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 3: Sharing of State's implementation on Mode S and related issues in APAC region

THE PROGRESSION OF OPTIMIZATION AND IMPROVEMENT OF ADS-B APPLICATION IN CHINA

(Presented by China)

SUMMARY

This IP presents the follow-up implementation progress of 'the Study on Optimization and Improvement of ADS-B Application' submitted by China on SURICG/7. This IP mainly introduces the nationwide optimization and improvement scheme, effects after adjustment, and the plans for the next stage.

1. INTRODUCTION

1.1 China submitted IP11 at SURICG/7, mainly introducing the study on optimization and improvement of ADS-B application organized by ATMB CAAC. In view of the problems found in the nationwide operation of ADS-B, the guidance materials have been prepared for the optimization and improvement of ADS-B ground stations, data processing centers and ATM automation systems. Subsequently, ATMB CAAC carried out the verification of the study results at 2 branch bureaus, proving the rationality of the results. Refer to:
https://www.icao.int/APAC/Meetings/2022%20SURICG%207/IP11_CHN%20AI.7%20-%20Study%20on%20optimization%20and%20improvement%20of%20ADS-B%20application%20in%20China.pdf

1.2 In the first half of 2022, ATMB CAAC formulated a national implementation scheme for optimization and adjustment of ADS-B application, which is used to guide and standardize the whole-chain-adjustment including ADS-B ground stations, data processing centers and ATM automation systems.

2. DISCUSSION

National ADS-B Optimization and Adjustment Implementation Scheme

2.1 Equipment to be adjusted: 332 ground stations, 36 level-3 data processing stations and 8 level-2 data processing centres constructed by National ADS-B Project; 38 sets of ATM automation systems in 22 operation sites. ATMB CAAC stipulates that all relevant equipment to be constructed in the future shall be implemented according to these guidance materials.

2.2 Contents to be adjusted: This adjustment mainly adopts the method of upgrading software version to standardize the data processing algorithms of various devices, as follows:

- Ground stations: China cleared and unified the ADS-B data output rule and data-age maintain-period of ground stations made by domestic manufacturers, including: mandatory items, conditional items, and some non-output items. The rule not only followed ICAO SARPs, relevant international standards, and guidance materials formulated by ATMB CAAC, but also met the ADS-B operation requirements in China. For details, please refer to SURICG/7 IP11 Appendix A.

- Data processing centres: Adjust the pre-processing rules for some abnormal ADS-B data, including MOPS missing, 24-bit address duplication, flight track hopping, Z-swing, and low quality indicator, etc.; Adjust data filtering rules for different operation scenarios based on data quality indicator.

- ATM automation systems: Standardize the ADS-B data pre-processing rules in ATM automation system, including key data items tracking such as Location, Speed, Heading, Call sign, 24-bit address, etc., and adjusting processing/discarding rules for the abnormal conditions such as targets missing and hopping according to the thresholds; The system functions are enhanced to process additional 15 data items, such as Selected Altitude, Quality Indicators, Airborne Ground Vector, and ACAS Resolution Advisory Report, etc.

2.3 Adjustment sequence: The scheme recommended that it should adjust the ADS-B ground stations firstly, then the data processing centres, and finally the ATM automation systems. For the areas located in weak coverage of radars, the adjustment is recommended channel by channel. For the areas located in good coverage, it is recommended to complete in one operation. During the adjustment period, the radars will provide surveillance service.

2.4 Deadline of adjustment: The adjustment of all ADS-B ground stations and data processing centres was completed at Jan 2023. The adjustment of ATM automation systems will be completed together with the renovation projects.

Effects after adjustment

2.5 The adjustment achieved some goals as follow:

- The ADS-B data output rule and data-age maintain-period of 332 ground stations made by domestic manufacturers have been unified,

- The abnormal ADS-B data caused by GPS interference, or performance defects of airborne equipment were filtered successfully by data processing centers; this adjustment recategorize the ATC operation scenarios, pre-processed the ADS-B data that did not meet the specific scenario, reduced the processing load of ATC automation systems, and improved the quality of ADS-B data application.

- After adjustment, the system track fused by ADS-B and radar was smooth and stable, and there was almost no large-scale track hopping or splitting; ADS-B flight identification information has been used effectively, greatly improved the accuracy of couple function, and optimized the safety-net alarm function.

2.6 During the adjustment, the following updates have been done:

- Software updates to solve problems in early ADS-B operation, such as: the earlier version OS didn't fit with the new version application software, alarms and some functions in monitoring interface were imperfect, software process exited abnormally, individual process occupied too much CPU resources, etc. China has combined the early problems with the contents of optimization and adjustment to form a new version of software to solve them together.

- Parameter adaptation to meet the site operation requirements, such as: the earlier interface cannot display individual data items of the new version ADS-B, the threshold of INDRA integrated tower system wasn't suitable so that normal ADS-B data being filtered, etc. China adapted some parameters according to the site operation requirements.

Plans for the next stage

2.7 ATMB CAAC carried out data quality analysis on some of the adjusted ADS-B data at the beginning of 2023. It is found that the package rules of ground stations for a few ADS-B data items can still be further optimized. The further optimized ADS-B data will not only meet the operation requirements of ADS-B, but also further improve the processing efficiency of the ADS-B ground stations.

3. ACTION BY THE MEETING

a) note the information contained in this paper; and

b) discuss any relevant matter as appropriate.

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