International Civil Aviation Organization

Fifth Meeting of the Asia/Pacific Air Traffic Management Automation System Task Force (APAC ATMAS TF/5)

Chengdu, China, 5 – 7 June 2024

Agenda Item 4: ATM Automation System Implementation Experience by States

4.5 Development of New Technology

ACHIEVING ENVIRONMENTAL BENEFITS THROUGH IMPLEMENTATION OF WAKE TURBULENCE GROUP AND APPROACH SPACING TOOL AT THE HONG KONG INTERNATIONAL AIRPORT

(Presented by Hong Kong China)

SUMMARY

The Hong Kong International Airport has taken proactive steps to address climate change and promote environmental sustainability. By implementing ICAO's Wake Turbulence Separation Minima Based on Aircraft Groups and the Approach Spacing Tool, the HKIA has successfully increased runway capacity, improved efficiency, and reduced fuel consumption and CO_2 emissions. This paper aims to highlight the HKIA's experiences and positive outcomes in achieving these goals.

1 INTRODUCTION

1.1 Aviation plays a significant role in contributing to global climate change through carbon dioxide (CO_2) emissions. The Hong Kong International Airport (HKIA) has committed to promoting environmental sustainability. Hong Kong China has implemented environmentally sustainable operational practices at the HKIA, focusing on maximizing efficiencies, reducing fuel consumption, and minimizing CO_2 emissions. This paper shares the experiences and positive outcomes of the HKIA in successfully increasing capacity, improving efficiency, and reducing fuel consumption and CO_2 emissions, while ensuring safety and sustainability.

2 DISCUSSION

2.1 The implementation of ICAO's Wake Turbulence Separation Minima Based on Aircraft Groups (WTG) has been effective at the HKIA since November 2020. In line with these initiatives, the Approach Spacing Tool (AST), fully incorporating WTG, has been implemented and transitioned into full operation since March 2024 to support the management of air traffic in the final approach airspace before landing on the HKIA.

<u>Environmental benefits achieved from implementation of WTG and AST at HKIA</u>

2.2 A study was conducted to assess the environmental benefits resulting from the implementation of WTG and AST at the HKIA. The study focused on estimating the reduced airborne delays during peak hours. The findings demonstrated substantial reductions in delays, leading to significant fuel savings and a notable decrease in CO_2 emissions.

2.3 The HKIA currently operates two parallel runways, with the north runway dedicated to arrival flights. With the implementation of WTG, the maximum hourly runway capacity for arrivals at HKIA has increased from 34 to 36.

2.4 Assuming a total of 68 arrivals during a peak period lasting for 2 hours, these flights could experience a maximum airborne delay of 15 minutes before any air traffic flow management measures are triggered. The impact of WTG application on reducing airborne delays is estimated in Table 1.

	Hourly Arrival Capacity	**Total no. of Arrivals in a 2-hour Peak Period**	**Total Airborne Delay (mins)**	**Average Airborne Delay (mins) per flight**
Before WTG	**34**	**68**	**1020**	**15**
After WTG	**36**	**68**	**797**	**11.7**

Table 1 - Effect of WTG application on airborne delay reduction

2.5 Analysis of operational data revealed a reduction of 223 minutes (equivalent to 3.7 hours) in airborne delays for the 68 flights during the peak period. This reduction translates to approximately 15 tons of fuel saved, corresponding to 47 tons of CO_2 emissions, based on the ICAO Aircraft Engine Emissions Databank. Considering that HKIA experiences multiple arrival peak periods daily as many as 3 arrival peak periods per day in the 2023 Summer Schedule of HKIA, it is estimated that over 16,500 tons of fuel have been saved, resulting in 52,000 tons of avoided CO_2 emissions over the course of a year. To put this in perspective, these figures are equivalent to the fuel consumption and CO_2 emissions of 120 round-trip flights between Hong Kong and London.

Achieving increased runway capacity and operational efficiency

2.6 The successful implementation of AST within the final arrival phase of flight has provided air traffic controllers with a visual presentation of the required spacing for each aircraft pair on the air situation display. Such visual aids, combined with the system's safety net features, have significantly reduced the workload for air traffic controllers, who could focus on positioning aircraft with reference to visual cues, ensuring optimal arrival spacing, while maintaining adherence to the declared runway capacity. In addition, with the operational experience and proficiency gained in using the AST, air traffic controllers could manage closer inter-arrival spacing under WTG in a safe and efficient manner. This allows higher hourly arrival capacity to be achieved for longer duration each day. The positive feedback from air traffic controllers regarding the use of AST for managing approach air traffic at the HKIA reinforces its effectiveness in handling increased movements under WTG while achieving environmental objectives.

Conclusion

2.7 In conclusion, the implementation of WTG and AST at the HKIA has yielded substantial benefits. The reduction in airborne delays, increased runway capacity, and enhanced operational efficiency have resulted in significant fuel savings and a notable reduction in CO_2 emissions from aircraft. These achievements align with the HKIA's commitment to becoming a greener airport and contributing to the broader objective of mitigating climate change by reducing the environmental impacts of the aviation sector.

3 ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the progress in and environmental benefits achieved from the implementation of WTG and AST at the Hong Kong International Airport; and

b) discuss any relevant matter as appropriate

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