International Civil Aviation Organization

Ninth Meeting of the Aerodromes Operations and Planning Sub-Group (AOP/SG/9)

Bangkok, Thailand, 30 June to 4 July 2025

Agenda Item 8: Airport Innovation and Technology

THE APPLICATION OF FOD DETECTION EQUIPMENT ON AIRPORT PAVEMENT

(Presented by China)

SUMMARY

As global air traffic continues to grow, the traditional manual inspection method for detecting Foreign Object Debris (FOD) on airport runways is increasingly unable to satisfy the evolving safety requirements of modern airports. Consequently, countries worldwide are actively exploring and implementing FOD detection technologies. Empirical evidence demonstrates that FOD detection equipment significantly enhances the quality of runway inspections and improves overall runway safety. In response to this trend, China has conducted a comprehensive analysis of the safety risks and operational challenges associated with such equipment. Based on the findings, the administration has developed targeted solutions and established standards and certification systems for FOD detection devices, which is mitigating potential safety risks during equipment deployment, to ensure the reliability and efficiency of these systems in practical applications.

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 MEETING

3.1 The meeting is invited to note the information contained in this paper.

—END—