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**EXECUTIVE COMMITTEE**

**Agenda Item 17: Environmental Protection — International Aviation and Climate Change**

**REDUCTION OF CO<sub>2</sub> EMISSIONS THROUGH THE IMPLEMENTATION OF OPERATIONAL MEASURES**

(Presented by Brazil)

**EXECUTIVE SUMMARY**

This information paper aims to announce CO<sub>2</sub> emissions reduction obtained by implementing several operational measures by the Department of Airspace Control (DECEA). These measures are part of the undertakings of the DECEA Sirius Program, based on the Global Air Navigation Plan, which aims to promote the evolution of Brazilian air traffic management while attending to environmental needs. Since the beginning of large-scale PBN concept implementation in Brazilian airspace and the implementation of several other operational measures, thousands of tonnes of CO<sub>2</sub> have stopped being emitted. Additional operational measures will be implemented shortly and contribute even more to the efficiency of the air operations leading to a reduction of CO<sub>2</sub> emissions.

<i>Strategic Objectives:</i>	This working paper relates to Strategic Objective – <i>Environmental Protection</i> .
<i>Financial implications:</i>	None
<i>References:</i>	Doc 9988, <i>Guidance on the Development of States' Action Plans on CO<sub>2</sub> Emissions Reduction Activities</i> Doc 9750, <i>Global Air Navigation Plan</i>

**1. INTRODUCTION**

1.1 ICAO Resolution A37-18 (2010) was approved with the target of a 2% annual improvement in energy efficiency and neutral growth in greenhouse gas (GHG) emissions from 2020 by implementing new technologies, operational improvements, use of alternative fuels, and adoption of market-based measures.

1.2 DECEA has already implemented several operational measures to mitigate environmental impacts in aviation. These measures are evidenced in the three editions of the “Action Plan for the

Reduction of CO<sub>2</sub> Emissions from Brazilian Civil Aviation”, a document prepared jointly by the Secretaria de Aviação Civil (SAC), Agência Nacional de Aviação Civil (ANAC) and DECEA and published by the Ministry of Infrastructure. The publication of the fourth edition will occur in the second semester of 2022.

1.3 This Action Plan is constantly updated and submitted to ICAO every three years, in line with the recommendations in Resolution A39-2: "Consolidated statement of ICAO ongoing policies and practices related to environmental protection." The last published plan (third Edition) covered the period between 2016 and 2018. The methodology used for the calculations is presented in Doc 9988, "Guidance on the Development of States' Action Plans on CO<sub>2</sub> Emissions Reduction Activities".

1.4 The operational measures implemented by DECEA are part of the various undertakings of the DECEA Sirius Program, which is based on the use of strategic solutions for the permanent evolution of Brazilian air traffic management, associated with the needs of the environment, and which aims to meet the provisions of the Global Air Navigation Plan. This information paper will present the main operational measures implemented by DECEA that contribute to the reduction of CO<sub>2</sub> emissions.

## **2. PBN OPERATIONAL IMPLEMENTATION IN TERMINAL CONTROL AREAS AND ATS ROUTE OPTIMIZATION**

2.1 DECEA has conducted airspace restructuring in Terminal Control Areas and ATS Route Optimization, which increased airspace capacity and the efficiency of air operations throughout the flight path, using more direct air routes and the Performance-Based Navigation (PBN) concept.

2.2 DECEA applied the PBN concept at Terminal (TMA) in Brasília and later at TMA São Paulo, Rio de Janeiro, and throughout the southern region of the country, together with the application of the Continuous Climb Operation (CCO) and Continuous Descent Operations (CDO) concepts, in instrument arrivals and departure procedures at various airports in the country. As a result, continuous climbs and descents were ensured without the aircraft having to fly on “steps” during these phases of the flight, which generated less fuel consumption, less CO<sub>2</sub> emissions, and less noise.

2.3 DECEA calculated, according to the methodology established in ICAO Doc 9988, that after all the PBN implementations in Brazilian airspace, using the CCO and CDO concepts, in 2018 reached an annual saving of approximately 176 thousand tonnes of fuel, which is equivalent to about 556 thousand tonnes of CO<sub>2</sub> that are not released into the atmosphere.

2.4 In May 2021, the TMA-SP NEO project was implemented, which improved the airspace structure of the São Paulo Terminal, better balancing the arrival flows that previously entered predominantly through the northeast sector of the terminal. In addition, fewer restrictions were adopted on climbs and descents, and departures and arrivals were segregated according to the performance of the aircraft.

2.5 All these measures related to the implementation of the TMA-SP NEO project were essential for improving the efficiency of operations and the consequent reduction in emissions of approximately 180 thousand tonnes of CO<sub>2</sub> annually. Additionally, the new arrival and departure routes implemented in the TMA-SP Neo project reduced the areas covered by the airport's noise curves in their various noise levels.

2.6 “Cardeal Nordeste” project is underway, implementing the PBN concept in TMA in the country's Northeast region. This implementation is expected to generate annual savings of 90.000 tonnes

of aircraft fuel annually, which translates into a reduction of approximately 280.000 tonnes of CO<sub>2</sub> released into the atmosphere.

2.7 Based on discussion with stakeholders carried out in 2020, the year that marked the beginning of the COVID-19 pandemic, DECEA implemented direct routes in the Recife and Amazônica Flight Information Regions (FIR), which allowed Brazilian airspace users to plan their flights more efficiently, using the shortest possible routes between origin and destination airports, whenever traffic density conditions permit.

2.8 The implementation of the aforementioned direct routes generated savings of 7.900 tonnes of fuel in 2020, corresponding to approximately 25,000 tonnes of CO<sub>2</sub> that were no longer released into the atmosphere from April 16 to December 31, 2020. These savings correspond to 3.950 flight legs on the Rio-São Paulo route.

2.9 Due to the positive results obtained with direct routes in the Recife and Amazônica FIR, DECEA carried out intense coordination to maintain them, even after the resumption of air traffic flow in the end of 2020 and intends to implement them in the other Brazilian FIR.

### **3. FLEXIBLE USE OF AIRSPACE (FUA)**

3.1 This enterprise aims to optimize and balance airspace use among its users through coordination among all interested parties. DECEA works directly in the implementation of the FUA concept in Brazil. At the current implementation stage, it is already possible to manage airspace at the strategic and pre-tactical levels, which brings benefits based on coordination between civil and military air traffic units.

3.2 Some benefits are using more flexible ATS and direct routes, reducing the emission of polluting gases due to lower fuel consumption by aircraft, making general air circulation more efficient, and increasing airspace capacity without harming military aircraft operations.

3.3 As an example of the implementation of the FUA concept by DECEA, there is the Letter of Operational Agreement with EMBRAER, which allows General Air Circulation departing from Sao Paulo Terminal Area to fly over the conditioned airspaces granted to the company when it is not using them, in a high traffic density scenario. This initiative allowed savings of 165 kg of fuel per aircraft, corresponding to approximately 520 kg of CO<sub>2</sub> no longer released into the atmosphere.

### **4. ARRIVAL MANAGER (AMAN)**

4.1 The benefit of AMAN implementation is 50 to 100 kg of fuel savings per aircraft, according to the methodology presented in ICAO Doc 9988. It allows for more efficient aircraft sequencing in the approach phase. As a result, there is a reduction in fuel consumption and, consequently, in CO<sub>2</sub> emissions and noise levels, especially those caused by holding at low altitudes. The annual fuel savings generated using AMAN in 2018 reached 3,797 tonnes of fuel, equivalent to approximately 12 thousand tonnes of CO<sub>2</sub> no longer released by the aircraft. However, this number tends to increase with the implementation of this tool in other Brazilian Area Control Centers and Approach Controls.

### **5. AIRPORT COLLABORATIVE DECISION MAKING (ACDM)**

5.1 Another essential operational measure implemented was the Airport Collaborative Decision Making (A-CDM) at the Guarulhos airport, which aims to improve operational efficiency,

predictability, and punctuality of flights, both in air traffic flow management and in arrival, turnaround, and departure operations, performed at an airport.

5.2 Considering the implementation of ACDM in 2020, the calculation methodology established in ICAO Doc 9988 and the average movements of the last three years at the Guarulhos airport, the fuel savings generated will be about 7,176 tonnes per year when if the existing pre-COVID-19 pandemic demand is restored, which is equivalent to approximately 22 thousand tonnes of CO<sub>2</sub> that will no longer be released into the atmosphere.

## **6. IMPROVEMENT OF AIR NAVIGATION SERVICES IN OIL BASINS - OCEANIC AREAS**

6.1 In 2018, DECEA implemented ADS-B surveillance at the Macaé Terminal in the Campos Basin, previously served only by radar surveillance, which did not adequately cover the area of the oil platforms. ADS-B surveillance expanded coverage, covering the most distant offshore platforms. In this same scope, the project to restructure the helicopter routes in the Santos Basin is underway, which will have ADS-B aeronautical surveillance in the future.

6.2 For the year 2018, it was estimated that the implementation of ADS-B surveillance in the Macaé Approach Control generated fuel savings of 122 tonnes, corresponding to approximately 385 tonnes of CO<sub>2</sub> no longer released into the atmosphere.

## **7. FUTURE OPERATIONAL MEASURES TO REDUCE CO<sub>2</sub> EMISSIONS**

7.1 As future operational measures to reduce CO<sub>2</sub> emissions, we can mention the FUA implementation at the tactical level, causing the airspace structure to be modified in real-time to meet and harmonize the needs of airspace users, increasing efficiency in air traffic flow management.

7.2 Other future operational measures include expanding the implementation of DCT Routes to all Brazilian FIR, ACDM to other airports in the country, and improving air traffic flow management in Brazil.

7.3 Other crucial operational measures to be implemented in the future are the RNP procedures that use the RF LEG, which reduces the flight path of aircraft, resulting in fewer miles flown and a reduction in the emission of polluting gases into the atmosphere.

## **8. CONCLUSION**

8.1 The implementation of several operational measures by DECEA has contributed to the improvement of operations efficiency and the reduction of CO<sub>2</sub> emissions. Future active measures in the SIRIUS Program will be implemented in the following years and improve the rate of emissions reduction even more.

8.2 The Meeting is invited to take note of the information provided.