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 (GREPECAS/23)**

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Agenda Item 8: CAR/SAM Air Navigation Implementation

**VIRACO₂POS PROJECT: OPERATIONAL EFFICIENCY AND ENVIRONMENTAL
 BENEFITS IN THE SÃO PAULO TMA**

(Presented by Brazil)

EXECUTIVE SUMMARY

This Information Paper presents the ViraCO₂pos Project, developed by the Brazilian Department of Airspace Control (DECEA), aimed at enhancing operational efficiency and environmental sustainability within the São Paulo Terminal Control Area (TMA-SP), with particular focus on Viracopos International Airport (SBKP). The project aligns with ICAO strategic objectives by promoting optimized airspace design, performance-based operations improvements, and measurable reductions in fuel consumption and CO₂ emissions. The initiative represents a practical example of how airspace modernization and procedure redesign in high-density terminal environments can simultaneously support aviation growth and environmental protection. Quantitative assessments, based on airline operational simulations, indicate an annual reduction of more than 302,000 nautical miles flown and approximately 5.4 million kilograms of CO₂ emissions avoided, demonstrating the relevance of the project to the CAR/SAM Region and its potential replicability in other complex TMAs.

<i>Strategic Objectives 2026-2050:</i>	<ul style="list-style-type: none"> a) Every flight is safe and secure b) Aviation is environmentally sustainable c) Aviation delivers seamless, accessible, and reliable mobility for all d) No country left behind e) The International Civil Aviation Convention and Other Treaties, Laws and Regulations Address All Challenges f) The Economic Development of Air Transport Assures the Delivery of Economic Prosperity and Societal Well-Being for All
<i>References:</i>	<ul style="list-style-type: none"> • ICAO GANP • ICAO ASBU Framework • AIC A 17/25 – Project ViraCO₂pos

1. Introduction

1.1 The continuous growth of air traffic in major metropolitan regions presents increasing challenges related to airspace capacity, operational complexity, and environmental impact. Within this context, the São Paulo Terminal Control Area (TMA-SP) stands out as one of the most complex and congested TMAs in the CAR/SAM Region.

1.2 The ViraCO₂pos Project was conceived by DECEA as part of Brazil's ongoing efforts to modernize its air navigation system, building upon previous initiatives such as the TMA-SP Neo Project. While earlier projects prioritized capacity and efficiency at Guarulhos (SBGR) and Congonhas (SBSP) airports, residual operational constraints at Viracopos International Airport (SBKP) required specific and targeted operational interventions.

1.3 This paper aims to inform GREPECAS about the objectives, scope, and quantified operational and environmental benefits of the ViraCO₂pos Project, highlighting its alignment with ICAO strategic goals related to the sustainable development of the aviation industry and environmental protection.

2. Overview of the São Paulo TMA and Its Main Airports

2.1 The São Paulo TMA encompasses one of the busiest airspace environments in Latin America, supporting high-density domestic and international operations and integrating multiple major airports with distinct operational profiles and demand patterns.

2.2 Guarulhos International Airport (SBGR) is Brazil's primary international gateway, characterized by a high volume of long-haul and regional traffic. Congonhas Airport (SBSP), located within the urban core, handles intensive domestic shuttle operations with severe infrastructure and airspace constraints. Viracopos International Airport (SBKP), located in Campinas, has experienced sustained growth in both passenger and cargo operations, exceeding pre-pandemic levels by more than 13 per cent.

2.3 In addition to these hubs, the TMA-SP includes secondary aerodromes such as Jundiaí (SBJD), whose IFR accessibility has historically been constrained by airspace interactions with the major airports. The close proximity of these aerodromes, combined with converging arrival and departure flows, results in elevated controller workload and increased operational complexity.

2.4 Within this environment, any airspace or procedure modification must be carefully designed to preserve safety while improving efficiency and minimizing environmental impact, reinforcing the need for integrated, performance-based solutions.

3. Alignment with ICAO Strategic Objectives

3.1 The ViraCO₂pos Project directly supports ICAO's strategic objective of fostering the sustainable development of the global aviation industry. By optimizing the use of existing infrastructure rather than relying on capacity expansion alone, the project contributes to more efficient and resilient air navigation services.

3.2 From an environmental perspective, the initiative aligns with ICAO's long-term aspiration for carbon-neutral growth and the implementation of operational measures that reduce fuel burn and emissions. The emphasis on the expanded application of CCO and CDO procedures reflects ICAO guidance on performance-based operations and environmentally optimized trajectories.

3.3 The project also supports the GANP and ASBU framework by demonstrating the practical implementation of modules related to terminal airspace optimization, improved arrival and departure management, and environmental efficiency. As such, it represents a tangible contribution to regional and global aviation objectives, particularly relevant for high-density TMAs in the CAR/SAM Region.

4. Quantitative Results: Fuel Savings and CO₂ Emissions Reduction

4.1 Quantitative assessments of the ViraCO₂pos Project were conducted based on airline operational analyses using their own simulation tools. These assessments considered the non-linear relationship between distance flown and fuel consumption, taking into account different flight phases, including climb, cruise, and descent.

4.2 The redesign of procedures and traffic flows at Viracopos Airport is expected to result in an annual reduction of approximately 210,000 nautical miles flown, corresponding to significant fuel savings and an estimated reduction of about 4.46 million kilograms of CO₂ emissions per year.

4.3 Additional adjustments to procedures at Congonhas Airport are expected to reduce more than 92,000 nautical miles flown annually, corresponding to a mitigation of approximately 975,000 kilograms of CO₂ emissions per year.

4.4 In aggregate, the ViraCO₂pos Project is estimated to achieve an annual reduction of over 302,000 nautical miles flown and approximately 5.44 million kilograms of CO₂ emissions avoided. These results demonstrate that targeted airspace and procedure redesign in terminal environments can yield substantial environmental benefits while maintaining or enhancing operational performance.

5. Conclusions and Way Forward

5.1 The ViraCO₂pos Project illustrates how strategic airspace modernization initiatives can reconcile aviation growth with environmental sustainability in complex terminal environments. The quantified operational and environmental benefits reinforce the value of performance-based design, collaborative development, and close coordination with airspace users.

5.2 The experience gained in the TMA-SP may serve as a reference for other States facing similar challenges, particularly within the CAR/SAM Region. Sharing lessons learned and best practices through GREPECAS contributes to harmonized regional implementation and supports ICAO's "No Country Left Behind" principle.

5.3 Brazil remains committed to advancing initiatives that enhance efficiency, safety, and environmental performance, and looks forward to continued collaboration within GREPECAS and ICAO frameworks.