



Agenda

Item 2:

Report of activities of the GESEA and Subgroups

b) ATM implementation. Progress of the Subgroups.

**USE OF RADAR SYNTHESIS DATA IN
SISCEAB PERFORMANCE MONITORING**

(Submitted by Brazil)

Summary	
The purpose of this Working Paper is to present a summary of the actions carried out by DECEA regarding the collection, treatment and use of radar synthesis data in the performance monitoring of the Brazilian Airspace Control System (SISCEAB).	
References:	
<ul style="list-style-type: none">• Guide for the implementation of the ATFM service in the SAM Region 2020-2025, ICAO• SAM/IG meeting reports.	
Strategic objectives of ICAO:	<i>A – Safety</i> <i>D – Efficiency</i>

1 Introduction

1.1 The International Civil Aviation Organization (ICAO) emphasizes the importance of performance-based management and encourages States, Regions and Organizations to get involved and participate in activities to benchmark the performance of their respective ATM systems. Consequently, the Brazilian Airspace Control System (SISCEAB) is being structured with the aim of expanding the forecasting capacity of the Airspace Control Department (DECEA) with adequate processes and human resources, through the analysis of performance indicators and goals.

1.2 Since 2020, Brazilian ATFM has undergone a major reformulation after the restructuring of the Air Navigation Management Center (CGNA), the Brazilian central agency for air navigation management, investing in the development of post-operations analysis and monitoring of ATM performance indicators developed by ICAO.

1.3 Key Performance Indicators (KPIs) are metrics that quantitatively express expected past, current, and future performance against the organization's performance goals. In general, they are not measured directly, but are calculated from supporting metrics according to well-defined formulas. DECEA follows the methodology described by the Global Air Navigation Plan (GANP), in addition to developing other indicators of its own interest, as published in MCA 100-22. Each indicator needs a specific source for data collection and processing, aiming at its application in accordance with the published methodology.

1.4 Thus, radar synthesis data is needed to calculate some of the GANP indicators such as additional time in terminal airspace (KPI08) and actual en-route extension (KPI05), which are important for understanding the impact of airspace structures in flight planning and the efficiency of air operations.

2 Analysis

2.1 In 2020, with the aim of optimizing the provision of the ATFM service in Brazil, the CGNA was restructured internally, grouping the sectors according to their performance in the ATFM schedule: processes more than a week in advance of the day of operations would be attended by the strategic sector; those with a week (or less) in advance, attended by the pre-tactical sector; the tactical sector was left in charge of the real-time operation; and, finally, with the aim of developing the monitoring of indicators, the post-operations sector was established, bringing together specialists from different areas: air traffic controllers, statisticians, programmers, data analysts and others who became part of it team.

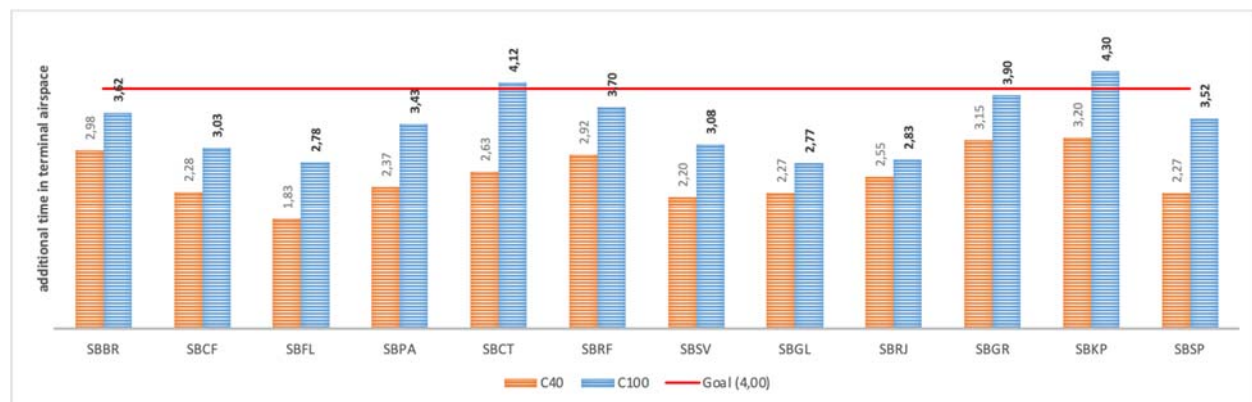
2.2 DECEA carried out studies to optimize performance management which, after the restructuring of CGNA, became the responsibility of the post-operations sector, through a working group included in the SIRIUS Brazil program. This project was absorbed by the post-operations sector, facilitating the optimization of ATFM products and processes.

2.3 The first study with radar data was applied using a sample from September 2018, based on a complete monthly basis with data from all the FIR and TMA of interest in Brazil. Crossing this data with other sources (which present the actual landing time at the airports), it was possible to calculate the KPI 08 of the GANP, additional time in terminal airspace, following its performance over time. Other preliminary studies based on September 2018 include the identification of flight holdings, the distance between aircraft on final approach and possible conflicts due to violation of the minimum separation between two aircraft.

2.4 After a few unsuccessful attempts, CGNA succeeded in accessing the radar synthesis data, building a large data storage architecture, and availability for the data set list from March 2021, with all information stored with a loss of less than 1% of the information.

2.5 From the radar data storage, GCNA measured, calculated and monitored the KPI 08 of the GANP of the 12 Brazilian airports of major movement. This study carried out the validation and monitoring of the radar data since then, allowing the analysis of the performance and the inclusion of this indicator in the SISCEAB Performance Report of 2021, to be published by the DECEA in June 2022. Figure 1 summarizes the performance of these airports in KPI08 in 2021.

Figure 1 - additional time in terminal airspace



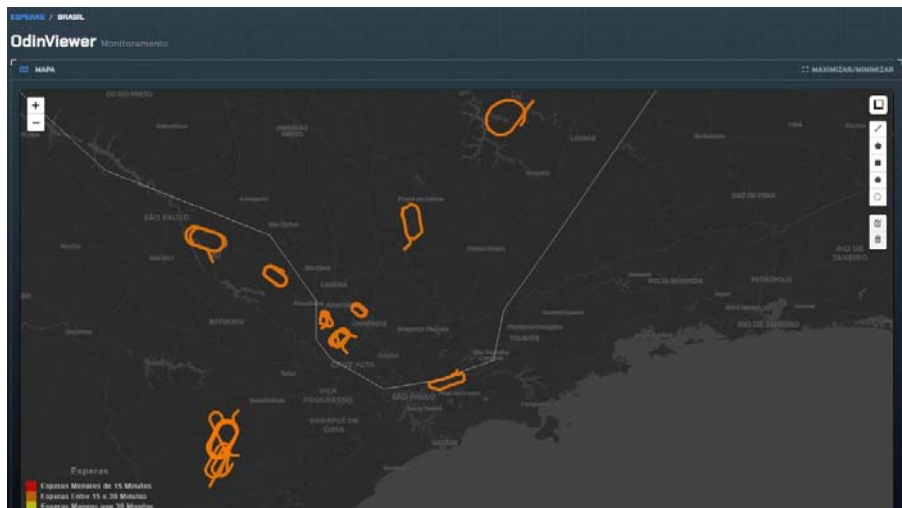
Source: radar data.

2.6 The development of Big Data to work with radar information allowed the creation of other tools such as, for example, the tactical monitoring of holdings in flight. This tool identifies real-time holdings, enabling the location and mitigation of possible imbalances in demand and capacity in the CGNA operating room. This tool also allows us to create a database of flights with delays and possible studies to reduce their occurrence or evaluate the effectiveness of projects in terms of reducing additional fuel consumption.

2.7 The main premises of the application of tactical holding monitoring are listed below:

- a) validation of the radar information through the analysis of the density algorithm and the behavior of the flight trajectory;
- b) data scan every 4 seconds;
- c) question the data if there was an overflight of some previous point of the trajectory itself;
- d) identification of a ray around the last coordinate, ignoring the point immediately after (1 or 2 minutes), to identify a trajectory crossing (item “c”);
- e) the first point overflowed is considered the start of the holding; and
- f) the last point you flew over is considered the end of the holding.

Figure 2 - Holding monitor for Campinas on May 16, 2022



Source: radar data.

2.8 The change of runway threshold used for arrivals at Guarulhos/São Paulo, the most congested airport in Brazil, points to a direct relationship with the increase in the number of in-flight holdings for aircraft arriving in the first hours after the runway change. Based on the radar data, DECEA is studying the additional fuel expense due to the reorganization of the landing sequence after that change.

2.9 Validations of the results generated by the tactical monitoring of the holdings with the main Brazilian airlines were carried out. In the case of GOL Linhas Aéreas, comparing the September 2018 base with the company's waiting data for the same period, the consistency of the DECEA information was greater than 95%.

2.10 The working group in charge of studying the radar data plans to implement applications to generate flow heat maps, monitor the separation on final approach of large airports, monitor air traffic incidents in controlled airspace and, finally, monitor the use of airspace, crossing information on demand and capacity of the ATC sectors.

3. **Suggested actions**

3.1 The States participating in the Meeting are invited to:

- a) Take note of the information provided in this Working Paper; and
- b) consider the results obtained as a way to develop and guide the use of radar and similar data in performance analysis.

— END —