The Fifth Meeting of the Aerodromes Operations and Planning Sub-Group (AOP/SG/5)

Video Teleconference, 29 June to 2 July 2021

Agenda Item 4: Provision of AOP in the Asia/Pacific Region

- **Planning & Design of Aerodromes**

A-SMGCS ONBOARD GUIDANCE SYSTEM IMPLEMENTATION IN KOREA

(Presented by Republic of Korea)

SUMMARY

This paper presents Advanced Surface Movement Guidance and Control Systems (A-SMGCS) is being deployed and upgraded by Incheon International Airport Corporation to provide routing, guidance and surveillance for the control of aircraft and vehicles for maintaining the required level of safety on surface domain under the aerodrome visibility operational level. The deployment and planning of A-SMGCS onboard system in Incheon airport would contribute the standardization of A-SMGCS Level 5.

1. INTRODUCTION

1.1 A-SMGCS is short of Advanced Surface Movement Guidance and Control Systems. According to ICAO accident report, the number of accidents related to RWY and ground safety accounted for is more than half of all aviation accidents. Meanwhile, the importance of aviation safety is highlighted and airports try to minimize the possibility of surface movement accidents by deploying innovative data-driven solutions. In ICAO ASBU, as a final target of SURF with block1 element 1, the system which is able to give situational awareness to pilot as well as vehicle driver.

1.2 Currently Incheon airport operates the Vehicle Display System let driver get the airside traffic information including track movement, routing so that strengthen the safety of vehicle movement as well as efficiency.

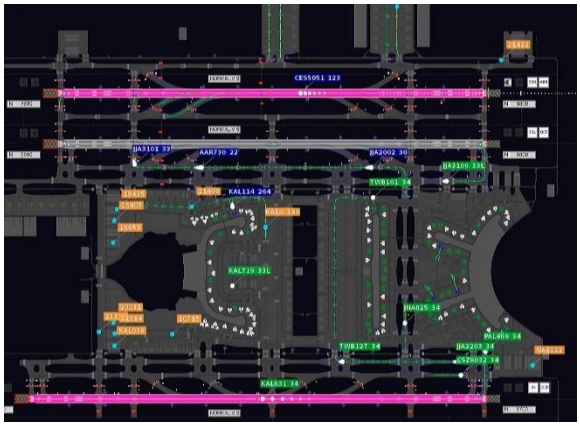
2. VALIDATION OF A-SMGCS IN KOREA

A-SMGCS deployment in ICN

2.1 The first stage of A-SMGCS in Incheon Airport had been deployed with Level 3, as defined in ICAO Doc.9830. The system provides the target position as interfacing with Airport Surface Detection System and routing and guidance function operated manually based on aeronautical ground light control and monitoring system (AGLCMS) which is capable for single lamp control and monitor. A-SMGCS should be designed to operate under all-weather condition especially, in low visibility. Followed by ICAO Annex 14, in low visibility procedure, the kinds of AGL and its serviceable percentage shall be maintained. Initial stage of ICN A-SMGCS was significant technical delivery and experience for Incheon airport operator to harmonize between AGLCMS and surface manager (SMAN) and to consolidate 4 major functions (Surveillance, Routing, Guidance and Control) to one platform.

2.2 Based on the mature A-SMGCS standard (Doc 9830) and operational experience with practical system, Incheon International Airport upgraded A-SMGCS to level 4 at 2008. The key of A-SMGCS level 4 is to provide an optimized individual route proposed by route planning function for aircraft from the landing runway to docking on the gate and push-back from gate to runway to take-off. Moreover, it also controls the aeronautical ground lights automatically to give visual aids to pilots and vehicle drivers to prevent potential conflict with other mobiles. Conflict prediction makes stop-bar automated operation to reduce the surface traffic such as aircraft distance separation.

ICN A-SMGCS CWP HMI (2001-2007)



ICN A-SMGCS CWP HMI (2008~Current)

A-SMGCS Onboard Guidance System for Vehicle

2.3 Incheon International Airport is now working on upgrading A-SMGCS to level 5 which is final and expected to enable all the equipped mobiles to use guidance and route planning function as well. To establish A-SMGCS level 5 fundamental infrastructure, ICN design and developed Vehicle Display System (VDS) which has the ability to monitor all surface traffic situation and make a driver get appropriate situational awareness. Safety inspection car, rescue and firefighting car, deicing car and so on, which regularly enter runway equipped with Vehicle Display System since developed on Apr.2020.

The vehicle equipped with VDS

User Interface of VDS

3. FUTURE PLAN

A-SMGCS Onboard Guidance System for Aircraft

3.1 Based on VDS establishment, Incheon airport is planning to design and develop to A-SMGCS Onboard Guidance System for Aircraft from Sep. 2021 to June 2023. The Onboard system,

so called Airport Moving Map Display (AMMD), with own-ship position symbol is designed to assist flight crews in orienting themselves on the airport surface to improve pilot positional awareness during taxi operations. The AMMD applications to be hosted on portable electronic flight bags (EFBs) usually based on iPad. The technology readiness level of AMMD including D-taxi system is highly based on A-SMGCS operational level. Incheon Airport has validated A-SMGCS and wireless interface has been studied via up-gradation project so that optimized data exchange and integrated position between target detected by radar and displaying EFB position of itself. AMMD graphically portray runways, taxiways and also provide routing information to support taxi and taxi-related operations. Additionally, warning functions can be provided that notify crews about potentially dangerous conditions, for example, inadvertently entering a runway, route deviation etc. Commercial AMMD currently operates on EFB only provides own-ship position without any route information, other object moving, restricted area display. It can be only provided by A-SMGCS AMMD.

The cockpit equipped with AMMD (concept image)

User Interface of AMMD (concept image)

3.2 To commercialize AMMD in Incheon airport in short period, the main wireless network stand base on LTE public telecommunication, but also interface with Aeronautical Mobile Airport Communications System (AeroMACS) would be carried out as experimental trial. Incheon International Airport Corporation (IIAC) is collaborating with Korean air to develop AMMD which enables real time data exchange such as routing, clearance traffic situation and so on. When project will finish successfully, AMMD improve the pilot positional and situational awareness and support safe ground movements. It helps also to improve the capacity of aerodrome especially, in poor visibility.

3.3 Incheon International Airport Corporation, as a first operation airport of A-SMGCS Level 4.5, we would like to share our experience of this new technology with all airports in Asia, to contribute more in civil aviation safety improvement and furthermore to standardize of A-SMGCS level 5.

4. ACTION BY THE MEETING

4.1 The meeting is invited to:

a) evaluate the necessity and feasibility of applying A-SMGCS Onboard system in Asia; and

b) discuss any relevant matters as appropriate.

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