International Civil Aviation Organization

Fifth Meeting of the Asia/Pacific Air Traffic Management Automation System Task Force (APAC ATMAS TF/5)

Chengdu, China, 4 – 7 June 2024

Agenda Item 4:   ATM Automation System Implementation Experience by States

4.4   Integration with External Systems

INTEGRATION OF AIRPORT EMERGENCY GRID MAP WITH TOWER ATMAS

（Present by China）

SUMMARY

This paper primarily introduces the role of the Airport Emergency Grid Map, proposes an application method integrated with the Tower ATMAS, and describes and explains issues encountered during its application.

1.   INTRODUCTION

1.1   In the field of aviation safety, the Airport Emergency Grid Map serves as an efficient information management tool. Utilizing a grid-based design concept, it divides the airport into distinct zones and displays information such as resource distribution and emergency response force deployment in a graphical format. By precisely delineating airport areas, the grid map enables rapid identification of the specific location of an incident and facilitates coordinated rescue efforts with departments like firefighting.

1.2   The grid map divides the rescue area into multiple small grids, each with a unique number, providing a clear and precise positional reference system for air traffic control and airport rescue departments. In emergency situations, these numbers can quickly and accurately determine the specific location of the accident, ensuring that rescue resources can arrive at the scene promptly and precisely.

1.3   As shown in Figure 1, if an aircraft accident occurs off the runway, the "D06" grid number can indicate the precise accident location to air traffic control and airport rescue departments.

Figure 1. Schematic Diagram of the Airport Emergency Grid Map

2.   DISCUSSION

Traditional Application Methods

2.1   There are two traditional ways of utilizing the Airport Emergency Grid Map: the paper-based method and the overlaid electronic layer method.

2.2   Presented in a paper format at the airport's emergency management center or control tower, this method allows relevant personnel to quickly access location information of the incident site and the distribution of surrounding resources.
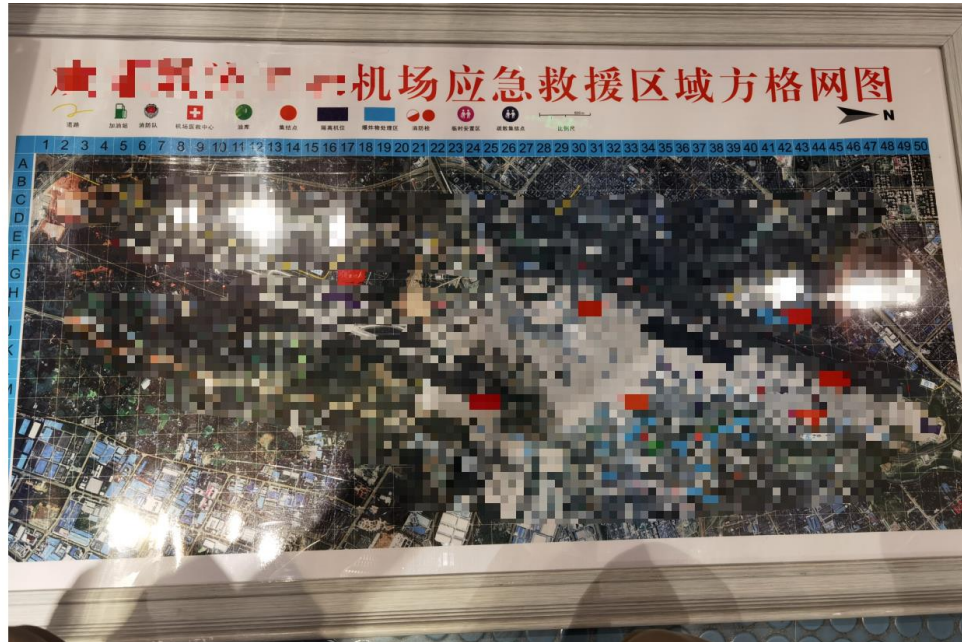

Figure 2: Paper-based airport emergency grid map

2.3   The airport emergency grid map is designed as a specific set of electronic layers, overlaid on the display interface of the Tower ATMAS, similar to a digitized version of the paper map.
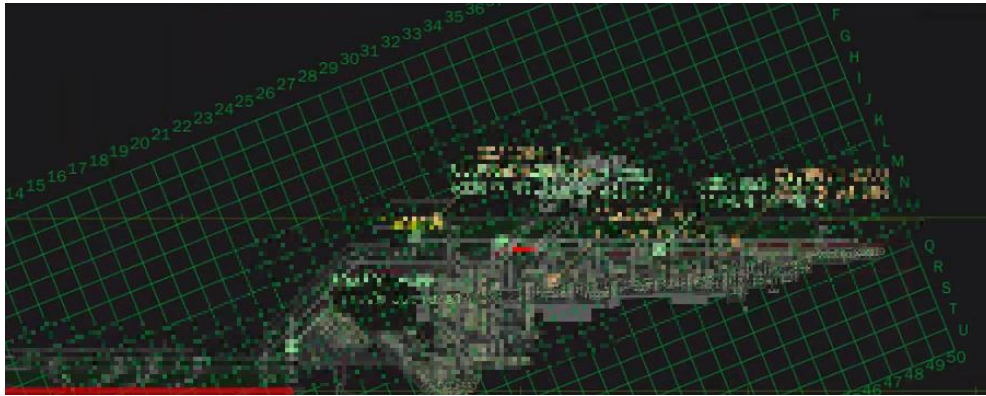
Figure 3. Overlay layer showing emergency grid map

<u>Integration with Tower ATM Automation System</u>

2.4   To rapidly respond to abnormal aircraft operations, especially in complex environments such as low visibility, ensuring controllers can accurately determine whether an aircraft has overrun or deviated from the runway, and automatically locate its specific grid number, the Tower ATMAS is deeply integrated with the emergency rescue grid map, providing the following intelligent assistance functions.

2.5   The Tower ATMAS precisely maps an airport area grid composed of hundreds of equally-sized rectangular zones, complete with accurate attribute data. Under normal circumstances, this layer is not actively displayed to controllers to maintain a clean interface.
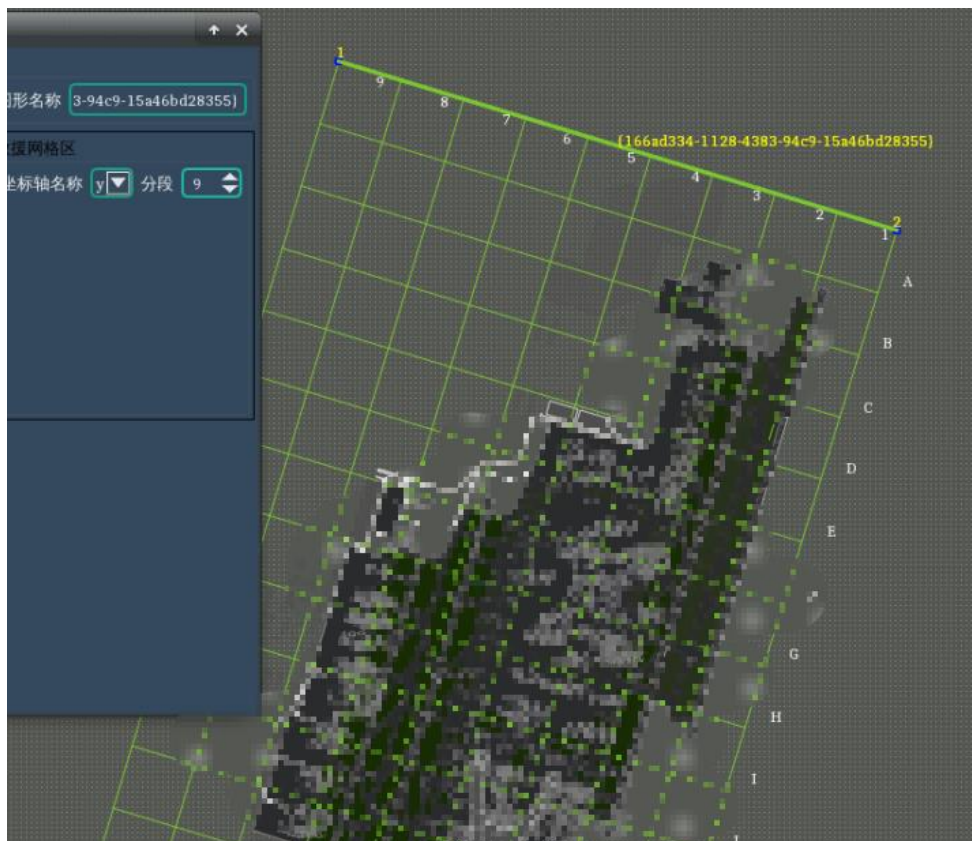

Figure 4. System grid map

2.6   When an aircraft enters the designated area, the system performs real-time correlation calculations between the aircraft's location and the grid map, quickly and accurately determining the

grid number the aircraft is in. Under normal aircraft operation conditions, these grid number information is retained in the background only and is not directly displayed on the interface.

2.7   During the takeoff or landing process of an aircraft, if the aircraft deviates from the runway, the system will automatically trigger the emergency rescue grid functionality.

Figure 5: Schematic of an aircraft deviation from a runway

2.8   To ensure the accuracy of calculations, a specific detection range is set, and tracks not associated with flight plans or not assigned to takeoff and landing runways are excluded. During takeoff, if the system detects that the aircraft has started rolling but has not yet lifted off and has deviated from the runway beyond a preset threshold, it will automatically trigger the display. For landing aircraft, if they deviate from the runway after touchdown and are not within the taxiway area, the display will also be triggered automatically.

2.9   Upon triggering the display, a grid map and alarm sound will pop up at all tower positions, ensuring that controllers can quickly access relevant information. For the targeted aircraft, the target tag will clearly display the "FIRE" character and the number of the emergency rescue grid map, with border flashing alerts to ensure the information's visibility and prominence.

2.10   Even if the target is no longer captured by radar, the system will continue to display its last known position.

Figure 6. Schematic of the user interface effect after triggering

2.11   Simultaneously, the flight's tower electronic strip will also display the grid number and provide a flashing alert in sync, providing controllers with comprehensive information support.

2.12   To accommodate special use scenarios, controllers are provided with a manual trigger display function. Controllers can manually operate on aircraft targets as needed, and after a second confirmation, the system will display the same effects as an automatic display, offering controllers greater operational flexibility and emergency response capabilities.

2.13   In June 2023, this feature was successfully implemented for the first time in the Tower ATMAS of domestic air traffic control units. Currently, it is being promoted and used in other domestic air traffic control units and has received widespread praise from controllers.

2.14   Since its implementation, this functionality has generally performed stably but has occasionally experienced false alarms. Through analysis, the primary cause of these false alarms is attributed to the sudden change in signal source location. Therefore, the effectiveness and reliability of this feature hinge on the stability and accuracy of the airport surveillance signal source. In the event of a false alarm, the manual alarm cancellation function can be used to quickly eliminate the display of the grid map and restore the warning status of the track target to normal.

Conclusion

2.15   The deep integration of the Airport Emergency Grid Map with the Tower ATMAS utilizes automated technology and algorithms to achieve real-time monitoring and precise analysis of the airport's operational status. In case of emergencies, the system can quickly locate the site of the incident, automatically calculate the relevant numbering information, and present the emergency rescue grid map in a pop-up format on the tower controller's interface, providing intuitive and comprehensive information support for rescue decision-making.

2.16   The application of this innovative method greatly improves rescue efficiency, reduces decision-making time, and provides strong security for the safe operation of airports. As technology continues to advance, the use of the Airport Emergency Grid Map and other functions within the Tower

ATMAS can be further expanded and optimized, leading to more intelligent and automated rescue processes.

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 matter as appropriate.

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