



# ICAO

**The First Meeting of Air Traffic Management  
Automation System Task Force of APANPIRG  
(ATMASTF/1)**

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**Agenda Item 5.5:** New ATM Technologies application (RECAT, TBO, PBN, Extended AMAN)

## **IMPLEMENTATION OF ENHANCED WAKE TURBULENCE SEPARATION AND APPROACH SPACING TOOL IN HONG KONG CHINA**

(Presented by Hong Kong China)

### **SUMMARY**

This paper presents the new ICAO enhanced Wake Turbulence Separation (eWTS) scheme to be implemented for arrival traffic of Hong Kong International Airport (HKIA) on 5 November 2020. Runway capacity is expected to enhance as result of revised wake turbulence separation under the application of eWTS. In addition, a distance-based Approach Spacing Tool (AST) is being implemented for assisting controllers to handle air traffic under eWTS and improve consistency in delivering arrival traffic to the runway threshold according to the intended runway capacity.

## **1. INTRODUCTION**

1.1 The Amendment 9 of the PANS-ATM (Doc 4444) approved by ICAO will be effective on 5 November 2020, which introduces a new “enhanced Wake Turbulence Separation” (eWTS) scheme with an alternative set of wake turbulence groups and associated wake turbulence separation minima for approach and departure phases of flights. The new eWTS scheme is based on the studies performed by Federal Aviation Administration (FAA) and European Organization for the Safety of Air Navigation (EUROCONTROL) on the wake generation and wake resistance characteristics of different aircraft types, which allows a reduction in wake turbulence separation between some aircraft pairs depending on the leading and the following aircraft type, as well as increases in wake turbulence separation for the smaller and more vulnerable aircraft type.

1.2 The harmonized ICAO eWTS scheme categorizes aircraft into the 7 wake turbulence groups based on maximum certified take-off mass and wing span:

- GROUP A - aircraft types of 136 000 kg or more, and a wing span less than or equal to 80 m but greater than 74.68 m;
- GROUP B - aircraft types of 136 000 kg or more, and a wing span less than or equal to 74.68 m but greater than 53.34 m;
- GROUP C - aircraft types of 136 000 kg or more, and a wing span less than or equal to 53.34 m but greater than 38.1 m;
- GROUP D - aircraft types less than 136 000 kg but more than 18 600 kg, and a wing span greater than 32 m;

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- GROUP E - aircraft types less than 136 000 kg but more than 18 600 kg, and a wing span less than or equal to 32 m but greater than 27.43 m;
- GROUP F - aircraft types less than 136 000 kg but more than 18 600 kg, and a wing span less than or equal to 27.43 m;
- GROUP G - aircraft types of 18 600 kg or less (without wing span criterion).

1.3 The distance-based wake turbulence separation minima utilizing the aforementioned wake turbulence groups are:

<b>Leader \ Follower</b>	<b>Group A</b>	<b>Group B</b>	<b>Group C</b>	<b>Group D</b>	<b>Group E</b>	<b>Group F</b>	<b>Group G</b>
<b>Group A</b>	-	4 NM	5 NM	5 NM	6 NM	6 NM	8 NM
<b>Group B</b>	-	3 NM	4 NM	4 NM	5 NM	5 NM	7 NM
<b>Group C</b>	-	-	-	3 NM	3.5 NM	3.5 NM	6 NM
<b>Group D</b>	-	-	-	-	-	-	4 NM
<b>Group E</b>	-	-	-	-	-	-	4 NM
<b>Group F</b>	-	-	-	-	-	-	-
<b>Group G</b>	-	-	-	-	-	-	-

*Note: Minimum surveillance separation applies if not specified*

**Table 1 Distance-based eWTS Minima**

1.4 According to ICAO, ATS authority or service providers is given the flexibility to determine the scope of applicability of the new eWTS minima, or consider introducing the reduced minima in total, or in part as first step, or a combination of these with fewer groups, or updating the local minima based on a partial set of eWTS minima, whichever will provide the most benefit given the local traffic mixture.

1.5 Despite air traffic impacted by the unprecedented COVID-19 pandemic, Hong Kong China considered it would be a good opportunity to get air traffic controllers familiar with and commence timely transition to the new eWTS minima. As such, Hong Kong China will implement distance-based wake turbulence separation minima of ICAO eWTS scheme for all arrival flights on 5 November 2020, with a plan to extend the application of time-based eWTS to departure flights in the future. Industry briefing sessions were conducted to air operators and pilots in September 2020 on the new scheme with encouraging feedback.

1.6 In addition, Hong Kong China is acquiring an Approach Spacing Tool (AST) for assisting the approach controllers to cope with the air traffic under eWTS scheme and improve the consistency in the delivery of arrival traffic according to the intended runway capacity of HKIA.

## **2. DISCUSSION**

### **2.1 Implementation of enhanced Wake Turbulence Separation (eWTS)**

2.1.1 Hong Kong China has conducted a safety case study for the implementation of eWTS at HKIA. The study involves a 12-month wake study and analysis on the real-time data collection, generation and dissipation rates of wake vortices of different aircraft types in the local Hong Kong environment. The wake vortex data was analyzed by international experts and the safety case demonstrated that the safety assurance arguments and evidence support the implementation of eWTS in the context of HKIA operations and that the wake encounter risk for each aircraft pair remains with the current acceptable safety risk level.

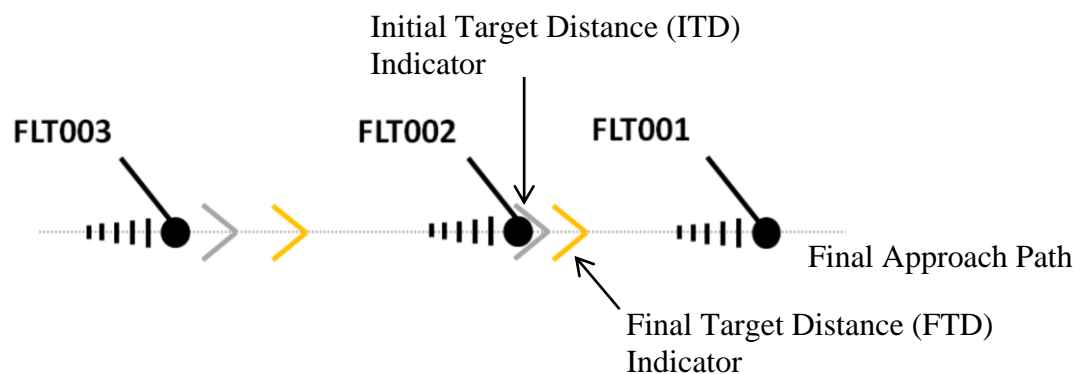
2.1.2 The ICAO Flight Plan will not be required to update with the new wake turbulence groups (Group A to G) and will continue to feature the existing wake turbulence categories (i.e. J, H, M and L). However, air traffic controllers will have to consider seven wake turbulence groups instead of four categories when applying the eWTS minima. The aircraft wake turbulence group shall be presented to the controller at the controller working position when it is to be applied in the provision of wake separation.

2.1.3 Hong Kong China will adapt an additional data field in the Air Traffic Management System (ATMS) to display the corresponding wake turbulence group of each aircraft type in the data block of aircraft tracks in the Approach and Aerodrome control positions. An electronic cue card with the prescribed distance-based eWTS minima will also be available in the ATMS to assist controllers in the application of the new wake turbulence separation minima.

2.1.4 Based on the study of historical traffic data at HKIA, it is anticipated that the overall arrival spacing on final approach would be reduced safely under the application of eWTS. With the fine-tuning of parameters in the Arrival Manager (AMAN) for eWTS, additional arrival slots would be generated dynamically according to actual traffic mix. An increase in runway capacity is anticipated through the implementation of the eWTS scheme.

## 2.2 Approach Spacing Tool (AST)

2.2.1 In addition, to assist controllers in handling air traffic under eWTS and improve controllers' consistency in delivering the traffic according to the intended runway capacity, a distance-based AST is being implemented at the Final Approach Director (FAD) position. The AST will determine the required spacing between aircraft along the approach sequence and provide advisories, in the form of graphical indicators on the Air Situation Display, to indicate the optimal positions of aircraft along the final approach path. The high-level presentation of the AST in air situation display is illustrated under the following figure:



**Figure 1 High-level Presentation of AST in Air Situation Display**

2.2.2 The Initial Target Distance (ITD) and Final Target Distance (FTD) indicators were calculated based on the wind information, flight profile, aircraft performance, spacing requirements and eWTS minima. Initial Target Distance (ITD) is the optimal distance for the following aircraft to be positioned behind a leading aircraft with the consideration of the required minimum spacing and the deceleration compression buffer. Final Target Distance (FTD) is the appropriate position for the following aircraft behind a leading aircraft at the required minimum spacing applied at the runway threshold. The follower shall always be behind its respective FTD indicator along the final approach path.

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2.2.3 With introduction of the AST to the FAD operation, the spacing requirement for each aircraft pairs is presented visually to the controllers on the air situation display via the ITD and FTD graphical advisory indicators. Controllers can focus on positioning the aircraft at the ITD indicator, i.e. the optimal distance from the leader, and ensure the required spacing is delivered at the runway threshold using the FTD indicator. In addition, AST will provide safety net features to detect catch-up scenarios, separation infringement events, speed discrepancies and incorrect approach sequence to alert controllers on abnormal conditions so as to allow early resolution of possible conflict situations.

2.2.4 After controllers get familiar with the AST operation, it is expected that full benefits of implementing eWTS can be experienced through the delivery of improved consistency and refined spacing on final approach.

**3. ACTION BY THE MEETING**

3.1 The meeting is invited to:

- a) note the information contained in this paper;
- b) share experience in conducting safety case study;
- c) consider the benefit of implementing Approach Spacing Tool in ATM automation system to improve the consistency in delivering air traffic according to the intended runway capacity by the ANSPs; and
- d) discuss any relevant matter as appropriate

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