International Civil Aviation Organization

WORKING PAPER

Asia and Pacific (APAC)
Twelfth Meeting of the Meteorological Requirements Working Group (MET/R WG/12)

Bangkok, Thailand, 02 to 05 May 2023

Agenda Item 4: Collaboration between MET and ATM stakeholders

AVIATION RESEARCH AND DEVELOPMENT PROJECT PHASE 2 (AvRDP-2)

(Presented by Hong Kong, China)

SUMMARY

This paper presents an overview and the latest developments of the Aviation Research and Development Project Phase 2 (AvRDP-2) and latest research efforts and trial products developed by Hong Kong Observatory (HKO).

1. INTRODUCTION

1.1 Riding on the success of the first phase of the Aviation Research and Demonstration Project (2015 – 2019) (MET/R WG/8 - IP/3), the AvRDP-2 was approved in early 2021 to extend the Project till 2025. The AvRDP-2 is a project under the World Weather Research Program (WWRP) led by the World Meteorological Organization (WMO) Research Board and the Services Commission (SERCOM) Standing Committee on Services for Aviation (SC-AVI).

1.2 This paper presents an overview and the latest developments of the AvRDP-2 and latest development efforts by Hong Kong Observatory (HKO).

2. DISCUSSION

Aviation Research and Demonstration Project Phase 2 (AvRDP-2)

2.1 The overall mission of AvRDP-2 is: through international collaboration, to develop, demonstrate and quantify the benefits of improvements to the forecasting of **significant convection and associated hazards**, including intense convection, convectively induced turbulence, high altitude ice crystals, etc. Various aspects of forecasting techniques would be explored, which includes probabilistic approach, development of machine learning methods, verification methodologies, etc.

2.2 The AvRDP-2 is expected to last for 5 years from 2021 to 2025 with a review around late 2023 to commence the phase focusing on research-to-operations (R2O). The Project hopes to demonstrate concepts of R2O and science-for-services, in particular, the gate-to-gate avoidance of convective hazards along flight routes. A community advisory group (CAG) was established to involve

aviation stakeholders to ensure the Project is steered towards the global air traffic management vision conveyed in the ICAO Global Air Navigation Plan (GANP).

2.3 More information related to AvRDP-2 is available at the project website (https://avrdp.hko.gov.hk/Phase2/index.html) hosted by HKO on behalf of WMO.

Connection to ICAO MET Panel initiative

2.4 The AvRDP-2 covers forecast lead times in two time scales, namely from 0 to 2 hours for tactical decision and up to 24 hours for flight planning. This also falls within the scope of the new concept Hazardous Weather Information Services (HWIS) being developed by the Working Group for Meteorological Requirements and Development (WG-MRAD) of ICAO Meteorology Panel (METP) with the assistance from WMO. The purpose of HWIS is to provide globally consistent and seamless information on weather and other environmental phenomena that might pose a risk to aviation en-route operations. It is anticipated that the AvRDP-2 would demonstrate the convection component of the HWIS concept.

Latest research efforts and products developed by HKO

2.5 The Project will focus on selected short and long-haul flight routes for areas that are prone to convection and crossing the tropics. There are 8 flight routes selected around the globe, with two routes involving Hong Kong, namely:

1) Hong Kong to Singapore (short haul)
2) Hong Kong to Sydney (medium to long haul)

Both routes are affected by the Intertropical Convergence Zone (ITCZ) and are prone to convection most times of the year. There could be flight delays and diversion on a strong convection day which may increase the workload of air traffic control and airline operations.

2.6 Several technical online meetings were held between HKO and Meteorological Services Singapore (MSS) about Route (1) mentioned in 2.5. The two parties plan to exchange their existing products and discussed ideas for the Project. Both parties agreed that the involvement of local airlines would be beneficial in assessing the project outcome. The demonstration of products over this flight route is targeted to commence in Q1/Q2 2024. As for Route (2) mentioned in 2.5, further technical meetings would be arranged between HKO and the Bureau of Meteorology (BoM), Australia.

2.7 The demonstration project will hopefully bring new techniques and products of significant convection forecast to aviation stakeholders. In this connection, HKO has developed a suite of seamless significant convection forecast in 2022. The suite comprised a combination of forecasts:

(a) For the first three hours, the forecast is based on the satellite nowcast utilizing Himawari-9 satellite,
(b) For T+4 h to T+8 h, the forecast is a blended forecast based on satellite nowcast in (a) and the forecast from Numerical Weather Prediction (NWP) models in (c),
(c) For T+9 h onwards, the forecast is based on the significant convection forecast from NWP models post-processed using the frequency-matching method.

2.8 Figure 1 shows the schematic work flow of the suite of seamless significant convection forecast. In addition, HKO has developed a web platform for the two flight routes mentioned in 2.5 and an algorithm to calculate on-the-fly the number of times/flight time encountering the convective hazards. A cross-section of the flight path was displayed alongside to aid decision-making by aviation stakeholders. A display of multiple flights and similar statistics utilizing SIGMETs was made available for easy comparison. Figure 2 shows a screen capture of the web platform. The web platform has been provided to local airline operations and dispatch team. User feedback would be sought on the applicability of these new convection products to their operations.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information presented in the paper;

b) discuss any relevant user requirements to be considered in AvRDP-2.

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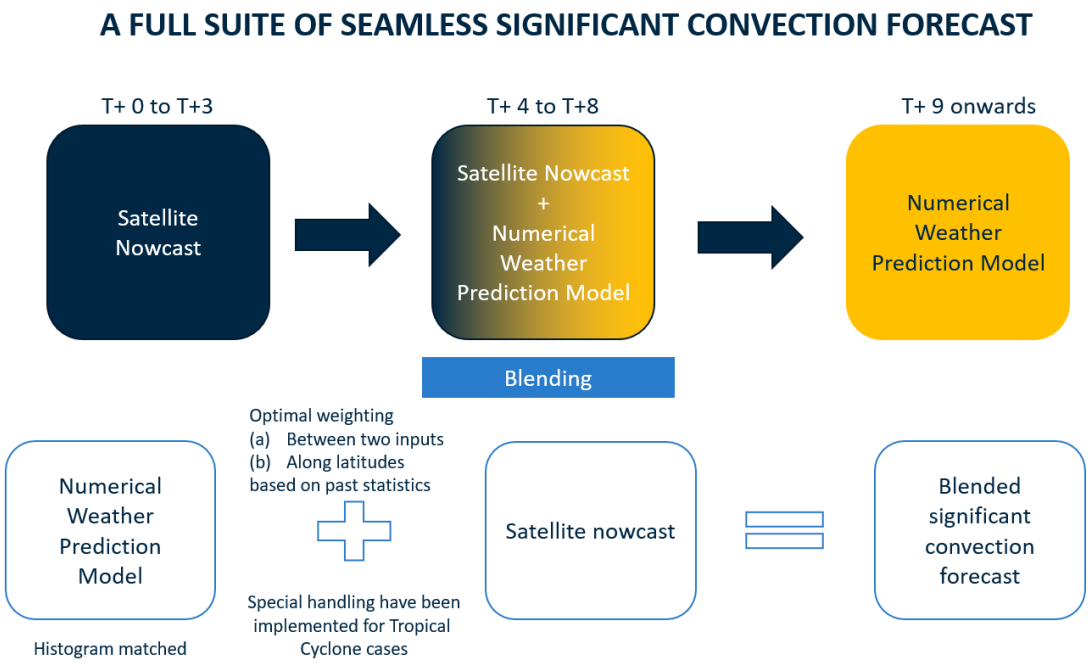

Figure 1 Schematic work flow of the full suite seamless significant convection forecast

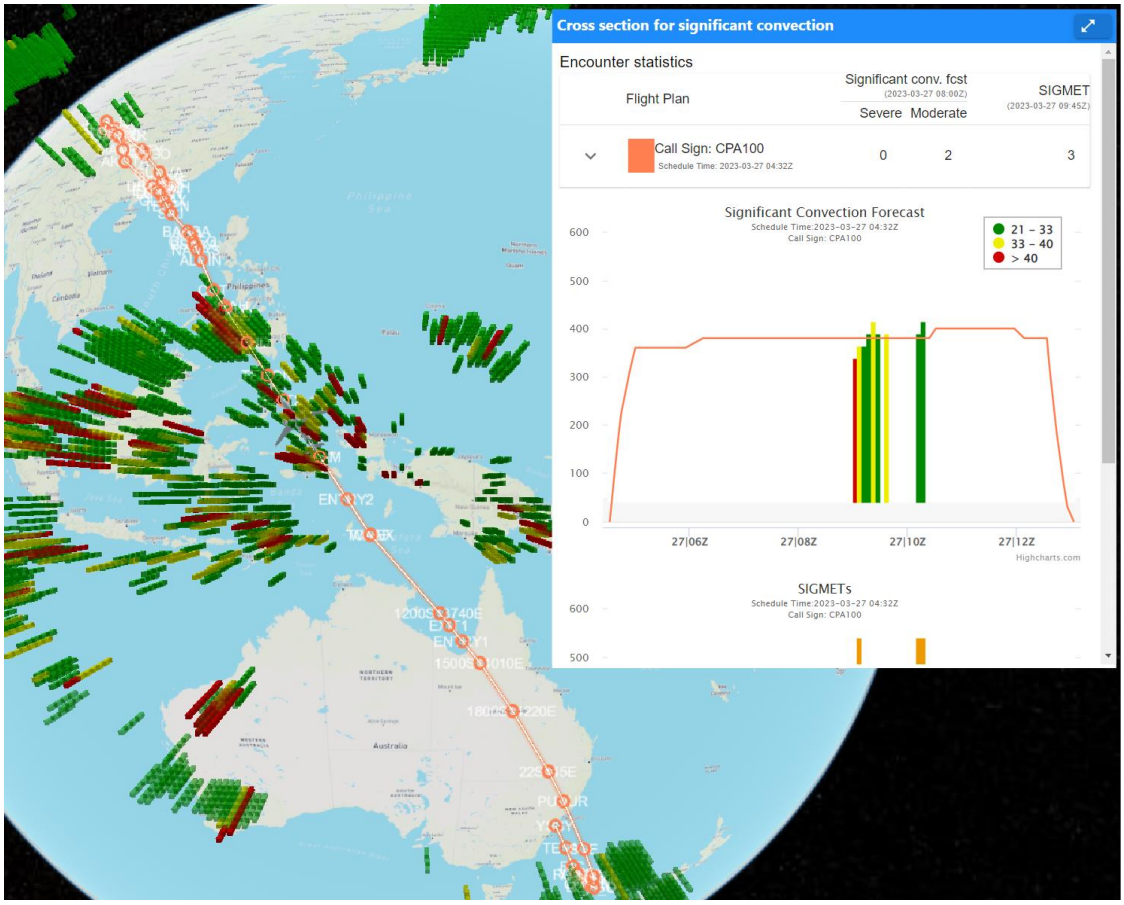

Figure 2 A screen capture of the HKO web platform in demonstrating the seamless significant convection forecast (right: cross-section of hazardous weather encounter, left: a display of flight plan and seamless significant convection forecast)