

Operational Comparison of ANS Performance

DECEA Performance Section, EUROCONTROL Performance Review Unit

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Preface

A continuing partnership

This third 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

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.

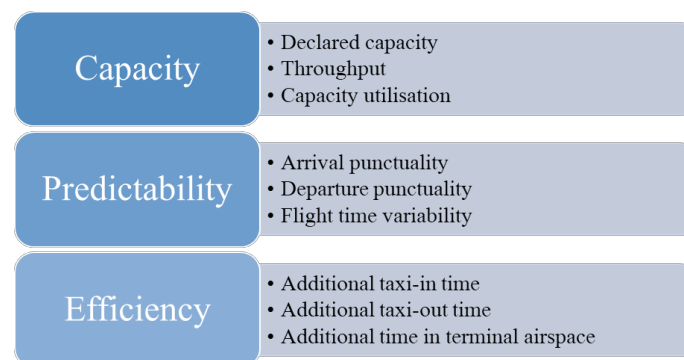


Figure 1: Key Performance Areas addressed in this edition

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 tighter 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 preparatory 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., PBWG¹), 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.

¹The 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.

From an indicator perspective and this report, 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.

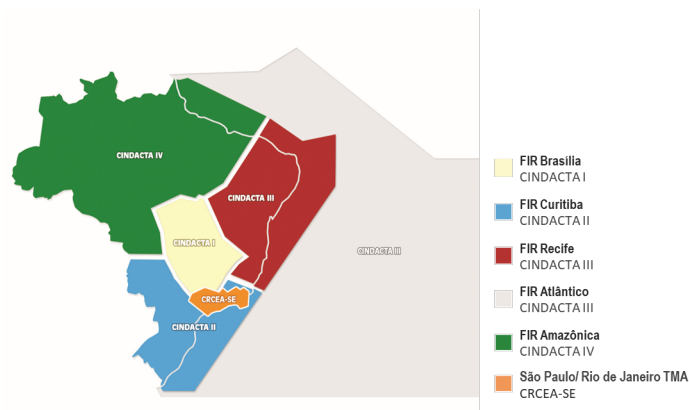


Figure 1.1: Brazilian Airspace Structure/FIRs (CINDACTAs)

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.

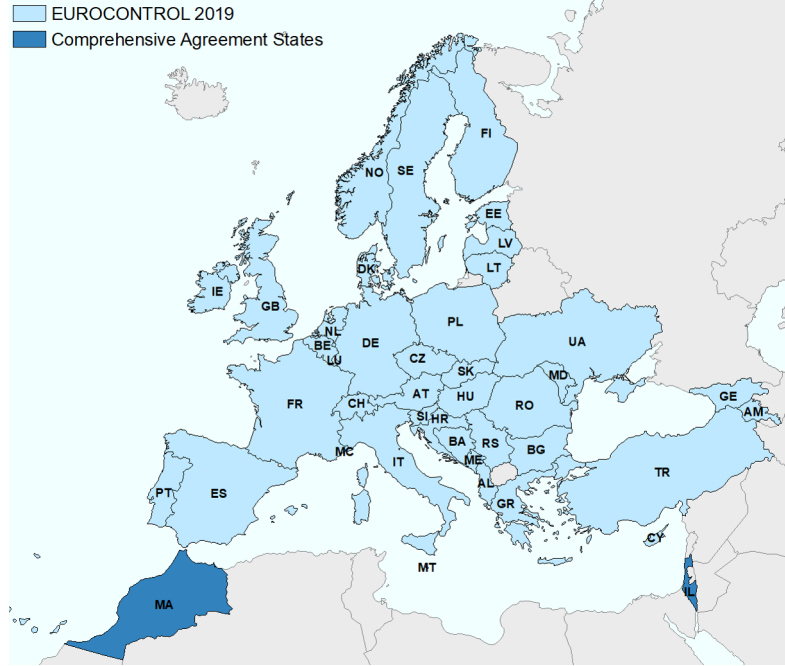


Figure 1.2: European Airspace and EUROCONTROL Member States

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). 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 volume.

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 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 provides an overview of the location of the chosen study airports within both regions. The airports are also listed in Table 1.1.

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)

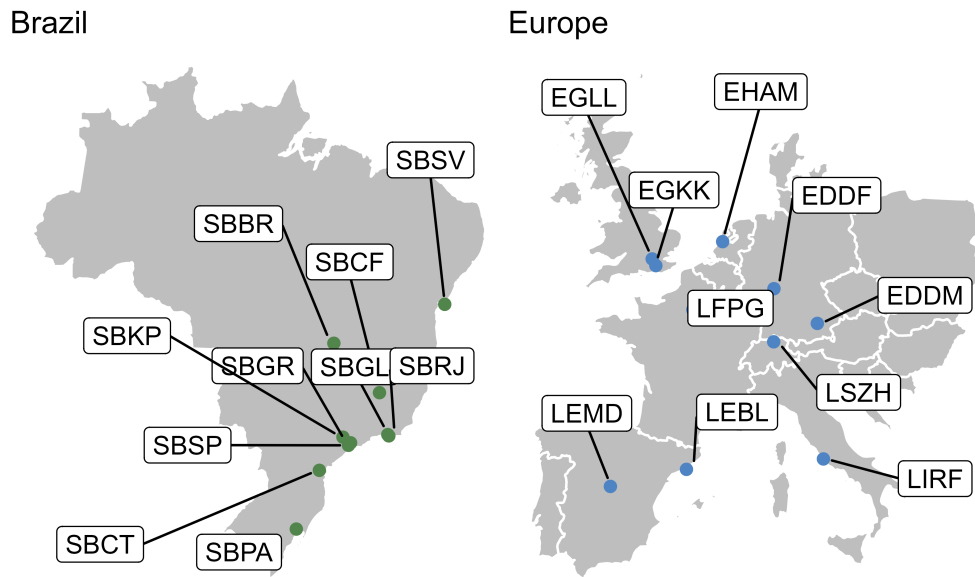


Figure 1.3: Study airports of Brazil/Europe Comparison

1.3.2 Temporal Scope

This report focuses mainly on the period from January 2019 through to December 2022. Based on the initial report and data availability, a longer time series, up to June 2023, will be presented, as far as practicable. 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 the tower system's data from the main airports as a data source for performance studies. The control tower system collects and provides 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 analysis work. The provided data includes 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) complemented with airport operator data. These sources

²Enhanced Traffic Flow Management System

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** 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.
- **Conclusions** summary of this report and associated conclusions; and next steps.

2 Air Navigation System Characterization

This section presents key characteristics of the air navigation systems of Brazil and Europe. In broad strokes, the provision of air navigation services in both regions relies on similar operational concepts, procedures, and supporting technology. Nonetheless, there are several distinctions between the two systems, which help to account for the similarities and differences in key performance indicators documented in this report.

2.1 Organisation of Air Navigation Services

One of the major difference between the air navigation systems of Brazil and Europe is the respective organisational structure. In Brazil, a single entity serves as the primary air navigation services provider, i.e. the Department of Airspace Control (DECEA). In contrast, in Europe, each member state has delegated the responsibility for service provision to either national or local providers.

DECEA holds the vital role of overseeing all activities related to the safety and efficiency of Brazilian airspace control. Its mission encompasses the management and control of all air traffic within the sovereign Brazilian airspace, with a significant emphasis on contributing to national defence efforts. To achieve this, DECEA operates a comprehensive and fully integrated civil-military system.

In 2021, a public company, NAV Brasil, was created to take over some facilities that were linked to an old airport infrastructure provider company in Brazil (INFRAERO). Today, this company has 1698 employees in 44 different units, providing aerodrome control services, nonradar approach, meteorology and aeronautical information for these locations. Despite having important numbers, Nav Brasil doesn't plan to have radar facilities or en-route services.

The Brazilian airspace, covering an extensive area of approximately 22 million square kilometres (8.5 million square nautical miles of non-oceanic airspace), is divided into five Flight Information Regions. These regions are further subdivided and managed by five Area Control Centers (ACC), 57 Tower facilities (TWR), 42 Approach Units (APP) and 84 AFIS/Remote-AFIS.

The non-oceanic airspace in Europe covers an area of 11.5 million square kilometres. When it comes to the provision of air traffic services, the European approach involves a multitude of service providers, with 37 distinct en-route Air Navigation Service Providers (ANSPs), each responsible for different geographical regions. These services are primarily organised along state boundaries and FIR (Flight Information Region) borders, with limited cross-border agreements in place between adjacent airspaces and air traffic service units.

A noteworthy exception to this predominantly national approach is the Maastricht Upper Area Control (UAC), which represents a unique multinational collaboration offering air

traffic services in the upper airspace of northern Germany, the Netherlands, Belgium, and Luxembourg.

Civil-military integration levels across European countries vary. Within the European context, the central coordination of Air Traffic Flow Management (ATFM) and Airspace Management (ASM) is facilitated by the Network Manager. The design of airspace and related procedures is no longer developed and implemented in isolation in Europe. Inefficiencies in the design and utilisation of the air route network are recognised as contributing factors to flight inefficiencies in the region. Therefore, as part of the European Union's Single European Sky initiative, the Network Manager is tasked with developing an integrated European Route Network Design. This is achieved through a Collaborative Decision-Making (CDM) process involving all stakeholders.

Another critical responsibility of the Network Manager is to ensure that air traffic flows do not exceed the safe handling capacity of air traffic service units while optimising available capacity. To accomplish this, the Network Manager Operations Centre (NMOC) continuously monitors the air traffic situation and proposes flow management measures through the CDM process in coordination with the respective local authorities. This coordination typically occurs with the local Flow Management Positions (FMP) within the respective area control centres. Subsequently, the NMOC implements the relevant flow management initiatives as requested by the authorities or FMPs.

2.2 High Level System Comparison

Figure 2.1 summarises the key characteristics of the Brazilian and European air navigation system for 2022. Comparing the high-level numbers, Brazil utilised an increased number of Air Traffic Controllers (ATCOs) even during the pandemic period. In contrast, the European system showed a reduction of total ATCOs in service. The different behaviour suggests a difference in work force flexibility between the systems. This may be partly explained by the fact that DECEA shares part of the structure used in basic training with other Air Force training processes. This leads to a more centralised and rigid process, in which abrupt reactions in hiring planning are unwanted due to the lengthy process of calling for candidates according to Brazilian laws related to public service jobs. In Europe, there exists a mix of organisational models and labour contracts ranging from public service to fully commercial organisation. En gros, European providers were able to react to the lower demand levels by delaying/stopping recruitment/training and offering early retirement packages.

KPA	Brazil 2019	Brazil 2022	Europe 2019	Europe 2022	BRA/EUR 2019	BRA/EUR 2022
geographic area (million km ²)	8.5 non-oceanic		11.5 non-oceanic		74%	
number of en-route ANSPs	1		37		3%	
number of TWR	59	57	400+		14%	
number of APP	43	42	16 (stand alone)		263%	
number of ACC	5		62		8%	
number of ATCOs in OPS	3 126	3 754	17 563	16 785 ¹	18%	22%
controlled flights	1 594 442	1 677 760	10 995 092	9 152 849	15%	18%
flights/ATCO	510	447	626	545	81%	82,02%
traffic density non-Oceanic (flights/km ²)	0,187	0,197	0,956	0,795	20%	25%

¹2021, ACE Report

Figure 2.1: High Level Comparison 2022

Another key difference affecting performance in both regions for this report is the development of air traffic demand. Unlike in Europe, it is interesting to note that Brazil ended 2022 already servicing air traffic movements above the pre-pandemic (i.e. 2019) level. However, as will be shown later, much of this growth was due to the strong increase in general aviation and only to a lower extent in commercial aviation.

Overall, the volume of air traffic also rebounded in Europe. At the end of 2022, the level reached about 85% of the pre-pandemic air traffic.

Both regions operate with similar operational concepts, procedures and supporting technology. Yet, Brazil, with lower traffic density related to airspace use, finds probably a more challenging cost-benefit ratio to maintain communications coverage and surveillance for low-traffic regions. In comparison, the European region faces more considerable challenges in coordinating efforts to avoid congestion due to a higher density.

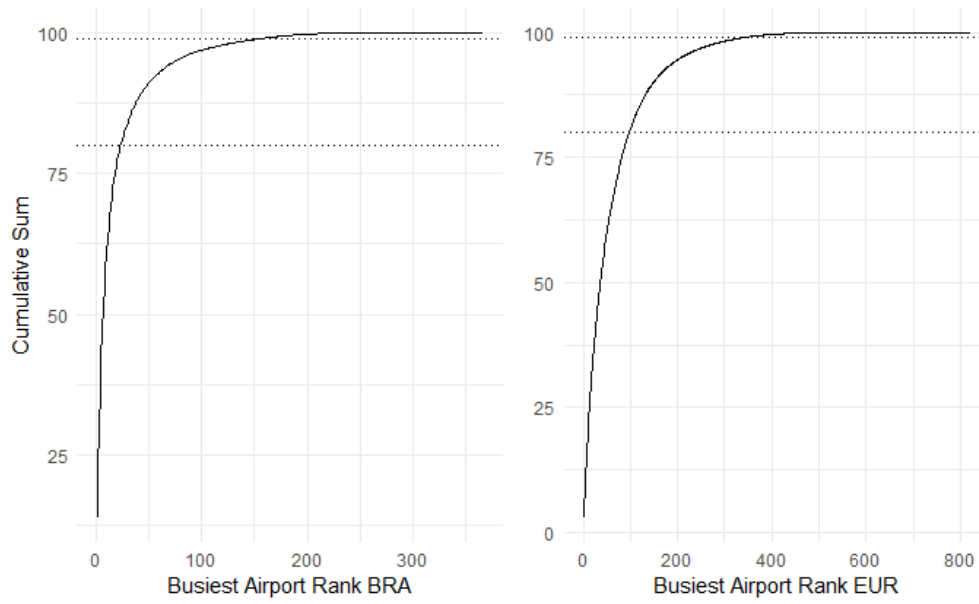


Figure 2.2: Airport Rank Comparison 2022

This report launched a first analysis of the systems’ network utilisation, taking advantage of the rich experience in comparing two regional aviation systems. Aviation infrastructure is always expensive and complex to maintain, including cost for the provision of air navigation services. The analysis of the facilities’ locations distribution for this service has always basically accompanied the distribution of airports in a region. Recently, technological feasibility modified this logic with the possibility of remote services and still with the possibility of joining more than one remote installation to provide services to several locations simultaneously.

Still, a closer look at the dynamics of these routes and potential connectivity between sites may indicate the potential for capacity to be exploited by the aviation community or that idle capacity is installed without reasonable prospects for use.

In Figure 2.2, we see the distribution of commercial departures for 2022 in both regions. Note that the concentration is proportionally slightly higher on the Brazilian side, with less than 50 airports handling 80% of the commercial take-offs that year. In comparison, the European system distributed the same percentage over approximately 100 airports. For both regions, the aforementioned share of air traffic is centralised in a small subset of airports. On the other hand, the cumulative charts in Figure 2.2 show that a high number of airports service under 1% of the regional air traffic volume. In both systems, this represents more than half of the airports that serve commercial flights. In Europe, approximately 486 airports handle only 1% of the movements, while in Brazil, there are 210 for the same percentage.

Despite being an already historically established distribution and somewhat expected, the aviation sector agents must revisit this data constantly to verify the use of deployed resources and capacity. There is scope for further assessing the service provision at smaller operations with a view to accommodate demand and capacity.

Analysing the part of ANS, specifically on the Brazilian side, the proportion of flights using AFIS aerodromes in this sample is 10.73%. Among them, the busiest airport serviced

approximately 4146 commercial departures in 2022 while only 124 were handled at the least busy AFIS aerodrome. In most cases, these operations represent remote airports where aviation is deemed needed to give access to that community. For the European data, a similar pattern is expected. The current data does not allow for a labelling of all aerodromes in terms of ATS service provision (in particular, the identification of AFIS-only services). Future work may highlight to what extent also resources within the European context are bound to establishing basic connectivity.

Further research can explore how both regions can maximise installed capacity, benefit from novel operational or technical concepts, and suggest improvements for ANS provision.

2.3 Regional Approach to Operational Performance Monitoring

The previous report detailed the historic setup of the performance monitoring systems in Brazil and Europe.

The implementation of the performance-based approach is not a fundamental new activity in Europe. The Performance Review Commission (PRC) was established within EUROCONTROL in 1998 aiming to establish and implement an independent European air traffic management (ATM) performance review capability in response to the European Civil Aviation Conference (ECAC) Institutional Strategy. The main goal of the PRC is to offer impartial advice on pan-European ATM performance to EUROCONTROL's governing bodies. Supported by the Performance Review Unit (PRU), the PRC conducts extensive research, data analysis, and consultations to provide objective insights and recommendations. EUROCONTROL's performance review system, a pioneering initiative in the late 1990s, has influenced broader forums like ICAO's global performance approach and the Single European Sky (SES) performance scheme. Collaborating internationally, particularly with ICAO, the PRC aims to harmonise air navigation practices. The PRC produces annual reports (ACE and PRR) and provides operational performance monitoring through various data products and online tools. Continuous efforts are made to expand the online reporting for stakeholders and ensure access to independent performance data for informed decision-making.

It is noteworthy to recall that DECEA, influenced by ICAO publications, embraced a performance-based approach, notably advancing with EUROCONTROL's collaboration. Beginning with the SIRIUS Brazil Program in 2012, DECEA faced challenges defining metrics, but made significant progress after signing a Cooperation Agreement with EUROCONTROL in 2015. DECEA published crucial documents for ICAO's Global Air Navigation Plan, prompting an organisational transformation and adaptation of practices. Establishing the ATM Performance Section in 2019, akin to EUROCONTROL's PRU, DECEA accelerated the build-up of expertise in operational performance monitoring. This culminated in the publication of the first Brazilian ATM Performance Plan for 2022-2023. Actively fostering an open culture of knowledge-sharing within South America, DECEA engaged in workshops and seminars, and inviting EUROCONTROL for collaboration.

Finally, it should be noted that the recurrent use of indicators by EUROCONTROL and DECEA and the deep debates that take place during the analysis periods for joint conclusions enrich not only the two regions but also have a global impact. Embracing

transparency, both agencies made indicators and databases publicly accessible, perpetuating a culture of reciprocity and transparency for mutual advancement. Looking for broader validation and harmonisation, the lessons learned from this scheme are systematically shared with the multinational Performance Benchmarking Working Group (PBWG) and the Performance Expert Group of the ICAO GANP Study Group, which deals with the development of GANP Key Performance Indicators (KPIs). In this respect, this collaboration between both parties serves as a role model for ANS performance management on a global level.

Updated dashboards, previous work, and supporting historical data are available at <https://ansperformance.eu/global/brazil/> or <https://performance.decea.mil.br/>.

2.4 Summary

While both regions operate on similar operational concepts and technologies, there exists key characteristics and distinctions in both regions. One of the key differences is the overall organisation of air navigation services. Brazil's air navigation services are centralised under DECEA, overseeing all airspace control and contributing significantly to national defense. In contrast, Europe's air navigation services are provided by multiple entities and ANSPs operating predominantly within state boundaries and FIR borders.

Also remarkable is the comparison of air traffic controller numbers between Brazil and Europe during the pandemic. This revealed contrasting trends. Brazil experienced an increase in ATCOs, while Europe witnessed a notable reduction. This disparity underscores a significant difference in the systems' responsiveness, partly attributed to Brazil's centralised and rigid hiring process. At the same time, European providers operate with greater independence and flexibility, enabling easier adjustments to the management of the ATCO workforce.

The distribution of commercial flights in 2022 indicates that only a subset of airports handle 80% of commercial take-offs. The concentration effect is higher in Brazil than Europe. On the other hand, a high number of airports operating commercial flights represent handle only a marginal share of 1% of the movements in both systems. This duality may inform decision-makers about potential performance benefit pools with a view to allocate scarce ANS resources and capabilities and ensure the proper balancing of demand and capacity.

This report documents the close collaboration between DECEA and EUROCONTROL. The effort benefits the two regions and contributes globally by sharing insights and lessons learned with international aviation communities, aiding the development of ATM performance management worldwide.

3 Conclusions

This third edition of the Brazil-Europe operational ANS performance comparison report builds on the joint project between the Performance Section of DECEA and the Performance Review Unit of EUROCONTROL. The collaboration aims at fostering the understanding and support the further development of approaches to measure operational performance in both regions. This report builds on a subset of indicators and metrics established under the umbrella of ICAO's Global Air Navigation Plan (ICAO 2019). The work is also used to showcase the application of the GANP indicators within a bi-regional and multi-regional project. DECEA and EUROCONTROL engage actively within the international community and share their findings of the bi-regional work. This iteration also comprised the integration of additional data sources on the Brazilian side. The new data sources offer to perform more fine-grained analyses of the observed operational efficiency performance. This will allow to further develop and complement the framework. The report also identified several observations and ideas for future research which pave the way ahead for augmenting the associated set of comparison analyses.

This report kicked off by examining the commonalities and differences in terms of the organisation of air navigation services in both regions. This was complemented by investigating the air traffic demand to better understand the factors influencing operational performance. The air navigation service provision is less fragmented in Brazil than in Europe. This plays out in the total number of air traffic service units. Both regions operate a central flow management function to ensure network wide flow management.

In terms of air traffic demand, both regions were impacted by the unprecedented decline of air traffic. Regional and global traffic restrictions resulted in different patterns. The recovery in Brazil followed a more continual path, while Europe experienced setbacks due to the variety of national and pan-European measures deployed to curb the spread of COVID. In 2022, the Brazilian system serviced more traffic than pre-pandemic. In terms of traffic volume, Europe is still lagging behind with about 85-90% of pre-pandemic network level traffic in 2022. The traffic situation is also reflected by the demand at the study airports. There is also a higher level of diversity in terms of air traffic evidenced by the share of light types serviced at the comparison airports. International traffic is more centralised in Brazil than in Europe.

The observed punctuality in both regions was strongly influenced by the prevailing COVID-19 recovery. Particularly, Europe suffered strongly from the surge of air traffic demand in early 2022 which is evidenced by the high share of departure delays. The reactionary knock-on effect amplified further the overall punctuality performance.

The utilisation of available runway system capacities is a fundamental enabler for high levels of operational performance. This report showed that associated capacities are commensurate with the current traffic levels. For the majority of airports, the realised throughput ranges still below the maximum declared capacities.

Operational efficiency is measured in this report in the form of the additional time during the surface movement phases and the terminal arrival phase. On average, taxi-in operations are less constrained than taxi-out operations. The observed performance varies across the airports and timeframe. In terms of arrival management, air traffic in Brazil observed higher additional times in the terminal airspace. This report showed that the scale effect of lower air traffic are potentially masked by the effects of airspace redesign in Brazil. In the European region, it appears that the higher level of air traffic demand puts pressure on the arrival management and sequencing, and 2022 marks a return to higher additional times within the terminal airspace. Further research can help to identify drivers and performance enablers.

This third edition of the bi-regional comparison report documents the continued technical collaboration between DECEA and EUROCONTROL. The joint work also helped to promote the approach and state-of-the-art with the international community. Both groups are contributing to the ICAO GANP Performance Expert Group and the multi-national Performance Benchmarking Working Group. The wider harmonisation of performance related data and joint refinement of the guidance material and application of the performance framework start paying dividends. For example, PBWG concluded in its most recent meeting to collaborate on topics of mutual interest for which this report supported the initial research and validation.

A further outcome of the project is the close technical collaboration. It is planned to augment the report and its future editions with a rolling web-based monitoring, including regular updates of the underlying data. This and future reports will help to complement the time series of the measures tracked.

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