INTERNATIONAL CIVIL AVIATION ORGANIZATION

AFI PLANNING AND IMPLEMENTATION REGIONAL GROUP FOURTEENTH MEETING (APIRG/14)

(Yaoundé, Cameroon, 23-27 June 2003)

Agenda item 4: AIR NAVIGATION ISSUES

4.8.1 : DEVELOPMENT OF AN ICAO GLOBAL AIR NAVIGATION PLAN DATABASE AND ASSOCIATED WEB-BASED INFORMATION AND CHARTING SERVICE

(Presented by the Secretariat)

SUMMARY

This paper outlines the requirement, technological basis, expected benefits and structure for the development of an ICAO global air navigation plan database and associated web-based information and charting service that would directly support ICAO's objectives for regional, interregional and global planning.

Action by APIRG is at paragraph 6.

1. INTRODUCTION AND REQUIREMENT

1.1 The Foreword to the *Global Air Navigation Plan for CNS/ATM Systems* (Global Plan, Doc 9750) describes the requirement and measures taken to establish a clear and functional relationship between the Global Plan and the regional air navigation plans (ANPs). Fundamental parts of this relationship are established in Part I, *Operational Concept and General Planning Principles*, which provides guidance for the further development of the Basic Operational Requirements and Planning Criteria (BORPC) of the regional ANPs and in Part II, *Facilities and Services for the Implementation of the Global Plan*, which reflects detailed material and relates to the Facilities and Services Implementation Documents (FASIDs) used in the regional planning process.

1.2 The Global Plan also identifies, in Part II, Chapter 4, several homogeneous air traffic management (ATM) areas and major international traffic flows/routing areas. This information together with forecasts of traffic flows is designed to assist the planning and implementation regional groups (PIRGs) in further determining the requirements for the supporting regional and interregional communications, navigation, and surveillance/air traffic management (CNS/ATM) system infrastructure.

1.3 The Fourth Meeting of the ALLPIRG/Advisory Group (ALLPIRG/4), whose membership comprises a wide range of CNS/ATM partners, considered that it would be valuable if electronic versions of the tabular material from all ANPs were accessible to States and for the amendment process to take place in real time. In addition, the meeting believed that electronic access to this ANP material and to related planning and implementation data of the CNS/ATM partners would constitute an invaluable analytical planning tool. The above ideas gained the unanimous support of the meeting, which recommended that implementation should encompass all ICAO ANP regions and should provide free access to relevant ICAO Headquarters' Sections, Regional Offices, PIRGs and participating CNS/ATM partners. The meeting, through ALLPIRG/4 Conclusion 4/13 — Database developments, initially envisaged the web posting of up-to-date ANP tabular material relating to facilities and services to an ICAO-controlled web site in a simple PDF format, to be followed by a further more intensive information technology effort to enhance the site's functionality as a planning tool.

2. TECHNOLOGICAL BASIS FOR DEVELOPMENT

2.1 The Aeronautical Information and Charts (AIS/MAP) Section at ICAO Headquarters currently maintains databases to support the hard copy production of the ANPs including associated charts. From the database, ICAO Regional Offices and PIRG meetings are frequently supplied with electronic PDF format versions of the ANPs on CD-ROM media and some Regional Offices have posted this electronic ANP information to their individual web sites to support PIRG meetings. While the PDF format of the ANP is useful for viewing, there is no direct database linkage to the PDF files and, hence, no possibility for authorized users to amend ANP information over the web.

2.2 In accordance with ALLPIRG/4 Conclusion 4/7, the AIS/MAP Section has developed a multilingual web site to assist States in the uniform implementation of World Geodetic System—1984 (WGS-84) related Standards and Recommended Practices (SARPs) and to provide a consistent online method of reporting the status of WGS-84 implementation. This web site provides ANP style tables related to WGS-84 implementation which are linked through an ICAO Headquarters' web server to a database. The primary users of the site are Regional Offices and their respective PIRGs, all ICAO Contacting States and Headquarters. Users with amendment authorization are able to submit amendments to the tables online which are presented electronically to an ICAO regional officer in charge of approval. The approval process also takes place online and approved amendments are promptly reflected in updated tables which are available for viewing by all other web site users. Database filters are included to limit erroneous amendment entries and a searchable record is kept of the amendment "transaction" details. It is considered that the technology used for this web site could be widely applied to allow for the on-line amendment of most, if not all, ANP tables and text.

2.3 For many years, the ANP charts have been prepared electronically, however, recently a project has been underway to produce those charts from a database driven geographic information system[1] (GIS) which is extensible to include Internet mapping capabilities. Most charts for the Africa-Indian Ocean (AFI), Caribbean and South American (CAR/SAM), European (EUR), and Middle East (MID) Regions ANPs are currently prepared with the new system and, at the time of the preparation of this paper, work is

[1] ***Geographic information system (GIS)***. A collection of computer hardware, software, and geographic data for capturing, storing, updating, manipulating, analysing, and displaying geographically referenced information.

underway on converting charts of the ASIA/PAC ANP. This database driven GIS offers particular benefits and efficiencies for the creation of interregional and global charts.

2.4 The efficiencies gained for print or electronic PDF format chart production by this system are important; however, the real usefulness of a GIS system is achieved when a chart is made available in an electronic GIS format either on CD-ROM or through a web server. A PDF format chart offers a scaleable view and some information search capability; however, it is essentially a "flat" chart, while a chart in GIS format is considerably more dynamic and functional. In a GIS format, an ANP chart may be presented in terms of layers of information that can be selected or deselected according to user requirements. For example, planned navaid or radar coverage areas may be viewed in conjunction with upper/lower air traffic services (ATS) routes. Because of the inherent database linkage, direct chart-based information queries are possible; such as clicking on an flight information region (FIR) name to see the detailed geographic coordinate tabulation for the associated FIR polygon. Spatial queries, such as a proximity analysis, are also practical. As an example, the system may be asked to show all international aerodromes with a runway length greater than 2 000 metres (6 500 ft) within 200 nautical miles from a specific airway.

2.5 Amendment proposals to the ANPs, particularly those concerning ATS routes and airspace areas, are often charted to ascertain that the textual or tabular information on which they are based is appropriate and correct. A GIS system that is available over the web could greatly assist this process by allowing users to create custom charts, based on up-to-date information from a central global air navigation plan database, without the cost and complexity of establishing and maintaining their own independent GIS systems. For example, if a possible proposal for the amendment of an FIR is being studied, that proposal could be entered on the web site in a predefined tabular format, using geographical coordinates. The tabular format is then imported into the current ANP FIR chart and the proposed FIR appears as a new chart layer in a different colour. That new chart layer may be displayed by the user with any other available chart layer (e.g. upper/lower ATS routes) and printed/plotted at a user defined scale. Similar technology is currently used on Internet mapping sites (e.g. MapQuest) that allow for the detailed custom mapping of personal road travel for example.

3. BENEFITS

3.1 Taking into account regional and global air navigation planning and associated document publication requirements, and the availability of existing ICAO databases and off-the-shelf technology, it is expected that an ICAO global air navigation plan database and associated web-based information and charting service would provide the following benefits:

a) improved access by States, PIRGs, participating CNS/ATM partners, Regional Offices and Headquarters to up-to-date ANPs and the data upon which they are based;

b) improved FASID amendment process;

c) improved overall standardization and harmonization of the ANPs through a central database management of ANP elements and support material;

d) increased ANP quality control and reduction of production bottle necks resulting from the resolution of questionable/inconsistent data through the use of standard tabulations and data entry filters;

e) increased charting quality, GIS functionality and products including the ability for authorized users to create, download and print custom ANP or global charts through an ICAO web chart server; and

f) facilitated development of the Global Plan through enhanced information availability and charting, with particularly regard to interregional homogeneous ATM areas and the charting of air traffic flow data and forecasts.

4. STRUCTURE AND INFORMATION FLOW

4.1 The responsibility for the preparation and publication of the ANP publications rests with Headquarters. Revised editions are published on the basis of material supplied by the Regional Offices and on information available in Headquarters from other sources. In order to provide an ICAO global air navigation plan database and associated web-based information and charting service, it is considered that the central web server should be located at ICAO Headquarters and thus be in proximity to current ANP databases, production resources, and information technology support.

4.2 The central web server would contain different, but interconnected software applications to support textual/tabular and charted material. A diagram in Appendix A to this paper illustrates the proposed overall structure of an ICAO global air navigation plan database and associated web-based information and charting service, and the information flow envisaged to keep the database up-to-date and provide for associated electronic and traditional publication outputs.

4.3 It is proposed that for ANP material the currency of the Web site would be maintained by authorized Regional Office and Headquarters staff who would input most amendments through standardized tables and text formats which include database filters to limit erroneous entries. A technical review and approval of submitted ANP material would take place at ICAO Headquarters before the material is posted as an approved ANP amendment. This would essentially follow the same paper/e-mail based process that now occurs when amendments are submitted for inclusion in the hard copy ANP publication. For certain other material that may be entered in the database, such as ANP-related implementation information and traffic flow forecasts, it is believed that this material could be evaluated by authorized Regional Office staff for their direct entry.

4.4 As envisaged by ALLPIRG/4, the web site could be an invaluable tool for many other users and, accordingly, access privileges may include viewing/download/custom charting capability. Possible additional products and services that would support regional and global planning are: hard copy, large size planning charts, custom charts and various electronic chart file formats. The provision of colour chart plotters to ICAO Regional Offices would enhance the availability and the presentation of charted material to PIRG and other planning meetings.

5. CONCLUSION

5.1 There is a well established interrelationship between the regional ANPs and the Global Plan and a pressing requirement to make up-to-date air navigation planning information more available and functional for all those involved in the planning process. ICAO has developed air navigation planning databases and related publication and charting systems that support CD-ROM and hard copy ANP publication formats, and are extensible to take advantage of recent Internet database and mapping technologies. Recent technology allows not only for the timely dissemination of ANP information through a central ICAO web server, but also for efficiencies in maintaining an up-to-date ANP database that could be extended to include interregional and global planning information. The functionality of this information could be significantly increased through an associated web-based charting/GIS system.

5.2 The development of an ICAO Global Plan database and associated web-based information and charting service would directly support the regional, interregional and global planning elements of Organization's Strategic Action Plan, Strategic Objective D: *Ensure the currency, coordination and implementation of regional air navigation plans and provide the framework for the efficient implementation of new navigation systems and services*.

6. ACTION BY APIRG

6.1 The meeting is invited to:

a) note the information presented in this paper; and support this proposal during the 11 Air Navigation Conference

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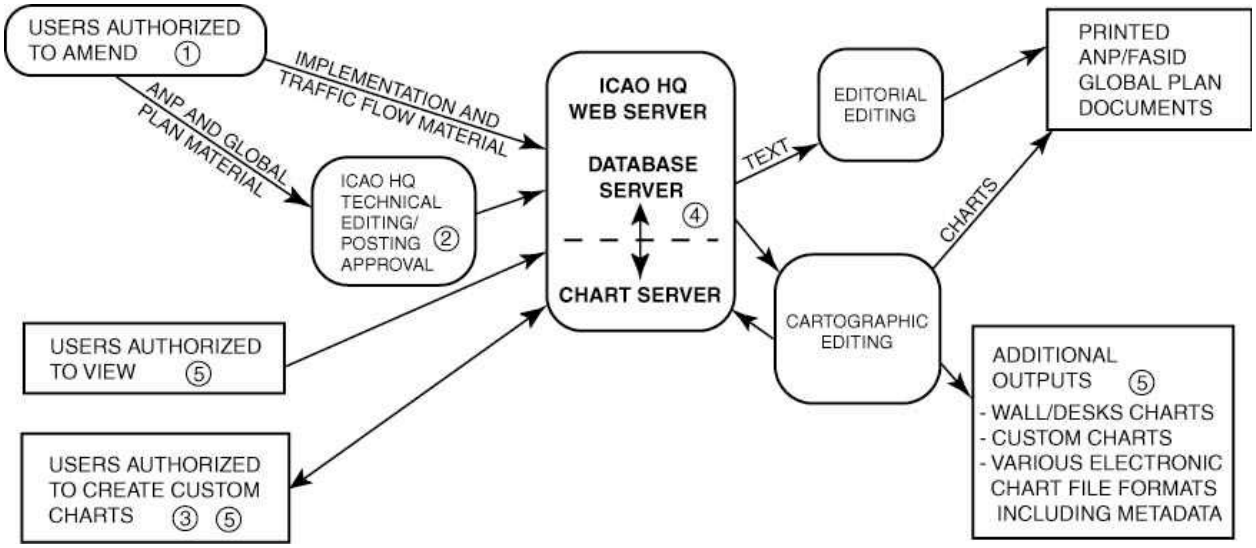
APPENDIX

STRUCTURE AND INFORMATION FLOW OF A PROPOSED ICAO GLOBAL AIR NAVIGATION PLAN DATABASE AND ASSOCIATED WEB-BASED INFORMATION AND CHARTING SERVICE



Annotations to diagram .—

① *Authorized users amend standardized tables and text formats which include database filters to limit erroneous entries. The proposed system would maintain a record of all amendment "transactions".*

② *ANP and Global Plan material to follow the normal approval process with final entry into the proposed system by AIS/MAP Section. This does not preclude draft entries by Regional Offices.*

③ *The availability of custom charts is expected to facilitate the development of appropriate and accurate amendments, and provide more efficient final ANP chart production. The provision of colour chart plotters to Regional Offices would assist chart presentation requirements for meetings.*

④ *Database and chart server applications are interconnected. Tabular ANP data that is coordinate-based may be directly charted.*

⑤ *Potential new products/services.*

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