



ICAO

International Civil Aviation Organization

The Seventh Meeting of the Asia/Pacific Aerodrome Design and Operations Task Force (AP-ADO/TF/7)

(Bangkok, Thailand, 17 to 20 February 2026)

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**Agenda Item 4: Planning, Design, Construction and Operation of Aerodromes**

**PROPOSAL ON PROMOTING THE NEW “VERTICAL NO-ENTRY CENTER-LINE LIGHTS” TO REDUCE RUNWAY INCURSION RISK**

(Presented by CHINA)

**SUMMARY**

This paper presents implementation of the recommendations in Annex 14 for reducing runway incursion risks in a cost-effective manner, China proposes an innovative solution: retrofitting existing unidirectional rapid-exit taxiway centreline lights into bidirectional fixtures capable of displaying a steady red light in the reverse direction. This approach makes full use of the existing infrastructure, requires no large-scale civil works, and significantly reduces retrofitting costs, construction complexity and operational impact. The solution has already been piloted at three airports and is planned for standardised promotion. The meeting is invited to consider its inclusion as a means of compliance in the relevant guidance material.

**1. INTRODUCTION**

1.1. Runway incursion is one of the core safety risks in airport ground operations. The International Civil Aviation Organization (ICAO) recommends in Annex 14 that “no-entry bar” be installed at the reverse-direction entry of a one-way exit taxiway to provide a clear warning to aircraft and vehicles against inadvertent entry, thereby reducing the risk of incursion.

1.2. For new airports, bidirectional taxiway centreline lights can be directly adopted. However, for many existing airports, especially those without pre-planned provisions, the installation of conventional no-entry bar presents significant challenges: it requires closure of critical intersections, pavement breaking, cable laying, and complex construction under live operations, resulting in high implementation difficulty, long lead times, high costs, and substantial operational impact.

1.3. To address these challenges, the New “Vertical No-Entry Center-Line Lights” has been developed. This solution aims to mitigate runway incursion risks and is applicable to both new airports and existing ones. Through an intelligent retrofit of the existing airfield lighting system, it achieves the same safety warning effect as conventional no-entry bar, while delivering lower retrofit costs, higher construction efficiency, and reduced operational impact.

**2. DISCUSSION**

Core Principle and Technical Features of the Solution

2.1. The core of this solution is the retrofitting of centreline lights along a one-way rapid exit taxiway, upgrading them to bi-directionally controllable light fixtures.

2.2. Normal Direction (Exiting the Runway): The lights display alternating yellow/green, with functionality identical to the original centreline lights, ensuring normal taxi guidance.

2.3. Reverse Direction (Entering the Runway): The lights emit a steady red light, providing a clear and continuous visual warning to any pilot or vehicle driver attempting to enter from the incorrect direction.

2.4. Technical Parameters: Key optical characteristics of the retrofitted lights, such as light intensity and beam spread, strictly adhere to the technical requirements for taxiway centreline lights and no-entry bar as specified in Annex 14 and related advisory material, ensuring consistency with pilots' visual expectations.

#### Analysis of Solution Advantages

2.5. This solution demonstrates significant advantages in terms of cost-effectiveness, ease of implementation, and reliability. By utilizing existing light bases, cables, and power supply systems for retrofitting, it avoids large-scale civil works and new cable laying, resulting in low investment costs. The retrofit work focuses primarily on lamp replacement and calibration, which can be carried out swiftly during operational intervals, minimizing impact on airport operations. The continuous red "path" it creates provides a visual warning effect equivalent to that of traditional no-entry bar. Furthermore, the entire system is based on mature individual lamp monitoring and low-current control technologies, ensuring stable and reliable operation.

#### Simulation Verification and Pilot Implementation

2.6. Simulation verification from multiple aircraft-type cockpit viewpoints has been completed, confirming the effectiveness of the red light warning. Pilot retrofit and on-site evaluation have been conducted on nine rapid-exit taxiways across three domestic airports. Based on the successful pilot results, the plan is to finalize the relevant product and engineering standards, amend domestic regulations, and establish a formal nationwide promotion program within the first quarter of 2026.

### **3. ACTION BY THE MEETING**

3.1 The meeting is invited to:

- a) note the innovative technical solution of the New “Vertical No-Entry Center-Line Lights” proposed by China for implementing relevant recommendations in Annex 14 and reducing runway incursion risks;
  - b) encourage States to follow and evaluate the pilot outcomes of this solution and assess its applicability at their own airports; and
  - c) suggest that ICAO consider including such innovative technical approaches which upgrade existing infrastructure to meet safety requirements—as successful examples in future updates to the Aerodrome Design Manual (Doc 9157) or related guidance material, thereby offering additional viable solutions for airports worldwide, especially those facing similar retrofit challenges.
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# A new type of longitudinal no-entry lights for reducing runway incursions

February 2026



# 1

## Background

- **The Risk:** Runway incursion remains a core safety risk in airport ground operations.
- **ICAO Recommendation (Annex 14):** Install "no-entry bar" at the reverse entry of one-way exit taxiways to provide clear warnings.

### Annex 14 — Aerodromes

Volume I

<i>Amendment</i>	<i>Source(s)</i>	<i>Subject(s)</i>	<i>Adopted/Approved Effective Applicable</i>
11-A (Annex 14, Volume I, 6th Edition)	Second meeting of the Aerodromes Panel (AP/2); Special Meeting of the Safety Management Panel (SMP/SM/1); Secretariat supported by the AIS to AIM Study Group (AIS-AIMSG)	Definition of hot spot; definitions of Aerodrome Mapping Data and integrity classification; definitions of instrument runway and non-instrument runway; transfer of safety management provisions to Annex 19; maximum allowable tire pressure category; condition of the movement area and related facilities; aerodrome mapping data; surface of runways and of runway turn pads; objects on runway strips; blast pad; runway end safety areas; surface of stopways and of taxiways; enhanced taxiway centre line marking; simple touchdown zone lights; alternate taxiway centre line lights; stop bars; runway guard lights; <b>no-entry bar</b> ; reformatting of Chapter 6; visual aids for denoting obstacles; aerodrome emergency planning including modular tests; rescue and fire fighting, including performance level C foam; siting of equipment and installations on operational areas; aerodrome maintenance, including runway surface friction characteristics; removal of contaminants, runway pavement overlays and visual aids, including light emitting diodes (LEDs); Appendix 1, colours for Aeronautical Ground Lights, Markings, Signs and Panels, including white colour for LED; Appendix 2, Aeronautical Ground Light characteristics, including <b>no-entry bar</b> ; Appendix 5, integrity classifications; Attachment A, guidance material on assessing the surface friction characteristics of snow-, slush-, ice- and frost-covered surface, determination of surface friction characteristics for construction and maintenance purposes, drainage characteristics of movement area and adjacent areas, runway end safety areas.	27 February 2013 15 July 2013 14 November 2013

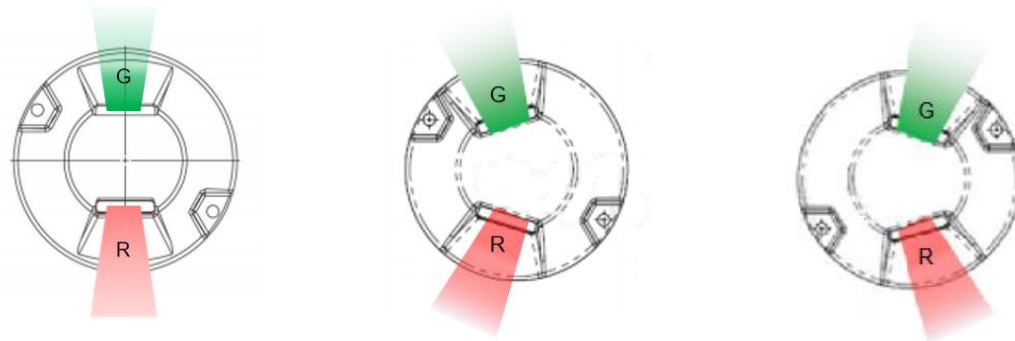
- **The Challenge for Existing Airports:**
- Retrofitting traditional no-entry bar is highly disruptive.
- Requires pavement breaking, new cable laying, and complex live-operation construction.
- Results in high costs, long downtime, and significant operational impact.



# 2

## The Innovative Solution

- Proposed Retrofit Solution:
- To ensure operational safety and reduce construction complexity, the proposed solution is to retrofit a portion of the existing unidirectional exit taxiway centerline lights into bidirectional fixtures with an added steady red light function in the reverse direction.
- Type of Light Fixture
- This fixture is a taxiway centerline light, used to display the centerline of a taxiway during nighttime or low visibility conditions. The lights are installed in-pavement (flushed with the surface) along the taxiway centerline.



# 2

## The Innovative Solution

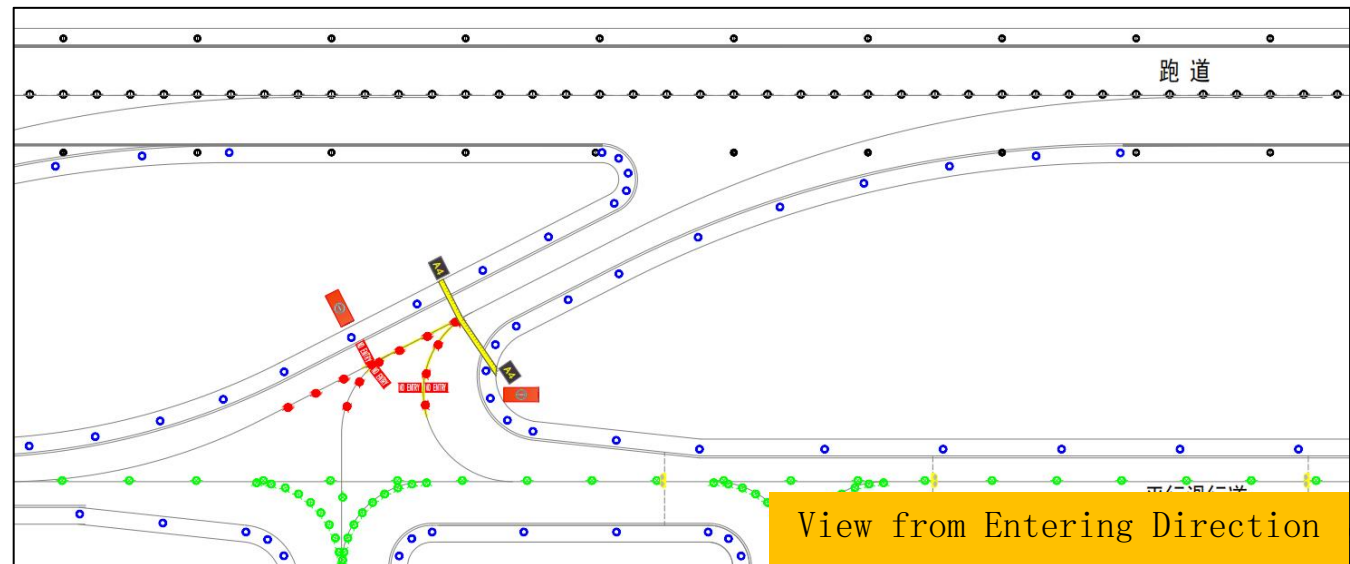
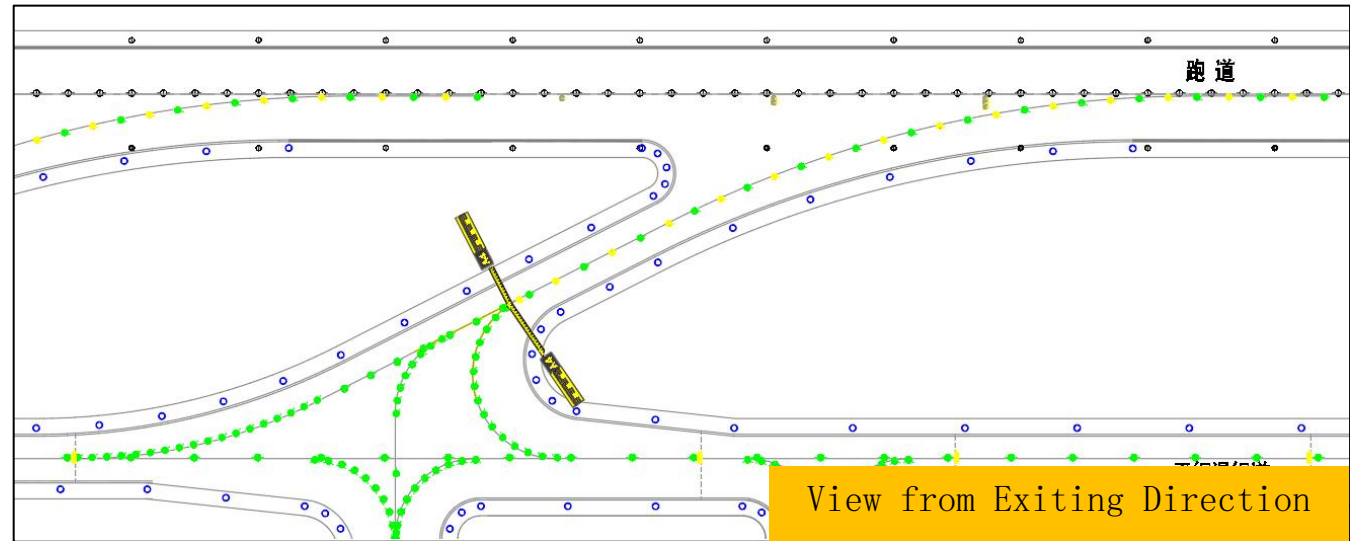
- Optical Characteristics
- The color properties of the light shall be consistent with those of a no-entry bar. Its light intensity and beam spread shall conform to the requirements for taxiway centerline lights, thereby adapting to pilots' established operational habits.

Application Scope	Light Distribution Pattern	Main Beam Angle		Color	Required Minimum Average Light Intensity (cd)
		Horizontal	Vertical		
Straight Section	飞标图E.12	±10°	1° to 8°	Green	200
				Red	200
Curved Section	飞标图E.14	±19.25° (Inward Tilt 5.75°)	1° to 10°	Green	100
				Red	100

# 3

## Scope of Application

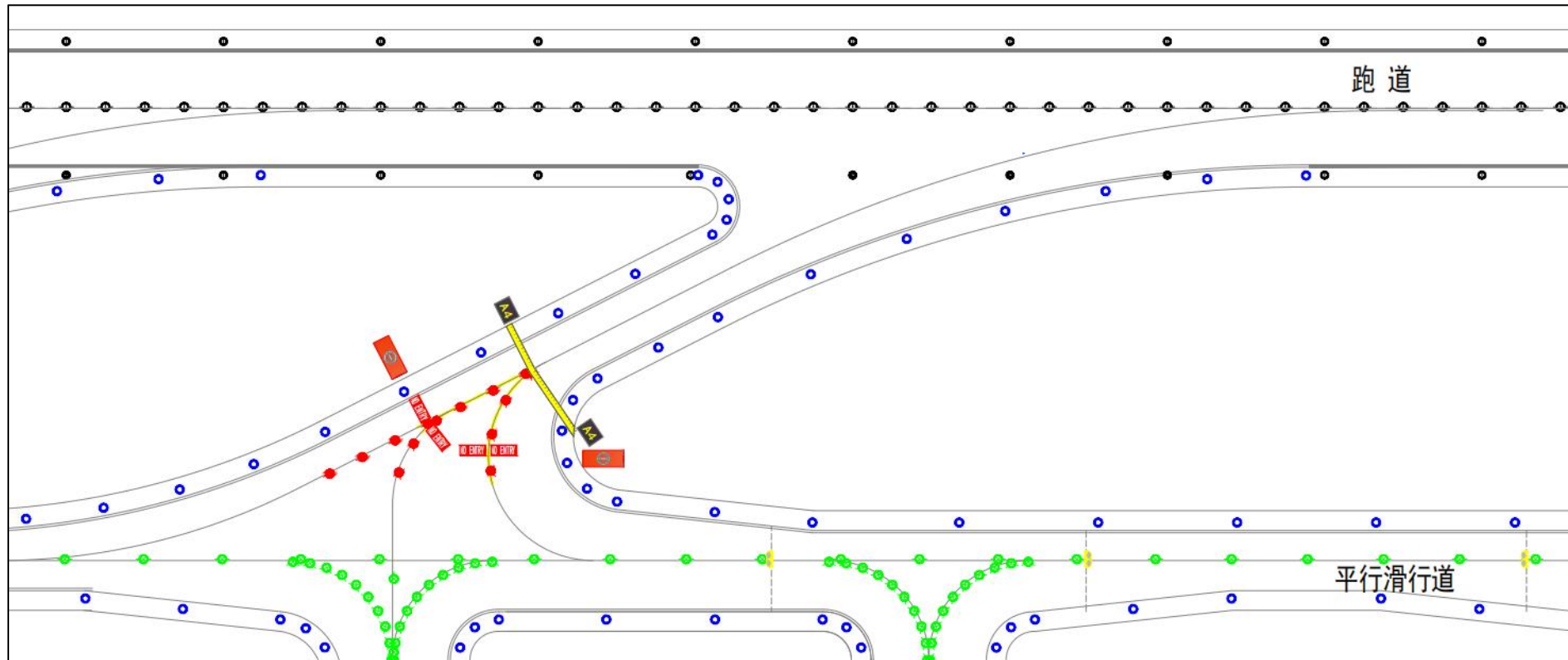
- Applicable to one-way rapid-exit taxiways.
- When observed from the direction of exiting the runway, the fixture appears identical to a standard rapid-exit taxiway centerline light.
- When observed in the reverse direction (from the direction of entering the runway), the light is steadily illuminated in red (currently, no light is present in this direction).



# 4

## Fixture Layout

- To avoid interference with normal taxiing and aircraft takeoff/landing operations, the installation scope of the fixtures is selected for the straight sections and part of the curved sections of the rapid-exit taxiway. The red fixtures in the straight section are consistent with the existing fixtures, while in the curved section, they are planned to be installed in an alternate pattern based on the existing curved-section fixtures.

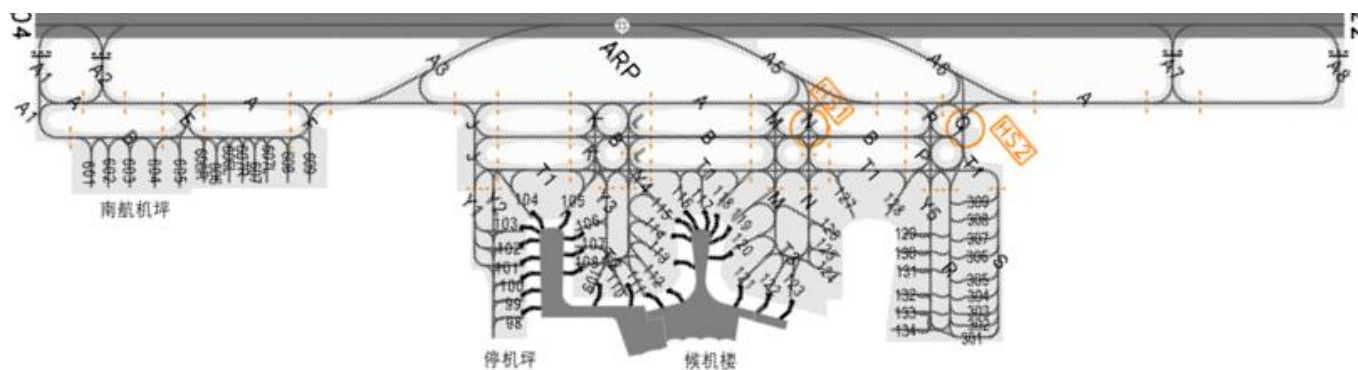


View from Entering Direction

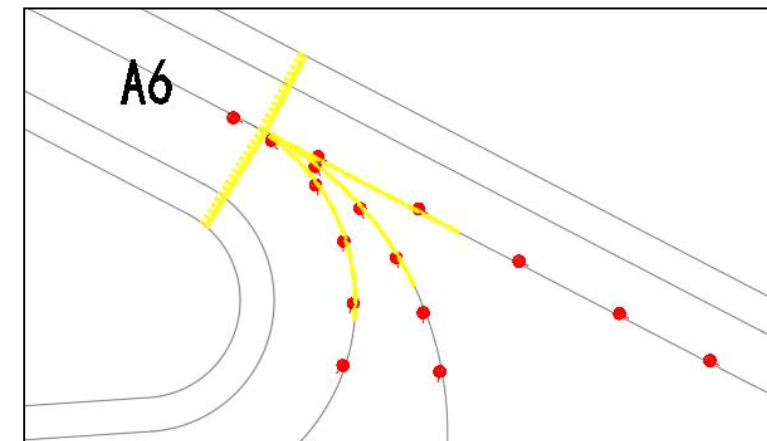
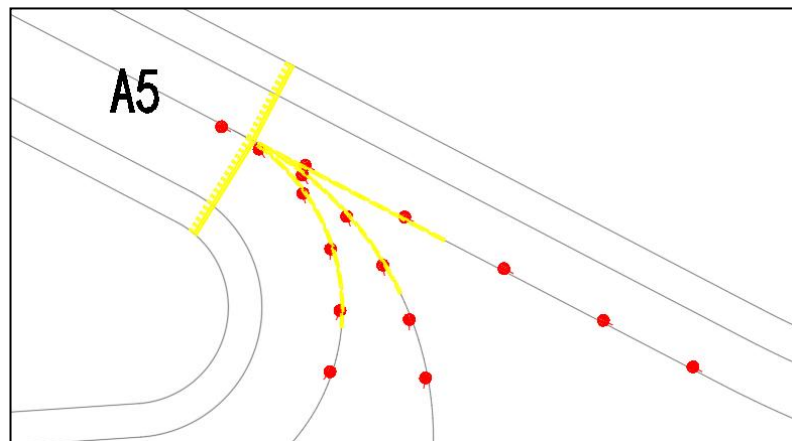
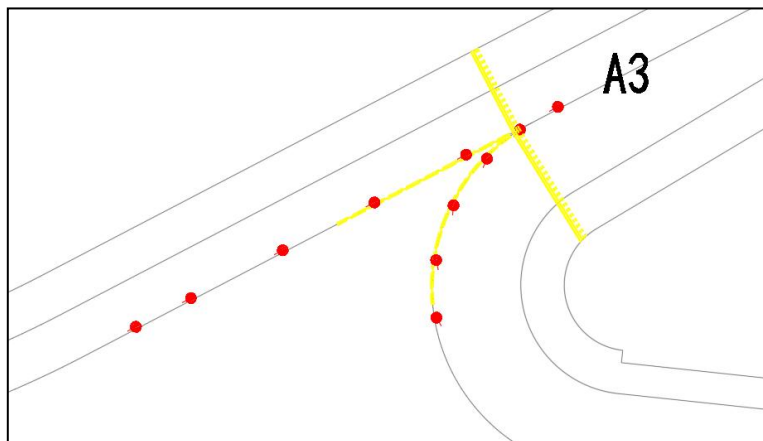
# 5

## Pilot Airport Program

Pilot projects are currently being carried out at Jieyang Chaoshan Airport, Yinchuan Hedong Airport and Nanchang Changbei Airport, with a total of 9 rapid exit taxiways selected from the above airports as on-site verification areas. This is the situation of the Chaoshan Airport pilot. Rapid exit taxiway A3, A5, A6.



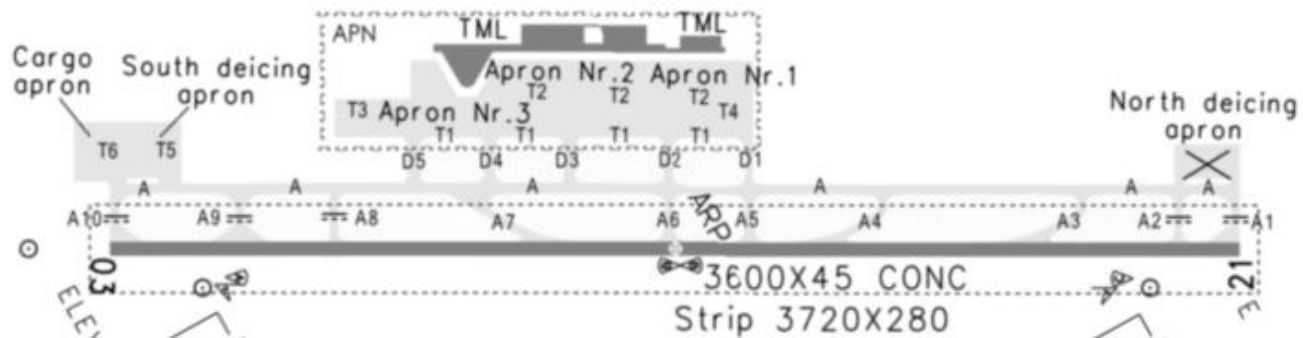
Rapid-Exit Taxiway Designation	Number of Fixtures to be Replaced
A3、A5、A6	43



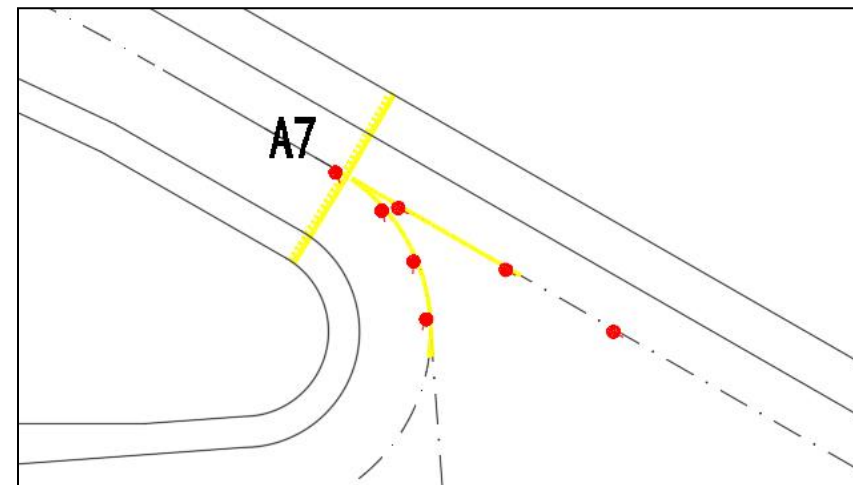
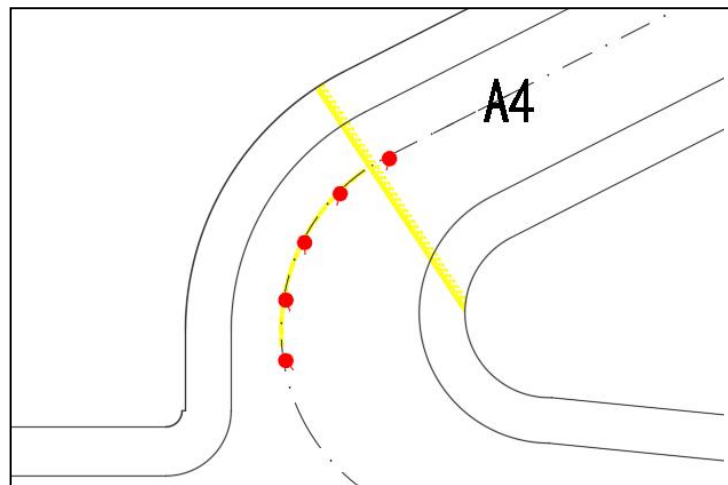
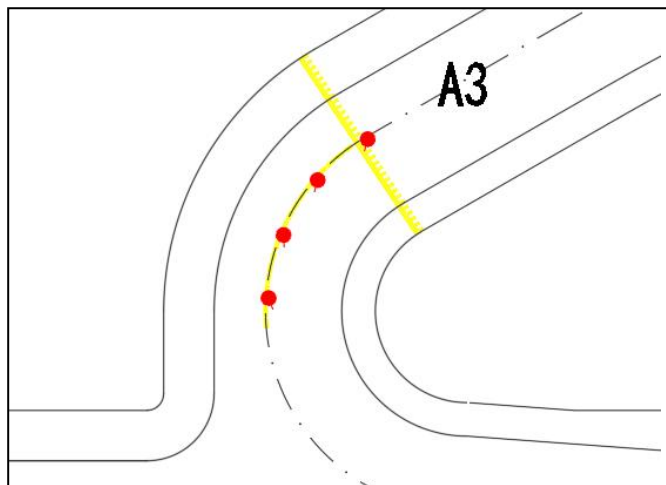
# 5

## Pilot Airport Program

- Yinchuan Hedong International Airport



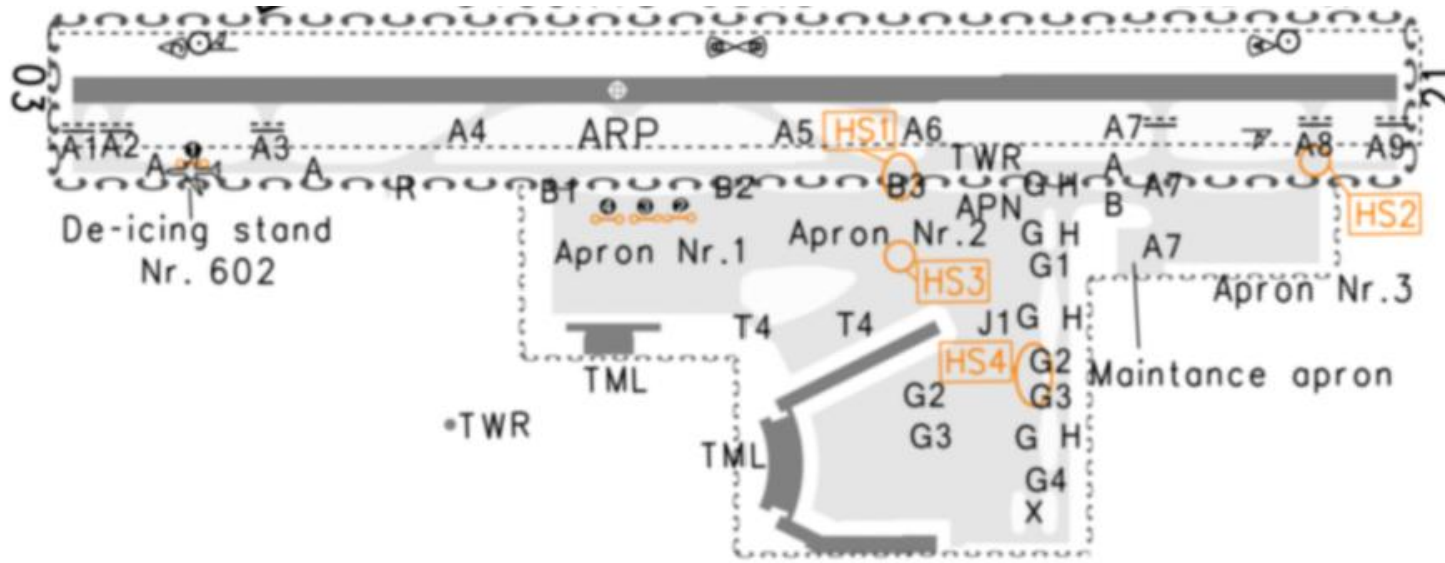
Rapid-Exit Taxiway Designation	Number of Fixtures to be Replaced
A3, A4, A7	16



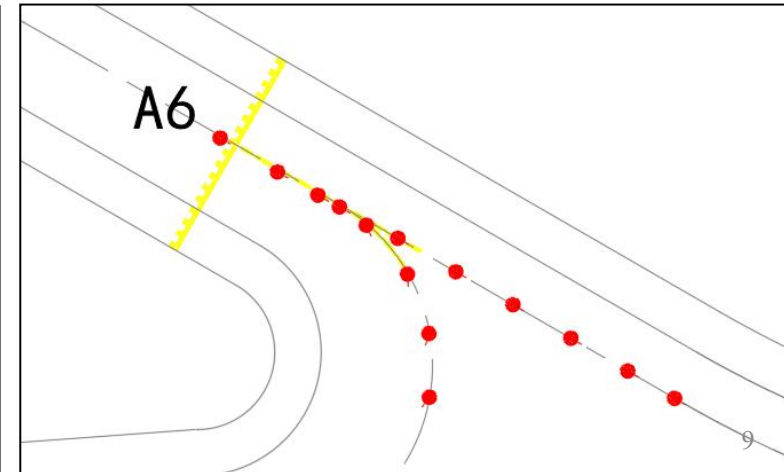
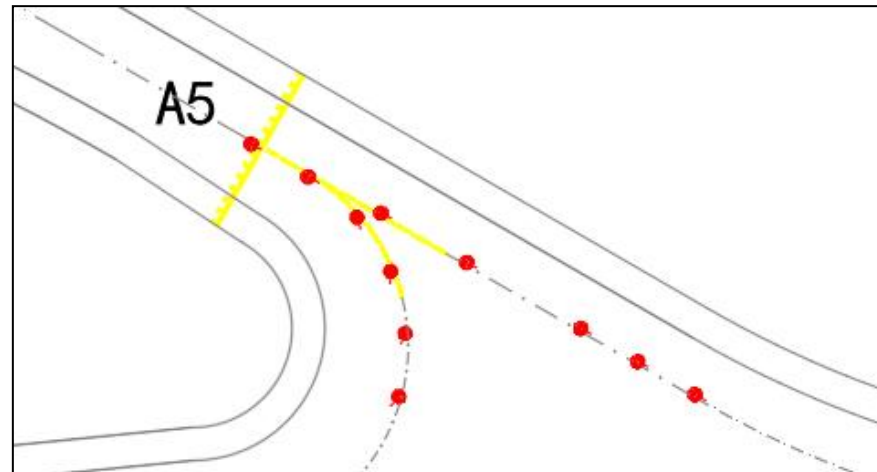
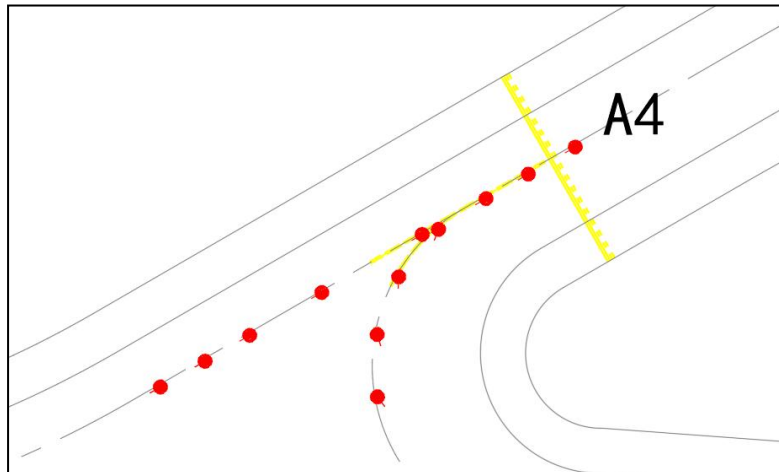
# 5

## Pilot Airport Program

- Nanchang Changbei International Airport



Rapid-Exit Taxiway Designation	Number of Fixtures to be Replaced
A4, A5, A6	37



# 5

## Pilot Airport Program



Comparison before and after the A4 taxiway renovation at Changbei Airport



The perspective of the parallel taxiway



The perspective of a slip-up

# 6

## Effect feedback and evaluation

- Pilot - Questionnaire feedback**

235 valid pilot questionnaires (Nanchang 102+ Yinchuan 90+ Jieyang 43)

Investigation Project	Number (person-times)	Proportion	Notes
1.1 Red lights are visible on the runway	119 people	About 51%	The proportion at each airport is between 41% and 65%
1.2 Impact on takeoff and landing, taxiing	0	0%	Individual "influential" feedback was found to be incorrect upon follow-up and corrected
2.1 Red light is visible on the smooth surface	200 people	<b>About 85%</b>	
2.2 Helps with anti-slip/anti-accidental slip	215 people	<b>About 91%</b>	All three airports showed significant positive ratings
2.3 Considered not to serve as a warning against misentry	5 people	About 2%	
3.1 Red lights are observed on other taxiways	78 people	About 33%	Observable but not affecting normal gliding
3.3 Considered to have an impact on normal coasting	0	0%	

Pilots believe that the pilot red light has a positive effect on preventing misentry/slip. Visibility on the runway varies but does not affect operational safety.

**Conclusion: Based on the actual verification at the three pilot airports, the pilot red light can serve as an anti-skid warning and has no adverse impact on operation in other respects.**

- Tower controllers, ground controllers, runway and lighting staff - discussion**

Interviews 98 people (Nanchang 40+ Yinchuan 20+ Jieyang)

Survey Dimensions	Summary Conclusions
Help with running recognition	It is agreed that the pilot red light helps to quickly identify one-way exit taxiways
Implications for control and command	Controllers consider it beneficial to identify fast slide positions during command without increasing command complexity
Impact on operational support	Feedback from operation and maintenance, track and lighting personnel: No impact on existing operation and maintenance processes
Impact on maintenance work	The system runs smoothly without adding to the burden of lighting maintenance and daily operations
Operational safety feedback	<b>No operational safety incidents or adverse effects were received due to the red center line light</b>

Ground personnel believe that the pilot red light has a positive effect on preventing misentry/slip

# 6

## Action Requested

The Meeting is invited to:

- a) Note this innovative technical solution proposed by China.
- b) Encourage States to follow its pilot results and assess applicability for their own airports.
- c) Suggest that ICAO consider including this approach as a case study in future updates to Doc 9157 or related guidance, providing a viable retrofit option for airports worldwide.



*THANKS!*