



ICAO

International Civil Aviation Organization

INFORMATION PAPER

Tenth Meeting of the Asia/Pacific Meteorological Requirements Working Group (MET/R WG/10)

Virtual Meeting (Online), 24 – 28 May 2021

Agenda Item 5: Coordination between MET and ATM services

INTEGRATION OF MET INFORMATION INTO APPROACH SPACING TOOL

(Presented by Hong Kong, China)

SUMMARY

This paper presents the integration of MET information into a distance-based Approach Spacing Tool being implemented in Hong Kong, China for assisting controllers to handle air traffic under enhanced Wake Turbulence Separation scheme and improve runway capacity.

1. INTRODUCTION

1.1 Hong Kong China is implementing an Approach Spacing Tool for assisting the approach controllers in improving the consistency in delivering spacing between flights along the final approach path and handling air traffic under the new [“enhanced Wake Turbulence Separation” \(eWTS\)](#) scheme, an alternative set of wake turbulence groups and associated wake turbulence separation minima by ICAO in Amendment 9 to PANS-ATM (Doc 4444).

2. DISCUSSION

Approach Spacing Tool

2.1 To assist controllers in handling air traffic under eWTS and improve controllers’ consistency in delivering the traffic according to the intended runway capacity of HKIA, a distance-based Approach Spacing Tool is being implemented at the Final Approach Director (FAD) position. The Approach Spacing Tool 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 (Figure1).

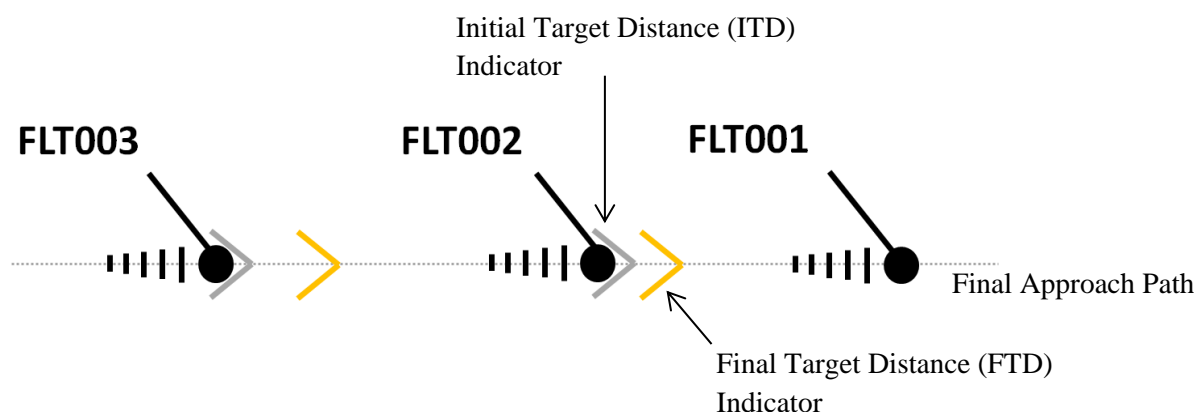


Figure 1: Illustration of Air Situation Display of Approach Spacing Tool

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.

2.3 With introduction of the Approach Spacing Tool 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.

Wind information for Approach Spacing Tool

2.4 The calculation of predicted position of each aircraft is highly dependent on the near real-time wind condition, as wind speed and direction could affect the ground speed of aircraft. The Hong Kong Observatory (HKO) will prepare two sets of wind data in GRIB format for integration into Approach Spacing Tool of Hong Kong Civil Aviation Department (HKCAD), viz. the wind covering Hong Kong FIR (FIR wind) and wind covering Terminal Area (TMA wind).

2.5 Table 1 shows the characteristics of FIR Wind and TMA Wind. The FIR Wind with 1.25 x 1.25 degrees horizontal resolution and 3 vertical levels below 20000 ft would be updated every 6 hours. In contrast to FIR Wind, TMA Wind dataset has finer spatial and temporal resolutions with an aim to reflect the more detailed changes in the wind distribution in the approach area. TMA Wind would be updated every 10 minutes and has a 0.05 x 0.05 degrees horizontal resolution and 25 vertical levels as follows:

- 0 – 5600 ft: 8 levels
- 5600 – 13000 ft: 8 levels
- above 13000 ft: 9 levels

Table 1: Characteristic of FIR Wind and TMA Wind to be integrated into Approach Spacing Tool

		FIR Wind		TMA Wind	
Update frequency		Every 6 hours (at 00, 06, 12, 18 UTC)		Every 10 minutes (shortly after 00, 10, 20, 30, 40 and 50 minutes of each hour)	
Forecast valid time		At T+6hr, T+12hr, T+18hr, T+24hr		At T+10 min, T+20 min, T+30 min	
Horizontal coverage		Hong Kong FIR		Area of 150NM radius of Hong Kong International Airport	
Horizontal resolution		1.25 x 1.25 degrees		0.05 x 0.05 degrees	
Vertical levels in pressure (hPa)	Vertical levels in altitude (ft) (approx.)	850, 700, 500, 400, 300, 250, 200, 150, 100	4800, 9900, 18300, 23600, 30100, 34000, 38700, 44600, 53100	995, 975, 950, 925, 900, 875, 850, 825, 800, 775, 750, 725, 700, 675, 650, 625, 600, 575, 550, 525, 500, 475, 450, 425, 400	500, 1100, 1800, 2500, 3200, 4000, 4800, 5600, 6400, 7200, 8100, 9000, 9900, 10800, 11800, 12800, 13800, 14900, 16000, 17100, 18300, 19500, 20800, 22200, 23600

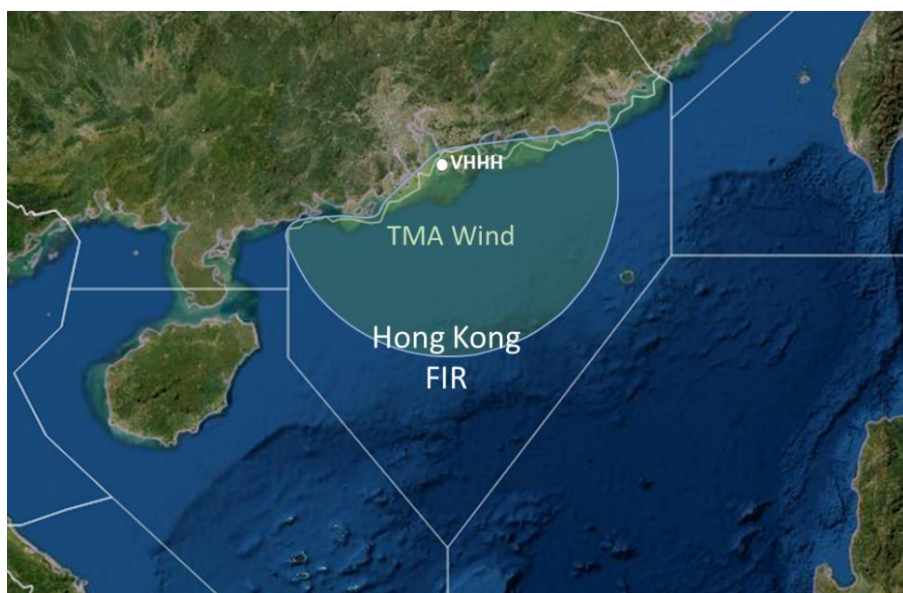


Figure 2: Coverage of TMA Wind in Hong Kong FIR

2.6 To achieve the high-spatial and temporal resolution of TMA Wind, it is prepared by harmonizing forecast wind with real-time aircraft-based observations including Aircraft Meteorological Data Relay (AMDAR), those derived from Mode S Downlinked Aircraft Parameters (DAP), and other data coming from ground-based sensors.

Agenda Item 5

24-28/05/21

CAPPI weather radar for Approach Spacing Tool

2.7 To prepare for potential upsetting of minimum separation due to aircraft deviating from severe convection, weather radar data in Constant Altitude Plan Position Indicator (CAPPI) is being generated by HKO for ingestion to the Approach Spacing Tool. The CAPPI radar image provides the controller with a colour picture of the convection intensity for overlaid on the air situational display of Approach Spacing Tool for situational awareness regarding the possible impact of significant convective weather on the approach spacing.

2.8 Figure A1 in **Attachment** shows an example of CAPPI weather radar data. The CAPPI weather data consists of 20 layers from 0.5 km to 10 km (approx. 1,500 to 30,000 ft) covering a range of about 256 km from HKIA and updated every 6 minutes. The radar reflectivity is categorized into three severities, with areas of light rain shown in green, moderate rainfall in yellow and intense rainfall in red. Controllers can select multiple layers of CAPPI based on altitude range, and the Air Situation Display will show the maximum intensity in the selected vertical column for each pixel.

2.9 In addition to the real-time CAPPI data, HKO is also generating forecast CAPPI data for Approach Spacing Tool to show the predicted movement of weather at 3km (approx. 10,000 ft) in the following 60 minutes at 6-minute intervals.

Next steps

2.10 HKO will continue to collaborate with HKCAD to test the ingestion of wind data and CAPPI weather data into the Approach Spacing Tool during acceptance tests, and evaluate the impact of TMA Wind accuracy on the calculation of optimal spacing using routine test data.

2.11 After controllers get familiar with the Approach Spacing Tool operation, it is expected that full benefits of implementing eWTS with enhanced runway capacity can be realized through the delivery of improved consistency and refined spacing on final approach.

3. ACTION BY THE MEETING

3.1 The meeting is invited to note the information contained in this paper.

Attachment

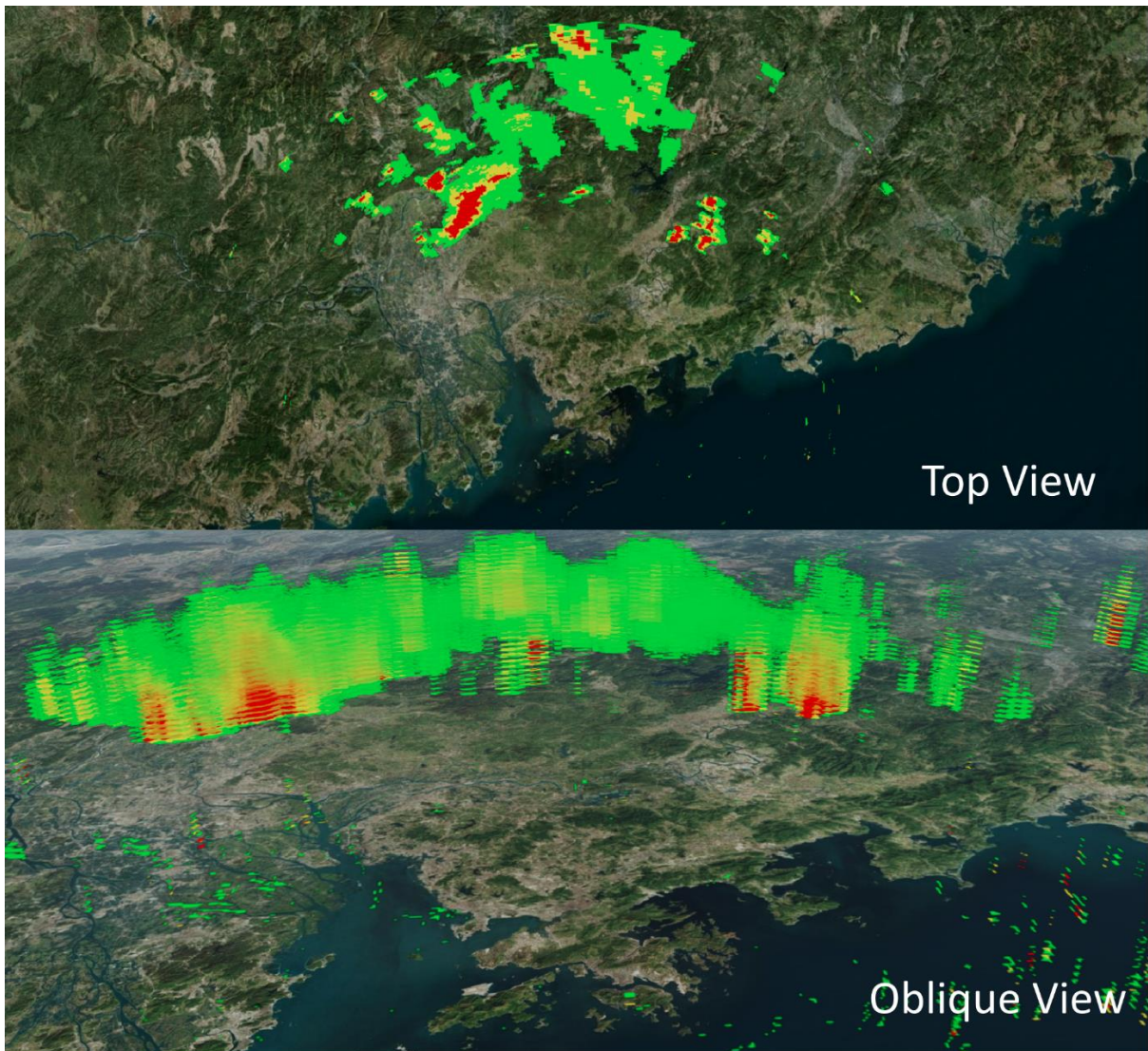


Figure A1: Illustration of Weather radar data in CAPPI of 20 layers.