61ST CONFERENCE OF DIRECTORS GENERAL OF CIVIL AVIATION ASIA AND PACIFIC REGION

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AGENDA ITEM 3: AVIATION SAFETY

PROPOSAL ON PROMOTING THE NEW "NO-ENTRY CENTERLINE LIGHTS" TO REDUCE RUNWAY INCURSION RISK

(Presented by the People's Republic of China)

SUMMARY

To implement relevant recommendations contained in Annex 14 on reducing runway incursion risks in a cost-effective manner, China has innovated a solution in modifying the existing unidirectional centerline lights on exit only taxiways into bidirectional lights with constant red light for the reverse direction. This solution not only provides a visual warning against taxiing onto the runway in the wrong direction, but also lowers modification complexity, thus improving modification efficiency and saving relevant cost. By far, this solution has been piloted at three Chinese airports with positive warning effects achieved, and is being planned for broader application in the next step. It is recommended that the Conference consider this practice and include it into relevant ICAO guidance materials.

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1. INTRODUCTION

1.1 Runway incursion is one of the major safety risks in airport ground operations. In Annex 14, Volume I (6th Edition), the International Civil Aviation Organization (ICAO) introduced a recommendation to install no-entry bars across the taxiway at the end of exit only taxiway to warn aircraft and ground vehicles against entering in the wrong direction, therefore reducing the risk of incursion.

1.2 While no-entry bars may be directly installed at newly built airports, the modification to install no-entry bars at existing airports faces numerous challenges, including the closure of rapid exit taxiways, demolition of pavements, cable laying, and other challenges associated with construction without closure, which would not only affect the efficiency of airport operation but also lead to increased investment and more safety risks.

1.3 To address the above issues, China practices an innovative solution of no entry centerline lights. This solution not only provides a visual warning against aircraft and ground vehicles entering the runway in wrong direction, but also reduces modification complexity, thus improving modification efficiency and saves relevant costs.

2. DISCUSSION

2.1 Core Principles and Technical Features of the Solution

The core of this solution involves modifying the centerline lights on exit only taxiways to upgrade them into bidirectional lights.

Direction to exit the runway: the lights show alternating yellow and green, with the same function as the original centerline lights, to ensure normal taxiway guidance.

Direction to enter the runway: the lights show constant red, providing a clear and continuous visual warning to any aircraft or vehicle driver attempting to enter the runway in the wrong direction.

Technical specifications: the optical characteristics of modified lights, including light intensity and beam angle, will strictly comply with the technical requirements for taxiway centerline lights and no-entry bars specified in Annex 14, Volume I and relevant guidance materials, ensuring consistency with pilots' established visual expectations.

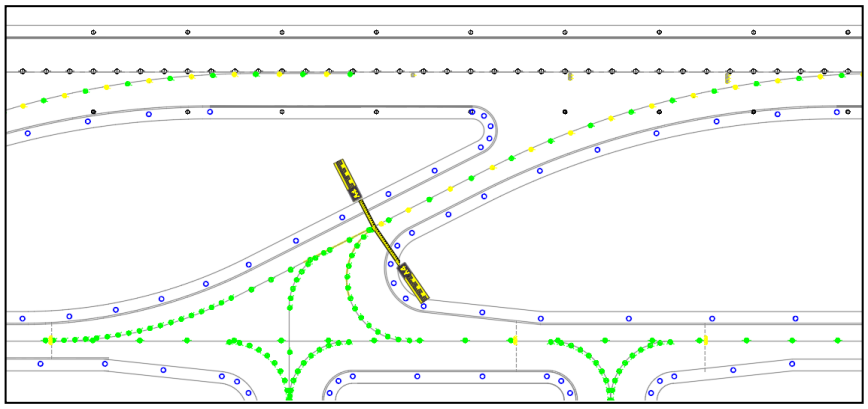

Figure 1: Diagram of centerline lights for rapid exit taxiway (viewed from exiting the runway)

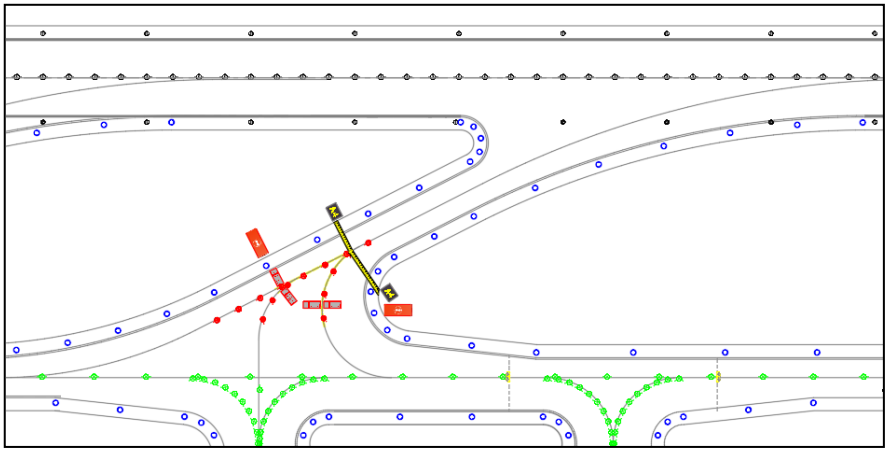

Figure 2: Diagram of centerline lights for rapid exit taxiway (viewed from entering the runway)

2.2 Advantage Analysis of the Solution

This solution offers high cost-effectiveness, operability, and reliability. By modifying existing light pits, cables, and power supply systems, it avoids large-scale demolition of pavement and cable laying, requiring low investment. The modification mainly involves light replacement and relevant system commissioning, which could be quickly completed during operational downtime and minimizing their impact. The continuous red “taxi path” generated by the solution provides a visual warning effect equivalent to that of original no-entry bars, with even better visibility than the one produced by crossbar light in certain acute-angle configurations.

2.3 Simulation Validation

Simulation validation of the lights’ optical and physical characteristics has been conducted using 3D computer modeling. Simulation results indicate that this solution provides an effective warning effect.

2.4 Pilot Implementation

Pilot modification and assessment tests have been conducted on a total of 9 exit taxiways at Yinchuan Hedong Airport, Nanchang Changbei Airport, and Jieyang Chaoshan Airport in China. All three airports have completed the assembly and installation of lights, the solicitation of industry feedback and the result analysis. The validation results show that the retrofitted lights provide effective warning against erroneous taxiing and have no adverse impact on routine operations or support activities.

Figure 3: Rendering of Nanchang Changbei Airport Modification

3. ACTION BY THE CONFERENCE

3.1 The Conference is invited to:

a) note China's experience in developing and trialing a modified "no-entry centerline lights" solution as a practical means of enhancing runway incursion prevention;

b) encourage States to undertake further operational assessments and share implementation experiences, where appropriate, to support the evaluation of the solution's safety and operational benefits; and

c) recommend ICAO to consider the inclusion of such innovative solutions to enhance runway incursion prevention into future revisions of Annex 14, Volume I and related guidance materials.

— END —