International Civil Aviation Organization

The Second Meeting of the Asia/Pacific Air Traffic Management Automation System Task Force (APAC ATMAS TF/2)

Video Tele-Conference, 14 - 16 September 2021

Agenda Item 4: ATM Automation System Implementation by States

4.1 System Implementation Planning

CURRENT STATUS AND PROMOTION PLAN OF THE DMAN/AMAN IN INCHEON INTERNATIONAL AIRPORT FOR ENHANCEMENT OF ATM AUTOMATION SYSTEM

(Presented by Korea, Republic of)

SUMMARY

This paper introduces the current status of the Incheon International Airport DMAN/AMAN System carried out as part of the Seoul Approach enhancement project, the direction of elevation which reflects ATM automation system, and anticipated effects.

1. INTRODUCTION

1.1 Seoul Approach is the core structure of ROK aviation, which monitors approximately 59.4NM (110km) peripheral airspace including Seoul (Gimpo International Airport), Incheon (Incheon International Airport), Gyeonggi-do, and parts of Chungcheong-do. By Automated Radar Terminal System (ARTS), approach rapidly collects and treats data such as flight path data transmitted from radar, flight path data from Aeronautical Fixed Telecommunication Network (AFTN), and flight operation information from Integrated Information System (IIS).

1.2 Since 2017, it has been operating new ATC system which replaced old one and currently propel enhancement project of control system from 2019 to set up more efficient information gathering environment. Among others, the most important part is Enhancing Arrival Manager (AMAN) and Departure Manager (DMAN) system of Incheon International Airport which reflects ATM automation system.

1.3 In this paper, we will first introduce the definition of DMAN/AMAN and related trends of ICAO related to them. Then, we will explain the current status, direction of enhancement, and the expected effects of the Incheon Airport DMAN/AMAN system.

2. DISCUSSION

2.1 Introduction for The definition of DMAN/AMAN and Trends of ICAO

2.1.1 Departure Manager (DMAN) automatically sets slot allotment and adjustment for departing aircraft by considering airspace situation, aircraft classes, manual settings, and various limitations. By utilizing runway capacity and terminal space optimally, it offers a non-delaying, safe departure schedule and route for departing aircraft.

2.1.2 On the other side, Arrival Manager (AMAN) offers an optimized arrival sequence by checking the position, time, and schedule of arriving aircraft. To calculate the joining time of them on a specific point, it uses time-based metering based on Control Time of Arrival (CTA).

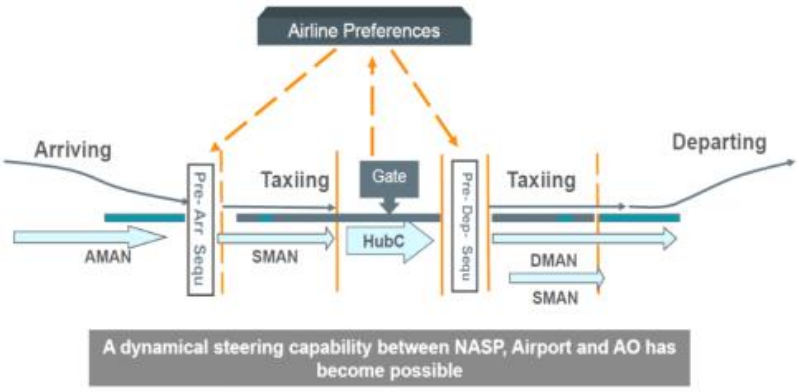

Figure 1. DMAN, AMAN procedure schematic

2.1.3 ICAO set four Performance Improved Area (PIA) at Aviation System Block Upgrades (ASBU). Among them, DMAN/AMAN corresponds to Airport Operation thread, and to be concrete, Runway Sequencing (RSEQ). The object is establishing a more efficient operating environment utilizing an automation system and ultimately optimizing airport operation using an integrated system with other threads.

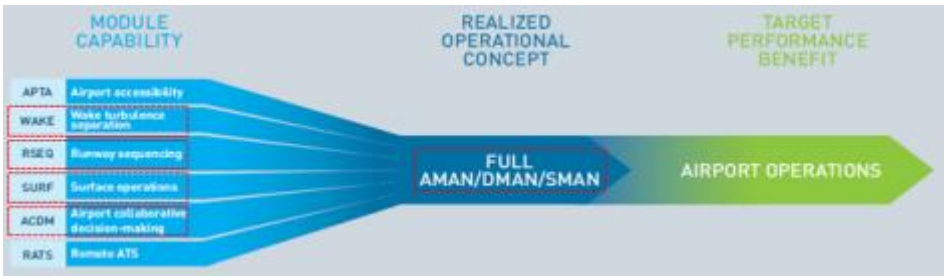

Figure 2. The PIA thread of ICAO's ASBU

2.2 Current Status, Enhancement Direction, and Expected Effects of Incheon Airport AMAN/DMAN System

2.2.1 Incheon Airport DMAN system calculates the required time for the departure of the aircraft by calculating the departure milestone based on pre-set minimum separation distances (approx. 2 min) between aircraft. When calculating estimated time, it uses travel time between gate and runway fixed in system. For arrival airport and Minimum Distance Interval for airway, operators are manually applying this.

2.2.2 The plan to enhancing the DMAN system is following; first, by utilizing the newly introduced timeline, we enable the DMAN system to self-decision making for departure operation via

systematic interlock with AMAN and existing Tower Electronic Flight Strip (TEFS). Also, we will reflect surface movement situations and various parameters via Variable Tax Time (VTT) calculation so that the system automatically calculates and determines the Minimum Departure Interval (MDI) instead of manually applying it by controllers. Finally, we will apply Tactical Runway Scheduling to determine the optimal tax time.

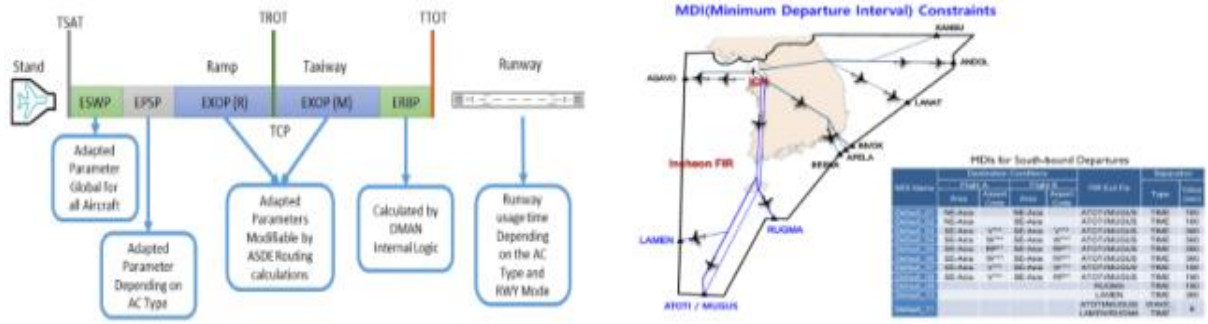

Figure 3. Method for calculating time using VTT and route using MID

2.2.3 The AMAN system was implemented by runtime calculation method using 4D-trajectory from Flight Data Process (FDP) module. It determines the entry order of runway for aircraft by calculating the Estimated Time of Arrival (ETA) for allotted runways. Also, it offers TTL/TTG (Time to Lose/Time to Gain) value comparing Controlled Time of Arrival (CTA) and ETA for pilots, which enable them to determine whether it is an efficient entry route.

2.2.4 For enhancing, first, we will implement AMAN system as closely linked with newly introduced Trombone Sequencing. Next, we will add a new system that offers multiple departure routes saved in the database and recalculated airway routes when flying unintended one to enable responding to complex and various changes for flight plans. Also, we will reveal expected control traffic for each sector to enable foreseeing aircraft arrival and utilizing strategic control resources. Lastly, we will apply six-level Wake Turbulence Re-categorization (RECAT) to offer display and warning features of wake turbulence between aircraft.

2.2.5 Most of all, we will enhance the position of the DMAN/AMAN system in ARTS through a system enhancement project based on the introduction of the ATM automation system. Both DMAN and AMAN system in Incheon Airport are currently operating as sub-function of the Flight Data Processor (FDP) module, one of the ARTS' components. Therefore, with the enhancement process, we will develop them as an independent module of the same position as the FDP so as to the DMAN/AMAN system will be the core component of the ARTS operation.

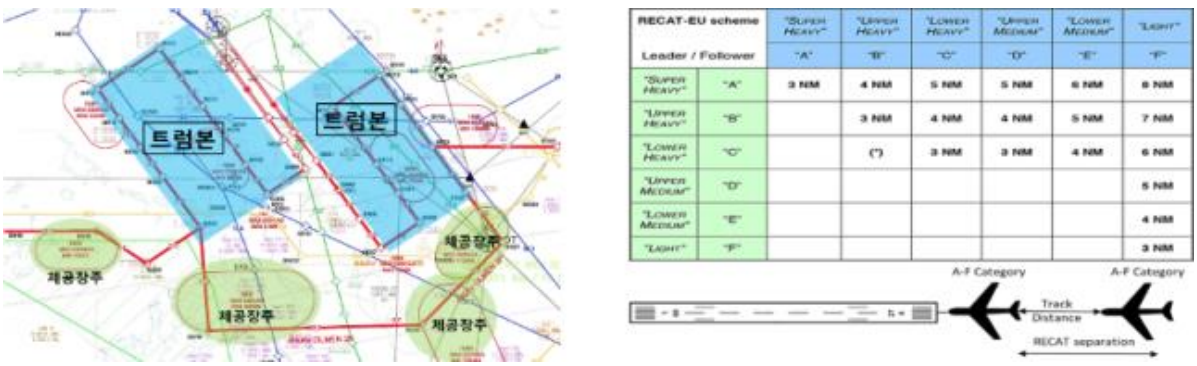

Figure 4. The Trombone sequencing and wake turbulence RECAT

2.2.6 Through enhancement project of the Incheon Airport DMAN/AMAN, we are expecting as follows:

a) ***Maximize Utilizing Runway Capacity*** By calculating optimal Target Take Off Time (TTOT) and Target Start Up Approval Time (TSAT) which considered both airway and runway situations, they prevent unnecessary flight delays, and maximizing the efficiency of runway operation.

b) ***Improve Efficiency of Air Control Services*** By replacing current manual DMAN/AMAN system which relying on controller's experiences, abilities and local process to automated, they enable not only alleviate controller's work burden but increase control accuracy, which ensure safe flight for aircraft.

c) ***Strengthen Airport Service Support*** By improving precision and punctuality of departure/arrival milestone, they enable prompt, reliable data communication among the departments, which accelerate set up Airport-Collaborative Decision Making (A-CDM) of Incheon Airport.

d) ***Future Preparation by Introducing State-of-the-art Technology and System*** By introducing a new AMAN/DMAN system reflecting state-of-the-art technology such as Trombone Sequencing and Wake Turbulence RECAT helps not only maximize short-term system efficiency but also contributes constructing long-term system of aviation such as realizing ICAO's ASBU objective.

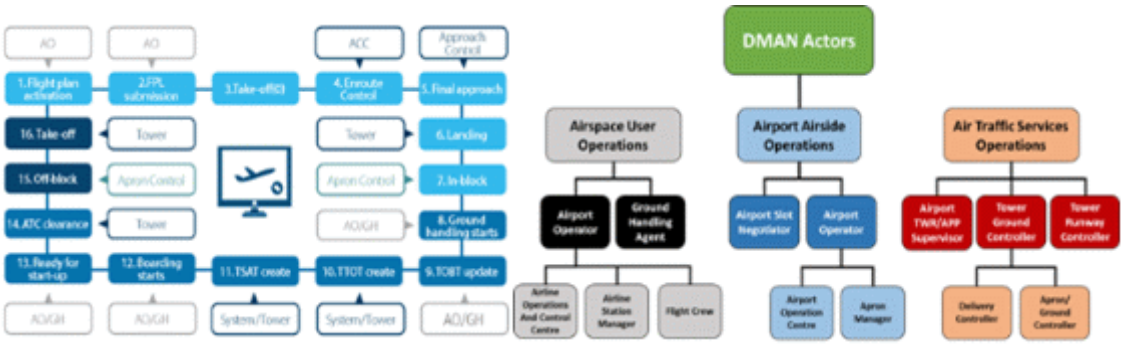

Figure 5. Incheon Airport A-CDM and DMAN actor diagram

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper; and

b) discuss any relevant matter as appropriate.

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