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AGENDA ITEM 4: AIR NAVIGATION

ELEVATING MALAYSIAN AIRSPACE PERFORMANCE: A DATA-DRIVEN STRATEGY FOR ENHANCED AIR TRAFFIC MANAGEMENT

(Presented by Malaysia)

INFORMATION PAPER

SUMMARY

This paper presents the collaboration efforts between Malaysia and leading industry stakeholders focused on enhancing and optimising airspace capacity to improve air traffic management through the adoption of data-driven strategies and performance-based approaches.

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1. INTRODUCTION

1.1 Malaysia is undertaking a comprehensive modernisation of its airspace and air traffic management (ATM) systems through strategic collaborations with international partners, including aeronautical solution providers, aviation analytics and systems provider, and other air navigation service providers (ANSPs). These efforts aim to optimise airspace structure, improve operational efficiency, enhance environmental performance, and support long-term sustainability goals. Key initiatives include a major airspace redesign centred on Performance-Based Navigation (PBN), the adoption of data-driven operational strategies at Kuala Lumpur International Airport (KLIA), and the development of advanced analytics tools to support performance measurement and continuous improvement.

1.2 In collaboration with a leading aeronautical solution provider, a strategic project known as the Kuala Lumpur Metroplex Study was initiated to leverage international expertise in airspace and flight procedure design. The objective was to support changes and enhancements to Kuala Lumpur International Airport and its surrounding airspace. Conducted over a 12-month timeline, the project includes a comprehensive CNS/ATM assessment to evaluate aircraft equipage and ATM infrastructure, leading to recommendations for implementing a PBN-based airspace design. The proposed redesign incorporates advanced operational concepts, including:

a. Continuous Descent Operation (CDO) and Continuous Climb Operation (CCO) principles

b. Established on RNP (EoR)

c. Simultaneous Operations on Instrument Runways (SOIR)

d. RNP to xLS transition.

1.3 Further collaboration with an international aviation analytics and systems provider focuses on optimising flight operations, improving fuel efficiency, and supporting sustainability goals. This includes the provision of advanced data analytics tools to aid decision-making, reduce operational costs, and minimise environmental impact. These tools integrate seamlessly within existing frameworks, leveraging insights from aircraft performance, flight planning and execution, as well as post-flight analysis to enable continuous operational improvements. Starting from Q4 2024, Malaysia implemented several operational improvements at KLIA, including the restructuring of arrival runway assignments. Previously, arrival runways were assigned based on parking terminal locations. Under the new system, assignments are made based on entry direction, e.g., arrivals from the west are directed to Runway 33/15, while those from the east are directed to Runway 32R/14L. This directional method enhances arrival flow efficiency. To bolster departure efficiency, KLIA has introduced the triple simultaneous departures from all runways, which, with this strategic change, increases departure throughput and reduces delays.

1.4 In partnership with leading air navigation service providers, the Green Aviation Insights (GAIN) tool is under development to support participating ANSPs in measuring airspace efficiency using standardised metrics. This enables benchmarking, hotspot analysis, and the formulation of strategies to enhance sustainable and performance-based airspace management.

2. DISCUSSION

2.1 The outcome of the Kuala Lumpur Metroplex Study has identified key areas that potentially increase the efficiency and capacity of the airspace by introducing flexible/dynamic use procedures, which;

a. Closed track procedures - minimise tactical vectoring and reduce controller workload;

b. RNP standards – continuous descend operation;

c. Eliminate crossover – reducing flight times; and

d. Optimal runway usage.

2.2 To enhance ground efficiency and reduce delays at Kuala Lumpur International Airport (KLIA), several infrastructure and procedural solutions can be considered as follows;

a. The implementation of End-Around Taxiways (EATs) would allow aircraft to taxi around active runways without disrupting arrival or departure flows, thereby improving safety and reducing surface congestion.

b. Adopting Taxi-Behind Operations can streamline aircraft sequencing during peak periods, minimising engine-on time and decreasing fuel consumption on the ground.

c. Review of current runway positioning and utilisation strategies may also yield significant benefits, including optimising runway pairings for arrivals and departures based on prevailing traffic and weather conditions.

Collectively, these measures support more efficient ground movements, improved punctuality, and a reduction in operational carbon emissions.

2.3 As a result of the operational initiative, the data obtained enables the service provider to make more accurate decisions and perform detailed analysis for ongoing improvements. According to the sampling data, arrival efficiency at KLIA has increased by an average of one per cent per flight. This improvement significantly translates into measurable savings in flight track miles, fuel consumption and associated carbon emissions.

2.4 The reduction in fuel burn directly contributes to a decrease in CO_2 emissions, aligning with global aviation sustainability goals. On average, a one per cent improvement in efficiency can result in the saving of several hundred kilograms of CO_2 per flight, depending on aircraft type and route length. When scaled across hundreds or thousands of flights, this equates to a substantial reduction in the airport's overall environmental footprint. Continued monitoring and refinement of these initiatives are expected to yield even greater environmental benefits over time.

Conclusion

2.5 In conclusion, the collaborative efforts with all industry stakeholders collectively represent a powerful thrust toward sustainable aviation. Respective stakeholders have their expertise, such as innovation in aircraft efficiency, data-driven operational optimization, and real-time environmental analytics, which play a critical role in reducing fuel consumption, lowering carbon emissions and enhancing flight efficiency. Hence, these initiatives create a comprehensive ecosystem that supports informed decision making, promotes international collaboration and drives measurable progress toward a greener and more efficient global aviation industry.

3. ACTION BY THE CONFERENCE

3.1 The Conference is invited to note the information contained in this Paper.

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