

Chapter 15

Supporting Aeronautical Information Management (AIM) Through Geographic Information Technologies and Spatial Data Infrastructures (SDI)

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ABSTRACT

The way aeronautical information is managed and disseminated must be modernized. Current aeronautical information services (AIS) methods for storing, publishing, disseminating, querying, and updating the volume of data required for the effective management of air traffic control have become obsolete. This does not contribute to preventing airspace congestion, which turns into a limiting factor for economic growth and generates negative effects on the environment. Owing to this, some work plans for improving AIS and air traffic flow focus on data and services interoperability to allow an efficient and coordinated use and exchange of aeronautical information. Geographic information technologies (GIT) and spatial data infrastructures (SDI) are comprehensive technologies upon which any service that integrates geospatial information can rely. The authors are working on the assumption that the foundations and underlying technologies of GIT and SDI can be applied to support aeronautical data and services, considering that aeronautical information contains a large number of geospatial components. This article

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presents the design, development, and implementation of a Web-based system architecture to evolve and enhance the use and management of aeronautical information in any context, e.g., in aeronautical charts on board, in control towers, and in aeronautical information services. After conducting a study into the use of aeronautical information, it was found that users demand specific requirements regarding reliability, flexibility, customization, integration, standardization, and cost reduction. These issues are not being addressed with existing systems and methods. A system compliant with geographic standards (OGC, ISO) and aeronautical regulations (ICAO, EUROCONTROL) and supported by a scalable and distributed Web architecture is proposed. This proposal would solve the shortcomings identified in the study and provide aeronautical information management (AIM) with new methods and strategies. In order to seek aeronautical data and services interoperability, a comprehensive aeronautical metadata profile has been defined. This proposal facilitates the use, retrieval, updating, querying, and editing of aeronautical information, as well as its exchange between different private and public institutions. The tests and validations have shown that the proposal is achievable.

1. INTRODUCTION

In order for air navigation to be safe, it is essential to secure reliable, up-to-date information. Thus, aeronautical charts are a key navigation tool. They are used both in the planning stage and in steering and control. As a support for furnishing manageable, robust, and coordinated aeronautical information, aeronautical cartography is part of the information services government agencies provide to users of the standard navigation system. Aeronautical information and cartography are also key elements for the modelling and simulation of several air traffic management components, e.g., in traffic control training platforms (Shifeng & Danxia, 2010; Vieira, Neto, Scaico, Santoni, & Mercantini, 2010). However, this information is scattered and stored in assorted formats or represented in different media: digital, paper, optical, multiple discs and systems, etc. These characteristics raise different issues, such as the difficult updating of information, a non-integrated system, and no real-time updates in control systems, among others.

These kinds of restrictions have already been studied and solved in other contexts and domains relating to geographic information (GI). To that effect, some technologies, methodologies, and tools are available to perform multiple operations (querying, downloading, updating, editing, etc.) using geographic data of different natures, taking into account multiple sources. These are general-purpose technologies for the access, distribution, and visualization of geographic information and data. These procedures, based on ISO and OGC standards and specifications, allow their implementation in different technological platforms, which have been developed over several years and have proved their effectiveness and robustness. Therefore, this proposal parts from the assumption that the development of geographic information technologies (GIT) and their application in the aeronautical context makes possible the publication, discovery of, and access to updated aeronautical data in a reliable way through distributed networks and obtaining data from different kinds of sources.

One of the essential conditions for the air navigation process to be successful, whether real or simulated, is the availability of an adequate cartographic chart guiding pilots during the development of every phase of flight. This type of chart – aeronautical cartography – is specifically conceived to synthesize graphically the operative needs of aviation. As a result, it incorporates a large amount of

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