or Narcotic Drugs

There are a great number of medications that are not only used to fight illnesses, but they are used in a preventive way. These medications are vaccinations, antibiotics, others to fight diarrhoea, etc.

Medicine may adversely affect the AIS/MAP Technician in the decision making process.

8. AIS/MAP PERSONNEL SELECTION

Will be carried out in agreement with what is set forth in the Manual Guide for the Introduction of a Quality Management System for AIS/MAP of the CAR/SAM Regions, Part 4 - Selection, Competence, Formation and Reclassification for the Aeronautical Information Service personnel.

- END -

ATTACHMENT 6 TO THE APPENDIX

EXISTING QUALITY SPECIFICATIONS RELATED WITH AIM/SG CONTRIBUTORY BODIES DEVELOPED BY THE AIM/QM/TF

Aeronautical Information Management Training Task Force (AIM/TRAIN/TF)

- Guidance Manual for the Implementation of an AIS/MAP Quality Management System in the Car/Sam Regions, Part 4 – Selection, Competencies, Training, and Re-qualification of Aeronautical Information Service personnel. *(Appendix A to Agenda Item 2 of the AIS/MAP/SG/10 report)*

Remarks:

Part 4 of the Guidance Manual sets forth the specifications for proficiency, training and re-qualification and maintenance of AIS/MAP personnel.

Guidance related with personnel specialization was reviewed at the AIS/MAP QM/TF/2 Meeting, and is included in Appendix A to Agenda Item 5 of the AIS/MAP QM/TF/2 meeting report under Syllabus of the AIS/021 CAR/SAM Course-second generation, the finalization of which is in charge of AIM/TRAIN/TF.

In support of the AIM/TRAIN/TF, whose which programme includes the study and definition of quality criteria of the human factor element within the AIM, and in response to the decisions of the AIS/MAP/SG/10 Meeting, under Agenda Item 6 of this QM/TF Meeting, the references for the *Human Factors Principles in the AIM – Application Guidelines* were reviewed.

Aeronautical Information Management Automation Task Force (AIM/AUTO/TF)

- Procedure for Checking and Validating Aeronautical Data. *(Appendix B to Agenda Item 2 of the AIS/MAP/SG/10 Meeting report)*
- Requirements of ISO 9001:2000 Standard applied to Automated Systems described in ISO/IEC 90003:2004. *(Appendix to WP/10 of Agenda Item 7 of the AIS/MAP QM/TF/2 Meeting)*

Remarks:

The procedure for checking and validating aeronautical data was designed to be applied both for a manual environment and for a totally-automated environment. Checking and validation activities are present each time an input or output piece of information is manipulated. It also encompasses Cyclic Redundancy Check (CRC), when data are handled through database and digital file transfer, wherein human intervention is kept at a minimum. With this sole kind of process maximum integrity of critical data may be ensured.

The AIS/MAP QM/TF/2 Meeting studied the use of ISO/IEC 90003:2004 Standard, *Software Engineering – Guidelines for the application of ISO 9001:2000 to computer software*, recognising that ISO 9001:2000 Standard should be the standard to be applied to automated systems, complemented by ISO/IEC 90003:2004.

In general, AIS/MAP in the CAR/SAM Regions do not produce nor develop software, which is the reason why, when acquiring a system for the safe provision of our services, the requirements of ISO 9001:2000 Standard must be taken into account. The following requirements shall be fulfilled:

a) determination of processes where systems will be applied as well as their interaction with other processes;
b) to count with the necessary resources for its good working order;
c) to count with the necessary information for its good working order;
d) allow the measurement, follow-up and analysis of processes;
e) generate the necessary registers;
f) to be aware of responsibilities regarding operation and maintenance, and
g) ensure required checking and validation activities specific to the product, among other requirements of design and improvement, products control and data analysis with their respective actions.

Aeronautical Information Management Electronic Aeronautical Charts Task Force (AIM/e-MAP/TF)

- Verification and Validation of Aeronautical Data. *(Appendix B to Agenda Item 2 of the report of the AIS/MAP/SG/10 Meeting)*

Remarks:

Procedure applicable to aeronautical data in general, databases and even to metadata, to ensure the integrity of electronic data to be supplied in the ATM operational environment.

TC/211 of the International Organization for Standardization (ISO) is in the process of definition of ISO 19100 Standards series, aimed at the standardization in the digital geographical information field. There is not yet any certifiable standard, but its application may be controlled under ISO 9001:2000 Standard.

Once the AIM/e-MAP/TF starts providing the relevant guidance material for the production of electronic charts and other tasks, the AIM/QM/TF will include in its work programme the study and application of the standards of ISO 19100 series.

ISO 19100 Standard series to be applied are structured as follows:

- ISO 19113 – Quality principles
- ISO 19114 – Quality evaluation procedures
- ISO 19115 – Metadata.

- END -