International Civil Aviation Organization

Thirty-Fifth Meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/35)

Bangkok, Thailand, 25 to 27 November 2024

Agenda Item 3: **Performance Framework for Regional Air Navigation Planning and Implementation**

3.2: **ATM**

JAKARTA METROPLEX AIRSPACE OPTIMIZATION – ENHANCING EFFICIENCY, CAPACITY, AND ENVIRONMENTAL SUSTAINABILITY

(Presented by Indonesia)

SUMMARY

The Jakarta Metroplex Project is a collaborative initiative between Indonesia and Boeing to enhance air traffic management at Jakarta's main airports, Soekarno-Hatta and Halim Perdanakusuma, and taking into account Pondok Cabe airport. The project aims to improve capacity, reduce congestion, and enhance operational efficiency while prioritizing safety and environmental sustainability. Key benefits include increased runway throughput, reduced delays, enhanced fuel efficiency, and lower carbon emissions. Additionally, the project reduces workload for air traffic controllers by using Point Merge Systems and streamlined procedures, making traffic flows more predictable and manageable.

Strategic Objectives:

B: ***Air Navigation Capacity and Efficiency*** *— Increase the capacity and improve the efficiency of the global aviation system*

1. INTRODUCTION

1.1 The Jakarta Metroplex Project, a strategic collaboration between Indonesia and Boeing, aims to optimize air traffic management (ATM) in Indonesia's busiest airspace. Focused on Soekarno-Hatta and Halim Perdanakusuma Airports, and taking into account Pondok Cabe Airport, the project integrates modernized airspace design with advanced simulation modeling to meet the evolving needs of Indonesia's aviation sector. The primary goal of the Jakarta Metroplex initiative is to increase operational efficiency, enhance capacity, and reduce environmental impacts, all while maintaining the highest safety standards.

1.2 The project aligns with global best practices, incorporating the FAA's Metroplex approach, Eurocontrol's Point Merge System (PMS), and advanced Performance-Based Navigation (PBN) to ensure that Jakarta's airspace operates at peak efficiency.

2. DISCUSSION

Purpose and Objectives

2.1 The Jakarta Metroplex Project was developed in response to Indonesia's rapid air traffic growth, which has necessitated a more efficient and robust ATM system. The project's main objectives are to:

- Optimize operational capacity at Soekarno-Hatta and Halim Perdanakusuma Airports.
- Minimize air traffic bottlenecks to enhance on-time performance.
- Improve fuel efficiency and reduce carbon emissions.
- Lower the workload for Air Traffic Control (ATC) personnel.

Conceptual Design

2.2 The Jakarta Metroplex Project is built on the "metroplex" concept, an advanced airspace design and management approach initially developed for highly congested, multi-airport regions. In the Jakarta Metroplex, this concept is applied to optimize the complex airspace structure around Soekarno-Hatta International Airport and Halim Perdanakusuma Airport, addressing rapid growth in air traffic demand and creating a more efficient, predictable, and environmentally sustainable operation. The design focuses on systemizing routes and flight paths, so aircraft can flow through shared airspace seamlessly without frequent ATC intervention or tactical adjustments.

2.3 The Point Merge System (PMS) design within the Jakarta Metroplex Project introduces a structured and efficient way to manage arrival flows, especially in high-density areas around Jakarta's Soekarno-Hatta and Halim Perdanakusuma Airports. PMS is an advanced sequencing method that organizes arriving aircraft along curved paths, or "sequencing legs," positioned around a central merge point. For the Jakarta airspace, the design situates these sequencing legs strategically at designated points like LUVAX for Soekarno-Hatta's runways. This layout allows aircraft to join the approach path smoothly without the need for extensive holding or tactical vectoring by air traffic controllers.

2.4 The Jakarta PMS enables controllers to sequence arrivals effectively by directing each aircraft to join the most suitable point on the outer ring of the PMS sequencing leg, or by instructing it to proceed directly to the merge point, depending on traffic density and spacing requirements. This method significantly reduces the need for traditional holding patterns and minimizes the risk of bottlenecks, a common issue previously observed near LUVAX. Controllers can also use a "path-stretching" technique, which slightly extends an aircraft's path within the sequencing leg, to achieve optimal spacing without interrupting its descent profile.

Key Benefits of the Jakarta Metroplex Project

2.5 **Improved Capacity and Reduced Congestion.** Through optimized airspace design and redefined arrival and departure procedures, the Jakarta Metroplex Project targets a significant increase in runway and airspace capacity. By introducing advanced sequencing mechanisms like PMS and circuit-breaker techniques for flow control, the project allows for more aircraft to be handled simultaneously without compromising safety. This is particularly important at Soekarno-Hatta, which has seen high congestion due to Jakarta's air traffic growth. Key capacity-related benefits include:

- Higher Throughput: Efficient use of runways, with smoother arrival and departure flows, is expected to improve hourly aircraft movement rates.
- Reduced Delays: Minimized bottlenecks, particularly during peak times, will help reduce ground and air delays, enhancing overall on-time performance.

2.6 **Enhanced Fuel Efficiency and Reduced Environmental Impact.** The Jakarta Metroplex Project emphasizes environmentally sustainable operations through optimized air routes and PBN procedures, including Continuous Climb Operations (CCO) and Continuous Descent Operations (CDO). These procedures enable aircraft to maintain optimal flight profiles, reducing unnecessary fuel burn associated with level-offs and extended holding patterns. Environmental benefits include:

- Reduced CO2 Emissions: Enhanced fuel efficiency directly translates to lower CO2 emissions, supporting Indonesia's commitment to greener aviation practices.
- Lower Fuel Costs for Airlines: By reducing fuel consumption, airlines operating in Jakarta's airspace will experience cost savings, enhancing economic sustainability for operators

2.7 **Lower Workload for Air Traffic Controllers**. The redesign of Jakarta's airspace structure integrates systemized procedures to ease ATC workloads, reducing the need for tactical vectoring. Point Merge Systems, combined with closed-track procedures and streamlined Standard Instrument Departures (SIDs) and Standard Terminal Arrival Routes (STARs), enable ATC to monitor and manage traffic more effectively. Key benefits for ATC include:

- Simplified Traffic Management: By reducing vectoring requirements, controllers can focus on monitoring, leading to fewer manual interventions.
- Decreased Risk of Operational Errors: Streamlined, predictable traffic flows reduce the likelihood of operational conflicts and improve situational awareness for ATC personnel.
- Reduced Holding Patterns: The design minimizes the need for holding patterns by introducing path-stretching mechanisms, which decrease the likelihood of in-air collisions and improve predictability.

3. ACTION BY THE MEETING

3.1 The Meeting is invited to:

a) Note the information contained in this paper;

b) Encourage states to share best practices concerning the development for the airspace optimization initiatives.

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