INTERNATIONAL CIVIL AVIATION ORGANIZATION

TWENTY SIXTH MEETING OF THE ASIA/PACIFIC AIR NAVIGATION PLANNING AND IMPLEMENTATION REGIONAL GROUP (APANPIRG/26)

Bangkok, Thailand, 7 – 10 September 2015

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

3.2: ATM

Integrated AMAN/DMAN Development Status of Republic of Korea

(Presented by Republic of Korea)

SUMMARY

This Information Paper summarizes the development and implementation status of AMAN (Arrival Manager) and integrated AMAN/DMAN (Departure Manager) in Republic of Korea. As a preliminary operational system, an AMAN has been developed and implemented for metering of arrival flights to Jeju Airport, and the integrated AMAN/DMAN is under development since November 2014.

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 air traffic in Republic of Korea (ROK) has increased by more than 5% per year for last 5 years, and the growth is expected to be continuing for a while. The demand for not only the hardware infrastructures, such as runways and terminals, but also controller decision support systems has been increased to improve operational efficiency and safety.

1.2 Accordingly, Ministry of Land, Infrastructure and Transport (MOLIT) of ROK planned to develop and implement the AMAN for arrival flights to Jeju Airport, of which traffic demand has risen sharply in recent years (12% in 2014). The AMAN system for Jeju Airport has been implemented in Incheon ACC and is now under operational test phase for system validation.

1.3 In addition, for compliance with ASBU, and efficiency increment in overall ATM operations through interworking with ATFM, development project for integrated AMAN-DMAN system started in 2014. The AMAN in this integrated AMAN-DMAN system should have functionality of route advisory generation for an individual arrival flight based on point-merge procedures.

1.4 The integrated AMAN-DMAN system development project is scheduled to be finished in 2020. Currently, it is being developed to comply with the regional restrictions and requirements from the controllers in ROK, at the same time, to be compatible with the general operation concepts of similar systems in Europe and USA.

2. DISCUSSION

AMAN

2.1 The AMAN currently implemented is a controller's decision supporting system for sequencing and metering of in-bound flights to Jeju Terminal Maneuvering Area (TMA). This system calculates the ETA of each aircraft at the TMA entering fix through 4D trajectory estimation, and generates STA, based on ETA and optimal sequencing result. The advisories provided and showed to controllers are the adjustment amounts of arrival time and speed for each aircraft.

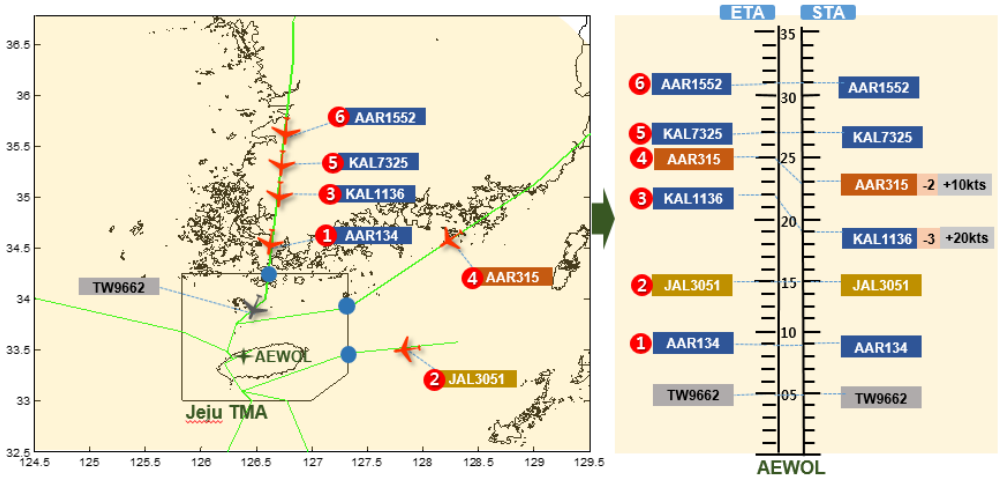

Figure 1. AMAN Concept

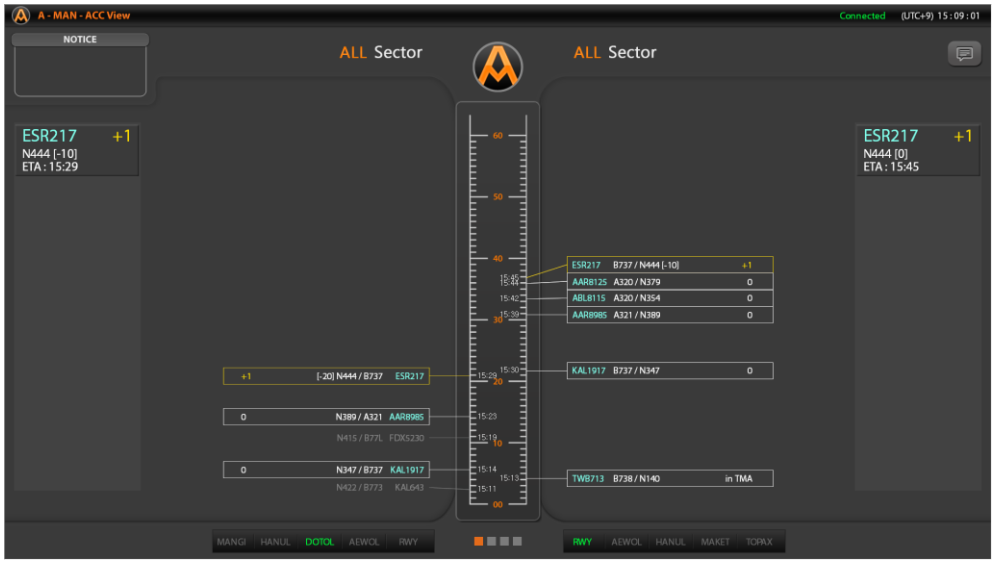

Figure 2. AMAN GUI

2.2 Currently, this AMAN system is being tested for gathering user requirements and estimation accuracy improvement through comparison of calculated ETA and measured ATA.

2.3 For now, uncertainties due to radar vectoring by controllers are still severe for accurate estimation of ETA of aircraft which enter into the Jeju TMA. In order to control the in-bound traffic flow effectively before aircraft's entry into the Jeju TMA, this AMAN system has been implemented in Incheon ACC.

Integrated AMAN/DMAN

2.4 In the case of Incheon FIR in ROK, it is quite common that ATFM measures, such as Estimated Departure Clearance Time (EDCT) in USA or Calculated Take-Off Time (CTOT) in Europe, are given to the outbound traffics to the adjacent foreign FIRs, Shanghai FIR of China and Fukuoka FIR of Japan. In most cases of ROK, furthermore, the short flight distance from a departure runway to a merging point into the en-route traffic causes small tolerance window of a departure time slot, and this resulted in the necessity for DMAN.

2.5 A small but busy airport such as Jeju Airport has already high demand for DMAN, especially with the mixed mode single runway operation, has also high expectations for the effectiveness of the integrated AMAN-DMAN. The accurate Estimated Landing Time (ELDT) from AMAN it-self will be very useful for take-off scheduling in a single runway as well as turnaround process management.

2.6 Currently in ROK, point merge procedures were developed and are being used as STARs for arrival flights to Incheon airport and Jeju Airport, but manual radar vectoring by controllers are still frequent when congested. If the inbound traffic flows are stabilized reasonably by high usage of the AMAN system currently implemented in ACC, the usage rate of the point merge procedures will increase, and reduction of estimation uncertainties for aircraft maneuvering in TMA is expected. This might result in promising improvement of estimation accuracy for landing times of arrival flights. And this is the key feature for integration of AMAN-DMAN for a small busy airport with a single runway.

2.7 For accurate estimation of ELDT and assistance for the controllers about arrival flights in TMA, route advisory generation features based on point-merge procedures should be newly incorporated in the integrated AMAN-DMAN system.

2.8 The operational concept of the integrated AMAN-DMAN system under development are shown in figure 3, and the main features of the integrated AMAN-DMAN system are;

a) Route advisory generation for arrival flights based on point-merge procedures;

b) Precise scheduling of Target Take-Off Time (TTOT) for departure flights with consideration of metering at the merging point into the en-route traffic and ELDT of arrival flights to the same runway;

c) Variable Taxi Time (VTT) calculation;

d) Target Start-up Approval Time (TSAT) scheduling with consideration of TOBT and VTT;

e) ATFM (EDCT/CTOT) compliance;

f) Runway crossing scheduling; and

g) Optimal departure scheduling with consideration of minimization of departure queue and other constraints

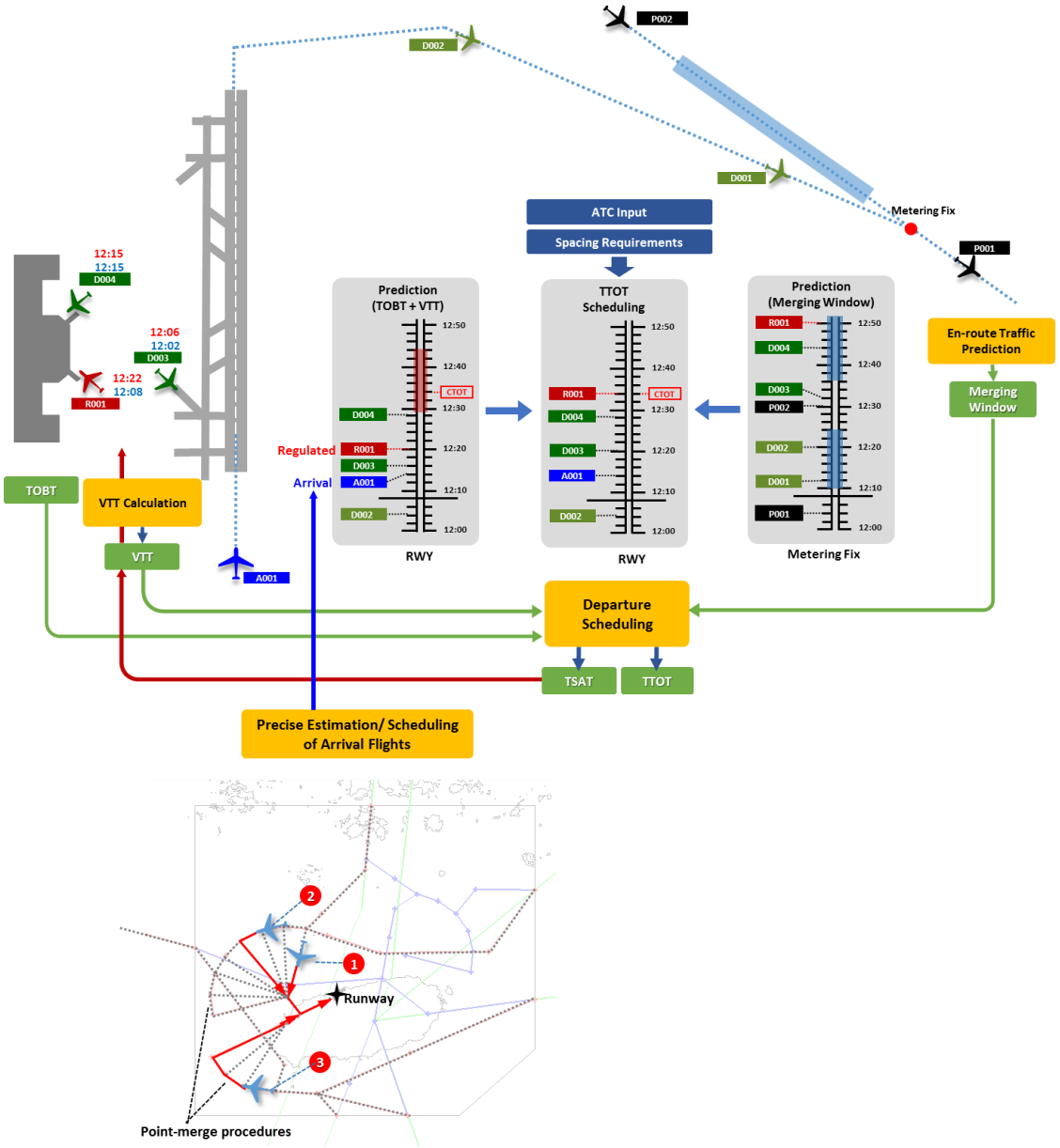

Figure 3. Operational concept and system features of integrated AMAN-DMAN

2.9 The development project of ROK for an integrated AMAN-DMAN system for a single airport has been launched in November 2014, and planned to be completed by August 2020. Currently, definition of system requirements are being achieved.

3. ACTION BY THE MEETING

3.1 The Meeting is invited to note this information.

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