Chapter 2
The SYNCROMAX Solution for Air Traffic Flow Management in Brazil

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ABSTRACT

This chapter charts Brazil’s participation and strategy in dealing with Air Traffic Flow Management (ATFM). First a review of ATFM concepts is provided, where the demand and capacity balancing problem is defined. Afterwards the Brazilian air traffic scenario is laid out and a short history is presented. Finally, the SYNCROMAX system architecture is presented as defined for its first implementation phase. Internal details to the system are given and finally current directions indicate a higher level of decision making tools required in the future, in order to face the growing air navigation requirements.

INTRODUCTION

At recent years, air traffic demand increased at double-digit figures at several Brazilian airports and as a consequence increased controller workload was observed at many Sectors of the Air Traffic Control Facilities, with clear indications that demand consistently surpassed the available capacity of airports and air traffic control units. Although determination of air traffic control capacity values is still a very subjective and controversial issue, with no proven and universally accepted method in place, there is no doubt that there are limits and operating at values above a certain “threshold” will impact the system’s efficiency, and, ultimately, also its safety.

“Demand” is defined as the number of aircraft requesting to use the Air Traffic Management system.
in a given time period, whilst “Capacity” stands for the maximum number of aircraft that can be accommodated in a given time period. Capacity is normally expressed as the maximum number of aircraft which can be accepted over a given period of time within the airspace or at the aerodrome concerned, and, in order to maintain a balance between demand and capacity, the National Aeronautical Authorities decided to establish the Air Traffic Flow Management service, as a centralized unit within the Brazilian Air Navigation Management Center (CGNA). From the very beginning it was clear that the management of air traffic flow would require acquisition and processing of huge amount of data and, therefore, the automated Traffic Flow Management System (SYNCROMAX) became a major enabler of the new service.

The automated Traffic Flow Management System presents a system-wide overview of actual and projected air traffic situations, offering flow managers with detailed information that supports the implementation of a broad range of measures, encompassing strategic, pre-tactical, and tactical scenarios. The variety of offerings assists in preventing imbalances between system and associated services capacity and demand on Air Traffic Control, airport and airspace systems. Ultimately, it contributes to reduce or eliminate restrictions to users and enhance operational safety. The system offers, through a set of user-friendly and intuitive graphical interfaces, secure and accurate decision support information.

This chapter starts focusing on some general aspects of Air Traffic Flow Management in Civil Aviation and its envisaged goals in terms of safe and efficient maximum use of limited capacity of airports and airspace, both in terminal areas and en route. Further, information is presented on the Brazilian Air Traffic scenario and more specific aspects of the SYNCROMAX System, it’s overall architecture, the underlying principles for a phased implementation, and status of work being advanced in the Brazilian Air Navigation Management Center. Finally, trends in air traffic flow management and technology are considered as guidelines to improve the system.

BACKGROUND

Air Traffic Flow Management

Air traffic flow management (ATFM) is a “service established with the objective of contributing to a safe, orderly and expeditious flow of air traffic by ensuring that ATC capacity is utilized to the maximum extent possible, and that the traffic volume is compatible with the capacities declared by the appropriate Air Traffic Services (ATS) authority” (ICAO, 2007). This document also establishes clear guidance about procedures applicable to shortfalls in capacity.

- Where traffic demand varies significantly on a daily or periodic basis, facilities and procedures should be implemented to vary the number of operational sectors or working positions to meet the prevailing and anticipated demand. Applicable procedures should be contained in local instructions.
- In case of particular events which have a negative impact on the declared capacity of an airspace or aerodrome, the capacity of the airspace or aerodrome concerned shall be reduced accordingly for the required time period. Whenever possible, the capacity pertaining to such events should be predetermined.
- To ensure that safety is not compromised whenever the traffic demand in an airspace or at an aerodrome is forecast to exceed the available ATC capacity, measures shall be implemented to regulate traffic volumes accordingly.

“Demand” has been defined as the number of aircraft requesting to use the Air Traffic Management system in a given time period, whilst