

**54th CONFERENCE OF
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ASIA AND PACIFIC REGIONS**

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**AGENDA ITEM 3: AVIATION SAFETY AND
AIR NAVIGATION**

**PAVING WAY FOR INTEROPERABILITY OF
AIR TRAFFIC MANAGEMENT SYSTEM**

(Presented by Hong Kong China)

SUMMARY

In November 2016, the Hong Kong Civil Aviation Department commissioned its new Air Traffic Management System (ATMS) which has successfully demonstrated its performance in coping with the challenges of peak traffic demands during the holiday and adverse weather seasons. A risk-based approach has been adopted throughout ATMS development, testing/acceptance, system and operations transition, handling of teething issues with good lessons learned. Since the last Air Navigation Conference held in 2012, the ICAO has been developing a global roadmap and performance-based requirements for ATMS under its Global Air Navigation Plan (GANP), with a view to harmonizing functions and operations for interoperable, consistent and predictable air traffic management service across States and regions. This paper shares the experience from Hong Kong China and suggests conducting workshops/user groups for subject matter experts and ATMS suppliers to share their experience paving way for interoperability of ATMS.

PAVING WAY FOR INTEROPERABILITY OF AIR TRAFFIC MANAGEMENT SYSTEM

1. INTRODUCTION

1.1 The Air Traffic Management System (ATMS) is a safety-critical and highly complicated system with high-level of integration among various sub-systems. The ATMS primarily processes and displays flight and surveillance data to air traffic controllers in an integrated manner by means of Flight Data Processing Sub-system (FDPS) and Surveillance Data Processing Sub-system (SDPS) respectively. The increasing complexity of the modern air traffic environment has demanded advanced technologies, as promulgated through the ICAO Global Air Navigation Plan (GANP), for integration with the ATMS to support controllers in providing Air Traffic Control (ATC) functions in a safe, efficient and effective manner. These include, but not limited to, the following:

- Automatic Dependent Surveillance–Broadcast (ADS-B)/Automatic Dependent Surveillance – Contract (ADS-C)
- ATS Inter-facility Data Communications (AIDC)
- Arrival and/or Departure Manager (AMAN and/or DMAN)
- Controller Pilot Datalink Communication (CPDLC)
- Electronic Flight Strips (EFS)
- Enhanced Ground-based Safety Nets (GBSN)
- Mode S Downlink Aircraft Parameters (DAPS)
- Meteorological Information (MET)
- Multi-surveillance Tracking (MST)
- Pre-Departure Clearance (PDC)

2. DISCUSSION

2.1 In Hong Kong, the new ATMS was successfully commissioned in November 2016. The ATMS was designed to meet the latest international aviation standards on technical, safety, ATC operational and maintenance requirements including enhanced flight information and data processing, automated and advanced safety net features, and more precise flight trajectory prediction capabilities. It meets the latest requirements set by the ICAO, and is on par with the most advanced international air traffic management technologies. With an enhanced capacity to handle 8,000 flight plans per day and simultaneously monitor 1,500 air or ground targets (5 times and 1.5 times of the old ATMS respectively), the new ATMS can handle the projected air traffic growth, including that to be brought by the development of the three-runway system (3RS) of the Hong Kong International Airport (HKIA).

2.2 The ATMS has performed well during the peak air traffic flow of the festive periods at the end of 2016 and in early 2017 as well as under severe weather conditions, including typhoon and heavy rainstorms, since its commissioning. The daily flight movements handled by the ATMS last month (July 2017) had surpassed that handled by the old ATMS in the same period in 2016.

2.3 Furthermore, the ATMS has multiple layers of fallback systems built-in to tackle different scenarios of system anomaly, which can meet the ever-increasing stringent aviation safety requirements - an improved feature compared with the old ATMS which had only one fallback system. The Fallback system is a separate but identical system to the Main System, which can immediately take up the role of Main System for uninterrupted operations in the event of failure of the Main System. The Ultimate Fallback System, developed by another supplier with a different software, could run independently to support ATC operation with reduced functions in the unlikely event of total failure of both the Main System and Fallback System, thus ensuring aviation safety.

2.4 Due to safety-critical nature of the ATMS, a risk-based approach has been adopted throughout system development, testing/acceptance, system and operation transition of the ATMS, allowing higher priorities and more resources to be allocated to manage areas identified as higher risks. This is in line with the international aviation safety standards to maintain the highest level of aviation safety while streamlining resources. For example, during flight inspection acceptance tests of the ATMS, focus was put on using the flight inspection aircraft to verify aircraft positions against routes and fixes on radar screen that were busily flown over based on past statistics, while leaving other relatively non-busy routes and fixes to be checked using targets of opportunities.

2.5 Like all new/upgrading of complex ATMS in other airports, there were teething issues, despite not affecting aviation safety, warranted optimisation during the initial operation period of their new ATMS operation. For example, known aircraft display issues on radar screen, such as temporary occurrences of “split tracks”, “false targets” and “aircraft positions not displayed”, were caused by, among other external factors, limitations of radar technology, irrespective of the suppliers/brands of ATMS. The Surveillance Implementation Coordination Group (SURICG) established under the ICAO’s Asia Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) has recently revised its ADS-B Operation and Implementation Guidance Document (AIGD), recognizing ADS-B as a cost-effective means to fundamentally overcome such limitations. Hong Kong China has formulated a plan for the ATMS to gradually integrate with ADS-B, while managing potential risks. With effect from November 2016 and mandatory ADS-B equipage for aircraft flying within the Hong Kong Flight Information Region (HKFIR), the first phase of ADS-B implementation has been completed with ADS-B integrated with the ATMS for operational use, covering the southern portion of the HKFIR. The gradual extension of the ADS-B coverage into the ATMS to cover the HKFIR is planned for completion in end 2017, by which time the surveillance performance of the ATMS will be further improved.

2.6 There exist various suppliers who has been designing and developing ATMS to meet operational/technical/maintenance requirements of individual Air Navigation Service Providers (ANSPs). In the Asia-Pacific (APAC) Region, there are more than 10 ATMS suppliers engaged by various ANSPs in different timeframes to implement new ATMS for replacing the old ATMS, in line with the ICAO’s initiative on Aviation System Block Upgrades (ASBU) framework in achieving enhanced aviation safety, air traffic handling capacity and operational efficiency. While the ICAO’s Annex 10 provides Standards and Recommended Practices (SARPs) for Communications, Navigation and Surveillance (CNS) systems, on which suppliers and ANSPs/regulators would respectively base to design and certify the CNS systems for operational use, it is a well-known fact that globally accepted performance-based requirements and standards are generally lacked for implementation of ATMS. As a result, the overall system architecture, functions and Human-Machine Interface (HMI) of ATMS are often determined by individual suppliers and/or ANSPs, leading to vastly different HMI and techniques. Nowadays, it is not uncommon to encounter interoperability issues among ATMS operated by various ANSPs, which prevail between ATMS developed from the same supplier in different timeframes, as well as from different suppliers adopting proprietary design.

2.7 With the ICAO’s ASBU framework emphasizing global interoperability and harmonization, globally accepted performance-based requirements for ATMS is highly desirable in ensuring the ATMS developed by various suppliers are interoperable for achieving consistent performance. Since the Twelfth Air Navigation Conference (AN-Conf/12) held in 2012, the ICAO has been developing a global roadmap and performance-based requirements for ATMS under its revised GANP, Edition 2019, with a view to harmonizing functions and operations resulting in interoperable, consistent and predictable air traffic management service across States and regions.

2.8 Hong Kong China has spearheaded the forming of an international user group for ATMS (Users’ Group). Subject Matter Experts (SMEs) experts from Dubai, India and the United States will join the Users’ Group to share operational and technical experience, and to enhance users’ operations and map out the future system development roadmap. The inaugural meeting of the Users’ Group will be hosted by the Hong Kong Civil Aviation Department on 19-20 September 2017. The outcome of the Users’ Group would be beneficial for the APAC Regions and ICAO in respect of development of the global roadmap and performance-based requirements of the ATMS.

2.9 This paper has been presented during the 21st Meeting of CNS Sub-Group (CNS SG/21) and 5th Meeting of the ATM Sub-Group (ATM SG/5), and gained their support.

3. ACTION BY THE CONFERENCE

3.1 The Conference is invited to:

- a) note Hong Kong China has taken a risk-based approach throughout system development, testing/acceptance, system and operations transition, handling of teething issues of its safety-critical ATMS with good lessons learned;
- b) spearheaded the forming of an international Users' Group for ATMS to share operational and technical experience, and map out the future system development roadmap, which could be beneficial for the APAC Regions and ICAO in respect of development of the global roadmap and performance-based requirements of the ATMS; and
- c) seek support from the ICAO in encouraging APAC States/Administrations to organize seminars/workshops/user groups to facilitate SMEs and ATMS suppliers to share experience.

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