



International Civil Aviation Organization

ICAO

**Tenth Meeting of the Air Traffic Management Sub-Group
(ATM/SG/10) of APANPIRG**

Video Teleconference, 17 – 21 October 2022

Agenda Item 5: ATM Systems (Modernisation, Seamless ATM, CNS, ATFM)

**REVIEW ON THE IMPLEMENTATION OF ENHANCED WAKE TURBULENCE
SEPARATION AT HONG KONG INTERNATIONAL AIRPORT**

(Presented by Hong Kong China)

SUMMARY

ICAO introduced a more efficient re-categorization of wake turbulence categories into wake turbulence groups (WTG) based on wake generation and wake resistance characteristics of aircraft in 2020. Hong Kong China has implemented the distance based enhanced wake turbulence separation minima (eWTS) based on the ICAO guidance as stipulated in Amendment 9 to PANS-ATM, Doc 4444 since 5 November 2020. This paper presents a review on the implementation of eWTS utilizing WTG for arrivals at Hong Kong International Airport (HKIA). The review concluded that the implementation increased the runway capacity of HKIA without compromising flight safety. An analysis on the potential benefit of implementing eWTS for departures at HKIA has also been conducted and the result is revealed in the latter part of the discussion.

1. INTRODUCTION

1.1 Hong Kong China is consistently working on capacity enhancement initiatives to increase the capacity of the ATM system and to minimize the use of ATFM measures to regulate traffic.

1.2 The final approach spacing between arrivals is one of the determining factors of the runway capacity. In view of ICAO's introduction of the more efficient re-categorization of wake turbulence categories into WTG, Hong Kong China has followed ICAO guidance and implemented eWTS for arrivals at HKIA in November 2020. Successful implementation of eWTS with optimized final approach spacing at HKIA has improved both runway capacity and efficiency in a safe manner with minimum investment in supporting infrastructure.

1.3 A review has been carried out recently to evaluate the implementation as part of the regular review exercise. From the data gathered on the rates of missed approach induced by eWTS and wake turbulence encounter reported by pilots during final approach phase, it indicated that the reduced final approach spacing, if applied correctly, increased the runway capacity without compromising flight safety.

1.4 While the extension of eWTS for departures is currently under evaluation, the preliminary analysis on the benefits of implementing eWTS for departures at HKIA is shared below.

2. DISCUSSION

2.1 HKIA operates on a segregated mode of operation with the two runways, whereby the north runway 07L/25R is dedicated for arrivals. The procedure for the eWTS was successfully implemented on the arrival runway since 5 November 2020.

2.2 With the implementation of eWTS, the maximum hourly runway capacity for arrivals at HKIA has been increased from 34 to 35 and progressively for more hours in a day. As controllers and pilots have become more accustomed to the closer inter-arrival spacing and in the light of more operational experience gained, there may be rooms for further marginal enhancement to the maximum hourly arrival capacity at HKIA in future.

2.3 Prior to the implementation of eWTS at HKIA, a comprehensive safety assessment and safety case were conducted to ensure all aspects of safety were reviewed and addressed. In order to prove that the increase in runway capacity did not compromise the safety of the operations at HKIA, missed approach data within 12 months before and after the implementation of eWTS were examined along with an analysis of wake turbulence encounters reported by pilots on final approach.

Findings from the analysis

1. While looking into the missed approach data since the implementation of eWTS, only 9 missed approaches (0.02% of the total no. of arrival on north runway) were related to eWTS at which remedial actions had been promptly taken by controllers before eWTS was compromised. In addition, most of them occurred shortly after the implementation.
2. From the review of wake turbulence encounter reports filed by pilots, none of them were related to eWTS.
3. With the increased runway capacity brought by the implementation of eWTS and no compromise on the safety of operations, the implementation of eWTS for arrivals at HKIA is considered successful.

An analysis on the expansion of scope – eWTS for departures at HKIA

1. Improving departure delivery rate is equally important in optimizing runway capacity under existing airport infrastructure. Following the implementation of eWTS for arrivals, an analysis on the potential benefit of implementing eWTS for departures at HKIA has been conducted.
2. The analysis studied the departure traffic mix (pre-COVID peak traffic data) at HKIA and their respective enhanced separation criteria based on ICAO WTG.
3. The following table shows the departure traffic mix at HKIA:

WTC	Based on legacy Wake Turbulence Categories	WTG	Based on Wake Turbulence Group
H	61.6%	B	59%
		C	2.6%
M	37%	D	34.1%
		E	2.4%
		F	0.6%

4. The following table shows the required time-based wake turbulence separation minima as stipulated from ICAO Doc 4444 PANS-ATM versus the proposed time-based wake turbulence separation minima to be adopted at HKIA:

Preceding aircraft WTG	Succeeding aircraft WTG	time-based wake turbulence separation minima (second) - ICAO Doc 4444 minima	time-based wake turbulence separation minima (second) - Proposed minima to be adopted at HKIA
B	D	100	100
	E	120	120
	F	120	120
C	D	80	100
	E	100	120
	F	100	120

5. From the analysis, the proposed minima planned to be adopted at HKIA will be more conservative than as stipulated in ICAO Doc 4444 PANS-ATM. The reason being that it already covers the majority (95.7%) of applicable pairs of WTG B, C and D traffic departing from HKIA; providing tangible operational benefits from eWTS and only inducing minimal changes to existing operational procedures.
6. After applying the eWTS as proposed in para 2.5.5, there is a potential to increase the maximum hourly departure capacity at HKIA by 2-3%, subject to further operational evaluation and validation.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) note the information contained in this paper;
- b) consider to convene relevant workshop led by ICAO to encourage members to share experiences and lessons learnt in the implementation of eWTS at their airports, as appropriate while maintaining safety; and
- c) discuss any relevant matters as appropriate.

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