International Civil Aviation Organization
THE 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 10: Future programme and any other business

THE ACHIEVEMENTS OF MODE S RADAR AND DAPS WG

(Presented by China and Singapore)

SUMMARY

This paper summarizes the achievements of the Mode S Radar and DAPs WG and the benefit it brought about for the members.

1. HISTORY

1.1 Recalls that in 2017, the SURICG/2 considered a proposal presented by ICAO to establish a working group to progress the subject and task relating to DAPS as specified in the TOR of SURICG. The Mode S Downlinked Aircraft Parameters Working Group (Mode S DAPS WG) was hence formed under **Decision SURICG/2-4: Mode S DAPS Working Group.**

1.2 The first working group meeting (Mode S DAPS WG/1) was hosted by Chengdu in March 2018. The attendees were from China, Hong Kong China, Japan, Malaysia, New Zealand, Singapore, Thailand, and USA. The meeting was co-chaired by Mr Luo Yi from China and Mr Ho Wee Sin from Singapore. Madam Xie Yu Lan from China subsequently replaced Mr Luo Yi as co-chair from Mode S DAPS WG/2 onwards.

1.3 In 2022, the Mode S DAPS WG was renamed as Mode S and DAPs Working Group under the suggestion of the SURICG. This is to better reflect the work done by the working group.

1.4 This paper summarized the major achievements of the Mode S Radars and DAPs WG thus far.

2. ACHIEVEMENTS OF MODE S AND DAPS WORKING GROUP

2.1 Guidance material

2.1.1 The working group achieved its main purpose, which is to produce the Mode S DAPs Implementation and Operations Guidance Document. The guidance document was first published in 2019 with improvements every year. The contents include:

a) Description of Mode S DAPs data.

b) Implementation principles and phases.
c) System integrity and monitoring.
d) Regulations and Procedures.
e) Training and competency.
f) Specific examples on mode S DAPs application

2.2 Mode S Road Map for Asia Pacific

2.2.1 The working group came out with a roadmap on Mode S related topics. The road map is summarized as follows:

a) Mode S mandate: States are encouraged to mandate Enhanced Mode S forward fit.
b) Use of SI code: States can use SI code provided their radar can support the II/SI mode operations
c) Radar clustering: no roadmap is proposed for radar clustering, but States with the capability may adopt this technique.
d) Use of conspicuity code: to support the use of 24-bit aircraft address for coupling in future, States are encouraged to ensure that the new ATM system supports the conspicuity feature. Mode A code of 1000 is reserved as the conspicuity code.
e) Weather reporting capability: As there are no service bulletins available to upgrade aircraft with the weather reporting capability, there is no roadmap to mandate weather reporting capability.
f) Datalink map: Europe has a datalink map which limits the data that each radar can extract. Due to the limited benefits and difficulty in enforcement, there are no plans to implement such datalink map in Asia Pacific.
g) Monitoring of 1030/1090 MHz usage: States with capability are encouraged to perform 1030/1090MHz monitoring.

2.3 Research and Development Activities

2.3.1 States shared actively on their research work.

2.3.2 For example, Japan shared their research work on the use of Mode S DAPs data to help in weather forecast.

2.3.3 China also shared its experiences, and some research work as follows:

a) the use of Mode S DAPs data to enhance safety nets, such as using selected altitude and barometric pressure setting for consistency checks and using velocity parameters for maneuvering flight trajectory prediction,
b) the use of ADS-B data to identify the GPS interference,
c) the analysis of SFL mismatch alarm phenomenon in ATM automation system caused by BDS SWAP problem, the abnormal problem caused by the incorrect Air-ground State of an Aircraft, and the incorrect RA Code On Mode S Radar, and give suggestion on control measures，
d) the research of Mode S radar roll-call scheduling management algorithm, the DAPs data recognition method, and Mode S Interrogator Codes allocation.

2.4 Planning of II/SI Assignment

2.4.1 The working group identified the lack of clarity in the ICAO's SARPS and guidance material for II codes for MLAT systems and subsequently coordinated with the Surveillance Panel. The Surveillance

Panel is now amending the Doc 9924 stating to the effect that MLAT can be assigned any II codes without coordination.

2.4.2 The working group also identified the lack of guidance on the assignment of Interrogator Codes in a mixed environment (i.e. presence of non-SI capable among the SI capable aircraft and mixture of radars using II and SI codes). The working group is working with EUROCONTROL to help improve the guidance documents.

2.4.3 The working group discussed the feasibility of reserving II codes for special use and concluded that such reservation may be done in future when more radars migrate to SI codes. The working group also offer a platform to discuss experiences by States, e.g. Republic of Korea, that performed trial use of SI codes.

2.5 Encouraging Enhanced Mode S forward fit

2.5.1 The working group assessed that it is beneficial for new aircraft to be equipped with enhanced Mode S. It was also found that there is no cost difference whether the aircraft is delivered with elementary mode S or enhanced Mode S. Airlines are therefore encouraged to request for enhanced mode S when ordering aircraft.

2.6 Sharing of experience in radar

2.6.1 Some States have shared their knowledge and experience on radars. For example, China shared information on how the various onboard equipment contribute to the DAPs data. Republic of Korea shared information on the empty Resolution Advisory message.

2.7 Streamlining of SAC code monitoring and publication of SAC in EUROCONTROL website

2.7.1 ICAO used to track the System Area Code (SAC) and System Identifier Code (SIC) of surveillance systems. SAC are used to identify the state that own the surveillance system and SIC is used to identify the individual surveillance system. Considering the frequent change in the SIC, the working group recommended ICAO only need to track the SAC and not the SIC.

2.7.2 EUROCONTROL used to publish the SAC codes used by States in various parts of the world except the Asia Pacific region. The working group coordinated with EUROCONTROL to publish the SAC for the Asia Pacific States on the EUROCONTROL website.

2.8 Conservation of 1090MHz Bandwidth

2.8.1 The 1030/1090MHz spectrum is used by several equipment including ADS-B, radars, ACAS. It is important that the spectrum be used responsibly. The Surveillance Panel has developed several solutions to help reduce frequency congestion (e.g. regular measurement of 1030/1090MHz usage, understanding the limitation of uncertified transponders for small UAS, removal of long P4 pulse etc.). The working group helped to share regular updates on the works done by the Surveillance Panel.

2.8.2 The working group also put together some guidance materials on the measurement of 1030/1090MHz frequency occupancy.

2.8.3 China shared the methods and results of the 1090 MHz occupancy experiment verification at their busy airports.

2.9 System Monitoring and Problems Report

2.9.1 The working Group continued to track the performance of the Mode S radar system and DAPs data quality, identified existing problems, and provided recommended actions.

2.9.2 Some States have shared their own DAPs data quality analysis reports. In Additional, China shared the progress and optimization achievement of the ADS-B ground-based network.

3. FUTURE FOR MODE S AND DAPS WG

3.1 The working group has achieved the objective that it is set up for. To conserve resources, the meeting may consider closing this working group. The outstanding action items may be transferred to the SUR ICG.

4. ACTION BY THE MEETING

4.1 The meeting is invited to:

a) note the information contained in this paper;

b) deliberate whether to close, or to continue with, the working group.

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