# INTERNATIONAL CIVIL AVIATION ORGANIZATION



**A REPORT OF THE SECOND MEETING OF THE AFI REGION STUDY GROUP
ON THE ESTABLISHMENT OF A CENTRALIZED AFI REGION AIS DATA BASE
(AFI – CAD/STUDY GROUP/2)**

**(NAIBORI,  KENYA, 3 – 5 OCTOBER  2007)**

**Conclusion 15/43 of the APIRG/15 Meeting states *inter alia*, "that IATA, in cooperation with ICAO and Air Navigation Service providers in the AFI Region Study the establishment of a centralized AFI AIS Data Base similar to the European Aeronautical database and forward it to the AFI AIS/MAP Task Force for its consideration".**

**AFI-CAD Study-Group is a Study-Group of the AFI Planning and Implementation Regional Group (APIRG). Its Reports are therefore submitted to APIRG for review and action.**

**The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of ICAO concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.**

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## Table of Contents

**Agenda Item 1:**    Election of the Chairman and Vice- Chairman.

**Agenda Item 2:**    Review of the AFI-CAD Framework adopted by the AFI AIS/MAP TF/4 and ATS/AIS/SAR SG/9 meetings**.**

**Agenda Item 3:**    Review of the AFI-CAD Guidance material adopted by the AFI AIS/MAP TF/4 and ATS/AIS/SAR SG/9 meetings**.**

**Agenda Item 4:**    Proposals for development of AFI-CAD user required specifications (URS)

**Agenda Item 5:**    Proposals for development of AFI-CAD Business model

**Agenda Item  6:**    Proposals for development of  AFI-CAD Financial model

**Agenda Item 7:**    Proposals for the development of a Quality Management System within the AFI-CAD

**Agenda Item 8:**    Elaboration of  Timelines for the development and  implementation of the AFI-CAD system and services

**Agenda Item 9:**    Any other business.

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**<u>APPENDICES</u>**

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**PART I - HISTORY OF THE MEETING**

**1.        Organization/Duration**

1.1        The ICAO Regional Offices in Dakar and Nairobi organized the Second Meeting of the AFI Regional Study Group on the Establishment of a Centralized AFI Region AIS Data Base (AFI – CAD) held in Nairobi, Kenya from 3 to 5 October 2007.

**2.        Officers and Secretariat**

2.1        Mr. G. Baldeh, the Secretary of the Study Group and Regional Officer, Aeronautical Information Services and Map (RO/AIS/MAP) of the ICAO WACAF Office, served as the Secretary of the meeting.  He was assisted by Mr. Brou Konan, Regional Officer (ATM) of the ICAO ESAF Office.

2.2        Mr. George Ochiel of the Kenya Civil Aviation Authority acted as chairperson and rapporteur of the meeting.

2.3        The meeting was opened by Mr. Apolo Kharuga on behalf of Regional Director ICAO ESAF Office in Nairobi, Kenya.  He highlighted that this meeting is a follow-up to endorsement of the framework and guidance material of the AFI – CAD, and pursuant to Draft Conclusion 4/9 of the AFI AIS/MAP TF/4 and Conclusion 9/12 of the ATS/AIS/SAR SG/9 meetings.  He further emphasized that the main objective of this second AFI – CAD meeting is to provide guidance for the establishment of a centralized AIS Data Base for the AFI Region through the development of user requirements specifications (URS) and business and financial models.  He then highlighted that the Study Group is expected to submit the results of its work to the APIRG/16 meeting for consideration.

**3.        Attendance**

3.1        The meeting was attended by 40 participants from 14 States and 4 International Organizations namely; ASECNA, IATA, GROUP EAD and ROBERTS FIR. The list of participants is given at **Appendix A** to this draft meeting report.

**4.        Working Language**

4.1        The meeting was conducted in the English language and documentation was issued in the same language.

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**5.      AGENDA**

5.1      The meeting adopted the following Agenda :

**Agenda Item 1:**      Election of the Chairman and Vice- Chairman.

**Agenda Item 2:**      Review of the AFI-CAD Framework adopted by the AFI AIS/MAP
                        TF/4 and ATS/AIS/SAR SG/9 meetings**.**

**Agenda Item 3:**      Review of the AFI-CAD Guidance material adopted by the AFI
                        AIS/MAP TF/4 and ATS/AIS/SAR SG/9 meetings**.**

**Agenda Item 4:**      Proposals for development of AFI-CAD user required specifications
                        (URS)

**Agenda Item 5:**      Proposals for development of AFI-CAD Business model

**Agenda Item 6:**      Proposals for development of  AFI-CAD Financial model

**Agenda Item 7:**      Proposals for the development of a Quality Management System
                        within the AFI-CAD

**Agenda Item 8:**      Elaboration of  Timelines for the development and  implementation of
                        the AFI-CAD system and services

**Agenda Item 9:**      Any other business.

**6.**                  Recommendations.

**6.1**                 The Study – Group recorded its action in the form of
                        recommendations.

**6.2**                 List of Recommendations.


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**LIST  OF DRAFT  RECOMMENDATIONS**

| Number | Title |
|---|---|
| **Recommendation 1:** | **That the adopted AFI – CAD Framework be endorsed by APIRG.** |
| **Recommendation 2:** | **Evaluation criteria for the identification of the AFI-CAD Operating Centers:**<br><br>1. Geographical Location<br>2. Communication Infrastructure<br>3. Sustainability of Economy<br>4. Political Stability<br>5. Information Technology – currently available and sustainable<br>6. Provision of training – Training ability / infrastructure<br>7. Power supply :<br>     – availability<br>     – reliability<br>     – sustainability<br>8. Human Resource availability –<br>     i. AIM<br>     ii. Management<br>     iii. Project Management<br>     iv. Information Technology<br>     v. Training<br>9. Financial availability / sustainability<br>10. Previous experience – Track record<br>11. Common consensus<br>12. Infrastructure – Buildings<br>13. Evaluation to be conducted by an International Organization with a proven track record of successfully completing similar evaluations (e.g. ICAO/ United Nations/ EUROCONTROL, etc.) |
| **Recommendation 3:** | **That the adopted Guidance Material be approved  by APIRG/16 .** |
| **Recommendation 4** | **Endorsement of EAD URS as a Basis for AFI-CAD URS** |
| **Recommendation 5:** | **Introduction of QMS by AFI-CAD States**<br>That each contracting AFI – CAD Member State shall take all necessary measures to introduce a properly organized QMS containing procedures, processes and resources necessary to implement the quality management at each function stage. The execution of such quality management shall be in accordance with Annex 15, Chapter 3 paragraph 3.2.1. |
| **Recommendation 6**: | **Measurement tool for evaluation of AIS Services**<br>That Appendix K to APIRG/15 report as per Attachment A to DP/7 be adopted by AFI States as a measurement tool for evaluation of services in order to provide room for improvement and the prevention of  non-conformity. |

| Number | Title |
|---|---|
| **Recommendation 7**: | **Framework for development of the QMS**<br><br>That AFI – CAD member States adopt the template for a project proposal in Appendix XX to Attachment A of DP/7 as a framework for development of the QMS in terms of defining scope, assessing the potential benefits, continuing the program, determining the roles and responsibilities of those involved in the development and implementation of the QMS, and specifying deliverables, target dates and the resources needed. |
| **Recommendation 8**: | **Timelines for the development and implementation of the AFI – CAD**<br>That ICAO would synchronize the most suitable timelines for the development and implementation of the AFI – CAD based on the evolution of events. |
| **Recommendation 9:** | **Development of the required training modules**<br>That AFI – CAD through the cooperation with GroupEAD develops the required training modules for AFI-CAD member States. |
| **Recommendation 10:** | **Development of the required format of a service level agreement**<br>That AFI – CAD through the cooperation with GroupEAD develops the required format of a service level agreement for the AFI – CAD member States. |
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**PART II          REPORT ON AGENDA ITEMS**

**Report on Agenda Item 1:**

1.1              Mr. George Ochiel, Chief   Lecturer AIS/MAP, Kenya Civil Aviation
Authority acted as the Chairperson and Rapporteur of  the Second AFI CAD meeting.

**Report on Agenda Item 2:**

**Review of the AFI – CAD Framework Adopted by the AFI AIS/MAP TF/4 and ATS/AIS/SAR/SG/9 meeting**

2.1          The meeting noted that the AFI – CAD Framework was already adopted by the AFI AIS/MAP TF/4 and ATS/AIS/SAR/SG/9 meetings and therefore would not require any further action.

2.2          The  Study Group recommends the APIRG/16 meeting to  review and approve the evaluation process as recommended below.

**Recommendation 1:  That the adopted AFI – CAD Framework be endorsed.**

**Recommendation 2: Evaluation criteria for the identification of the AFI-CAD Operating Centers:**

14. Geographical Location

15. Communication Infrastructure

16. Sustainability of Economy

17. Political Stability

18. Information Technology – currently available and sustainable

19. Provision of training – Training ability / infrastructure

20. Power supply :
    – availability
    – reliability
    – sustainability

21. Human Resource availability –
    i.    AIM
    ii.   Management
    iii.  Project Management
    iv.   Information Technology
    v.    Training

22. Financial availability / sustainability

23. Previous experience – Track record

24. Common consensus

25. Infrastructure – Buildings

26. Evaluation to be conducted by an International Organization with a proven track record of successfully completing similar evaluations (e.g. ICAO/ United Nations/ EUROCONTROL, etc.)

**Report on Agenda Item 3:**

**Review of the AFI – CAD Guidance Material Adopted by the AFI AIS/MAP TF/4 and ATS/AIS/SAR/SG/9 meetings**

3.1             The meeting noted that the AFI – CAD Guidance Material was already adopted by the AFI AIS/MAP TF/4 and ATS/AIS/SAR/SG/9 meetings and therefore would not require any further action.

**Recommendation 3:  That the adopted Guidance Material be approved  by APIRG/16 .**

**Report on Agenda Item 4:**

**Proposal for development of AFI – CAD user requirements/specifications (URS)**

4.1              Under this Agenda Item, the meeting noted that they have been mandated to develop the  AFI – CAD user requirements specifications (URS) by Draft Conclusions 4/9 of the AFI AIS/MAP Task Force 14 meeting which states *inter alia*:

> "That States and  or Organizations in a position to do so, provide the required technical expertise to assist the Study Group to Develop User Requirement Specifications (URS) for AFI – CAD".

4.2              Following a thorough review of the CIT Client configuration document as per attachment A of DP/4, the meeting noted that this attachment was just an element of a basic URS that would have to be developed for the AFI – CAD.

4.3              The meeting reviewed DP/6 concerning operational concept and user requirements on the above Agenda.  The meeting noted that the subject of writing a requirement specification and the process around this could be a time consuming and complex issue.

4.4              The meeting agreed that the V-model methodology as per Annex 2 of DP 16 could be utilized as the frame work for  the development of AFI-CAD URS. The Authorities of EUROCONTROL were contacted during  the meeting and they kindly offered their support in providing the EAD URS as the reference material for the AFI-CAD URS.

The Meeting then recommended the following:

**Recommendation 4**: **Endorsement of EAD URS as a Basis for AFI-CAD URS**

The AFI-CAD Study Group for the establishment of a centralized AFI Region AIS Data Base accepts the EUROCONTROL EAD URS as the basis for the AFI-CAD URS taking into consideration the specific AFI Requirements.

**Report on Agenda Items 5 and 6:**

**Proposals for development of AFI-CAD Business model and proposals for development of AFI-CAD financial model.**

5.1          Under this Agenda Items, the meeting noted that they have been mandated to develop a business model and financial model for the AFI-CAD by Conclusion 9/12 of the the ATS/AIS/SAR SG/9 meeting which States inter-alia.

> **"That the study group develops a business model and financial model for the AFI-CAD".**

5.2          The meeting reviewed and noted the proposals presented under DP/2, 5, 6, 12, 13, 17, 18 and noted that it does not have the expertise to produce a Business/Financial model addressing the establishment of AFI-CAD..

5.3          The meeting agreed that the elements contained in DP/17 and DP/18 be considered in formulating the Business / Financial Plans .The meeting proposed that ICAO appoints Business/Financial experts to formulate the required Business/Financial model based on the elements listed in Recommendation 10 of the adopted AFI-CAD Guidance material for a Business Plan and Financial Plan as follows:

a)       **Business Plan**:

     i)    **Setup Capital**:  The business plan to be adopted must define the total set-up cost and where this capital will be obtained (e.g. loans, donations/aid, State contributions). Each States responsibility in this regard must be defined and be enforceable in any AFI-CAD membership agreement.

     ii)   **Financial Sustainability**:  The business plan to be adopted must also define how financial sustainability will be ensured e.g. by state contributions, fees to be charged for access by users, en-route charges, etc).  This must also show how continuous improvement and safety monitoring systems will be maintained and funded.

     (iii) **Service Providers:**  The resources that the service provider will bring to the project must be defined and enforced in the service provider's contract.  It should not be the sole responsibility of the member states or the Agency to fund this project as it should be  based on the user/beneficiary principle.

b)      **Financial Plans**: The financial model for AFI CAD as discussed above also needs to address the following operational consideration.

     **(i) Continuous Operational Cost Recovery:** Continuous operational cost recovery must be endorsed as a minimum requirement.  It this does not occur, AFI – CAD will not be a viable concern.

**(ii) Cost-Benefit Analysis**:   A cost benefit analysis reflecting the advantages and disadvantages of all business models discussed above needs to be performed before a particular model can be recommended and accepted by AFI CAD member States.

**(iii)Future Cost Benefits:** To AFI – CAD (eg. Via provision of services additional to what is presently being provided will need to assess to ensure organizational structuring to take advantage of these future benefits.

**Report on Agenda Item 7:**

**Proposal for the development of a Quality Management System (QMS) within the AFI – CAD**

7.1          Under this Agenda Item, the meeting reviewed the draft proposal for development of a QMS within the AFI – CAD.  The meeting noted that the role of AIM is one of the foundation building blocks for the successful transition to a Global ATM system. At the core of this building block, lies the QMS that will provide quality and timely information to the aviation community.

7.2          The meeting noted that the timeliness and integrity of quality aeronautical information/data is a significant enabling activity for the globalization of ATM. Amendment 29 to Annex 15, introduced the requirements for the implementation of a Quality Management 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 organized quality system containing procedures, processes and resources necessary to implement quality management at each function stage. The execution of such quality management shall be made demonstrable for each function stage when required" (Annex 15, Chapter 3 paragraph 3.2.1 refers)".

7.3          The meeting endorsed the above requirement as a recommendation for AFI member States joining the AFI CAD system.

**Recommendation 5: Introduction of QMS by AFI-CAD States**
          That each contracting AFI – CAD Member State shall take all necessary measures to introduce a properly organized QMS containing procedures, processes and resources necessary to implement the quality management at each function stage.  The execution of such quality management shall be in accordance with Annex 15, Chapter 3 paragraph 3.2.1.

7.4          The meeting also noted that in order to develop a QMS within the AFI-CAD, paragraph 3.2.2 of Annex 15, recommends that the QMS established, should be in conformity with the International Organization for Standardization (ISO) 9001 Series and certified by a recognized organization. These international standards specify the requirements for a QMS where an organization needs:

-    to demonstrate its ability to consequently provide products that meets 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 of non-conformity.

7.5          The meeting noted the action taken by Appendix K to APIRG/15 Report as a measurement tool for evaluation of services in order to provide room for improvement and the prevention of non-conformity. The meeting then reviewed Attachment B concerning the

Guidance material for the development of a QMS within the AFI  - CAD and endorsed the template for a project proposal in Appendix  to this document as a framework to be adopted by AFI – CAD Member States.

The meeting then recommended the following

**Recommendation 6**: **Measurement tool for evaluation of AIS Services**
        That Appendix K to APIRG/15 report as per Attachment A to DP/7 be adopted by AFI States as a measurement tool for evaluation of services in order to provide room for improvement and the preventions of  non-conformity.

**Recommendation** 7: **Framework for development of the QMS**
        That AFI – CAD member States adopt the template for a project proposal in Appendix XX to Attachment A of DP/7 as a framework for development of the QMS in terms of defining scope, assessing the potential benefits, continuing the program, determining the roles and responsibilities of those involved in the development and implementation of  the QMS, and specifying deliverables, target dates and the resources needed.

**Report on Agenda Item 8:**

**Time lines for the development and implementation of the AFI CAD**

8.1              Under this Agenda Item, the meeting was invited to elaborate on the timelines for the development and implementation of the AFI – CAD as presented by the Secretariat in DP/8.

8.2              The meeting reviewed the proposed timelines for the development and implementation of the AFI – CAD as per attachment A and B to DP/8.

The meeting recommended :

**Recommendation 8**: Timelines for the development and implementation of the AFI – CAD

That ICAO would synchronize the most suitable timelines for the development and implementation of the AFI – CAD based on the evolution of events.

**Report on Agenda Item 9:   Any Other Business**

9.1              **Training**

9.1.1   Under this Agenda Item, the meeting discussed the training requirements for AIS personnel to carry out AFI-CAD activities.

9.1.2              The meeting noted that the AIS Staff training development plans have been integrated in the approved framework of the AFI – CAD as per Item (i) (State AIS Human Resources).

9.1.3              However the GroupEAD pledged to assist AFI CAD in the Development of Training Programs for member States of AFI – CAD based on the its experience.

> **Recommendation 9:** Development of the required training modules
> That AFI – CAD through the cooperation with GroupEAD develops the required training modules for AFI-CAD member States.

9.2              **Service level Agreements (SLA)**

9.2.1   The meeting then noted the requirements for the development of the various service level agreements for the AFI CAD.

> **Recommendation 10:** Development of the required format of a service level agreement
> That AFI – CAD through the cooperation with GroupEAD develops the required format of a service level agreement for the AFI – CAD member States.

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# INTERNATIONAL CIVIL AVIATION ORGANIZATION
# EASTERN AND SOUTHERN AFRICAN OFFICE

## SECOND MEETING OF THE AFI REGION STUDY GROUP ON THE
## ESTABLISHMENT OF A
## CENTRALIZED AFI REGION AIS DATA BASE

### (NAIROBI, KENYA, 3 - 5 OCTOBER 2007)

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**INTERNATIONAL CIVIL AVIATION ORGANIZATION**
**EASTERN AND SOUTHERN AFRICAN OFFICE**
**NAIROBI, KENYA**

**2nd Meeting of the AFI Regional Study Group on the**
**Establishment of a Centralized AFI Region AIS Data base**

**(AFI-CAD)**

**(Nairobi, 3 – 5 October 2007)**

# AFI CAD Requirements

Hannes BRUNNER
Nairobi, October 2007

# General Requirements

→No implementation project, but COTS
→Provable references are essential
→Produce Roadmap of at least 3 years available
→Compliance to ICAO Annex 15
→Experience with large systems connecting multiple countries and arbitrating amongst them for data consolidation must be proven

# General Requirements

→Financial stability of the proponent is essential for such a large scale project
→High level of maturity of development processes to be proven as a constructive safety argument
→Experience with safety management required
→Existing safety case is desireable
→Experience with Security Management required

# General Requirements

→  System delivery alone is not sufficient. Equally important is the transition support from current systems / processes to the new connected service.
→  Workflow automation support
→  Adapting systems to new versions of AIXM is essential but expensive. Continuous upgrades to keep the system in line with new AIXM releases shall therefore be included in the standard software maintenance.

# Temporal Static Database (SDO)

→storing all information relevant for
- **Validation / creation of NOTAM**
- **creation of aeronautical publications**
- **creation of aeronautical charts**
- **Flight Plan Validation / Management**
- **Weather Management**

- **Procedure Design**
- **Airspace Design**

# Temporal Static Database (SDO)

→ **Compliance to AIXM**
→ **rules checking the data validity, correctness and integrity are applied to any information entered into this database**
→ **facilities for retrieving, updating, checking, and publishing static data**
→ **differentiate between pending and committed data**
→ **Newly, entered data shall remain in status "pending" until all necessary quality review measures have been completed**

# Temporal Static Database (SDO)

→ **AIXM-based access layer to update the database, which prevents users from directly accessing the objects in the database**
→ **Static Data Maintenance: maintain spatial attributes to enable spatial queries (e.g. all VORs within a region). Static Data Maintenance shall allow committing sets of related data updates as a whole to the database**
→ **Static Data Workflow: a publishing mechanism to co-ordinate and check static data updates for which multiple Data Providers are responsible. It shall be possible to combine related data updates in sets.**
→ **It shall be possible to check a number of sets commonly for consistency within all of them. Data shall be checked for self-consistency and for consistency with the existing static data;**
→ **AIXM / ARINC Update Upload / Download:**
**It shall be possible to process a file containing aeronautical data in either ARINC 424 or AIXM (XML syntax) exchange format. The data shall be interpreted, checked, and stored in the database or retrieved from the database**

# Temporal Static Database (SDO)

→ **Static Data Reporting**
  - **shall allow the definition and execution of reports on the static AIS data**
  - **shall be able to generate reports as HTML, XML and plain text output.**
  - **It shall be possible to dynamically define reports**
  - **it shall be possible to store predefined report templates allowing users with lower permission level only to enter a subset of parameters**

# NOTAM creation and processing System (INO)

→ **Message Creation:**
→ **Message Creation comprises functions to create, edit, store or delete messages. The following messages are supported:**
  - **NOTAM,**
  - **SNOWTAM,**
  - **ASHTAM,**
  - **AFTN Freetext.**
→ **Messages shall be created by using the content of the Temporal Static Database. The system shall verify the messages against a pre-defined set of rules and the Temporal Static Database. In case of an error, the system shall react by the appropriate error handling. If no error occurs, the message shall be stored, distributed, and made available for retrieval.**

# NOTAM creation and processing System (INO)

→ **Message Processing:**
  - **It shall be possible to process different types of messages.**
  - **The system shall verify the format against a pre-defined set of rules and the Temporal Static Database.**
  - **In case of an error, the system shall react by the appropriate error handling.**
  - **An erroneous message is either stored in a queue for manual processing or rejected and sent back to the message originator.**
  - **Whether an erroneous message is stored in the message queue or not depends on the message type and the system configuration.**

# PIB Briefing System

→ **PIB and Message Retrieval:**
**shall include different report generator modules to retrieve NOTAM and to format Pre-flight Information Bulletins, NOTAM summaries, and other NOTAM Retrieval products. To reduce the amount of information that has to be re-typed in case of frequently used inquiries, it shall be possible to maintain pre-defined profiles;**
→ **PIB Inquiry:**
**It shall be possible to generate the following types of PIBs:**
  - **Aerodrome Bulletin (all NOTAM covering a specific aerodrome)**
  - **Area Bulletin (all NOTAM within a specific area),**
  - **Route Bulletin (all NOTAM within FIRs crossed by a route),**
  - **Narrow Route Bulletin (all NOTAM within a definable corridor around a route),**
  - **Special Area Bulletin (all NOTAM within a special area),**

- **Update bulletin and update service (PIBs only taking into account changed information with respect to the previous PIB).**
→ **Maintenance of the routes for the narrow-route Bulletin,**

# PIB Briefing System

→**Maintenance of predefined PIB Inquiries:**
**To define templates for queries which are used more than once.**
→**NOTAM Summary Inquiries:**
- **FIR and Aerodrome Summary,**
- **NOF Summary.**

→**Single NOTAM Retrieval for the NOF, Aerodrome, FIR,**
→**Administrative Bulletin:**
- **NOTAM checklist format,**
- **Detailed format.**

# Aeronautical Charting System

→ **The Aeronautical Charting shall allow the creation and maintenance of aeronautical charts.**
→ **It shall be possible to retrieve information from the Temporal Static Database and to automatically sketch this information on the aeronautical chart.**
→ **It shall be possible to maintain charting configuration data (data related to chart specifications, graticule definitions, ellipsoid definitions, and chart symbolisation).**

## Aeronautical Charting System

→ **Chart set-up, i.e. defining the chart's geographical reference,**
→ **Compose the chart, i.e. add elements from the database,**
→ **Synchronise chart, i.e. check chart annotation against database,**
→ **Update chart, i.e. provide changes for new effective date,**
→ **Publish chart, i.e. create output that is ready for publication,**
→ **Maintain chart specification, i.e. define chart attributes, grid appearance, and element symbolisation.**

## Aeronautical Charting System

→**The aeronautical charting System shall support all types of aeronautical charts, e.g.**
- **IFR charts**
- **VFR charts**
- **Procedure charts**

→**It shall allow automatic sketching of AlXM/ ARlNC encoded procedures**

# AIP Authoring

→**The AIP authoring subsystem shall allow the creation and maintenance of aeronautical publications (e.g. AIPs).**
→**In order to allow efficient work and in order to ensure overall data consistency from data entry to publication the AIP authoring subsystem shall use the data stored in the Temporal Static Database to support the creation of AIP documents.**

# AIP Authoring

→ **It shall be possible to populate AIP documents with aeronautical data from the database.**
→ **Data links can be inserted into the AIP documents, which reflect the changes in the database. This allows the critical data in the AIP to be automatically updated.**
→ **Creation and modification of AIPs which allows modifications to be made for future publication,**
→ **Generation of AIRAC Amendments, Non-AIRAC Amendments, Supplements, AICs,**
→ **Database connectivity allowing linked data from the Temporal Static Database to the document,**

# AIP Authoring

→ **AIP Management allows an AIP to be added to the AIP database.,**

→     Insertion of change bars at the point where a document has been modified,
→     Creation of PDF (Portable Format Files) files of the AIP, AIC, Supplement and Amendments,
→     Automatic Table Generation to allow the user to create data linked tables without manually inserting data links,
→     Report generation of all changes and tracking information.
→     Creation and publication of AIPs in accordance with the eAIP (electronic AIP) standard

# AIP Publication system

→The AIP Publication System shall allow the storage of published AIP and related documents. This includes AIP, AIP Amendments, AIP Supplements, and AICs. The AIP documents shall be checked into the AIP Publication System, where they are stored. Charts, generated with the Aeronautical Charting System, are also stored in the AIP Publication System.
→The following functionality shall be provided:
- Import and publishing of AIP documents (AIP, AMDT, SUPP, AIC, Charts) manually and from the AIP authoring system,
- Import and publishing of eAIPs,
- Possibility to view Charts (only charts embedded in pdf-files),
- Searching AIP documents via Meta-Data (current version, authorities, Sections…) and full-text search,

# AIP Publication system

- View the published AIP document,
- View eAIPs,
- Print the AIP document,
- Download AIP documents,
- View the history of the document (versioning),
- More than one user can view the same document,
- Check-in (version and Meta Data) of AIP documents,
- Check-out and cancel checkout of AIP documents,
- Deletion of AIP documents,
- Cancellation of AIP documents.

# Geographical Information System

→The GIS for Static Data and PIB subsystem shall allow displaying the data stored in the Temporal Static Database within a Geographical Information System. It shall be possible to display pending and committed data in order to allow the users to graphically evaluate the impact of pending changes before committing them.
→In addition to the display of static data stored in the Temporal Static Database it shall be possible to display the results of a PIB enquiry within the Geographical Information System.

# Geographical Information System

→The GIS for Static Data and PIB shall allow the following functionality:
- Querying data stored in the Temporal Static Database (pending and committed) of a given effective date with attribute filter and spatial filter,
- Presenting the result of queries in a multi-layered map,
- Standard map controls such as panning, zooming, selecting, undo and redo zoom or pan, measuring and coordinate readout,
- Advanced map controls such as redlining, geometrical operations, printing, changing projection, raster file background,
- Representing SDO entities in a geometry tree with edit preview,
- Representing entities in a table.

- **Querying INO entities (NOTAM, SNOWTAM, ASHTAM, BIRDTAM, ATFM and CRAM) using PIB requests,**
- **Printing of the map,**
- **Change the map projection,**
- **Presentation of NOTAM entities in a table.**

# Flight Plan Management

→**The FPM module shall allow Aircraft operators to file ICAO FPL**

→**It shall be possible for ARO/FPL office employees to efficiently manage and trace the FPL validation and approval process**

## Deployment and Technologies

→        **In order to allow efficient software distribution and maintenance it is essential that widely used system components do not require any installation on the workstation, i.e. they should be based on web technology like HTML or JAVA. It shall be possible to automatically receive software updates without the need to do local installation tasks.**

→        **Web-based  access must therefore be at least possible for the subsystems:**
  - **Temporal Static Database**
  - **Static Database Reporting**
  - **NOTAM creation and processing System**
  - **PIB Briefing System**
  - **GIS for Static Data and PIB**

## Maintenance / Service Desk Requirements

→        **The proponent shall include in his proposal the yearly price for software maintenance (preventive and corrective maintenance). In order to ensure the envisaged possibility to seamlessly exchange information with the EAD (European AIS Database), the maintenance shall moreover include the adaptation of the new AIS system to the same AIXM version that is used in the EAD (the Proponent has to ensure that the solution is always capable to exchange data with the at the time current EAD-AIXM version).**

→        **In order to ensure that the new AIS system is always up to date, it is not sufficient to utilize potential backwards-compatibility features of EAD, but the new AIS system shall make full use of the most recent AIXM version used in EAD.**

→        **The proponent shall confirm in his proposal that the yearly maintenance rate will not be increased more than 10 % per year and that the proponent is prepared and willing to provide the maintenance described above for at least 4 years.**

→        **The proponent shall operate a 24x7 helpdesk covering at least the NOTAM creation and processing System and the PIB Briefing System.**

# Timeline (based on experience from existing  customers / similar projects)

# Implementation Project

→**Requirements engineering: 6-10 months**

→**Implementation: 2-3 years**

→**Acceptance / Finetuning: 6 months**

→**Roll-out: 6 months**

→ **Data migration: 12-24  months**

**Cons: Long lead time, long project duration, implementation risk, risk of project failure, long implementation time, high cost, child diseases**
**Pro: Tailored solution, full freedom for selection of functionality**

# Definition Implementation Project

→**Custom development based on 100 % compliance with client requirements**
→**Fully tailored solution, specifically implemented for the project**

# COTS or modified COTS Project

→**Requirements engineering: 1-2 months**
→**Implementation: 3 months (for modified COTS project)**
→**Acceptance / Finetuning: 1 month**
→**Roll-out: 1 month**
→ **Data migration: 6-12  months**

**Cons: No full freedom regarding requirements**
**Pro: short lead time, implementation time, no implementation risk, Tailored solution (for modified COTS project), no child diseases, lower cost, profit from best practices, hands-on possibility before project start**

# Definition COTS / modified COTS

→**Commercial Off the Shelf Product**
→**Available as a commercially available product**
→**Same software is also used for other customers (maybe  with different parameters)**

→**Modified COTS:**
→**Basis is a COTS product**
→**Customer specific extensions or modifications are put in place to cover specific requirements not covered in the standard COTS product.**

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**(AFI-CAD)**


**(Nairobi, 3 – 5 October 2007)**


*General approach for an AFI Region AIS Centralized dB user requirements*

Index of subjects

Background (I/II)

Background (II/II)

Index of subjects

## Who is GroupEAD  Europe S.L.

- **GroupEAD Europe S.L. is a multinational society that was founded to provide the EAD service on bechal of EUROCONTROL on 1 April 2001 as Sociedad Limitada (S.L.) in Madrid, Spain.**
- **Founding members: AIS service providers + system expert industry**
    - Spanish  **ANSP** Aena              **(36%),**
    - German  **ANSP** DFS                **(36%),**
    - Austrian **industry**  Frequentis      **(28%).**


## Who is GroupEAD  Europe S.L.

- **GroupEAD Europe S.L. is a flexible Organization, working under the highest quality , safety and security standards with high recognition in the world wide aviation community.**


## Index of subjects

An approach for the AFI-CAD

## General User requirements

- **With the aim of improving and harmonising procedures and the delivery of aeronautical data in Africa, APIRG Plan has recommended in their 2005 General Meeting to** establish one central AFI Region AIS database (AFI-CAD)**.**
- **This centralised database should provide clients with** validated **dynamic and static aeronautical data through high level standards.**
- **The objective is the delivery of high-quality aeronautical information to the** African Aviation Community **and** their national Air Traffic Services Providers**.**
- **The AFI-CAD must** contribute to safety, economics, uniformity and quality **with independence of the situation and means of each country.**

## Proposal on User requirements

- **The AFI-CAD must perform** coherence checking of the data **and then making a consistent view available to the Users of the Data.**
- **At all times,** every African State would maintain intellectual property rights **and would have control of the data for which they are responsible.**
- **The** AFI-CAD must conform **to the ICAO and AFI Region** international standards **and must fully support the production of information following the AIRAC cycles.**
- **The AFI-CAD must accommodate a** modular interface **to the database and related applications,** allowing clients to implement **those applications complementary to their functions** (non captive service provision)**.**

## Proposal on User requirements

- Full compatibility and connectivity with existing AIS databases **is a key aspect (e.g. EAD, NYMA) to exchange data of AFI countries and vice versa.**
- Connectivity **and** availability **are key issues in this kind of operational services (especially for dynamic data info).**
- Reliability **and** fixed implementation timeframes**: Not reinventing the wheel will save a lot of money granting at the same time straight, faster and fixed implementation calendars.**
- Who will regulate the AFI-CAD? **An** Oversight Management Unit **shall be established by the most appropriate organisms (AFCAC/ICAO, etc.).**

## Proposal on User requirements

- **Proven** functionality **and** technology
- **System protocol following** AIXM **(e.g. AIXM 5.0)**
- **Demonstrated compliance with the ICAO safety and security recommendations and trends.**
- **Higher reliability with fully** dedicated COTS **product adapted to the AFI environment vs new developments without guarantee on their development and implementation timeframes and costs..**
- **Existing systems will help to reduce/share the additional costs for the yearly enhancements required.**
- **Demonstrated system availability over 99%**

## Proposal on User requirements

## Proposal on User requirements

## Proposal on User requirements

## Timeframes

## Index of subjects

## Summary of conclusions

- An efficient and reliable approach**: Taking advantage of the EAD experience already tested, validated and implemented, a similar model for the AFI-CAD could save a lot of money and efforts.**
- Timeframes reduction**: A similar development can be implemented in a faster way and with proven guarantees of functioning.**
- Peculiarities of the AFI region **and member states shall be taken absolutely into account for a successful implementation.**
- Identification of **such** peculiarities **should be an important key** task for this study group **in a parallel process.**
- EUROCONTROL **could be proposed as an impartial expert organism** for the validation of the service model**.**
- Demonstrated **operational and technical** availability over 99%.

## **Thank you**

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Index of subjects

Background

Index of subjects

User requirements approach

I. Service Management
•**Service Provision Management**
•**Quality Assurance**
•**Safety and Security Management**
•**Change Management**
•**Performance Reporting**
II. Data Operations
•**Data Consistency (Quality)**
•**Static Data Operations (SDO)**
•**International NOTAM Operations (INO)**
•**Published AIP Management System (PAMS)**
III. Contingency Services
•**Business Continuity**

Index of subjects

User requirements approach

Service Provision Management**:**
        **It consists on the management, performance, monitoring and coordination of the Services,**
**maintaining a company organisation, its resources, qualification and experience to ensure that it delivers**
**to the service levels specified.**
• **To ensure compliance to all the specifications of the AFI-CAD Services.**
• **To establish and document the processes and procedures required for the management, performance**
  **monitoring and coordination of the AFI-CAD Services.**
• **A Service Management Plan shall cover the specifications of the complete services requirements and its**
  **Management Plan.**
• **To ensure that the operational and financial competitiveness of the services is maintained.**

User requirements approach

Quality Assurance**:**
• **The Quality Assurance service shall cover all processes which can influence the quality of the delivered**
  **services.**
• **During the whole duration of the service provision, the Quality System which meets the ISO 9001:2000**
  **requirements shall be maintained.**
• **The Services shall be delivered following the procedures established in the Quality System.**
• **The degree of adherence to and the adequacy of the Quality System shall be monitored periodically.**
  **Any revision of the Quality System shall be carried out if required as a result of the monitoring**
  **process.**
• **A certification body shall be selected to collaborate with it during the periodic certification audits.**

## User requirements approach

Safety and Security Management**:**

The Safety and Security Management service shall cover the AFI-CAD in a broad sense, including hardware, software, applications, staff, procedures and documentation. The objectives are to:
- **Develop and apply the AFI-CAD safety and security policy**
- **Comply with the AFI-CAD Safety Case once developed**
- **Support the AFI-CAD oversight management  to keep AFI-CAD Safety Case up-to-date.**
- **Perform the required safety assessments for any change on the Services producing the due report for traceability;**
- **Validate the System Safety Assessment Reports and Preliminary  System Safety Assessment Reports.**
- **Conduct regular Proactive Safety and Security Risk assessments.**

## User requirements approach

Change Management**:**
- **The Change Management service shall ensure the ability to manage all changes to the AFI-CAD Service/System with a minimum adverse impact.**
- **The Change Management process shall assess (cost, impact, benefits, etc) and categorise Change Requests (CR) in order to allow the right level of authority and expertise (e.g. through a Change Control Board or similar) to authorise and manage them.**
- **The Change Management process shall encompass every change, temporary or permanent, affecting the AFI-CAD systems and/or service**

## User requirements approach

Data Consistency**:**
- **The data contained in the AFI-CAD database shall be reviewed according to the Quality System procedures. The data consistency reviews shall be realised for Static Data (SDO), Dynamic Data (INO) and Electronic AIP Library (PAMS) data.**
- **All data errors contained in the AFI-CAD shall be recorded and reported by the AFI-CAD users or by the service provider staff.**
- **For each recorded error, the error source shall be determined (Originator, Service provider company or System Error).**
- **A table of errors classified by severity shall be established.**
- **The detected errors shall  be corrected, coordinating its correction with the responsible states when required for database consistency.**

## User requirements approach

Static Data Operations (SDO) :

The objective of the SDO service shall be to provide a database of validated Static Data for Clients and shall facilitate the exchange of this data.
- **The addition, withdrawal or amendment of data items shall be assured, being effectively coordinated amongst the AFI-CAD Data Providers.**
- **The SDO service shall be delivered and guaranteed to Data Providers in order to enable them to maintain their Static Data in the AFI-CAD as scheduled.**
- **The proper execution of the SDO services shall be ensured by maintaining basic parameters.**

## User requirements approach

Static Data Operations (SDO) Services

## User requirements approach

International NOTAM Operations (INO) :
- **The objective of the INO service is to facilitate the exchange between States of the NOTAM, SNOWTAM, BIRDTAM and ASHTAM messages (TAM in general) received via AFTN., as well as the report creation and querying facilities for airspace users .**
- **A complete, consistent and validated database of coherent NOTAM, SNOWTAM, BIRDTAM (military**

**only), ASHTAM and ATFM messages (TAM) shall be made available to Clients both for browsing and for PIB use.**
- **The receipt and processing of Free Text Messages (FTM) shall be ensured.**
- **The proper execution of the INO services by maintaining basic parameters shall also be ensured.**

## User requirements approach

International NOTAM Operations (INO) :
- **The AFI-CAD INO Service shall operate as a "NOTAM Processing Unit" (processing all TAM in accordance with the ICAO guidelines).**
- **The AFI-CAD INO Service shall ensure that all received TAM messages are validated, coherent, in the recommended format and that syntax and structure of the messages conform to ICAO Annex 15 before allowing them to be saved and distributed.**
- **To increase the validation and quality of NOTAM the AFI-CAD INO Service shall link NOTAM to the static data object in the SDO DB they temporarily affect.**
- **The AFI-CAD INO Service shall continuously ensure the completeness of the database by monitoring the world-wide NOF and take the corrective actions in case no NOTAM has been received from a NOF in a pre-defined timeframe .**

## User requirements approach

Published AIP Management System (PAMS) :
- **The objective of the PAMS service shall be to make available a library of published English version of AIP's, AIP Amendments, AIP Supplements and AIC's in digital format.**
- **The responsibility for the correctness, accuracy and validity of the information contained in the Publications remains with each issuing State.**
- **The PAMS library shall be updated with the last available Publications for States which are not yet managing the addition, deletion or modification of their Publications directly in the AFI-CAD.**
- **The PAMS library shall include all the AIP's, AIP Amendment, AIP Supplements and AIC's.**

## User requirements approach

Business continuity management (BCM)
  **The objective is to maintain the AFI-CAD Service at an available state at all times in accordance to the agreed Service Levels in times of a major interruption to the service including in the event of  Force Majeur and social unrest; it shall consist of:**
- **To recover the level of AFI-CAD services in the event of a disaster within the agreed timeframe and budget;**
- **To minimize the impact of a disaster on the Service Levels provided to AFI-CAD Clients;**
- **To prevent the occurrence of any disaster on those services by managing the risks and the vulnerabilities.**
- **To provide and manage a business continuity plan including all risks, threads and mitigations to enable the delivery of the AFI-CAD Service.**

## User requirements approach

Service Desk (SD) :
  **The objective shall be to act as the H-24 main interface between Clients and the AFI-CAD, including all AFI-CAD systems, responding to requests for operational and technical assistance, managing the resolution of operational and technical problems for Clients and managing the delivery of specific services in response to Client requests.**
- **Any question addressed towards the AFI-CAD SD shall be managed in by an independent "service ticket". This can concern an incident, a problem, a service request, a guidance (request for information), etc.**
- **The AFI-CAD SD shall be responsible to establish and document the processes, procedures and functions required for the management, performance, monitoring and co-ordination of the Service Desk.**

## User requirements approach

IT Centre Services:
- **.**

User requirements approach

Client terminal-supply Services:

- .

User requirements approach

Maintenance Services:

- .

User requirements approach

System Management Service:

- .

User requirements approach

Network Management Services:

- .

**Thank you**

## INTERNATIONAL CIVIL AVIATION ORGANIZATION
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## 2nd Meeting of the AFI Regional Study Group on the Establishment of a Centralized AFI Region AIS Data base

## (AFI-CAD)

## (Nairobi, 3 – 5 October 2007)

# What are the lessons learned in Europe?

**The advantages of a centralized AIS Database are multiple…..**

**Is there a cost benefit analysis?**

## Cost Reduction by usage of EAD for Member States

"EAD Feasibility Study", "Feasibility Report"
–Initial Study commissioned by Eurocontrol, CAP debis (1993)
–Updated Study covers the following cost issues
- **Implementation costs for EAD (5,5 Mio + 4,85 Mio for local interfaces)**
- **Operating costs (7,2 Mio / year); "full configuration"** (10,9 Mio / year)
–Updated Study covers the following benefit issues
- **Initial Analyze Report (IAR) found total operation costs of 54,3 Mio / year**
- **30 % of these costs could be reduced (staff reassigned in total 102)**
- **Direct savings of** 16,4 Mio / year
But:
- **Benefits based only on reassignment of <u>operational</u> staff**
**Missing: cost avoidance/reduction based on unnecessary clients´ local AIS solution**

• **EAD avoided costs on IT-focus for EC Member States\***

Total savings based on EAD

**Operational savings      16,4 Mio**
**Avoided IT costs    38,4 Mio**
                    ========
**Total savings          54,8 Mio / year**

**Total costs of Service      8,3   Mio / year**
**(Eurocontrol based)**
**(without depreciation)**

What is the conclusion?

- **Focussing on the pure commercial details there is a business-case for a centralized AIS database.**
- **There are operational benefits which have not been evaluated in the investigation:**
  - **Higher quality and better standardization leading to a higher level of safety.**
  - **Additional enhancements of the database my lead to higher benefits**

**➔There is a positive Business Case for Europe….**

**➔ ….why shouldn't there be one for Africa?**

*Thanks for your attention*

*questions?*

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Background

Requirements for a Financial Model
**Thesis 1:**
**Financial Model needs to be transparent and cost efficient**

The AFI-CAD financial model proposal

Requirements for a Financial Model

**Thesis 2:**
**Centralized Database = Monopoly = Inefficient Service**

Performance based payment
**An efficient service can be achieved by ….**

**… granting financial incentives or**

**… giving financial penalties**

**➔ For each service performances shall be defined to establish a bonus/Malus regime**

Clear benefits for the community
**Cost savings using AFI-CAD:**

DP**:**          **Better use of its own resources**
DU**:**          **Cost effective access to a single source**
DO&DU**:**   **No more investments on AIS own systems**

➜ **A cost effective solution sharing costs and avoiding permanent investments**

## Avoiding captive clients

**From easiest to complex, different options could be managed depending on client needs:**

**AFI-CAD** Basic**: Free of charge via Internet.**
**AFI-CAD** Terminal**: "AFI-CAD terminal" connected to AFI-CAD DB.**
**AFI-CAD** system to system interface**: Interface with the AFI-CAD DB to maintain the client's AIS own systems.**

➜ **Taylor made solutions depending on necessities**

## Conclusions

**The AFI-CAD financial model should be:**

✓ **Transparent and cost efficient.**
✓ **Sharing cost among actors**
✓ **Based on service level specifications (SLS).**
✓ **Paid under a bonus / malus regime.**
✓ **Designed to avoid duplications of investments**
✓ **Ready for different kind of clients**

➜ **A real existing efficient model**

*Thanks for your attention*

*questions?*

*Ignacio.iglesia@groupead.com*

# COMMON AFI DATABASE – PRESENTATION FROM KENYA

Presented by Francis K. Mwangi – Senior Engineer (Telecommunications)

## PRESENTATION OUTLINE

*PREAMBLE*

*SERVERS HARDWARE*

*SERVER DATABASE*

*CLIENT STATIONS*

*TELECOMMUNICATION LINK*

## PREAMBLE

A Common AFI Region Database (CAD) is long overdue. With CAD, the AFI region will improve the accuracy of the data since the states will use the same static data for civil aviation operations. It will also improve the delivery of services to the data users. Data users will be able to download all the information needed at their convenience. CAD will also remove service duplication and other existing deficiencies. CAD will also reduce the overall cost of providing AIS services across the AFI region.

## CAD DATABASE SERVERS.

As already proposed in the previous meetings of the AFI CAD working group, multiple server sites are appropriate for the provision of services. The proposed number of centres are four. This will ensure the continuity and availability of the service at all times.  For each centre,

➢ Multiple servers (two in number recommended) should be installed in hot-standby mode. This will ensure the availability of each operating centre. For the proposed four operation centres, the number of servers is thus $4 \times 2 = 8$

➢ Each server at the operation centre should support multiple disks (mass storage) supporting a Redundant Array of Inexpensive Disks (RAID) arrangement. Hot pluggable disks will be most appropriate since it reduces the downtime of a server.

➢  The equipment provision should be in such a manner that for each member state, local support for the servers is available. So the exact server model may vary from state to state.

➢ Server switch over from the operational to standby should be seamless in order to increase availability. This calls for high-end, expensive hardware.

➢ For the operational centres, a distributed system topology is most appropriate. The four centres exchange data continuously with each other. A complete database will thus be available at each site and the data users can query any site.

## DATABASE SYSTEM

A AFI CAD system calls for a high-end, high performance database system that ensures maximum availability. The database system:-

➢ Supports cross-server database replication at each of the operational centre
➢ The system should be able to support very large sizes of database (in tetra bytes) as the common database is bound to grow.
➢ Support open database technology. This will enable flexibility of the data user application design and does not limit the technology used in querying the database.
➢ Supports advanced and quick recovery techniques in an event of failure.
➢ Support XML and other common internet technologies
➢ For each state(hosting an operational centre), local support for the RDBMS software should be available.
➢ ORACLE RDBMS very suitable for this operation, regardless of the operating system platform.

## CLIENT INTERFACE

This allows the interaction with the servers running the AFI CAD, allowing download, modification (data providers) and reporting of the aeronautical information.

➢ Support of graphical user interface (GUI)
➢ Standard Off-The-Shelf computer system that has local support in each state most appropriate
➢ The GUI based on internet technology – HTML, XML
➢ The client application should support AIS data models e.g. models for NOTAM, ASHTAM e.t.c. to ease data creation by the operators.
➢ Standard operating system with local support depending on each AFI member state.

**TELECOMMUNICATIONS LINK**

This inter links the operational centres (4) and also links the client terminals to the data centres.

> ➢ Due to the limitations of the existing AFTN network in the AFI region, it can not be used for the purpose of the AFI CAD. However, this network can be used for the distribution of NOTAM as is current.
> ➢ The system to be implemented on Internet Protocol IP network and use of other internet technology e.g. Virtual Private Network (VPN).
> ➢ For the server synchronization, fast data transfer technologies should be implemented. These include Frame Relay, xDSL, Satellite technology e.t.c. AFI should consider the use of networks such as NAFISAT, CAFSAT e.t.c.
> ➢ The satellite network should be used for
>   o CAD servers replication
>   o Upload of AIS data – NOTAM, AIP, AIC e.t.c.
> ➢ For the distribution of and query of the CAD databae, existing AFTN will be used as the EAD system does currently. AIS data users should be able to download NOTAM from the CAD data operational centres. This will call for the linking of the centres to the existing AFTN network
> ➢ Data user replies from the data centres to be seamless: a reply can originate from any of the centres
> ➢ States with existing automated AIS to link their systems to the CAD through the satellite network

**KENYA CIVIL AVIATION AUTHORITY**
**KENYA PRESENTATION THE AFI REGION CENTRALIZED AIS DATABASE**

## INTRODUCTION

• In recognizing the global nature of Aeronautical Information provision and its exchange ICAO called for an active, coordinated global approach to the evolution of AIS, thus the ICAO 11th Air Navigation Conference held in 2003 in Montreal – Canada, recommended (Rec. 1/8 Global Aeronautical Information Management and data exchange model) that ICAO:

• When developing ATM requirements, define corresponding requirements for safe and efficient global Aeronautical Information Management that would support a digital real time, accredited and secure Aeronautical Information environment and:INTRODUCTION. Cont.

2. Adopt a common Aeronautical Information Exchange model, taking into account operational systems or concepts of data interchange and their mutual interoperability.

Consequently the APIRG/15 meeting held in Nairobi, 26 -30 September 2005 developed conclusion 15/43 which states inter alia:-

"That IATA in Cooperation with ICAO AND Air Navigation Services providers in the AFI Region, study the establishment of a centralized AFRI AIS Database similar to the European Aeronautical Database (EAD) and forward it to the AFI AIS/MAP Task Force for consideration."

## CURRENT SITUATION IN AFRICA.

**Each AFI states processes its Aeronautical Data manually and mainly being paper – based, with a few exceptions having Automated AIS Systems.**

**Therefore, for improved Aeronautical Data quality, there is need for standardized procedures and harmonized systems – to ensure Data Integrity, Accuracy, Timeless and Availability.**

## KENYA PROPOSALS TO IMPROVE CURRENT SITUATION

**Kenya supports the ICAO/APIRG 15 Concept of an AFI Centralised AIS Database.**

**Objective of the AFI Region AIS Centralized Database:-**

**To deliver high – quality Aeronautical Information to the Aviation community.**

**Reduce safety risks posed by the publication and Distribution of Aeronautical Information by improved data quality, increasing availability and accessibility of AIS data.**

**Reduce cost of Aeronautical Information Services.**

**The concept paper should cover the following**

## KENYA PROPOSALS TO IMPROVE CURRENT SITUATION

- **Institutional Framework**

    Air Navigation Service providers should take the leading role with the assistance of ICAO.

    (i) All the AFI Region member states will be the participating states and their rights be defined.

    (ii) Participating states to be involved in all stages of the implementation of the project and operation of the Data base.

    (iii) Establish a Standing Committee composed of all DG's. (or there empowerd delegated representatives)

## KENYA PROPOSALS TO IMPROVE CURRENT SITUATION

- **Institutional Framework (cont.)**

    **(iv) Empower the Task Force to manage the process from the beginning to the establishment of the Data Base. (By inclusion of the relevant required experts**

    **(v) Appoint a Technical team competitively sourced from participating states to manage the data base.**

    **(vi) A Contractor should be competitively sourced to establish the database.**

    **(vii) Maintenance to be contracted out only when necessary**

## KENYA PROPOSALS TO IMPROVE CURRENT SITUATION

- **Control and Ownership**

    The control and ownership should be vested to the participating states or their appointed agency. Management level to be involved in the approval of every stage through the standing committee of the DG's or a Sub Committee appointed by the DG's. The States AIS to be involved in the acceptance of the system and reviewing of the documents.

## KENYA PROPOSALS TO IMPROVE CURRENT SITUATION

- **Financing**

    (i) Feasibility Study – should be financed by participating states or through grant.

    (ii) Project for establishment of Data Base – Should be financed by participating states or through borrowing

    (iii) Maintenance and Operations – financing through cost recovery by States, fees for access to data to those not paying ANS charges.

## KENYA PROPOSALS TO IMPROVE CURRENT SITUATION

- **Procurement process**

(i)  The participating states should   ensure that the procurement process is done in a transparent manner acceptable to the participating  states.

(ii)  Develop procurement procedures acceptable to participating member states.

(III). Task force to procure consultant to do the feasibility study:
    consultant to establish the data base and source competitively staff  for the Technical Team from participating member states.

(iv) The Technical Team will competitively source for the system maintenance

## KENYA PROPOSALS TO IMPROVE CURRENT SITUATION

•      **Location**

**The Standing Committee to propose location subject to a criteria being set to determine location possibly on requisite infrastructure currently available.**

## KENYA PROPOSALS TO IMPROVE CURRENT SITUATION

•      **Cost Recovery**

The component of cost of the AFI Regional AIS Data Base for each country should be incorporated in their ANSP charges.  A fee to be applied for access to those who do not pay ANSP charges.

## <u>CONCLUSION</u>

**All AFI Region states be encouraged to Fully participate in the Development, Implementation and operations of the AFI  Region Centralized AIS Data Base for maximum benefits to be realized.**

**APPENDIX-I**


**INTERNATIONAL CIVIL AVIATION ORGANISATION**
**AFI Region Study Group on the Establishment of a Centralized**
**AFI Region AIS Data Base**


**SECOND MEETING**
*(Nairobi, Kenya, 3-5 October 2007)*


**Agenda Item 3:**    Proposal for development of AFI-CAD user requirement specification
(URS)

**INTERNATIONAL CIVIL AVIATION ORGANIZATION**


*Peter Rudolph*

| **SUMMARY** |
| --- |
| This paper provides some thoughts about a possible methodology and process for the development of a Requirements Specification and the other documents which are necessary to prepare a call for tender for the AFI Region Study Group on the Establishment of a Centralized AFI Region AIS Data Base (further called in this paper AFI CAD SG). |

Annex 2 is separate.

## INTERNATIONAL CIVIL AVIATION ORGANIZATION

# Introduction

Draft Conclusion 4/9 of the AFI AIS/MAP TF/4 requests States and/or Organisations which are in a position to do so, to assist the AFI CDA SG to develop User Requirements Specification (URS) for the Centralized AFI Region AIS Data Base (AFI CAD).

The URS is a very important document in the set of documents which need to be developed to prepare a call for tender for the AFI CAD. However, when writing the URS it should generally be agreed in which set of documents the URS will have to fit in after its finalisation. This requires to identify the principle method and process under which the AFI CAD call for tender will be managed and which program managed principles will be chosen and used.

The procurement and installation of the AFI CAD is going to happen as a multinational procurement under the auspices of an organisation (e.g. ICAO, African Union, African Civil Aviation Commission), or made by an especially inaugurated interest group of States or Civil Aviation Authorities or an other appropriate body. Whatever type of entity will be responsible all will need to follow a strong, well documented and proven principle of procuring a complex technical information system under well defined procurement and program management principles. This is also important in case that a loan or credits are given by a bank like the African Development Bank or others as those organisations have strong procurement guidelines and principles in place.

The AFI CAD initiative is a very advanced approach to fulfil the airspace user needs in aeronautical data, aeronautical obstacle, and terrain data requirements. It will built, in a large extend, the basis for and assist the implementation and usage of the Global Satellite Navigation System (GNSS) technology on the African continent. Therefore the ICAO ATM Operational Concept (Doc 9854-AN/458) 1st Edition 2005 and ICAO Global Air Navigation Plan (Doc 9750-AN/963) 3rd Edition 2007 should be taken into account.

# Operational Concept – ICAO Baseline

Because of its far reaching influence the AFI CAD URS needs to take into account that the 1st Edition 2005 of the ICAO ATM Operational Concept views Aeronautical Information with its temporality, intelligent information management, with unlimited access, limited bandwidth and optimised transfer of information, with fully electronic and network environment with printouts used only as needed for reference, temporary memorisation and visualisation support to human operators (paragraph 2.9.12 to 2.9.16).

The AFI CAD URS shall also take into account that the ICAO ATM Operational Concept views seven ATM concept components in paragraph 2.1.6, Figure 2-1:

1. Airspace organisation and management (AOM),
2. Demand/capacity balancing (DCB),
3. Aerodrome operation (AO),
4. Traffic synchronisation (TS),
5. Conflict management (CM),

6. Airspace user operations (AUO),
7. ATM service delivery management (ATM SDM).

The AFI CAD will contribute to all of those new components which show that the aeronautical information in form of aeronautical data, aeronautical obstacle data, terrain data and others (e.g. NOTAM) is a key enabler for the new ATM concept. It should be carefully analysed during the preparation of the URS that the new requirements stemming from this concept are reflected in the URS.

The ICAO Global Plan Initiatives (GPI) of the 3rd Edition of the Global Air Navigation Plan shall also be taken into account Namely GPI-18 "Aeronautical Information" and GPI-20 "WGS-84" to ensure that the scope of both GPIs "to make available in real-time quality assured electronic information (aeronautical, terrain and obstacle) and " to implement WGS-84 by all States".

These two GPIs address also the quality of aeronautical information as made available by data originators and to be maintained during its process through national AIS in the AFI Region and AFI CAD to end users. Therefore the whole electronic uninterrupted aeronautical data chain shall be addressed in the Operational Concept for the AFI CAD.
It shall be noted that GPI-18 "Aeronautical Information" is the only GPI[1] which provides input to all seven ATM concept components. This underlines the importance of Aeronautical Information and the set-up of the AFI CAD.

# Program Methodology, Process and Management

**A program like the AFI CAD needs integrated program management principles for the whole life-cycle of the system. This means basically for the:**

1. Program set-up phase,
2. Call for tender preparation phase,
3. Tender phase,
4. Contract negotiation phase,
5. Implementation phase,
6. Operation phase,
7. Maintenance phase.

There are a couple of proven methodologies available around the world to organise such a process. Important for the AFI CAD is the fact that the organisation who will finally issue the call for tender is not yet existing. This means that the process needs to cover, from the professional point of view, nevertheless all phases including Set-up Phase, Tender Preparation Phase until Maintenance Phase and not only identifying user requirements. This is necessary in order to have a holistic approach to the methodology of the whole program process. If a mapping of the chosen methodology and process to a other methodology and process is needed at the end because of legal and/or liability requirements, then the mapping shall be done in total and not only for a limited part. However, when the whole process is chosen at the beginning of the work then it is very likely that the work can be re-used in total.

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[1] See Table 1-1 of ICAO Global Air Navigation Plan (Doc 9750-AN/963) 3rd Edition 2007

Possible methodologies area e.g. available from the Software Engineering Institute of the Carnegie Mellon University, USA (www.sei.cmu.edu); the Association of Project Management, UK (www.apm.org.uk); the Atlantic Systems Guild Inc. UK (www.volere.co.uk); or e.g. the V-Model ® XT of the German Government (www.kbst.bund.de).

It is suggested to use the methodology of the V-Model ® XT which the German Government uses for all of its civil and military procurements of software products and systems. The V-Model is designed as guidance for planning and executing development projects, taking into account the entire system life cycle. It defines the results to be achieved in a project (or program) and describes the actual approaches for developing these results. In addition the V-Model specifies the responsibilities of each participant. Thus, the V-Model describes in detail, "who" has to do "what" and "when" within a project. Other guidelines, e.g. ISO standards, are presently in use, but they are less concrete than the V-Model because they, e.g., do not specify product templates.

These standardized, methodical guidelines permit a systematic execution even of complex and extensive projects. Thus, projects get more planable, traceable and lead to high-quality results with greater reliability, which is advantageous for acquirer and supplier.

The cooperation between acquirer and supplier is an essential factor of success. Thus, it is regulated by the V-Model. The responsibilities of both sides are specified. Thus, the V-Model standards are an important basis for contracts between acquirer and supplier. In addition, the V-Model improves the comparability of Offers.

Thus, the V-Model can be used as basis for contracting, as process guidance and as basis of communication.

The big advantage of the V-Model is that it includes a process of tailoring the model for specific needs like the AFI CAD procurement. The V-Model is fully documented in PDF and HTML in English and German language, is available free of charge and includes electronic Java based tools for tailoring, customisation, document generation[2]. The V-Model uses free Open Source Editors (Open Office) but the documents are also compatible to commercial editors like Microsoft Word. Paragraph 0 of this paper contains the whole process of the V-Model including tender preparation, contracting, etc. Paragraph 0 (Annex 1) shows the complete model which needs to be tailored following the needs of AFI CAD. That the V-Model also contains the procurement cycle in total is a big advantage for the AFI CAD as the modelled procurement rules can be considered in setting up the AFI CAD program even when the procurement entity is not yet know. The V-Model comes from the generic approach of the German Government for procurement of all types of IT systems.

# Program Team

The initially set-up Program Team will grow over the time. It is important to set-up a team which understands the process from initial schedule and applicable documentation planning, making working plans including initial principle thinking about procurement and call for tender preparation. The team members need to be aware with the latest ICAO developments and need operational know and experience in the Aeronautical Information areas. The team needs founding and the right composition of representatives. The representatives shall represent:

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[2] The Requirements Specification Document which is provided as appendix to this paper was generated with the V-Modell Tool.

1.  the four indented areas of responsibility (North, West, East and South[3]),
2.  the three intended language groups (Arabic, English, French[3]),
3.  ICAO HQ, and ICAO AFI,
4.  Organisations in a position to contribute.

Initially the team can be set-up by ICAO AFI but as soon as the procurement agency is inaugurated the team shall be responsible to that entity.

It is very important that representatives of the intended areas are taking ownership in the idea of the AFI CAD at the earliest possibility. This means that those areas shall be formed as first provisional step very soon. Otherwise a real ownership and representation is not easy to achieve. If a program team starts working without representing the intended areas of responsibility and being not from the language groups' then special care needs to be taken by regular interviews and presentations to allow the areas to follow along the preparation of the concept and documents and to ensure input.

# Set of Documents and Structure

Whatever methodology and process is chosen, the AFI CAD program needs a proper set-up especially because of its size and complexity from the beginning. Following the principles of the various models, different documents are needed depending of the phase where the program is in. The minimum set of Documents could be viewed as follows:

| No | Doc Group | Doc Title | Audience | Priority |
|---|---|---|---|---|
| 1.1 | Planning and Control | Program Manual | Internal | - |
| 1.2 | | Program Plan | Internal | High |
| 2.1 | Requirements and Analyses | Program Proposal | Internal | High |
| 2.2 | | Legal Framework of the operation of the AFI CAD | Internal | High |
| 2.3 | | Operational Concept | External | High |
| 2.4 | | Requirements Specification Overall Project | External | High |
| 2.5 | | Requirements Evaluation | External | - |
| 2.6 | | Service Provision Requirements | External | High |
| 3.1 | Acquisition and Contracting | RFP Concept | Internal | High |
| 3.2 | | Criteria Catalogue for Assessment of Offers | Internal | - |
| 3.3 | | Request for Proposal | External | - |
| 3.4 | | Offer Assessment | Internal | - |
| 3.5 | | Contract | External | - |
| 3.6 | | Contract Addendum | External | - |

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[3] See Framework and Guidance Material for the Establishment of AFI CAD as provide in Appendix E to ATS/AIS/SAR/SG/9 Report

| 3.7 |  | Statement of Acceptance | External | - |
|-----|--|------------------------|----------|---|
| 4.1 | Configuration and Change Management | Problem Report - Change Request | External | - |
| 4.2 | | Change Status List | Internal | - |
| 4.3 | | Problem Change Evaluation | Internal | - |
| 4.4 | | Change Decision | External | - |

The documents marked in the Audience Column as "Internal" are important for setting up the internal process of the procurement team, the documents marked "External" need to be sent to the potential bidders during the tender process or to be used during program execution process. The documents marked in the Priority Column as "High" shall be developed in parallel to the Requirements Specification.

The documents with no priority shall be developed when the process for the set-up of the AFI CAD is more settled.

# Requirements Specification Outline

This paper uses the term "Requirements Specification" rather then the term "User Requirements Specification" to highlight that ALL requirements need to be gathered, and user requirements are only one part of requirements. A Requirements Specification document outline is provided as separate Annex 2 (Paragraph **Error! Reference source not found.**) to this paper as example. It shows headlines for each type of requirements.

# Endorsement of Requirements Specification and other Documents

The Operational Concept (No 2.3) and the Requirements Specification (No 2.4) shall be evaluated whether they get acceptance by the user community. This evaluation shall follow the principle as outlined in the ICAO Global Air Navigation Plan Figure 1-1 (page 1-3).

The other documents shall be evaluated as defined in the Program Manual (No 1.1).

# Timeline

It is not easy to identify a timeline for the effort of writing the documents as described in this paper. With experience of the author of this paper it could be said that it might be possible to write all the documents mentioned in this paper with three persons full time in 6 month. Interviews and reviews included.

The effort mentioned in 0 depends on the review process for the documents. The review process is not yet clear as it relates to the set-up of the procure**ment entity for the AFI CAD. When this is clear a more precise assessment is possible.**

# Conclusions

This working paper covers some initial thought about the subject of writing a Requirements Specification and the process around this. It is suggested to use the term "Requirements Specification" and not the term "User Requirements Specification" because the non-functional requirements are very important from day one for defining such a complex system.

The most important issue is to decide whether the development of the Requirements Specification shall be developed before the procurement entity is founded. This has a major impact on the organisation of the work and who leads the Requirements Specification development. From the suggested methodology point of view (V-Model) it can be done without the final procurement entity in place as long as respective knows how and experience is in the team.
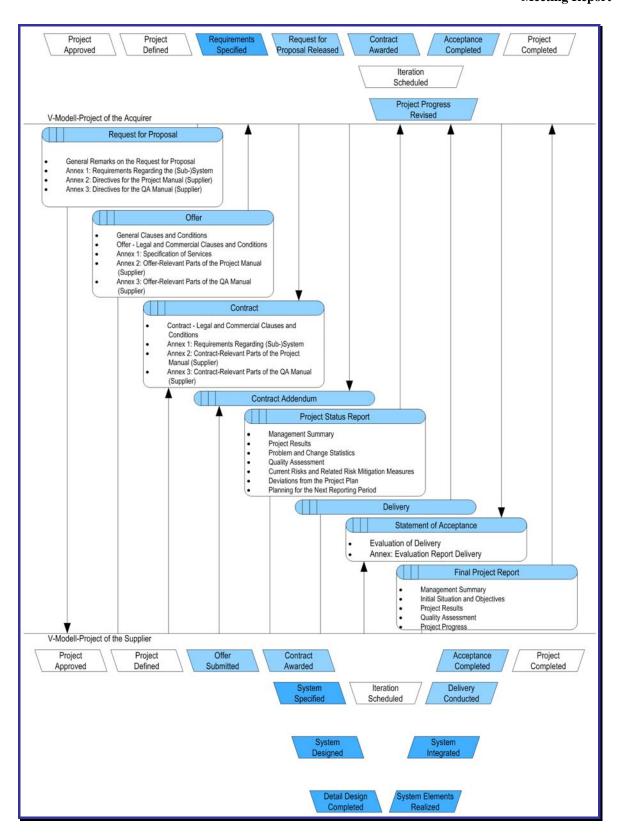
It shall be considered to start with the development of an Operational Concept rather then the Requirements Specification.

To gather a better understanding of the work share between the Operating Centres the foundation of at least "interim" areas of responsibility for North, South, East and West shall be considered. This has also influence on the Operational Concept, data exchange and others.

## Recommendation
The study group meeting is invited to note the information presented in this paper.

## Annex 1 - V-Model Process for Acquirer and Supplier
Refer to paragraph 0.

**APPENDIX-J**

**INTERNATIONAL CIVIL AVIATION ORGANISATION**
**AFI Region Study Group on the Establishment of a Centralized**
**AFI Region AIS Data Base**

**SECOND MEETING**
*(Nairobi, Kenya, 3-5 October 2007)*

**Agenda Item 5:**    Proposal for development of AFI-CAD Business Model

**INTERNATIONAL CIVIL AVIATION ORGANIZATION**

*Peter Rudolph*

| **SUMMARY** |
| --- |
| This paper provides some thoughts about a possible Business Model for preparation of the call for tender, the procurement and the operation of the Centralized AFI Region AIS Data Base (further called in this paper AFI CAD). |

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## INTERNATIONAL CIVIL AVIATION ORGANIZATION

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# Introduction

The Conclusion 9/12 of the ATS/AIS/SAR SG/9 requests that the Study Group develops, inter alia, a business model for the AFI CAD.

The business model for the provision of aeronautical information according to ICAO Annex 4 and Annex 15 and for the required changes as described in the ICAO Global ATM Operational Concept[4] (Doc 9854) and the ICAO Global Air Navigation Plan[5] (Doc 9759) is a monopoly business model by nature. There is no other legal entity responsible as the respective State according to the ICAO Convention.

The Framework and Guidance Material for the Establishment of the AFI CAD requires in Recommendation 1, no. ii., that the service of the AFI CAD shall be an activity of cost-recovery nature and shall not generate profit on its own behalf. However, the service can be operated by a service provider on behalf of the African States which are the owner of the service.

# ICAO Policies on Air Navigation Services Economics

Aeronautical Information Services (AIS) fall by definition under "Air navigation services" in sense of Charges[6]. Therefore the ICAO Manual on Air Navigation Services Economics (Doc 9161) shall be used as a guideline for identifying the cost for AFI CAD. The organisational and international cooperative aspects of Appendix D to the Global Air Navigation Plan (Doc 9759)shall also be taken into account as the AFI CAD:

1.   will be an multinational facility and service implementation,
2.   will need an international operating agency,
3.   will need an joint charges collecting agency,
4.   will need joint financing arrangements.

The AFI CAD activity is therefore full in line with Assembly Resolution A35-14, Appendix X, where Sates are expected to give consideration to cooperative efforts for introducing more efficient systems and services.

# Legal Framework

The initial establishment of an organisational kernel of the AFI CAD is very important to be able start continues work on the program and to establish initial funding. Users and all African countries can benefit from the AFI CAD establishment therefore it could be an initiative assisted by the African Organisation of Unity (OAU) and managed under the auspices of the African Civil Aviation Commission (AFCAC). From 53 African countries, 39 have signed the AFCAC Constitution, 44 have ratified, and 44 have deposited it. This is a big majority. AFCAC has in its constitution already the functions of "fostering arrangements between States", "contribute to ICAO Regional Plan implementation", and close consultation and cooperation with OAU and ICAO.

According to article 13 of the AFCAC Constitution, AFCAC shall prepare and approve a budget for the direct cost; indirect costs are handled under the practice of Chapter XV of the

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[4] See ICAO Global ATM Operational Concept (Doc 9854), Paragraph 2.9.12 to 2.9.14
[5] See ICAO Global Air Navigation Plan (Doc 9759), GPI-18 and GPI-20
[6] See ICAO's Policies on Charges for Airports and Air Navigation Services (Doc 9082/7), Appendix 3.

Chicago Convention. This would give the possibility to fund the set-up of the AFI CAD Office with defined and planed costs by AFCAC. During this set-up time a legal entity is inaugurated where all African States have the eligibility to joint. This legal entity will be funded by the members and, as to be identified in the financial model, eventually by alternative funding (see 1.27 to 1.34 of ICAO Global Air Navigation Plan). The alternative funding could be organised through the African Development Bank Group, where all African countries are members.

Other international source of financing[7] could be assessed.

At a later stage, and according to the financial model, added value services might be offered to users which may generate an additional revenue stream. However, the principle of cost recovery and not to allow double charges need to be adhered.

Figure 0-1 shows an initial legal framework which needs further development, but it is intended to give an initial overview and to open discussion.
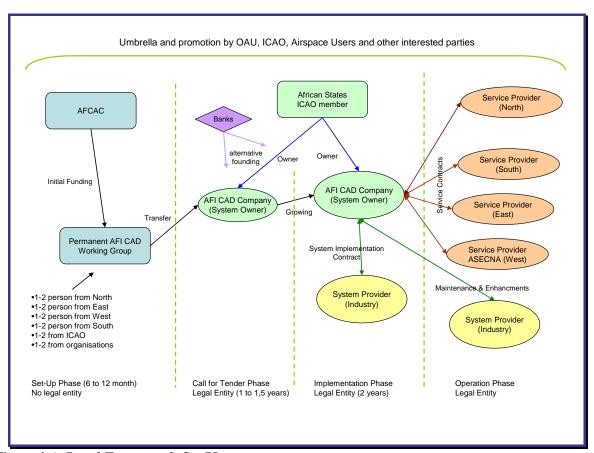


Figure 0-1: Legal Framework Set-Up

# Business Model

The classical business model requires defining of the Value Proposition, the Added Value and the Earnings of the AFI CAD. In the non profit environment of cost recovery of the ICAO model, in which the AFI CAD shall be operated, the cost planning is very important.

**The Cost assessment can be done generally in the following structure:**

1. Identification of direct set-up cost (set-up phase, funding by AFCAC),

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[7] See Appendix 6 Part A and B of the new Doc 9161 (under development)

 a. Setting up the legal structure according to Figure 0-1,

 b. Office, management, specialists from regions, administration,

 c. Writing the concept, preparing the documents[8],

2. Identification of the Call for Tender Cost (company operating cost, e.g. Ltd.),

 a. Company cost structure planning: personnel cost, infrastructure cost, travel, etc.,

 b. Personnel cost (staffing) related to the Call for Tender planning,

 c. Co-financing by banks possible (e.g. loan),

 d. Planning of the budget for the:

  i. Systems Contract, including training centres,

  ii. Service Contract, including training (Operating cost at 10 years),

  iii. Maintenance and Enhancement (10 years).

3. Identification of Implementation Phase cost (company operating cost),

 a. Company cost structure planning: personnel cost, infrastructure cost, travel, etc.,

 b. Personnel cost (staffing) related to the Call for Tender planning,

 c. Co-financing by banks possible (e.g. loan),

 d. Re-planning/update Operation Phase:

  i. Systems Contract, including training centres,

  ii. Service Contract, including training (Operating cost at 10 years),

  iii. Maintenance and Enhancement (10 years).

4. Update of Operation Phase cost.

The Business Cost Model is the basis before doing the next steps. It forms the basis for the set-up. It will need to be shown that the capital needed to cover the cost will bring earnings. There for the Value Proposition, the Added Value and Earnings shall be carefully developed. Also non financial advantages which can not be valued in cost advantage for users shall be identified and described.

The Value Proposition for the AFI CAD is probably the most important part for the users of the AFI CAD. Examples for the Value Propositions are:

1. electronic aeronautical data, obstacle data, terrain data from one source,

2. single access point,

3. consistent data,

4. online availability,

5. higher availability of services,

6. better quality,

7. etc.

**The Added Values of the AFI CAD for the African States are for instance:**

1. Sharing of cost,

2. Sharing of know,

3. Harmonisation of planning and work,

4. Better trained personnel,

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[8] See AFI CAD SG/2-DP/1

   5.  etc.

**The Earnings of the AFI CAD for the African States are for instance:**

   1.  Cost saving through common operation,
   2.  Cost saving through common training,
   3.  Cost saving through common procurement,
   4.  May be later selling of additional service as far as ICAO's Policies on Charges for Air Navigation Services allows this.

# Existing International Cooperation's and International Operating Agencies

The Agency for Air Navigation Safety in Africa and Madagascar (ASECNA) is an recognised International Operating Agency of Air Navigation Services[9],) and the Roberts FIR Organisation is an recognized International Cooperation in the frame of an sub-regional activity[10].

In the coming discussions and the Set-Up Phase the position of ASECNA and Roberts FIR Organisation shall be exploited and it could be assessed how the experience of ASECNA and the Roberts FIR Organisation can be leveraged for the AFI CAD.

Both are possible candidate to operate one of the Operation Centres and/or Training Centres because they have experience in working based on agreements for the mutual benefit.

From this perspective it is necessary to discuss the area of responsibility of the East, North, South, and West centre in the not so far future.

# Advantage for Users

The Business Model shall also contain, as already shortly mentioned in paragraph 0, what advantage the User have from the implementation of the AFI CAD.

Important advantages are the implementation of the "Aeronautical Information Requirements" of the ICAO ATM Operational Concept[11]. (paragraph 2.9.12 to 2.9.16) and the implementation of the Global Plan Initiatives "(GPI-18) Aeronautical Information" and "(GPI-20) WGS-84" of the ICAO Global ANP[12]

This, amongst other things, shall be contained in the Business Model document.

# Conclusions

This working paper covers some initial thought about the subject of a Business Model. It is suggested to structure the Business Model in phases as mentioned in Figure 0-1.

It should be considered to write the Legal Framework in a separate document and before finalising the Business Model as the Legal Framework will influence the Business Model.

# Recommendation

The study group meeting is invited to note the information presented in this paper.

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[9] See ICAO Global ANP (Doc 9750-AN/963), 3rd Edition – 2007, page App D-7 and D-8

[10] See ICAO Global ANP (Doc 9750-AN/963), 3rd Edition – 2007, page App D-5.

[11] See ICAO Global ATM Operational Concept (Doc 9854-AN/458, 1st Edition – 2005, paragraph 2.9.12 to 2.9.16

[12] See ICAO Global ANP (Doc 9750-AN/963), 3rd Edition – 2007, paragraph 1.83, 1.84, 1.88, and 1.89.

**INTERNATIONAL CIVIL AVIATION ORGANISATION**
**AFI Region Study Group on the Establishment of a Centralized**
**AFI Region AIS Data Base**

**SECOND MEETING**
*(Nairobi, Kenya, 3-5 October 2007)*

**Agenda Item 6:** Proposal for development of AFI-CAD Financial Model

**INTERNATIONAL CIVIL AVIATION ORGANIZATION**

*Peter Rudolph*

**SUMMARY**

This paper provides some thoughts about a possible Financial Model for preparation of the call for tender, the procurement and the operation of the Centralized AFI Region AIS Data Base (further called in this paper AFI CAD). The paper is completely based on the ICAO Global ANP (Doc 9750-AN/963, 3$^{rd}$ Edition – 2007) and tries to map the philosophy and principles of that document to the AFI CAD development and implementation.

## INTERNATIONAL CIVIL AVIATION ORGANIZATION

# Introduction

The Conclusion 9/12 of the ATS/AIS/SAR SG/9 requests that the Study Group develops, inter alia, a financial model for the AFI CAD.

According to Recommendation 10 of the "Framework and Guidance Material for the Establishment of the AFI CAD[13]" the financial model shall include the Continuous Operational Cost Recovery, a Cost Benefit Analysis, and Future Cost Benefits.

# ICAO Approach

For the further work on the Financial Model the Appendix E "Cost-Benefit and Economic Impacts" and Appendix F "Financial Aspects" of the ICAO Global ANP (Doc 9750-AN/963, 3rd Edition 2007) shall be used as guidance material by the AFI CAD SG. This paper is based on that two Appendixes.

The text below is therefore heavily taken from this document and tries to relate the ICAO approach to the AFI CAD where it seems to be relevant from the point of view of the author of this paper.

# Cost- Benefit Methodology

The cost-benefit analysis is used to estimate the economic viability of the planned AFI CAD investment project, i.e. the extent to which the total benefit from the investment exceeds the total cost. The AFI CAD is complex and consists of a package of investments. Measures of the viability of the new investment package (the project case) are based on a comparison with the existing systems (the base case). The existing systems are defined to include their normal and expected maintenance and possible development over the planning horizon. The new facilities replace the existing facilities, and as the latter are phased out, the reduction in their costs can be regarded as benefits from installing the new systems. The most important benefits of the AFI CAD are the cost reductions from more efficient flight operations, reduced flight times, and enhancing safety and security which are expected to emerge as AFI CAD is implemented.

A rigorous approach to developing a measure of the expected economic performance of an investment project is the net present value (NPV) or life-cycle approach, which focuses on the annual flows of costs and benefits (cash flows) related to the project. The costs and benefits in cash flow terms are not distributed evenly over time. Typically, there are large capital expenditures in the early years of a new project followed by many years of benefits, and also of operating and maintenance costs. There could be significant costs during the period of transition from the existing to the new systems, and these must be included in the analysis. The benefits will normally be in the form of cost savings. The net benefit in each year is equal to the sum of all the benefit items minus the sum of all the cost items expected in that year. The NPV (i.e. current year capitalized value) of the stream of net benefits (net cash flows) can be determined by a process of discounting the future cash flows. This process takes into account the effect of the rate of interest on the present value of each future cash flow.

Estimation of the future flows of the costs and benefits, and hence the NPV associated with the implementation of the AFI CAD requires many assumptions about the prices and

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[13] As provided in Appendix E to ATS/AIS/SAR/SG/9

quantities of communications, equipment, services, and about the amount of potential savings in aircraft operating costs. Therefore, there is an element of uncertainty and risk in the NPV results. The financial risks can be appreciated by studying the effects on the NPV estimate resulting from changes in the assumptions. A particularly important assumption is that the transition to the AFI CAD by the AFI CAD provider and its owners (the AFI States) and aircraft operators occurs in a coordinated fashion so that net benefits are maximized.

Comprehensive guidance material to assist States in carrying out cost-benefit studies of the implementation of CNS/ATM systems was made available by ICAO in relation of Economics of Satellite-based Air Navigation Services in Circular 257. This circular focuses on the NPV methodology, which is widely recognized and used by financial institutions such as those potentially involved in funding AFI CAD.

# Business Case Evaluation

The development of a business case for the implementation of the AFI CAD systems by a service provider or an operator (owned by the AFI States) involves taking the financial cost-benefit analysis a step further. In particular, changes in revenues resulting from changes in the price of the product/services sold must be taken into account. It is generally expected that the AFI CAD systems will facilitate reduced operating costs and a lower price for the service provided. From the point of view of a specific organization, assessment of the net financial impact, in present value terms, must include not only the implementation cost and operating cost savings, which are included in the cost-benefit analysis, but also consequent changes in revenues.

For a service provider, a business case evaluation must include the impact on revenues of changes in charges associated with the implementation of the AFI CAD systems. Assuming that the AFI CAD service provider is an autonomous organization (owned by the AFI States) operating on a commercial basis and is currently covering its costs with the present technology systems, the basic issue is for the service provider to be satisfied that the changes in revenues expected from the planned changes to AIS charges will match the net change in costs, measured by the cost-benefit analysis. However, if the relationship between costs and revenues is not being monitored (e.g. if costs are met from the government budget and revenues are treated independently as general government revenues), then the AFI CAD services are not being provided on a commercial basis. Even in these circumstances it is recommended that a business case evaluation be conducted to assess the financial impact of the new systems on the service provider.

For an airline and other airspace users, a business case evaluation would include, among other factors, assumptions about the impact on its costs of expected changes in route charges and operating costs and the impact on revenues of changes in airline fares and rates or operating cost of other airspace users (like business aviation, military, etc.), where these changes are associated with the implementation of the AFI CAD systems. These impacts are in addition to the direct investment costs and operating cost savings attributable to the new AFI CAD systems and identified in the cost-benefit analysis described above.

The AFI CAD SG could consider to use or at least to check whether the ICAO CNS/ATM Business Case Analysis Tool (DFACS)[14] can be used to assist the Finical Model.

The ICAO Africa-Indian Ocean Regional Traffic Forecasts, 2004–2020. (Doc 9879) shall be considered as input to the Financial Model to underline the necessity to built the AFI CAD. This report contains long-term air traffic forecasts for the major route groups to, from and

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[14] ICAO Catalogue 2007, CD-109.

within the Africa/Indian Ocean area, in terms of both passengers and aircraft movements. It also contains movement forecasts at city-pair level for the top 25 city-pairs and an analysis of the year 2005 FIR traffic data for the airspace controlled by ASECNA including various peak period parameters. This Traffic Forecast could be used as an indicator for the rollout plans and stepwise coverage of the AFI CAD.

# Other Economic Effects

States may be interested in the broader economic and social impact of the AFI CAD systems as well as the financial viability of the new systems. For example, implementation of the new systems should produce passenger time savings, improve safety, produce environmental benefits and may also lead to some industry restructuring and changes in skills required.

CNS improvements, which produce benefits for ATM such as more direct flight paths and less delay from airspace congestion, will reduce the passenger travel time for a given journey. If passengers value these time savings, they represent an additional benefit.

An understanding of the contribution of air transport to general economic activity can increase the political commitment to the process of transition to the AFI CAD systems. National accounting and industry data and employment surveys may be used to determine the share of air transport in total economic activity and its importance as an employer. The input/output tables of a State's national accounts can illustrate the interrelationships among the various elements of the air transport industry and other industries and economic sectors. Other industries purchase air transport services or supply products and services to the air transport industry. From a national or regional economic planning perspective, it is especially important to appreciate the role of air transport in generating employment and incomes and in supporting other non-aviation economic activities. This will put into perspective the value of supporting and investing in state-of-the art national and regional air transport facilities.

### Summary of Economic Effects of CNS/ATM

1. Financial benefits and lower fares and rates,

2. Improved safety,

3. Passenger time savings,

4. Environmental benefits,

5. Transfer of high-tech skills,

6. Productivity improvements and industry restructuring,

7. Higher traffic and stimulation of related industries.

# ICAO Policy on Cost Recovery

Whatever approach is taken by a State or group of States collectively to provide the AFI CAD systems services within the airspace for which responsibility has been assumed, the resultant cost recovery through charges must be in conformity with basic ICAO policies on charges for airports and air navigation services. This policy is contained in Article 15 of the Chicago Convention and is supplemented by ICAO's Policies on Charges for Airports and Air Navigation Services (Doc 9082/7). The implementation of the AFI CAD systems should not require any basic changes to that policy.

The Statement of ICAO Policy on CNS/ATM Systems Implementation and Operation, approved by the ICAO Council in March 1994, addresses cost-recovery as follows: "In order to achieve a reasonable cost allocation between all users, any recovery of costs incurred in the provision of CNS/ATM services shall be in accordance with Article 15 of the Convention and

shall be based on the principles set forth in ICAO's Policies on Charges for Airports and Air Navigation Services (Doc 9082), including the principle that it shall neither inhibit nor discourage the use of the satellite-based safety services. Cooperation among States in their cost-recovery efforts is strongly recommended."

In ICAO's policies set out in Doc 9082, the following four general principles should particularly be noted with regard to CNS/ATM systems:

in paragraph 36, " . . . as a general principle, where air navigation services are provided for international use, the providers may require the users to pay their share of the related costs; at the same time, international civil aviation should not be asked to meet costs that are not properly allocable to it . . .";

paragraph 38 i), "The cost to be shared is the full cost of providing the air navigation services, including appropriate amounts for cost of capital and depreciation of assets, as well as the costs of maintenance, operation, management and administration";

in paragraph 38 ii), "The costs to be taken into account should be those assessed in relation to the facilities and services, including satellite services, provided for and implemented under the ICAO Regional Air Navigation Plan(s) . . ."; and

in paragraph 47, ". . . the providers of air navigation services for international use may require all users to pay their share of the cost of providing them regardless of whether or not the utilization takes place over the territory of the provider State."

Particular attention also needs to be given to the following principle in paragraph 41 iii) of Doc 9082: "Charges should be determined on the basis of sound accounting principles and may reflect, as required, other economic principles, provided that these are in conformity with Article 15 of the Convention on International Civil Aviation and other principles in this document. The application of economic principles to setting charges which are consistent with ICAO's policy should emphasize the need to recover costs in an efficient and equitable manner from the users of air navigation services. Within an economic context, charges should be set to recover costs, provide a reasonable return on investment where appropriate and provide additional capacity when justified."

In ICAO's policies on charges, pre-funding of projects is considered as a possible source of financing and the following policy guidance is included in paragraph 42 of Doc 9082: "notwithstanding the principles of cost-relatedness for charges and of the protection of users from being charged for facilities that do not exist or are not provided (currently or in the future) that, after having allowed for possible contributions from non-aeronautical revenues, pre-funding of projects may be accepted in specific circumstances where this is the most appropriate means of financing long-term, large-scale investment, provided that strict safeguards are in place, including the following:

   (i) Effective and transparent economic regulation of user charges and the related provision of services, including performance auditing and "bench-marking" (comparison of productivity criteria against other similar enterprises).

Comprehensive and transparent accounting, with assurances that all aviation user charges are, and will remain, earmarked for civil aviation services or projects.

Advance, transparent and substantive consultation by providers and, to the greatest extent possible, agreement with users regarding significant projects."

# Cost Determination

Charges for the AFI CAD systems services should not be imposed unless these services are actually being provided according to the regional ANPs concerned. Consequently, it is important that regional plans be promptly amended to incorporate the AFI CAD once the

States involved have agreed that the element(s) should form part of the plan or plans concerned.

The regional ANPs should provide a schedule for the phase-out of facilities made redundant by the provision of the AFI CAD systems services. This is also of major importance because significant financial benefits from AFI CAD systems implementation will not be realized if the facilities and services made redundant continue to be listed in the regional plans and charged for.

As AFI CAD systems components are implemented, the costs are added to the costs of the AFI CAD multinational system and service cost base for charges.

From an organizational viewpoint, it is important, with regard to cost recovery of the AFI CAD system and services costs, the States concerned should assign, to one entity, the responsibility for ensuring that the costs attributable to the provision of AFI CAD systems and services by the different entities in the States are included in the cost basis for any cost-recovery programme or mechanism. This assignment can be made to the AFI CAD services provider.

Costs, in the form of payments made by a State to the service provider offering AFI CAD systems services, will need to be allocated amongst the different participating States, which are potential all AFI States.. That, in turn, will require an agreement between the parties concerned as to how such an allocation should proceed. Assuming a uniform level of service, such allocation could be based on either distance flown or the number of flights in the airspace for which each State has accepted responsibility, or others. Both are viable options. Distance flown would offer more precision while using number of flights as the basis would be simpler to administer. Other schemas could relate number of airports to be provided or similar.

## Cost Recovery during Development and Implementation

One particular issue that needs to be addressed in the implementation of the AFI CAD systems is the treatment of costs and cost recovery during the three initial stages: (1) Set-Up Phase, (2) Call for Tender Phase, (3) Implementation Phase.

The implementation of the AFI CAD systems will, in many cases, lead to the retirement of existing AIS facilities before the end of their economic life. In such circumstances, the balance of the undepreciated portion of the facilities concerned could be included in the cost basis for charges. The same procedure could apply to such costs that may be incurred because of premature retirement or training of personnel made redundant by the implementation of the new systems. Such costs, however, should be limited to termination settlements, costs attributable to early retirement and costs of retraining and/or relocation. These costs could be capitalized and thereafter written off gradually, with the portion written off each year being included in the cost basis for charges. These factors would need to be taken into account in any related cost-benefit analysis or business case study.

## Consultation with Users

Particular attention should be drawn to Doc 9082, paragraphs 49 to 51, and the emphasis placed on (direct) consultation with users regarding increased or new air navigation services charges, where AIS charges are part of it; and also on users being consulted as early as possible when major air navigation services are being planned. This would call for such consultations to be carried out when plans are being developed for the implementation of the AFI CAD systems.

The involvement of IATA in the AFI CAD SG work can be leveraged for this.

# Financing Plan

**The purpose of the financing plan is to provide basic information as follows:**

    (i)  estimates of the element costs (labour, materials, equipment, etc.) of each distinct part of the overall project;

    (ii)  the funds required to make disbursements at various stages in the project's progress;

    (iii) the currencies in which payments are to be made; and

    (iv) the sources from which the funds are to be forthcoming, whether from:

        a.  sources generated by the entity providing the AFI CAD services from its operations, which would primarily include user charges, and possibly retained earnings, but could in some circumstances also include contractual payments; or

        b.  other sources, including information on the applicable conditions, i.e. interest rate, repayment period, etc.

Also to be emphasized is the importance of the availability of data showing the financial situation of the air navigation services provider over recent years, as well as anticipated developments over the period of debt repayment. Of particular relevance is the recording of revenues and expenses by major item. Estimates regarding future financial developments would emanate from budgets and longer-term financial plans. In the absence of such financial data, it would be much more difficult to decide whether or not the loan or financing sought should be granted and, if so, what terms should be offered.

# Sources of Financing

A survey of potential sources of funds and which of them to approach should be done as early as possible in the planning process. Potential sources of funds will vary considerably from project to project and State to State. The sources to be approached should be studied and decided upon individually for each project and could be grouped as follows: direct contributions from government(s); loans or debt financing; internally generated resources; equity financing; and leasing.

**Direct Contributions from Governments**

The extent to which direct contributions will be required from the government depends on a number of factors. Chief among these is the organizational form under which the AFI CAD systems services will be provided, i.e. will the government be directly involved, either alone, or in a joint effort with other governments, or will it primarily involve a commercial corporation? Yet another factor is whether the traffic volume within the airspace concerned is sufficient to support the AFI CAD systems component in financial terms, including servicing debt.

For most States, the foreign sources of financing are principally government operated. Such foreign financing may be available from foreign governments in the form of loans negotiated directly with the government of the recipient country or may otherwise be facilitated by particular agencies of government which have been established for the primary purpose of promoting the nation's export trade. Of particular importance among the possible sources of foreign financing available to developing States are the international banks and funds that have been established to assist in the financing and execution of projects promoting national economic development.

Project costs payable in foreign funds constitute a demand on the State's reserves of foreign exchange and as such their financing will usually have to be arranged through or with the

approval of the appropriate government authorities. Nevertheless, foreign sources should always be explored as a matter of course, since financing may be available from them on more favourable terms than those obtainable from domestic institutions (e.g. lower interest rate, repayment over a longer period). However, there are also some risks involved in foreign exchange, such as currency fluctuations.

**Debt Financing**

The feasibility of debt financing will depend on whether the traffic to be served by the AFI CAD systems to be financed is of sufficient volume and strength to service the debt, including interest and repayment of capital. Where an international agency or corporate entity would be providing basic AIS systems services, its costs of financing could be reduced if the States for which the basic services are being provided were to guarantee the servicing and repayment of the loans concerned. This in turn should reduce the costs to be recovered from these user States.

**Internally Generated Resources**

Depreciation and retained profits from the operation of air navigation services may become a supplementary source of financing for the AFI CAD systems facilities. However, with regard to profits, an important qualification that needs to be recalled is the principle outlined in Doc 9082, paragraph 38:

> "Air navigation services may produce sufficient revenues to exceed all direct and indirect operating costs and so provide for a reasonable return on assets (before tax and cost of capital) to contribute towards necessary capital improvements."

Reference should also be made to the text on pre-funding of projects in 0 of the paper.

**Equity Financing**

Equity financing may be a viable alternative in some instances. For example, if the AFI CAD systems services were acquired under contract from a commercial service provider, that operator could finance the investment required partially or completely through increased equity.

**Leasing**

Leasing rather than outright ownership could become an important alternative in the AFI CAD systems and service provision. The possibility could also be explored of applying leasing to local units at AFI CAD Centers, possibly through the establishment of leasing companies, which would operate in a manner similar to those purchasing and leasing out, for example, computer systems, communications systems and/or others under long-term leases.

# Conclusions

This working paper covers some initial thought about the subject of a Financial Model.

The paper tried to adapt the principles of the ICAO Global ANP (Doc 9750-AN/963) 3rd Edition – 2007, as much as possible for the AFI CAD undertaking.

# Recommendation

The study group meeting is invited to note the information presented in this paper.

**– END –**

**APPENDIX-L**

**TIME LINES**

| | 2008 | | | | 2009 | | | | 2010 | | | | 2011 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1st Q. | 2nd Q. | 3rd Q. | 4th Q. | 1st Q. | 2nd Q. | 3rd Q. | 4th Q. | 1st Q. | 2nd Q. | 3rd Q. | 4th Q. | 1st Q. | 2nd Q. | 3 Q. | 4 Q. |
| ELEMENTS | | | | | | | | | | | | | | | | |
| URS | | x | | | | | | | | | | | | | | |
| BUSINESS PLAN/MODEL | | | x | | | | | | | | | | | | | |
| FIN PLAN/MODEL | | | x | | | | | | | | | | | | | |
| OBTAIN FINANCES | | | | | x | | | | | | | x | | | | |
| QUALITY CONTROL PROCESS | | | | | | | x | | | | | | | | | |
| HARDWARE | | | | | | | | | x | | | | | | | |
| SOFTWARE | | | | | | | | | | x | | | | | | |
| COMMS | | | | | | | | | | | | | | | | |
| SYSTEM POPULATION + TRNG | | | | | | | | | | | | | x | | | |
| AIS MIGRATION | | | | | | | | | | | | | | x | | |
| TEST PHASE | | | | | | | | | | | | | | | x | |
| FULL IMPLEMENTATION | | | | | | | | | | | | | | | | x |