INTERNATIONAL CIVIL AVIATION ORGANIZATION

TWENTY SEVENTH MEETING OF THE ASIA/PACIFIC AIR NAVIGATION PLANNING AND IMPLEMENTATION REGIONAL GROUP (APANPIRG/27)

Bangkok, Thailand, 5 to 8 September 2016

Agenda Item 3: Performance Framework for Regional Air Navigation Planning and Implementation

3.6: Other Air Navigation Matters

FOSTERING A SAFE, SECURED AND EFFICIENT AVIATION SYSTEM THROUGH IMPLEMENTATION OF NEW AIR TRAFFIC CONTROL SYSTEM IN HONG KONG

(Presented by Hong Kong, China)

SUMMARY

This Paper shares the robust system architecture and various advanced features of new ATC System to enhance safety and operational efficiency in accordance with the ICAO GANP and ASBU initiatives. Additional efforts have been in place to assess system and operational readiness to pave way to ensure smooth commissioning of the new ATC System. The phased functional implementation approach will better manage potential safety risks, further strengthen the competency and confidence of ATC operational personnel in mastering the new ATC System under the SMS regime.

Strategic Objectives:

A: ***Safety** – Enhance global civil aviation safety*

B: ***Air Navigation Capacity and Efficiency**—Increase the capacity and improve the efficiency of the global aviation system*

1. INTRODUCTION

1.1 The existing Air Traffic Control (ATC) System has been providing reliable and non-stop services since the commissioning of the Hong Kong International Airport (HKIA) in July 1998. To continuously foster a safe, secured and efficient aviation system in Hong Kong, a replacement programme has commenced since year 2007 to replace the aging ATC System. The new ATC system has been developed with reference to the latest ICAO initiatives such as Global Air Navigation Plan (GANP) and Aviation System Block Upgrade (ASBU) framework while adopting the latest international standards on technical, safety and ATC operational requirements.

1.2 This Paper highlights the key aspects of system development and project implementation leading to the phased commissioning of the new ATC System, with a view to ensuring a safe, secured and efficient aviation system in Hong Kong, China.

2. DISCUSSION

2.1 The existing ATC System is being used to support the Main ATC Centre (called W-ATCC) and Control Tower (called S-TWR) operations, whereas the Backup ATCC and Backup Control Tower (called N-TWR) is supported by an independent backup ATC System. Due to the accommodation constraints in W-ATCC and S-TWR, it is not feasible for in-situ replacement of the existing equipment. A new ATC Centre, known as East ATC Centre (E-ATCC), was subsequently constructed to accommodate the new ATC System and associated controller working positions to ensure no interruption to the existing H24 ATC operations.

2.2 The entire new ATC System was implemented through a total of eight major system contracts and all the systems after installation had to undergo a series of stringent acceptance tests (including Factory Acceptance Tests, Site Acceptance Tests, Reliability Acceptance Tests and System Integration Tests) and comprehensive safety assessments in accordance with international aviation safety management standards and established government procedures, in order to ensure that the system operation complies with the safety management and contractual requirements.

2.3 Amongst the eight major system contracts, the new Air Traffic Management System (ATMS) is the most complicated system. To cope with the increasing air traffic demand and to dovetail with the latest technological development of air navigation systems with reference to ICAO GANP and ASBU framework, the new ATMS is equipped with various advanced features including highly enhanced flight information and data processing capabilities, interoperability with neighbouring ATM systems such as AIDC (B0-FICE)[Note1], advanced automatic safety net features (B0-SNET)[Note2], more precise flight trajectory prediction functions and integrated Arrival Manager (B0-RSEQ)[Note3], multi-surveillance tracker technology (B0-ASUR)[Note4], and graphical presentation of current and predicted meteorological information (B0-AMET)[Note5], paving way for the forthcoming Block 1 functions. The new ATC System has incorporated its design with full capability for system upgrading and expansion to cope with future traffic growth.

2.4 In terms of system architecture, the new ATMS consisted of three levels of equipment provision, namely Main System, Fallback System and Ultimate Fallback System (UFS). The Main System is a fully self-contained system able to deliver on its own the full ATMS system capacity, functions and capabilities. The Fallback System is a separate but fully identical system to the Main System for continuing the operations in case of a meltdown of the Main System. Either the Main or Fallback System allows the controllers to exercise ATC duties with the other systems as an immediate backup. The UFS, being a separate system developed by another supplier running at all times, is totally independent from those of the Main ATMS and Fallback ATMS. The purpose to install the UFS is to mitigate the risk of encountering a total system failure since the UFS is not susceptible to common mode software issues that could similarly plague the Main and Fallback ATMS.

2.5 Real-time surveillance traffic and flight plan data feeding the existing ATMS are duplicated to the new ATMS. Training wise, prior to its commissioning, the new ATMS itself becomes a fully-fledged and ultimate training platform allowing trainees to interact with real traffic and mimic real ATC in almost all aspects except for the execution of ATC onto real-world traffic. Such an arrangement is essential to shadowing tests, shadowing operations, and the phased operational transition to the new ATMS as it allows for the flexibility of switching in and out of the functionalities of new ATMS partially or in full to suit the purposes. From a technical perspective, the same arrangement was conducive to the validation, analysis and appreciation of the performance of the new ATMS.

[Note1] B0-FICE Increased Interoperability, Efficiency and Capacity through Ground-Ground Integration
[Note2] B0-SNET Increased Effectiveness of Ground-based Safety Nets
[Note3] B0-RSEQ Improved Traffic Flow through Sequencing (AMAN/DMAN)
[Note4] B0-ASUR Initial Capability for Ground Surveillance
[Note5] B0-AMET Meteorological information supporting enhanced operational efficiency and safety

2.6 The implementation and commissioning of the new ATC System is overseen by an independent Air Traffic Management Standards Office in accordance with the guidelines of the established Safety Management System, under which, potential safety issues are subject to the vigorous Safety Case Assessment Report System (SCARS) processes. In addition to the internal processes, safety case reports had been developed for design, implementation and transition of the new ATC System under the guidance and vetting separately by two external independent consultants. System engineering and safety assurance assessments, as well as human factor and ATC assessments were conducted by these consultants based on internationally recognized standards. Relevant safety control measures were implemented accordingly to address the recommendations made from these assessments.

2.7 Apart from the equipment, staff readiness is also critical in ensuring that the new ATC System will work properly and effectively. Hong Kong, China attached great importance to enhancing staff confidence and competence through extensive training and staff communication. A comprehensive training plan has been formulated to cover a series of intensive training sessions for air traffic controllers and relevant staff in phases through the use of simulator system and familiarisation training on the new ATC System. Comments from the controllers were reported back to the project team to further enhance the performance of the new ATC System.

2.8 To further strengthen controllers' confidence, sufficient time has been allowed to enable them to adapt to the new working environment and relieve their pressure during an extended period of transition. A progressive transition approach known as Phased Functional Implementation (PFI) was adopted to launch the new ATC System incrementally from June 2016 onwards. The use of the new ATC System was progressively expanded in terms of operating time and scope of service coverage over a period of about five months. Subject to actual experience and progress, the new ATC System will be fully commissioned and operated by October/November 2016. More details of the PFI are as follows:-

(a) As the first step of the PFI arrangement, the new ATC System was used to support selected control positions in the N-TWR in June 2016 for several hours a day during non-peak periods, while in parallel other ATC services continued to be delivered by the W-ATCC.

(b) In July 2016, real live traffic operations using the new ATC System were extended to include all control positions in N-TWR at different times of the day. Reviews were conducted after each and every operational day to ensure smooth operations and procedural improvement in subsequent sessions.

(c) From August to October 2016, the phased implementation will be extended to cover other ATC functions, namely Area, Terminal and Approach in the E-ATCC. Similar to Tower operation, real live traffic operations will start with selected control positions to gradually cover all control positions in Approach/Terminal functions, Area function, and eventually the whole E-ATCC. Both strategic and tactical ATFM measures will be implemented.

(d) The PFI of the new ATC System would be completed by October/November 2016. The existing ATC System will then serve as a back-up before its decommissioning.

3. ACTION BY THE MEETING

3.1 The Meeting is invited to:

a) note the content of this paper; and

b) seek support from the ICAO in organizing special seminars/workshops to help expedite States/Administrations on their implementation of ASBU modules through experience sharing on the best practice, lessons learned, and difficulties encountered.

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