



International Civil Aviation Organization

**FIFTEENTH MEETING OF THE ADS-B STUDY AND IMPLEMENTATION
TASK FORCE (ADS-B SITF/15)**

Bangkok, Thailand, 18 - 20 April 2016

Agenda Item 9: Any other business

THE EVALUATION ACTIVITIES OF DAPS IN JAPAN

(Presented by Japan)

SUMMARY

This paper presents about DAPs evaluation plan and results in Japan to support the installation of new processing system, which is capable for DAPs and will be operated by FY2018.

1. Introduction

1.1 JCAB is upgrading new processing system which is capable to deliver DAPs information to ATC consoles and will be operated by FY2018. JCAB is also upgrading all SSRs in Japan with DAPs function through the aged SSR replacement program in next 10years. With these background JCAB needs to accumulate DAPs evaluation and installed the evaluation equipment. In 2015 we completed the initial evaluation and this IP reports the outline of the evaluation equipment and evaluation results.

2. Installation of multi radar system with DAPs function and issue

2.1 JCAB is designing/re-constellating surveillance facilities such as SSR, WAM and ADS-B. The data fusion system has been developed as the new configuration for the purpose of optimizing these surveillance systems. The combined “fusion” target information derived from SSR and WAM will be in use in 2018.

2.2 Mode S Downlink Parameters (DAPs) will be initially used for the improvement of situational awareness for Air Traffic Controllers, and then will be developmentally used for enhanced and progressive application, such as the predicted position data for the 4D trajectory in future.

2.3 In the development of multi-radar system, the new functions related DAPs have been added such as DAPs information display on ATC console or conformance monitoring. However, Mode S SSRs in Japan do not have the capability of DAPs function except RA information, so there was no environment in order to evaluate and verify the DAPs performance. JCAB is currently upgrading all SSRs in Japan with DAPs function through the aged SSR replacement program. On the other side WAM equipment is equipped with DAPs interrogate function but the operation of interrogation from Omni antenna has concerns not only about the interfere effect to the RF signal environment but also about the transponder occupancy.

3. Outline of ASFEE

3.1 With these background JCAB introduced the specialized equipment aiming the development of new surveillance device for the future and the evaluation of DAPs. The equipment, named “Advanced Surveillance Function Evaluation Equipment (ASFEE)”, is composed of the two radars as the proving device for DAPs. These radar’s features are as follows:

- i. Sector antenna for Mode-S interrogation: An Omni directional antenna array consist of eight (8) sector antennas which have 45 degrees horizontal coverage each. It enables to evaluate regarding the utilization of the sector type of antenna for WAM and its performance of DAPs acquisition.
- ii. Phased array antenna for SSR: This radar antenna is composed of the 64 phase-shifted elements. It is possible to perform the Mode S data link by transmitting selective interrogation to each target without all-call sequence. Because initial acquisition is achieved to receive ADS-B out signal within its coverage.
This system does not depend on the antenna rotation and it is expected to acquire the DAPs data frequently.
The final goal is to use this phased array antenna SSR as the replacement of current SSR. But there are issues about shortage range than we expected and phase regulator coordination, etc.



Figure1; Sector antenna



Figure2; Phased array antenna

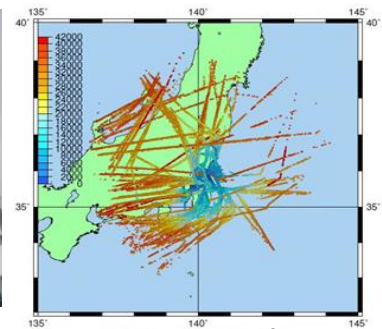


Figure3; Coverage of radars

4. Evaluation results by ASFEE

4.1 The evaluation has been started from the beginning of 2016. In this IP we report the evaluation by using the data for a week in January 2016. The fundamental evaluation results are as follows.

- i. DAPs equipage rate ... Domestic airlines were 72.59%, foreign airlines were 93.81%. We are thinking the reason why the lower rate of domestic airlines is effected by the policy that there is no ADS-B mandate policy in Japan.

	Domestic airlines		Foreign airlines	
	equipped Aircraft number	Rate	equipped Aircraft number	Rate
Total (1/25~1/29)	1091	72.59%	788	93.81%

Table1; DAPs equipage rate

- ii. Ability prevalence rate ... DAPs can get a capacity retention rate of the aircraft. Most of aircrafts equipped DAPs are also corresponding to the EHS (Enhanced Surveillance).

Date	Aircraft number	BDS2.0 %	2.1 %	3.0 %	4.0 %	4.4 %	4.5 %	5.0 %	5.1 %	5.2 %	5.F %	6.0 %
1/25	489	99.8	34.6	94.3	99.8	0.2	0.2	100	22.7	22.7	63.8	100
1/26	512	100	35.9	92.4	99.6	0.2	0	100	20.3	20.3	64.8	100
1/27	516	100	34.1	92.6	100	0.2	0	100	22.9	23.1	63.6	100
1/28	408	100	34.1	93.9	100	0.2	0.2	100	20.6	20.6	63.7	100
1/29	512	100	33.6	93.9	100	0.2	0	100	20.5	20.5	63.7	100
Average	—	100	34.5	93.4	99.9	0.2	0.1	100	21.4	21.4	63.9	100

Table2; Ability prevalence rate

- iii. Only one aircraft, which can transmits BDS4,4 and BDS4,5 information containing the weather information, has been observed during the five-day period of data acquisition.
- iv. BDS SWAP problem... This is a certain problem that the value of register is duplicated from the other registers in some cases. In this evaluation, these problematic events have been detected several times during the five-days. The phenomenon has been observed regardless of the type of radar, and JCAB has recognized the necessity of further analysis.

5. Action required by the meeting

- 5.1 The meeting is invited to note this information.
