



ICAO

*International Civil Aviation Organization***Tenth Meeting of the Surveillance Implementation
Coordination Group (SURICG/10)***Bangkok, Thailand, 21 - 23 April 2025*

Agenda Item 8: Update on surveillance activities and explore potential cooperation opportunity

**ANALYSIS OF ABNORMAL TRACKS CAUSED BY
ELECTROMAGNETIC ENVIRONMENT**

(Presented by China)

SUMMARY

This paper presents target missing, erratic track and reflection target caused by trees and lightning arrestors, and puts forward solutions and recommendations for electromagnetic environment protection and lightning arrestors construction of radar station.

1. INTRODUCTION

1.1 With the application of tower ATM automation system and the implementation of flight procedures such as independent parallel instrument approach and visual approach, higher requirements are put forward for radar track quality under radar control. The problems of target missing, erratic track and reflection target caused by electromagnetic environment are becoming more and more intolerable.

1.2 In order to protect the electromagnetic environment of radar stations, CAAC has formulated and issued the "Specification for aeronautical communication, navigation and surveillance station siting criteria- Part 2: Surveillance" (MH/T 4003.2-2014), which limits the vertical and horizontal shielding Angle of the surrounding obstacles.

1.3 Although there are regulatory restrictions, the following conditions still affect the operation of radar:

1) The illegal construction of ultra-high buildings occlusion reduces the radar coverage, and results in the problem of reflection.

2) Growing trees occlusion, result in target missing, erratic track (especially for unmanned stations)

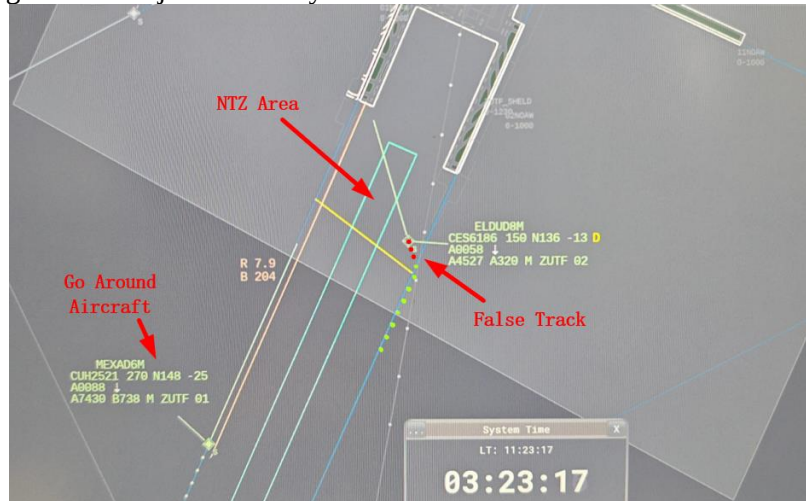
3) Lightning arrestors occlusion, result in erratic track and reflection targets.

1.4 In traditional cognition, non-metallic shelters such as trees have little effect on radar; As a necessary facility for radar lightning protection, Fiber Reinforce Plastics lightning arrestors can effectively avoid the impact on radar. However, that is not the case, and the effects cannot be ignored.

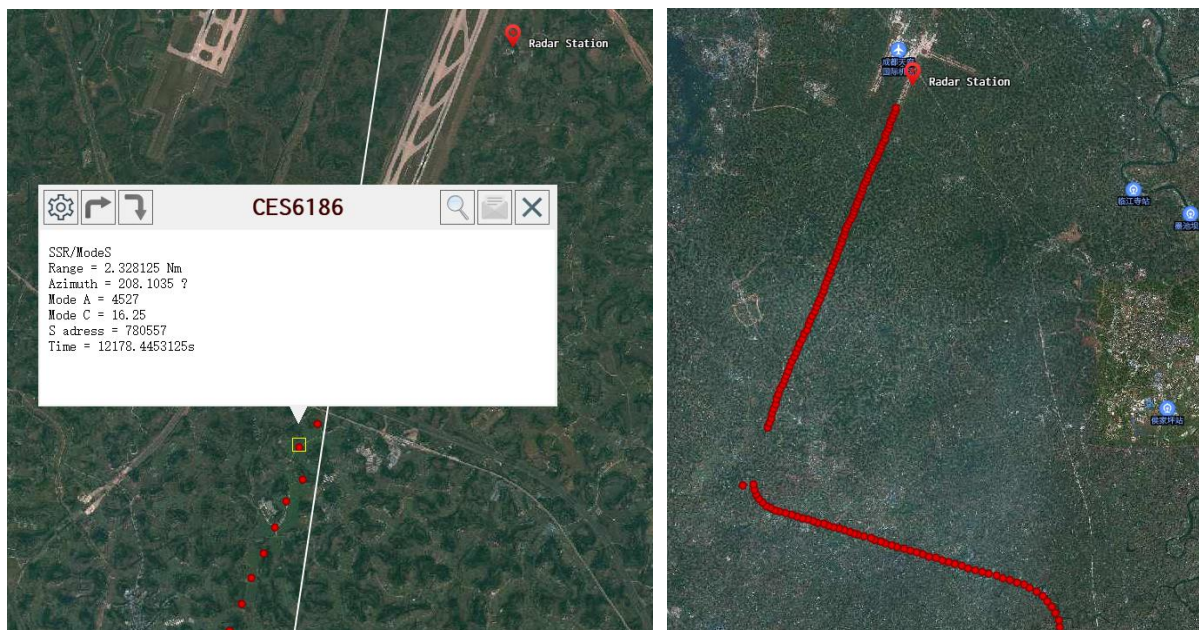
1.5 Based on the analysis of radar data, this paper introduces the abnormal tracks caused by trees and lightning arrestors, and puts forward relevant solutions and recommendations.

2. DISCUSSION

2.1 In February 2024, during the independent parallel instrument approach, a radar generated erratic tracks due to the occlusion of trees, which mismatched the turning mechanism of the automated system, and generated a false target turn to the adjacent runway, resulted in the go-around of subsequent flight on the adjacent runway.

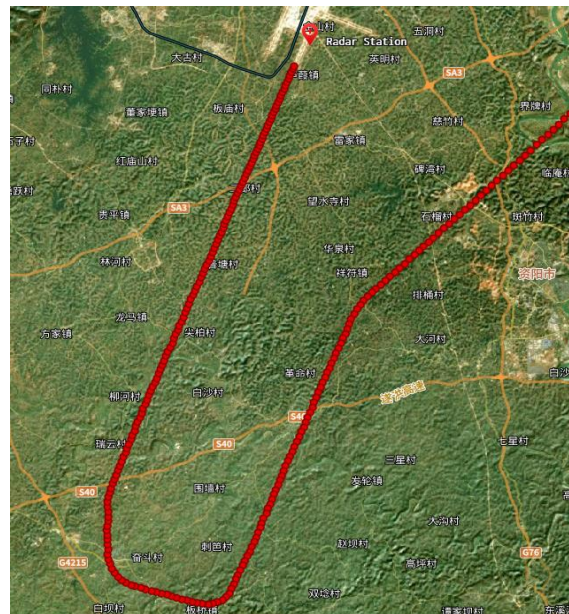
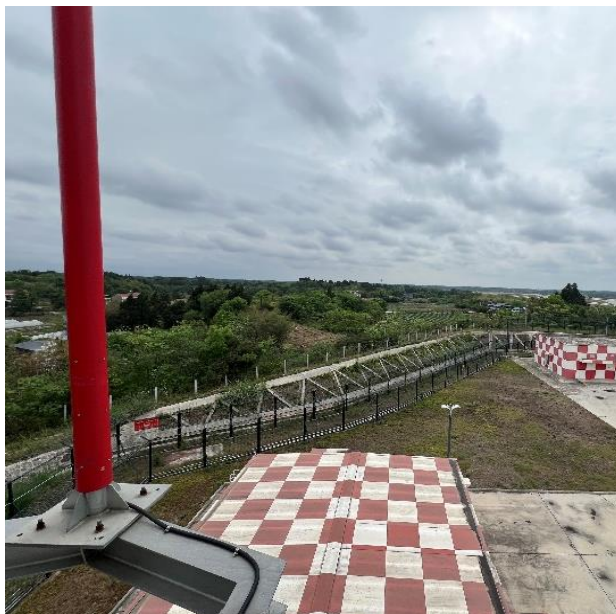


2.2 It was caused by the occlusion of trees. Further analysis found that targets missed in the direction of trees occlusion. The quality of track was greatly improved after clearing the trees.



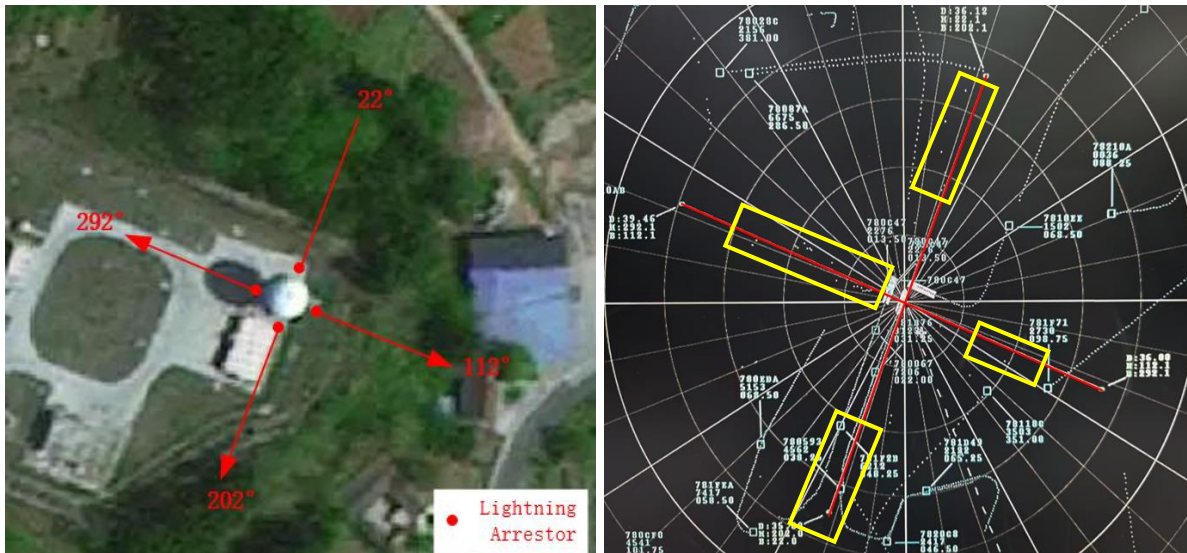


Target missing and erratic track caused by Trees occlusion



The quality of track was greatly improved after clearing the trees

2.3 In the direction of lightning arrestor, the track is erratic, and some reflection plots can be observed. Once the tracks are generated, it will result in reflection targets.



2.4 There is a lack of research and guidance on the impact of lightning arrestors for ATC radar. According to data analysis, the impact of lightning arrestors on radar is larger than the actual obstructing angle, even up to $\pm 5^\circ$.

SOLUTIONS AND RECOMMENDATIONS

2.5 In order to timely detect and deal with the illegal construction or trees occlusion, China has carried out electromagnetic environmental protection monitoring based on AI technology, by setting up cameras and laser rangefinders on the radar tower, automatically identify building construction, calculate the obstructing angle of trees, and provide early warning information.

2.6 It is recommended that the installation of lightning arrestors should be carefully decided during the design period to reduce the influence:

- 1) The installation angle of the lightning arrestors for terminal radar should consider the direction of the runway to avoid obscuring the upwind or final of the runway;
- 2) The installation angle of the lightning arrestors for route radar should avoid along with the route as much as possible;
- 3) The installation position of the lightning arrestors should be as far away from the radar antenna as possible while meeting the requirements of lightning protection.

2.7 It is recommended to research the impact of lightning arrestors material, thickness, etc. on radar based on surveillance radar frequency and operating characteristics, develop relevant standards and specifications to guide the installation of lightning arrestors.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) note the information contained in this paper;
- b) discuss the proposed solutions and recommendations; and
- c) discuss any relevant matter as appropriate
