International Civil Aviation Organization

FOURTEENTH MEETING OF THE SOUTH EAST ASIA AND BAY OF BENGAL SUB-REGIONAL ADS-B IMPLEMENTATION WORKING GROUP (SEA/BOB ADS-B WG/14)

Bangkok, Thailand, 7 - 9 November 2018

Agenda Item 3: Review implementation and co-ordination activities and sub-regional implementation plans

3.2 Progress on ADS-B implementation – South East Asia

ADS-B IMPLEMENTATION ACTIVITIES IN CHINA

(Presented by China)

SUMMARY

This paper presents the latest ADS-B implementation progress in China, especially the related situations in Urumqi and Shenyang FIR.

1. INTRODUCTION

1.1 China had been planning a national ADS-B project since 2016, which was composed of 308 ground stations and a 3-level network architecture to process and distribute the ADS-B data. According to the project scheme, all the installation and deployment activities have already been finished, and all the Site Acceptance Test (SAT) and flight inspection will be finished by the end of 2018. Initial operation for ADS-B service is about to be ready at the beginning of 2019. Trial ADS-B operation of all national airspaces is scheduled on 1st July 2019.

-Refer to SEA/BOB ADS-B WG/13 – IP05 "Progresses of ADS-B Project in China"

2. DISCUSSION

2.1 The project implementation is divided into 4 steps, installation/ deployment, flight inspection, application evaluation and operational use. The implementation was firstly started and finished in Urumqi and Shenyang，details as follow：

Installation and Deployment in Urumqi FIR and Shenyang FIR

2.2 Urumqi FIR located in the northwest of China, is the largest FIR in China, covering 2 million square kilometers. Since only 6 radars running there, ADS-B becomes the first choice for improving surveillance performance. According to the national project plan, 30 ground stations and one level-2 data processing center had been deployed there by the end of November 2017. Shenyang FIR is located in the northeast of China, covering 1.386 million square kilometers, 37 ground stations

and one level-2 data processing center had been deployed as well by the end of June, 2018. The ADS-B coverage of Urumqi is shown in Figure 2.1; Shenyang is shown in Figure 2.2.

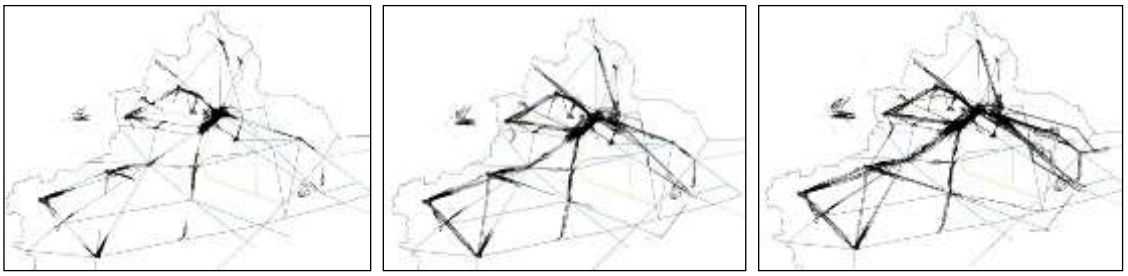

Figure 2.1 ADS-B coverage of ≤6000m, 6000~9000m and ≥9000m in Urumqi FIR

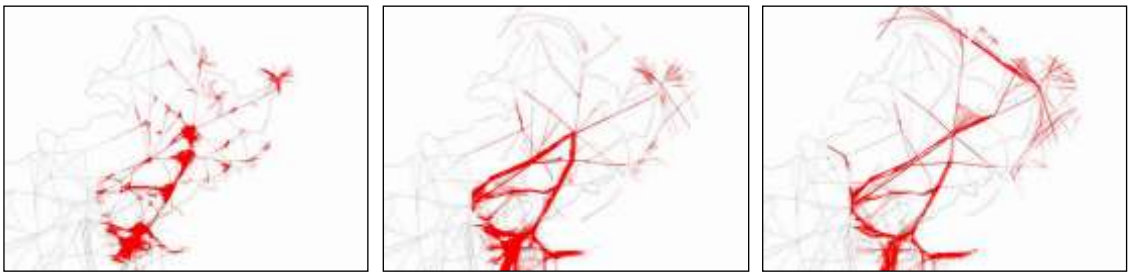

Figure 2.2 ADS-B coverage of ≤6600m, 6600~9500m, and ≥9500m in Shenyang FIR

Flight Inspection

2.3 After the installation and deployment activities, the system was firstly tested before flight inspection, by observing the regular flights and simulated flights. And after that, flight inspection were applied, the main items of flight inspection and related results are listed in Table 2-1:

Table 2-1 Main Items of Flight Inspection

No	Item	Purpose	By Means	Result
1	Route Coverage	main route coverage	Regular Flight	Meet operational requirements
2	Area Coverage	vertical and important area coverage	Inspection Flight	Meet most operational requirements, some area need supplementary surveillance
3	Blind Cone	blind cone	Inspection Flight	There is no blind cone
4	Code and Alert Test	Mode A code, 7500, 7600, 7700 MED, MFL, DWN	Inspection Flight	Function works properly except the aircraft doesn't support MED, MFL, DWN test

Application Evaluation

2.4 In order to progress ADS-B operation safely and successfully, CAAC conducted application evaluation before putting into use. The evaluation includes:

a) Aircraft equipage status. The percentage of ADS-B equipage for all aircrafts in Urumqi and Shenyang are 90% and 96%. And among them, the approximate percentage of DO-260, DO-260A and DO-260B are 80%, 5% and 15% respectively.

Table 2-2 ADS-B Equipage in Urumqi and Shenyang

ADS-B equipage	DO-260	DO-260A	DO-260B
Urumqi (90%)	81.96%	4.58%	13.46%
Shenyang (96%)	81.90%	2.67%	15.43%

b) Data quality analysis. Since most of the aircrafts are equipped with DO-260, the analysis is mainly based on the NUC distribution. More than 95% of the NUC values are greater than 5.

Table 2-3 Data Quality of NUC Distribution

NUC value	0	2	4	5	6	7
Urumqi	4.30%	0.12%	0.06%	2.09%	11.29%	82.14%
Shenyang	2.94%	-	0.005%	3.49%	17.25%	76.33%

c) Data transmission analysis. Data transmission latency is measured between the ground station and the level-2 processing center's input. Both in Urumqi and Shenyang, the measured maximum average delay is less than 200ms. Ground station throughput is measured on the output points of ground stations. Both in Urumqi and Shenyang, the measured maximum throughput is less than 1Mbps.

Table 2-4 Data Transmission Analysis

Transmission	Max Delay (ms)	Max Throughput (kbps)
Urumqi (average/peak)	167/315	126/167
Shenyang (average/peak)	180/230	238/703

d) Data process and usage analysis. This analysis performs between on the level-2 processing centers and the ATM automation system.

The function of level-2 processing center includes ADS-B Collection and Decoding (ADCD), Radar Collection and Decoding (RDCD), Flight Plan Collection and Decoding (FPCD), ADS-B Validation and Filtering (ADV&ADF), Data Distribution Processing (DDP), Log Recording Service (LRS) and Data Recording Service (DRS). All the functions worked properly and passed the test, and some of the processing abilities are listed in Table 2-5.

Table 2-5 Part of Level-2 Processing Center Capabilities

	Processing Limit
Max ADS-B input number	512
Max Radar input number	16
Max system track	8192
Processing delay	≤0.3s

There are 2 ATM automation system working in Main-Standby mode in Urumqi and Shenyang, both of which are able to support to decode the ADS-B data, and part of the processing capabilities are listed in Table 2-6.

Table 2-6 Part of ADS-B Processing Capabilities

Systems	Max Input Number	Max Track per Input	Max System Track
NUMAN	16	500	2048
SkyNET-X	20	1000	3000

Both of the ATM automation system will check the target qualities by NUCp, NACp, NIC and SIL. Since most of the avionics version is DO-260, both systems nowadays calculate target quality by NUCp, if NUCp is less than 5, target will be classified to low quality, and if NUCp is equal to and greater than 5, target will be classified to high quality, and related labels are shown in Figure 2.3.

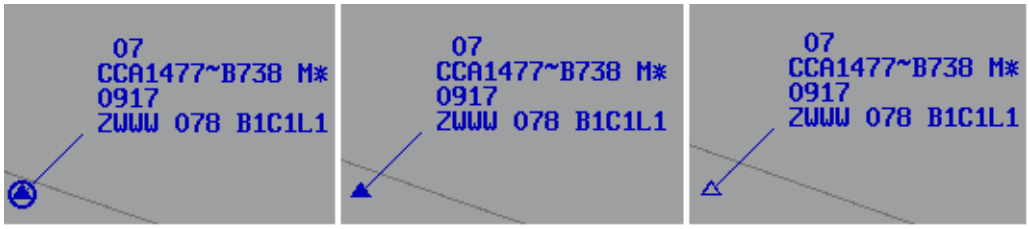

Figure 2.3 Label of Combined Track, ADS-B high quality track, ADS-B low quality track

ADS-B Operation in Urumqi and Shenyang

2.5 After flight inspection and application evaluation, ADS-B operation had been implemented in Urumqi FIR from January 2018. Operation applied in Sector 2 and 3 (from lowest flight level to 12500m *included*) and Sector 5 and 6 (from 6000m *excluded* to 12500m *included*), except route Z5 and Z6. The applied Separation Standard - ADS-B contacted aircrafts at the same flight level hold a separation of no less than 40 kilometers in the ADS-B coverage.

All the flight inspection and application evaluation activities in Shenyang FIR are finished, and the ADS-B operation is under preparation.

Operational Issues

2.6 It was observed in March 2018 that targets jump frequently in Urumqi, and the jumping deviation can be more than 2.5km, as shown in Figure 2.4 as the yellow line. After thorough investigation, it was found that there was an illegal GPS jammer around that area, after switching off the jammer, the jumping phenomenon disappeared.

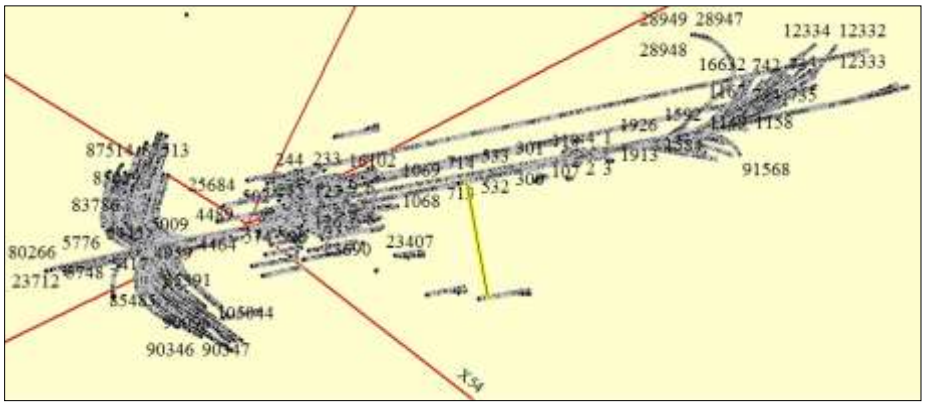

Figure 2.4 Target Jumping Illustration

3. ACTION BY THE MEETING

3.1 The meeting is invited to note the information contained in this paper.

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