60th CONFERENCE OF DIRECTORS GENERAL OF CIVIL AVIATION ASIA AND PACIFIC REGIONS

Sendai, Japan
28 July - 1 August 2025

AGENDA ITEM 3: AVIATION SAFETY

THE APPLICATION OF FOD DETECTION EQUIPMENT ON AIRPORT PAVEMENT

(Presented by the People's Republic of China)

INFORMATION PAPER

SUMMARY

As global air traffic grows, manual Foreign Object Debris (FOD) inspections on runways are becoming inadequate for modern airport safety needs. Countries are thus adopting FOD detection technologies, which have proven to enhance runway safety and inspection quality. China has analyzed the associated risks and operational challenges, developed targeted solutions and established standards and certification systems for FOD detection devices. This ensures their reliability and efficiency while mitigating deployment risks.

THE APPLICATION OF FOD DETECTION EQUIPMENT ON AIRPORT PAVEMENT

1. INTRODUCTION

1.1 Currently, the predominant FOD detection systems worldwide primarily utilize millimeter-wave radar or visible light technology. These systems are typically deployed in either edge-light or tower configurations. In China, some smaller airports are exploring mobile solutions, where FOD detection devices are mounted on vehicles to facilitate pavement inspections through vehicle-based mobility.

1.2 The edge-light type equipment faces several challenges. Firstly, its relatively heavy head and large wind-receiving surface area make it susceptible to damage from strong winds. While enhancing its anti-blow-off performance can mitigate this issue, such improvements often compromise the equipment's flexibility and impact resistance. Additionally, since the edge-light type equipment must be installed on the runway shoulder, its proximity to the runway introduces significant safety risks. Furthermore, there are limitations to its installation height, which not only increases investment costs but also complicates future renovations.

1.3 The primary challenges associated with tower-mounted equipment include restrictions on installation location and height imposed by regulations of clear zone and runway strips protection. Additionally, due to the relatively greater installation distance, its operational effectiveness may be compromised during nighttime conditions.

1.4 For mobile devices, including vehicle-mounted systems, clear and established technical standards for reference remain lacking.

2. DISCUSSION

2.1 In the past, an incident was reported at a Chinese airport wherein a runway edge-light FOD detection system was dislodged by an aircraft's wake turbulence and fell onto the runway strip, presenting potential safety hazards. Following the conduct of wind tunnel tests and other technical simulation analyses, China has concluded that the installation location, height, breakaway properties, and tethering mechanisms of such edge-light detection systems require the establishment of precise and stringent technical standards for regulation.

2.2 With regard to wind resistance and breakaway performance, based on wind tunnel tests assessing the maximum windward surface exposed to wake turbulence, China has set requirements for equipment that it should be able to withstand at least 1762 N·m of bending moment without damage, and it should break when the bending moment reaches 2847 N·m.

2.3 Regarding equipment tethering, China mandates that side light detection equipment be fitted with a tethering rope connection to prevent dislodgement caused by wake turbulence. Additionally, specific tethering performance parameters have been clearly defined.

2.4 In terms of detection performance, China proposes that under specified weather conditions, the detection equipment should be capable of identifying at least 95% of standard FOD targets within a defined area of 30m x 30m.

2.5 For mobile devices, China establishes clear technical requirements, including key performance indicators such as detection capability, operation mode, and response time.

2.6 Regarding false alarms preventing, China suggests that the number of false alarms per day should not exceed one through a 90-day test.

2.7 To ensure that the equipment strictly adheres to the technical indicators outlined by China Civil Aviation, in 2024, China issued the Technical Standards for FOD Detection Equipment and incorporate FOD detection equipment into the regulatory framework for specialized equipment. A

rigorous standard compliance inspection system was enforced, and any equipment failing such inspections were prohibited from being deployed within airport premises.

2.8 As of the latest update, China has successfully completed qualification testing for three FOD detection devices, including two edge-light type systems and one tower-mounted system, all of which have been installed and commissioned at airports in Ezhou, Daxing, and Hangzhou. Furthermore, China has required that airports installed these devices must conduct necessary rectifications to align with established standards and suspend the use of those that do not meet the standards.

3. ACTION BY THE CONFERENCE

3.1 The Conference is invited to note the information contained in this Paper.

3.2 Advocate states to give serious attention to the potential safety risks posed by FOD detection equipment and recommend that states establish a certification and accreditation system for FOD detection equipment and implement stringent oversight of such equipment.

3.3 Encourage states to share their experiences in the standards, management and application of FOD detection equipment, and jointly promote the safe application of FOD detection equipment at airports in various countries to enhance the operational safety of airports.

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