International Civil Aviation Organization

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Agenda Item 5: ATM Systems (Modernisation, Seamless ATM, CNS, ATFM)

PRACTICE SHARING OF A-SMGCS LEVEL IV LIGHTING GUIDANCE APPLICATION IN CHINA

(Presented by China)

SUMMARY

This paper presents the construction, application, the effect and relevant technical suggestions of implementing A-SMGCS Level 4 in China Daxing International Airport. Daxing Airport is the first airport in China to realize A-SMGCS Level 4 application, which has a very important reference role in promoting A-SMGCS Level 4 application.

1. INTRODUCTION

1.1 At present, traditional guidance methods include tower controller's instructions via VHF communication, and follow-me vehicle, etc. but in large, complex, busy airports, especially under low visibility conditions, traditional guidance methods prone to cause problems such as heavy control workload, high error rate, low aerodrome operational efficiency, high conflict risk etc.

1.2 To solve the above problems, ICAO DOC 9830 suggests adopting lighting guidance for aircraft taxiing to improve surface safety, efficiency and capacity. ASBU SURF-B1/1 suggests that "Follows the Greens" should be adopted to optimize routing during taxi operations.

1.3 China's civil aviation research institutes have continuously deepened the research on and verification of lighting guidance technology based on A-SMGCS for more than ten years, and applied it in Beijing Daxing International Airport in 2019 to realize all-weather lighting guidance, achieving the operational standard for A-SMGCS Level IV.

2. DISCUSSION

Solutions

2.1 A series of tasks need to be completed to realize the lighting guidance.

2.1.1 Build A-SMGCS and surface surveillance systems such as SMR, and MLAT at the aerodrome, forming accurate (surveillance accuracy of 7.5 meters), continuous and stable target synthetic track data covering the whole surface.

2.1.2 The aerodrome builds individual light control and monitoring system (short for ILCMS) that can interact with A-SMGCS, and deploys taxiway centerline lights and stop bar lights on the aerodrome surface. The taxiway centerline lights and stop bar lights can be controlled by a single light or a light segment.

2.1.3 Research on and apply the technologies of A-SMGCS Level IV lighting guidance, such as automatic route planning technology, lighting guidance instruction generation & interaction control technology, conflict detection & resolution technology etc.

2.1.4 In order to ensure the smooth operation of lighting guidance, standard specifications & operating regulations are formulated.

Application Case

2.2 On September 25, 2019, Beijing Daxing International Airport came into service and started the all-day and all-weather lighting guidance of A-SMGCS Level IV.

2.3 Project Construction

2.3.1 In 2017, the A-SMGCS project of Beijing Daxing International Airport was launched. The system integrates and processes airport surveillance source signals to form accurate and stable aircraft trajectory information covering the entire surface. Automatic route planning technology conforming to the control operation rules is applied to plan the taxiing route of the aircraft in real time, which lays the foundation for the realization of the lighting guidance technology.

2.3.2 On-site installation (of A-SMGCS) was completed in May 2019. From July to September in 2019, we participated in 3 flight test verifications, including CAT IIIB flight test, successfully verified that Daxing International Airport meet the requisite to operate in low visibility with a runway visual range of 75 meters.

2.4 Application Effect

2.4.1 Up to now, all-weather lighting guidance has been continued for 3 years, running stable and well; the number of all-weather lighting guidance-enabled days accounts for 99.5% of the total number of guidance days; the proportion of guided flights accounting for more than 99% of the take-off and landing flights; the maximum number of guided flights per day is more than 800.

2.4.2 The Daxing Airport tower controller issues the "FTG" instruction. The pilot drives the aircraft to the designated position according to the guidance of the taxiing centerline lights (green lights). If there are conflicts during aircraft taxiing process, A-SMGCS automatically controls stop bar lights on/off to instruct the aircraft to wait or continue to move forward, to achieve conflict resolution.

2.4.3 By adopting lighting guidance to aircraft taxiing, the amount of communication between the controller & the pilot and the error rate are greatly reduced; the safety and efficiency of taxi guidance are significantly improved; and the control workload is reduced. Especially in low visibility, the airport operational capacity, efficiency and safety are greatly improved. At the same time, it can replace the guidance car and reduce the operating cost of the airport.

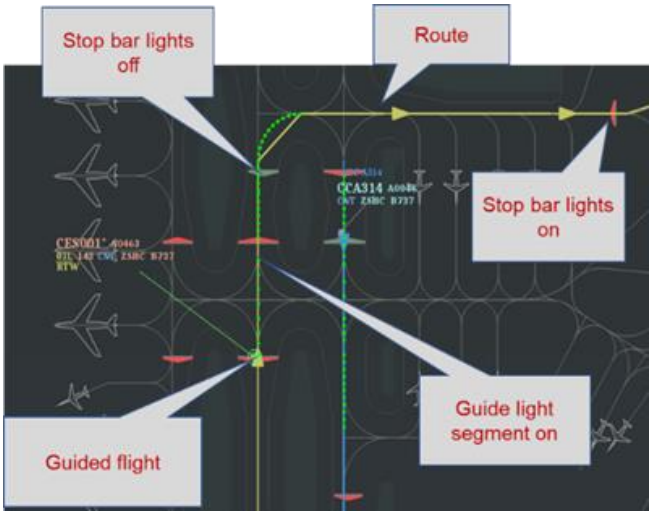

Fig. 1 Lighting Guidance Interface of A-SMGCS

Fig. 2 Lighting Guidance Operation at Daxing Airport

2.5 Advice to Construction and Implementation of A-SMGCS

2.5.1 In order to promote the efficient construction and implementation of A-SMGCS lighting guidance in different countries, the following construction suggestions are shared:

2.5.2 As surveillance data are the basis of lighting guidance, a sufficient number of SMRs and MLATs should be deployed in advance, and the system testing should focus on the full coverage, accuracy and stability of the surveillance data.

2.5.3 The construction of the ILCMS should be completed in advance of the A-SMGCS, and single-light monitoring devices should be installed for the taxiway centerline lights and stop bar lights on the surface.

2.5.4 The light response loop time should be controlled within 3 seconds (from the time A-SMGCS sends out the command to the time A-SMGCS receives the light status command). If the response loop time is too long, it will limit the taxiing speed of the aircraft and the timeliness of conflict resolution which may lead to operational risks.

Summary and Outlook

2.6 The promotion of A-SMGCS lighting guidance operation at Beijing Daxing International Airport by CAAC is an in-depth exploration and practice of the standard of ICAO DOC 9830 operational concept of lighting guidance. The A-SMGCS Level IV lighting guidance operation in China will provide experience for aviation authorities to promote the construction and implementation of A-SMGCS Level IV lighting guidance, and provide support for the implementation of ICAO ASBU and improvement of the safety and efficiency of surface operations.

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 matters as appropriate.

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