Operational Comparison of ANS Performance

DECEA Performance Section, EUROCONTROL Performance Review Unit

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# Preface

**A continuing partnership**

This fourth and best edition of the bi-regional Brazil-Europe comparison report of Air Navigation System Performance continues to add transparent and robust data to support an informed discussion about operational performance in both regions. Further, it strengthens the close collaboration between DECEA and EUROCONTROL. This report is jointly developed by the Performance Section of the Department of Airspace Control (DECEA) and EUROCONTROL’s Performance Review Unit (PRU).

For any questions, please do not hesitate to contact one of the authoring organisations.

Performance Section, DECEA Performance Review Unit, EUROCONTROL

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# Foreword

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# Executive Summary

The Performance Section of the Brazilian Department of Airspace Control and the Performance Review Unit of EUROCONTROL jointly developed this third edition of the Brazil-Europe comparison of Air Navigation System Performance. This edition of the bi-regional report builds on the previous comparison reports using commonly agreed metrics and definitions to compare, understand, and improve the performance of air navigation services. This report and previous editions are available at \* <https://ansperformance.eu/global/brazil> or \* <https://performance.decea.mil.br/>.

This report revises the assessment of both the Brazilian and European air navigation systems, extending the time frame and incorporating additional analyses. The report focuses on a subset of the eleven Key Performance Areas identified by the ICAO Global Air Navigation Plan. The focus of this report is on operational air navigation system performance, in particular Predictability, Capacity and Efficiency.

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| Figure 1: Key Performance Areas addressed in this edition |

The comparison shows similarities and differences in the air navigation service provision and observed performance in both regions. Major take-aways of this report include:

* The close collaboration between DECEA and EUROCONTROL is highlighted sharing insights and experiences with the international aviation communities, thus assisting in advancing ATM performance management worldwide.
* Brazil saw a rise in the ATCOs number, whereas Europe observed a considerable decrease, highlighting a substantial contrast in the systems’ responsiveness to the challenges of COVID/re-emerging demand for air traffic.
* In 2022, the commercial flight distribution reveals that a smaller number of airports manage 80% of commercial takeoffs, with Brazil showing a slightly greater concentration compared to Europe.
* Regarding punctuality, unique trends were evident in both regions, not solely attributable to the extent of traffic resurgence. In Brazil, a consistently higher proportion of flights arrived significantly early, a pattern largely unaffected when comparing 2019 to 2022. Conversely, the documented challenges of European airports in coping with the recovering traffic demand in 2022 highlighted the repercussions of their lower preparedness levels.
* The recorded throughput at Brazilian airports exhibited less variability amid the pandemic, indicating a sustained demand concentration during peak operational hours. In the European context, innovative operational ideas present the most substantial potential for growth, considering the existing runway systems and associated capacities, which set an upper limit.
* The fresh dataset for Brazil reaffirmed past patterns regarding the extra time spent in terminal airspace. Typically, arrival sequencing and limited capacity lead to extended times during the arrival phase. In Europe, reduced air traffic translated to less strain on arrival sequencing. Yet, the notable rise from 2021 to 2022 in multiple airports implies that constraints and heightened sequencing might resurface as demand increases.

This report will be updated throughout the coming years under the umbrella of the DECEA-EUROCONTROL memorandum of cooperation. It is also planned to establish a web-based rolling monitoring updated on a regular basis.

Future editions will complement the data time series and support the development of further use-case analyses. The lessons learnt of this joint project will be coordinated with the multi-national Performance Benchmarking Working Group (PBWG) and the ICAO GANP Study sub-group concerned with the further development of the GANP Key Performance Indicators (KPIs).

# 1. Introduction

## 1.1 Background

Air transportation is a key economic driver in Brazil and Europe. Both regions share the political goal of a performance-based approach to foster the continual growth and efficiency of air transport. It is recognised that Air Navigation Services (ANS) play a critical role in terms of limiting the constraints on airspace user operations. Accordingly, the analysis and regional comparison of operational ANS performance informs about trends over time, the success of change implementation, and potential performance benefit pools for future exploitation.

With a view to a tigher collaboration between Brazil and Europe, DECEA and EUROCONTROL signed a cooperation agreement in 2015. This agreement encompasses various activities, most notably cooperation and joint initiatives in the domain of operational performance benchmarking of ANS.

The close technical collaboration of the Performance Section of DECEA and EUROCONTROL’s Performance Review Unit comprises the further development and validation of proposed ICAO GANP indicators, regular performance related data exchange, and the production of regional or multi-regional performance reports. An essential part of this work entails the identification and validation of comparable data sources, the development of a joint data prepartory process, and supporting analyses to produce this report or contribute to the aforementioned international activities.  
This report represents the third edition of joint comparisons between Brazil and Europe.

## 1.2 Performance Areas

Establishing shared definitions and a mutual understanding is essential to facilitate comparisons and operational benchmarking activities. Therefore, the groundwork presented in this report is rooted in commonly accepted findings from prior work conducted by ICAO, other regional or multi-regional operational benchmarking initiatives (e.g., PBWG [[1]](#footnote-36)), and practices within various regional or organisational settings.

The key performance indicators (KPIs) utilised in this study have been developed through a rigorous process that integrates the best available data from both the DECEA Performance Section and PRU. It is important to note that the comparative analysis outlined in this iteration of the report does not encompass all eleven Key Performance Areas (KPA) as presented in [Figure 1](#fig-scope-KPAs-KPIs).

From an indicator perspective, the DECEA Performance Section and PRU have reached a consensus to concentrate on operational benchmarking and aligning their efforts with the performance indicators proposed by ICAO in conjunction with the update of the Global Air Navigation Plan (GANP). Future work may also include aspects of cost-effectiveness.

## 1.3 Geographical Scope

This report’s geographical focus encompasses Brazil and Europe.

Airspace control in Brazil is a fully integrated civil-military operation. The Brazilian Air Force is responsible for air defence and air traffic control functions. Within this framework, the Department of Airspace Control (DECEA) operates as a governmental entity under the authority of the Brazilian Air Force Command. DECEA plays a pivotal role by coordinating and furnishing human resources and technical equipment to all air traffic units operating within Brazilian territory. This collaboration ensures air traffic safety while contributing to military defence efforts.

DECEA is the cornerstone of the Brazilian Airspace Control System (SISCEAB). This department provides air navigation services for the vast airspace jurisdiction covering 22 million square kilometres, including oceanic areas. The Brazilian airspace is further divided into five Flight Information Regions (FIR) and the areas of responsibility of these integrated Centres for Air Defence and Air Traffic Control (CINDACTA) are depicted in [Figure 1.1](#fig-BRA-airspace).

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| Figure 1.1: Brazilian Airspace Structure/FIRs (CINDACTAs) |

The CINDACTAs merge civilian air traffic control with military air defence operations. In addition to the CINDACTAs, there’s the Regional Center of Southeast Airspace Control (CRCEA-SE), tasked with managing air traffic in the densely congested terminal areas of São Paulo and Rio de Janeiro.

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| Figure 1.2: European Airspace and EUROCONTROL Member States |

In this report, Europe, i.e. the European airspace, is defined as the area where the 41 EUROCONTROL member states provide air navigation services, excluding the oceanic areas and the Canary islands (c.f. [Figure 1.2](#fig-EUR-airspace)). In 2016, EUROCONTROL signed a comprehensive agreement with Israel and Morocco. Both comprehensive agreement States will be successively fully integrated into the working structures of EUROCONTROL, including performance monitoring. Within this report, these states are included in the reported network traffic volumes.

EUROCONTROL is an inter-governmental organisation working towards a highly harmonised European air traffic management system. In general, air traffic services are provided by air navigation service providers entrusted by the different EUROCONTROL member states. Dependent on the local and national regimes, there is a mix of civil and military service providers, and integrated service provision.  
The Maastricht Upper Area Control Center is operated by EUROCONTROL on behalf of 4 States (Netherlands, Belgium, Luxemburg, and Germany). It is the only multi-national cross-border air traffic unit in Europe at the time being. Given the European context and airspace structure, the European area comprises 37 ANSPs with 62 en-route centres and 16 stand-alone Approach Control Units (i.e. totalling 78 air traffic service units).

Europe employs a collaborative approach to manage and service airspace and air traffic. This includes the integration of military objectives and requirements which need to be fully coordinated within the ATM System. A variety of coordination cells/procedures exists between civil air traffic control centres and air defence units reflecting the local practices. Many EUROCONTROL member states are members of NATO and have their air defence centres / processes for civil-military coordination aligned under the integrated NATO air defence system.

Further details on the organisation of the regional air navigation systems in Brazil and Europe will be provided in Section 2.1.

### 1.3.1 Study Airports

As concerns airport-related operational air navigation performance, this edition of the comparison report addresses the performance at a set of selected airports. These airports represent the top-10 or most relevant airports in terms of IFR movements in both regions and allow to make meaningful comparisons.  
In Brazil, the selected airports play a significant role for the national and regional connectivity, including the major hubs for international air traffic. These study airports have consolidated systems and structured processes for data collection in support of this comparison report.  
For the European context, the study airports comprise the busiest airports in several states exhibiting a mix of national, regional, and international air traffic. These airports are also characterised by varying operational constraints that make them excellent candidates for an international comparison. All of these airports are subject to the performance monitoring under the EUROCONTROL Performance Review System and provide movement related data on the basis of a harmonised data specification.

[Figure 1.3](#fig-scope-airports) provides an overview of the location of the chosen study airports within both regions. The airports are also listed in [Table 1.1](#tbl-scopetable).

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| Table 1.1: List of study airports for the Brazil / Europe operational ANS performance comparison   | Brazil | Europe | | --- | --- | | Brasília (SBBR) | Amsterdam Schiphol (EHAM) | | São Paulo Guarulhos (SBGR) | Paris Charles de Gaulle (LFPG) | | São Paulo Congonhas (SBSP) | London Heathrow (EGLL) | | Campinas (SBKP) | Frankfurt (EDDF) | | Rio de Janeiro S. Dumont (SBRJ) | Munich (EDDM) | | Rio de Janeiro Galeão (SBGL) | Madrid (LEMD) | | Belo Horizonte Confins (SBCF) | Rome Fiumicino (LIRF) | | Salvador (SBSV) | Barcelona (LEBL) | | Porto Alegre (SBPA) | London Gatwick (EGKK) | | Curitiba (SBCT) | Zurich (LSZH) | |

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| Figure 1.3: Study airports of Brazil/Europe Comparison |

### 1.3.2 Temporal Scope

This report focuses on the period from January 2019 to December 2023. With this report, the focus is on building a timeline with comparable data to be augmented in future editions.

Throughout the report, summary statistics will be given with reference to calendar years of this comparison study.

## 1.4 Data Sources

The nature of the performance indicator requires the collection of data from different sources. DECEA Performance Section and PRU investigated the comparability of the data available in both regions, including the data pre-processes, data cleaning and aggregation, to ensure a harmonised set of data for performance comparison purposes.

DECEA mainly uses data from the tower systems of the main airports as a data source for performance studies. The control tower system collects and provides data for each landing and take-off operation automatically. This edition blended ANAC (Brazilian CAA) official and public data with DECEA’s data to increase precision for specific indicators, adding a pre-processing phase to the data analytical work. The provided data include such items as the times of operations, gate entry and exit, and flight origin and destination.

Within the European context, PRU has established a variety of performance-related data collection processes. For this report the main sources are the European Air Traffic Flow Management System (ETFMS [[2]](#footnote-54)) complemented with airport operator reported data. These sources are combined to establish a flight-by-flight record. This ensures consistent data for arrivals and departures at the chosen study airports. The data is collected on a monthly basis and typically processed for the regular performance reporting under the EUROCONTROL Performance Review System and the Single European Sky Performance and Charging Scheme (EUROCONTROL 2019).

## 1.5 Structure of the Report

This third edition of the Brazil-Europe comparison report is organised as follows:

* **Introduction** – overview, purpose and scope of the comparison report; short description of data sources used;
* **Air Navigation System Characteristics** – high-level description of the two regional systems, i.e. areas of responsibility, organisation of ANS, and high-level air navigation system characteristics;
* **Traffic Characterisation** – network level and airport level air traffic movements; peak day demand, and fleet composition observed at the study airports;
* **Predictability** observed arrival and departure punctuality;
* **Capacity and Throughput** assessment of the declared capacity at the study airports and the observed throughput, including runway system utilisation comparing achieved peak throughput to the declared capacity;
* **Efficiency** analysis of taxi-in, taxi-out, and terminal airspace operations; and
* **Conclusions** summary of this report and associated conclusions; and next steps.

# 2. Next chapter

This placeholder chapter is used to practice the git workflow.

As a reminder: we can always toggle between the docs folder that is used to serve the site and the **internal** (local testing) by switching the output-dir in \_quarto.yml to \_books.

We can mock around with it without impacting the exising material.

The workflow will be to update chapter by chapter - and use this for experimental purposes. In the end we simply delete / remove this file.

# References

EUROCONTROL. 2019. “Eurocontrol Specification for Operational ANS Performance Monitoring - Airport Operator Data Flow.” <https://www.eurocontrol.int/publication/eurocontrol-specification-operational-ans-performance-monitoring>.

1. The Performance Benchmarking Working Group (PBWG) comprises participants from Brazil (DECEA), China (CAA-OSC), Japan (JCAB), Singapore (CAA), Thailand (AEROTHAI), United States (FAA-ATO), and EUROCONTROL. [↑](#footnote-ref-36)
2. Enhanced Traffic Flow Management System [↑](#footnote-ref-54)