



ICAO

*International Civil Aviation Organization*

**SIXTH MEETING OF MODE S AND DOWNLINKED  
AIRCRAFT PARAMETERS WORKING GROUP  
(MODE S AND DAPS WG/6)**

Bangkok, Thailand, 28 – 30 March 2023

Agenda Item 6: Interrogator Code (IC) planning and coordination

**RESEARCH ON THE MIXED OPERATION OF MODE S RADAR CODES II AND SI**

(Presented by China)

**SUMMARY**

This paper shares the information about the progress of Mode S radar from II codes operation to II and SI codes mixed operation in China.

**1. INTRODUCTION**

1.1 At present, there are 78 Mode S secondary surveillance radars in service in China and have been allocated II codes from 1-13. In this case, the II code resources in the eastern coastal area have been exhausted. Therefore, interrogation strategies of all-call lockout override protocol, roll-call non-lockout or intermittent lockout commands have been set to some radars with overlapping coverage.

1.2 There will be build more than 40 Mode S radars from 2023 to 2030, in China. At that time, only II codes operation will completely fail to satisfy demand. It is an urgent task for transform the II codes operation into the mixed II codes and SI codes operation in China.

1.3 China plans to change a part of radars to SI codes, and set interrogator strategy of roll-call non-lockout or intermittent lockout commands for the Non-SI transponder to ensure that every aircraft can be detected and the detection performance of radars will not be affected ,if there are other radars allocation the same IC fields with these SI codes radars having overlapping coverage.

1.4 In order to promote the II codes and SI codes mixed operation effectively, the following jobs will be carried out in China:

- a) Centralized allocation of IC codes in China;
- b) Research and test of II codes and SI codes mixed operation;
- c) Prepare and issue relevant management documents to comprehensively promote the implementation of II codes and SI codes mixed operation.

**2. DISCUSSION**

Centralized allocation of IC codes in China

**Agenda Item 6**

28-30/03/23

2.1 In order to avoid conflict of II codes between radars with overlapping coverage, the Mode S Interrogator Code Allocation System has been deployed to guide allocation of IC codes in China. The system is able to allocate IC codes and analysis conflict of IC codes. Based on the system, the centralized allocation of IC codes for in service and plan Mode S radar's has been completed. The allocation rules are as follows:

- a) II code 14 and matched SI codes are reserved for testing, experiment and mobile emergency equipment. II code 15 and matched SI codes are reserved for military;
- b) Reallocation of II codes 1-13 or matched SI codes to the radars which had same II codes and overlapping coverage before;
- c) Pre-allocation of non-conflicting II codes or SI codes for construction and plan radars;
- d) Ensure that there are no radars with overlapping coverage using the same II codes or SI codes in China and neighboring countries.

2.2 The II codes of neighboring countries' radars have been considered in this centralized allocation of IC codes in China. However, due to the incomplete information, there may still have conflicts between China and neighboring countries in the later application. At that time, China will follow the relevant provisions of ICAO to contact these countries in a timely and resolve the conflict as soon as possible.

Research and test of II codes and SI codes mixed operation

2.3 At present, China has selected individual radars to carry out two tests:

2.4 The first test: The test radar is allocated of SI code without IC field conflict to other radars (allocation of II code). The purpose is to test the operation effect of the radar allocation of SI code.

2.5 The second test: The two test radars with overlapping coverage are allocated of II code and matching SI code. Set the SI code radar to all-call lockout override and non-lockout commands for the Non-SI transponder, No special settings for the II code radar. The purpose is to test whether the SI code radar can normally capture and track the Non SI transponder in the overlapping coverage.

2.6 The results of the two tests are in line with expectations. In the next step, more factory's radars will be selected for further testing in different air routes.

Prepare and issue relevant management document

2.7 After all tests, China will prepare and issue management document, including the centralized allocation table and the management program.

2.8 All Mode S radars in China will modify the IC codes according to the document, and the whole modification process needs overall control. In the process, it must be considered whether it will affect other radars within the overlapping coverage. If necessary, two or more radars may be modified at the same time.

**3. ACTION BY THE MEETING**

- a) note the information contained in this paper; and
- b) discuss any relevant matter as appropriate.

-----