International Civil Aviation Organization

THE THIRD MEETING OF MODE S DOWNLINKED AIRCRAFT PARAMETERS WORKING GROUP (MODE S DAPs WG/3)

Web-conference, 12 – 15 May 2020

Agenda Item 3: Sharing of State's implementation on Mode S

MODE S DAPS IMPLEMENTATION IN CHINA

(Presented by China)

SUMMARY

This information paper shares Mode S DAPs implementation in China. It includes the guideline of implementation plan and technical specifications, the Mode S radars deployment and researching, the Mode S DAPs application in ATM Automation Systems.

1. INTRODUCTION

1.1 Following the Global Air Navigation Plan (GANP) Aviation Safety Block Upgrade (ASBU) framework, and the Asia/Pacific Seamless ATM Plan implementation, China has been accelerating new technology application in ATM operation.

1.2 During Mode S DAPs WG/1, the potential benefits of DAPs (downlink aircraft parameters) were clearly illustrated and presented by ANSPs and manufactures. It was believed that DAPs-Based surveillance will benefit ATM operations.

1.3 Hereinafter to introduce mode S DAPs application and relevant work in China.

2. DISCUSSION

Implementation plan and relevant technical specifications.

2.1 In order to guideline ADS-B and Mode S radar data application in China, Air Traffic Management Bureau of CAAC published an implementation plan and the related technical specification in 2017. Which gave the implementation schedules and the requirements of ATM automation system.

-Refer to SURICG/3 – IP14" the Implementation Plan for ADS-B and Mode S Radar Data in China".

2.2 The Implementation Plan for ADS-B and Mode S Radar Data in China was amended, and the new ADS-B and Mode S DAPs application technical and functional requirements of ATM automation system was published in 2018 based on the actual situation.

2.3 In view of the Implementation Plan for ADS-B and Mode S Radar Data in China, as well as the Revised Terms of Reference of Mode S DAPs Working Group by SURICG/4, China Mode S DAPs Working Team worked out the Mode S DAPs Application Research Plan in 2019, to guide the relative activities in China.

Mode S radars deployment and related activities.

2.4 In the mainland of China, there are 24 primary radars, 127 secondary radars, which provide service for civil aviation at the end of 2019. These radars supply double layer coverage for the main air routes and air lines of eastern part, and provide continuous coverage for the main air routes and air lines of western part.

2.5 Considering that mode S DAPs application will benefit ATM operation, more and more mode S radars have been deployed since the first mode S radar put into operation in 2008. There are 74 mode S radars had been commissioned till the end of 2019.

2.6 Before 2018, only the Elementary Surveillance (ELS) function of mode S radars were put into application, because of the limited capability of ATM automation systems. Since 2018, more and more ATM automation systems are capable of processing Enhancement Surveillance (EHS) messages from mode S radars.

2.7 Since 2019, in order to know more about mode S radars, and to facilitate the usage of mode S DAPs, China Mode S DAPs Working Team started to take test to current commissioned mode S radars in the field of Interrogation Code supporting capabilities, radar BDS extracting capabilities, radar data output capabilities, etc.

Mode S DAPs application in ATM Automation Systems.

2.8 At the end of 2019, there are 87 sets of main and backup ATM automation system in the mainland of China, with 9 different suppliers. To enhance safety and operational efficiency in accordance with the ICAO GANP and ASBU framework, all ATM automation systems are continuously upgraded to support new technology application, including mode S DAPs. Hereinafter gives the introduction of mode S DAPs application in Beijing, Shanghai and Guangzhou ATM automation systems.

2.9 Beijing, Shanghai and Guangzhou airport are the top three busiest airports in China, and the annual traffic flow of these three areas is about 70% of all civil flights in the mainland of China. Since 2004, along with the operation of Beijing, Shanghai and Guangzhou Area Control Center, the three areas keep using the same brand of ATM automation system, which main system is the product of THALES, backup system is the product of LES. Both main and backup ATM automation systems keep the function consistent. Following paragraphs cover the major aspects of mode S DAPs application in Beijing, Shanghai and Guangzhou ATM automation systems.

2.10 Coupling Function Improvement. After ADS-B and mode S DAPs message are used in ATM automation system, the surveillance track can couple with flight plan when the Mode A SSR code of the surveillance track matches the SSR codes of the flight plan, when the target identification of the surveillance track matches the Callsign of the flight, and when the target address of the surveillance track matches the ICAO 24-bit code of the flight plan. The coupling priority of SSR code, Callsign and 24-bit code can be off-line defined.

2.11 SSR Code Consistency Check. When the mode A of the coupled surveillance track does not match the SSR codes of the flight plan, a SSR code mismatch warning shall be presented to the responsible controller with displaying the flight Callsign in yellow color. This improvement of function reminds the responsible controller to pay attention to this coupled track, it will be de-coupled when the surveillance track is out of the coverage of mode S radar. Please refer to the detail in **Appendix A**.

2.12 24-bit Code Consistency Check. When the 24-bit code of the coupled surveillance track does not match the 24-bit code of the FDR, an ICAO 24-bit code mismatch warning shall be presented to the responsible controller with displaying the flight Callsign in purple color. Please refer to the detail in **Appendix A.**

2.13 Target Identification Consistency Check. When the target identification of the coupled surveillance track does not match the Callsign of the FDR, a target identification mismatch warning shall be presented to the responsible controller with displaying the flight Callsign in purple color. Please refer to the detail in **Appendix B**.

2.14 The above are the ATM automation system's function related to Elementary Surveillance (ELS) data of mode S radars. Following introduce the latest ATM automation system's function of processing Enhancement Surveillance (EHS) messages from mode S radars.

2.15 Predicted Level Mismatch (PLM) function. The PLM function monitors the Final State Selected (FSS) Altitude of a surveillance track and compares it with the Cleared Flight Level (CFL). FSS altitude is received from the surveillance track of DAPs BDS4,0. A PLM warning shall be presented to the responsible controller as an indication in the coupled surveillance track label and in the associated flight strip when the FSS mismatches the CFL. PLM function is very useful, it can help controller getting a better awareness of the intention of the airplanes, discovering the crew's wrong operation in right time and taking actions timely to avoid the potential conflict. Please refer to the detail in **Appendix B**.

2.16 Downlink Aircraft Parameters Window. The ATM automation system can extract DAPs message from ADS-B, Mode S and WAM sensors, and displays in Human Machine Interface for controller after processing. Please refer to the detail in **Appendix C**.

2.17 Multi-sensor Tracking Function. The Multi-sensor tracking makes use of DAPs kinematics parameters for the consistency checking, in the Altitude filter, in the IMM filter, etc.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper; and

b) b) discuss any relevant matter as appropriate.

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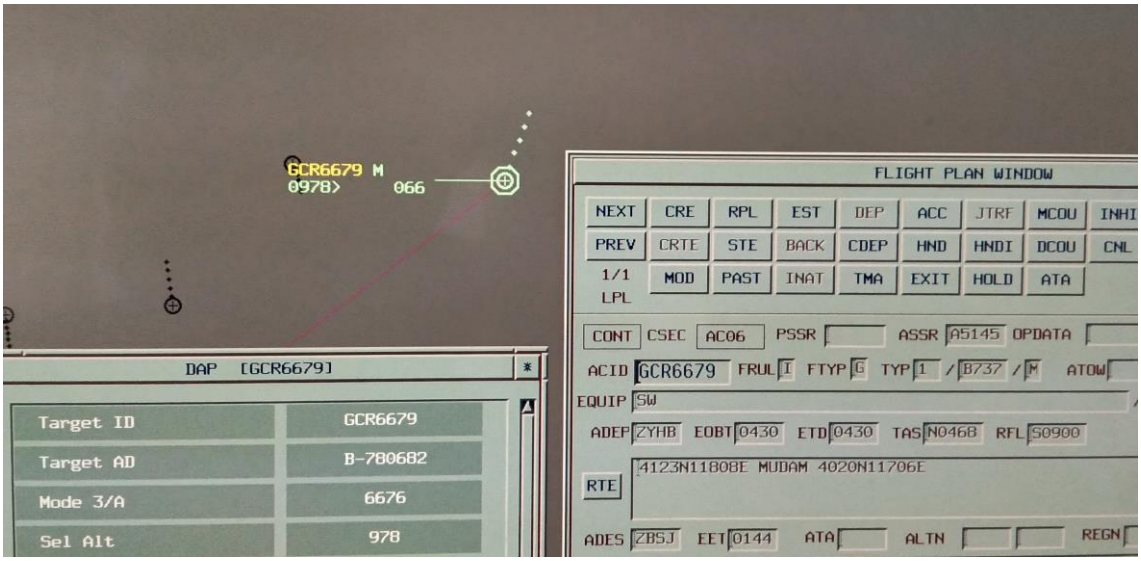
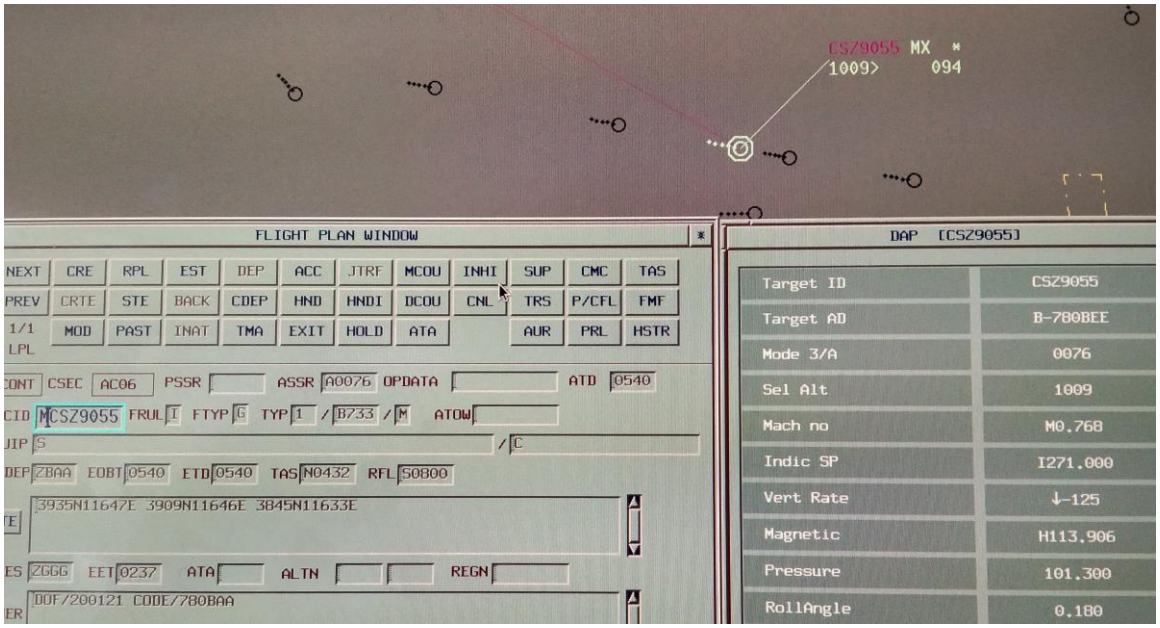
Appendix A

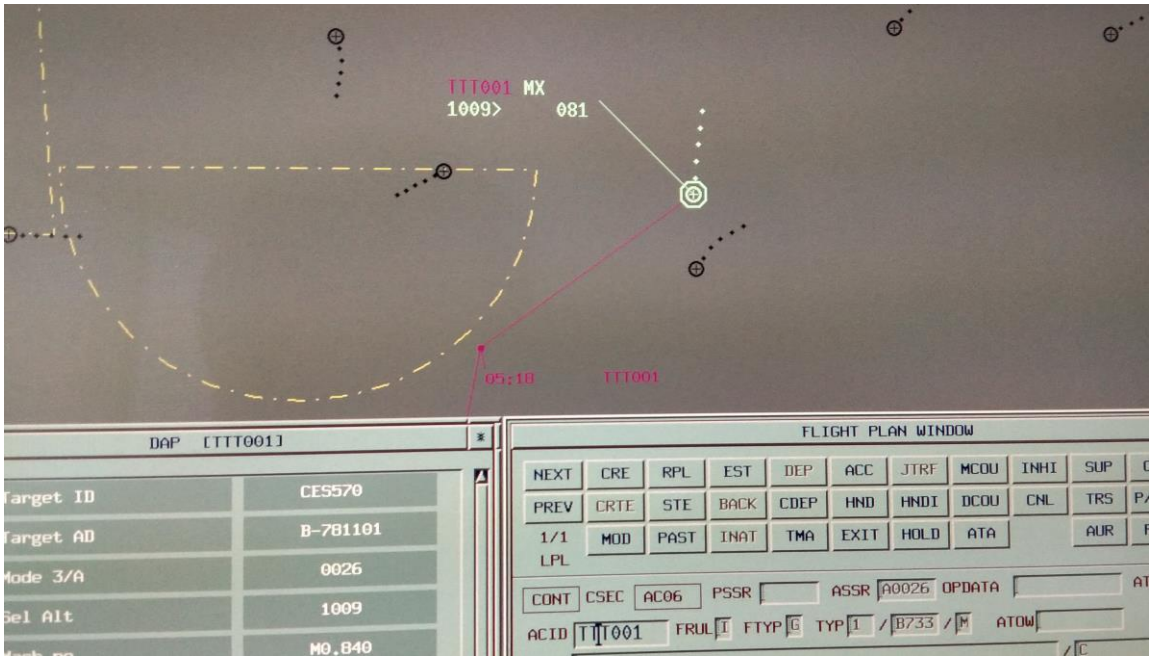


SSR Code Inconsistency

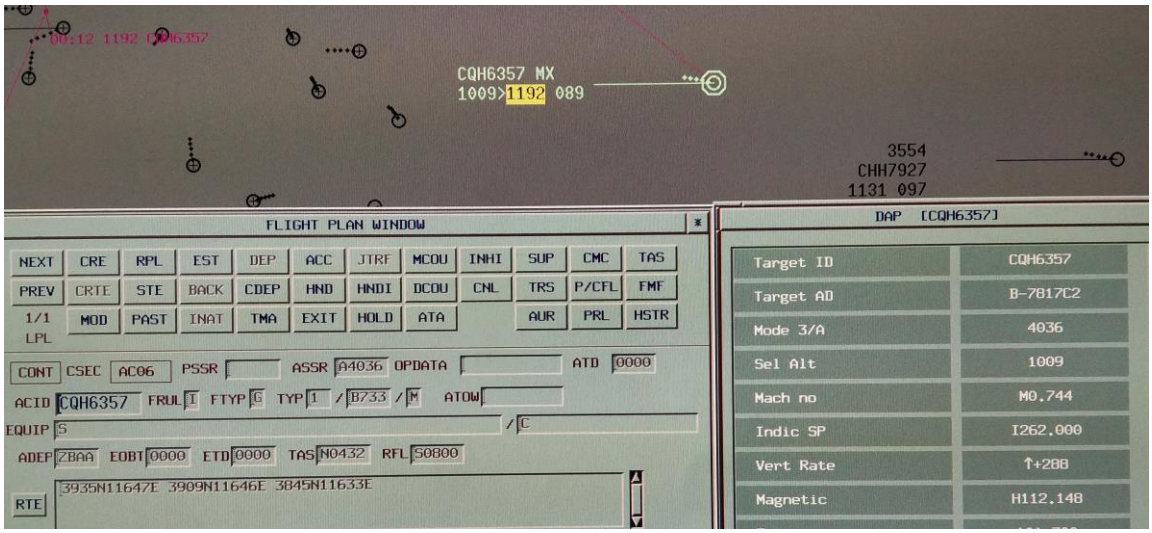


24-bit Code Inconsistency

Appendix B

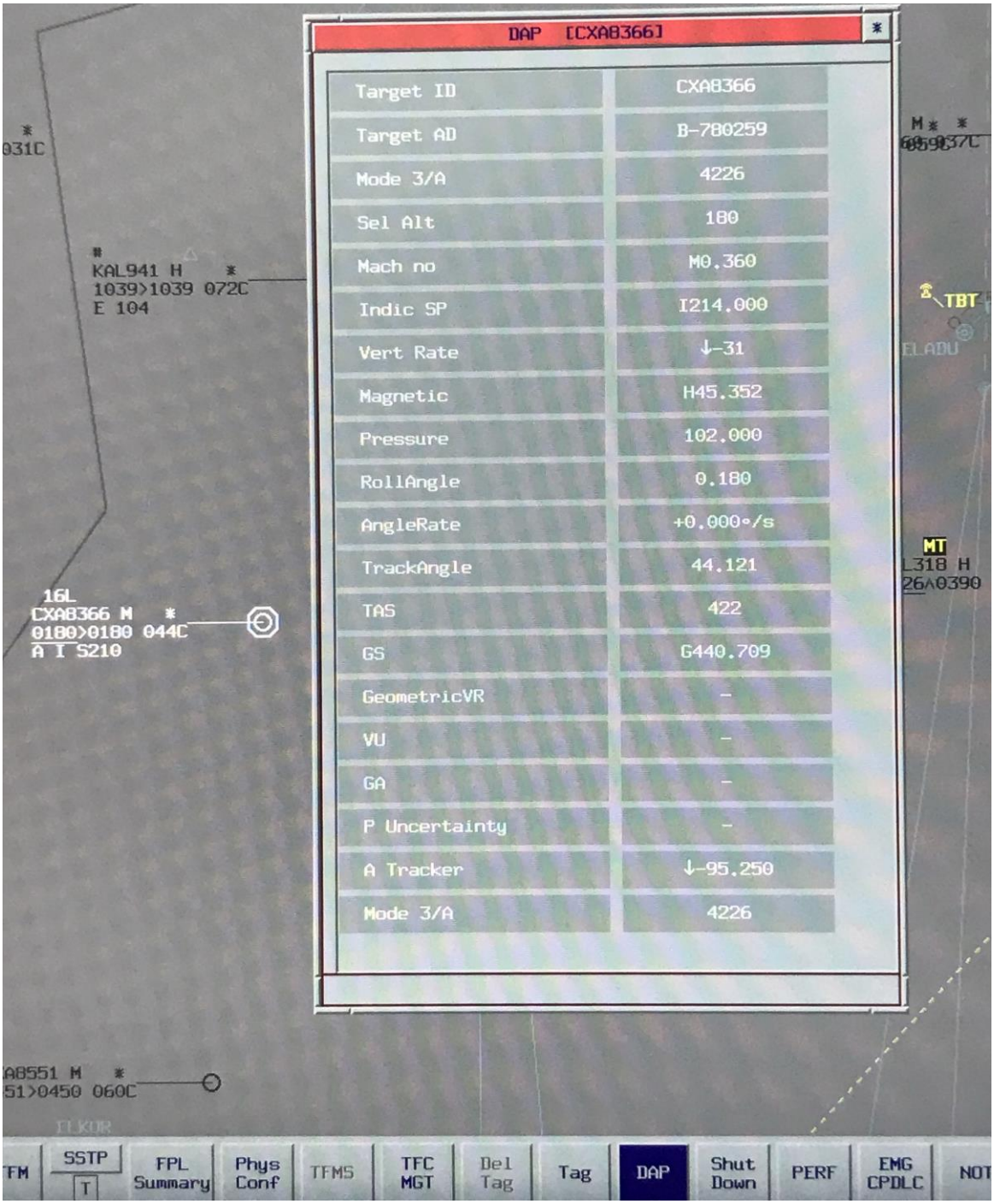


Target Identification Inconsistency



Predicted Level Mismatch

Appendix C



Downlink Aircraft Parameters Window