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DIRECTORS GENERAL OF CIVIL AVIATION  
ASIA AND PACIFIC REGIONS**

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**AGENDA ITEM 4: AIR NAVIGATION**

**ADVANCED & SUSTAINABLE TECHNOLOGIES FOR SUPPORTING  
A SAFE AND RELIABLE OPERATION OF THE HONG KONG  
INTERNATIONAL AIRPORT AND ITS EXPANSION**

(Presented by Hong Kong China)

**SUMMARY**

This paper shares Hong Kong, China's experiences in the application of advanced technologies to support the safe and efficient operations of the Hong Kong International Airport and its expansion into a Three Runway System in anticipation of air traffic recovery. Notwithstanding that the COVID-19 pandemic has caused unprecedented challenges to the aviation industry, the Hong Kong Civil Aviation Department has proactively engaged relevant stakeholders, and conducted robust safety assessments and operational trials in accordance with the ICAO Global Air Navigation Plan throughout the implementation processes.

# ADVANCED & SUSTAINABLE TECHNOLOGIES FOR SUPPORTING A SAFE AND RELIABLE OPERATION OF THE HONG KONG INTERNATIONAL AIRPORT AND ITS EXPANSION

## 1. INTRODUCTION

1.1 The Hong Kong International Airport (HKIA) was opened in 1998 and has since developed into one of the busiest airports in the world. In 2019, the HKIA served 71.3 million passengers, handled 4.7 million tonnes of cargo and accommodated 420,000 air traffic movements. Despite the challenges of the global pandemic, the HKIA handled 4.4 and 5.0 million tonnes of cargo in year 2020 and 2021 respectively.

1.2 The Three Runway System (3RS) project at the HKIA is progressing as planned despite the challenges of the global pandemic. The new Third Runway of the HKIA will be commissioned within 2022, after which the Centre Runway will be closed for re-configuration. The 3RS project is targeted for commission by 2024. To support the safe and efficient operations of the HKIA, especially for its future expansion, the Hong Kong Civil Aviation Department (HKCAD) has planned to deploy various advanced and sustainable aviation technologies in accordance with the roadmap stipulated in the ICAO Global Air Navigation Plan (GANP)/Aviation System Block Upgrades (ASBU). Apart from conducting the necessary safety assessment, the HKCAD has also made good use of the relatively low traffic environment and conducted operational trials in a more cost effective manner. The following highlight some of the advanced and sustainable technologies we have implemented.

## 2. DISCUSSION

### Digital Tower and Apron Management System

2.1 With the advancement of the optical sensing technology, it is technically feasible to capture the panoramic view of aircraft movements augmented with flight information at the airport, including the runway, taxiways and apron areas. The artificial intelligence functions in the system enhance runway safety net capabilities to track and detect the position of aircraft, and whether any ground vehicles has protruded into the runways and/or taxiways etc. Such digital technology can also enhance visibility of tower and apron controllers, especially during night time or low visibility environment. Hong Kong, China has therefore planned to incorporate such advanced technology into the digital tower and apron management system to further enhance safety and efficiency.

2.2 The HKCAD together with the airport operator (i.e. the Airport Authority Hong Kong) have completed a series of technical and operational trials at the HKIA in early 2020 during the low traffic environment at airport in a cost effective manner. With the successful trials, as well as noting trials and/or experiences of application of similar technology in other international airports, Hong Kong, China has decided to implement a full-scale system to provide digital tower and apron services for the HKIA under an integrated platform. This project installs more than 240 nos. of high-resolution cameras with resilient server/client system architecture. Upon its completion, it is one of the largest scale implementation worldwide. Phase 1 of the system has been completed to support operation of the Third Runway, and phase 2 for 3RS project will be completed by 2024.

### Advanced Surface Movement Guidance and Control System (A-SMGCS) and Surface Movement Radar (SMR)

2.3 A-SMGCS employing multi-lateration technology with sensors spreading throughout the airport with integration of signals from Automatic Dependent Surveillance-Broadcast (ADS-B) and SMR could provide a comprehensive surveillance and safety alert functions of aircraft and vehicle movements at the airport to enable the controllers to maintain a smooth and safe ground traffic during

all weather conditions. The HKCAD has installed a new A-SMGCS and five SMRs at the HKIA to replace the existing ones with enhanced resilience and additional sensors to expand the surveillance coverage to the Third Runway.

#### Advanced Instrument Landing System (ILS)

2.4 ILS is deployed to provide highly accurate vertical and horizontal navigation guidance signals to aircraft approaching and landing on the runway in all weather conditions, allowing safe and efficient aircraft landing at the airport. The HKCAD has installed the new ILS for the Third Runway using the latest wide-aperture localizer array with 32-element localizer antenna requiring smaller critical/sensitive areas and enhancing its immunity to radio frequency interference as compared with the existing ILS. The new ILS also supports Category III operation to facilitate low visibility operation under foggy/rainy conditions.

2.5 The Flight Inspection Centre of the Civil Aviation Administration of China has been engaged to conduct commissioning flight check on the new ILS. Despite the pandemic and weather challenges, the commissioning flight check was satisfactorily completed in compliance with the ICAO requirements.

#### Advanced Control Tower Simulator (CTS)

2.6 The HKCAD has installed a new CTS for the training as well as checking of the air traffic controllers. The new CTS is equipped with high-performance projection and image generation technologies. The previous CTS has also been upgraded and connected with the new CTS. The installation of such simulator training facilities has expanded the capability of training the controllers not only the skills in handling different situations, but also all the necessary operating procedures, including the twin-tower operational environment under the Interim Two Runway System and 3RS.

#### Early Engagement of Stakeholders

2.7 Introduction of advanced technologies necessitates early engagement of operational and technical personnel as well as their regulatory bodies for incorporation of opinion at early stage to ensure smooth implementation. Since commencement of the 3RS project, the HKCAD has set up a dedicated task force overseeing planning, trials and implementation of advanced technologies under the project. The task force is consisted of members from air traffic controllers, engineers and regulatory office. It provides a platform for all the stakeholders to discuss thoroughly on various aspects to ensure the smooth and safe implementation of those advanced technologies.

#### Need for Strengthening Regional Cooperation

2.8 The pandemic has created unprecedented industry-wide challenges in terms of scale and uncertainties. It is only by cooperation and experiences sharing can we overcome these challenges and survive. Through international and regional cooperative forums hosted by ICAO and other international organization, CAAs, ANSPs and industry partners should continue to share best practices and experiences in the use of advanced and sustainable technologies. Hong Kong, China is prepared to continue to participate and share our experiences in the relevant ICAO forums with a view to enhancing collaboration among the APAC members.

**3. ACTION BY THE CONFERENCE**

3.1 The Conference is invited to:

- a) Note the information and experiences shared by Hong Kong, China in the application of advanced technologies; and
- b) Encourage States/Administrations to continue with regional collaboration and the sharing of experiences in the use of advanced and technologies for the safe, efficient and sustainable development of aviation.

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