



International Civil Aviation Organization



**AUTOMATIC DEPENDENT SURVEILLANCE –
BROADCAST SEMINAR AND THIRTEENTH
MEETING OF AUTOMATIC DEPENDENT
SURVEILLANCE – BROADCAST (ADS-B) STUDY
AND IMPLEMENTATION TASK FORCE
(ADS-B SITF/14)**

Christchurch, New Zealand, 14 – 17 April 2015

Agenda Item 5 : Development of Asia/Pacific Regional ADS-B implementation plan and sub-regional ADS-B implementation plan

THE ADS-B DEVELOPMENT AND IMPLEMENTATION IN THE REPUBLIC OF KOREA

(Presented by Republic of Korea)

SUMMARY

This paper presents results of ADS-B development and operational test. It also introduces the deployment plan of the Korean government to efficiently manage increased airspace traffic and furthermore to reinforce the surveillance of low-altitude aircrafts and enhance situational awareness of their pilots.

1. Introduction

1.1 The Air Traffic Center (ATC), Republic of Korea provides radar based air-traffic surveillance service to aircrafts flying over Incheon FIR (Flight Information Region). The FIR has a very limited airspace, but the number of aircrafts travelling in the region has been constantly increasing every year. In order to improve the region's aviation safety, surveillance performance for low altitude radar coverage areas will be enhanced.

1.2 Increase in number of light-sport aircrafts travelling in VFR mode is another issue for Korean air traffic management. The aircrafts may mostly travel beyond radar coverage, which will increase air traffic accidents. In 2013, a private helicopter crashed in dense fog into a high-rise apartment building in southern Seoul, *resulting in the death of a pilot*. The Ministry of Land, Infrastructure and Transport (MOLIT) of Republic of Korea has since set to take measures for the aviation safety of light aircrafts.

1.3 To increase air-traffic control efficiency in controlled airspace and furthermore to provide air-surveillance and flight information service for light aircrafts, the MOLIT has been working on ADS-B system development since 2010. ADS-B equipment includes 1090ES ground station (GS), UAT GS, UAT airborne equipage, UAT ground-vehicle equipage, ADS-B/TIS-B/FIS-B server, Monitoring system and ADS-B Validation System tool.

2. Discussion

2.1 ADS-B development status.

The ADS-B R&D program consists of three phases, i.e., prototype fabrication, verification and validation testing, operational testing, respectively. All three phases have now been completed. ADS-B system prototype has been designed to support both 1090ES and UAT data-link. The International standards (RTCA/RTCA/EUROCAE) compliance testing has been performed. To conduct operational testing, two of 1090ES ground station and UAT ground station have been installed.

The 1090ES ADS-B ground station has been designed to be compatible with DO-260B and CAT021 version 2.1. The 1090ES GS provides rich ADS-B information including GPS integrity data (NIC, NAC) and MSAW designated Mode A/C code. As a result of the operational testing, the ground station has been proved to improve pilot situational awareness by transmitting locations of aircraft without ADS-B equipment through TIS-B service.

UAT GS supports both TIS-B and FIS-B service. FIS-B broadcasts weather and NOTAM data in real-time, which provides better picture for pilots. UAT uses frequency modulation (FM) technique which has been tested to have a better suitability for the low-altitude air-surveillance system and reception performance than 1090ES.

Monitoring system can improve pilot situational awareness by displaying radar track as well as aircraft information of ADS-B(1090ES, UAT).

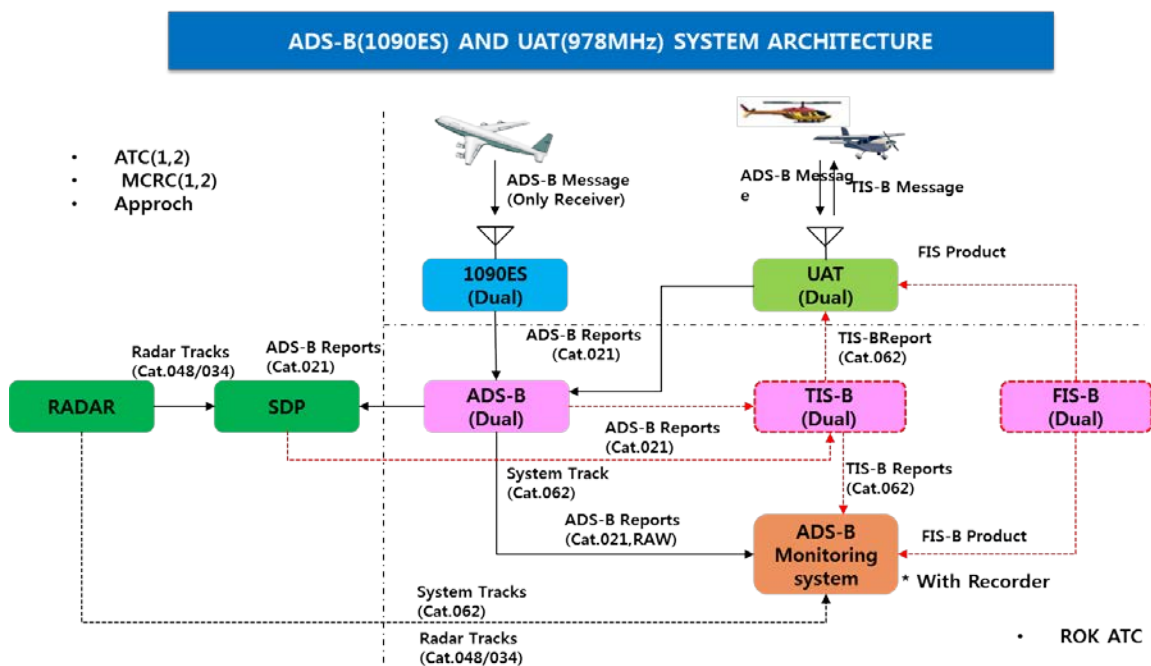


Figure 1. ADS-B system architecture

2.2 Operational test

- (1) Target aircrafts

The tested aircraft has used 1090ES DO-260A compliant transponder of the flight inspection aircraft. The equipage uses GPS with quality factors of $NIC=8$, $NAC_P=8$ and $NAC_V=2$. The aircraft can record GPS information of such ADS-B message, and ADS-B GS records the target information to measure data accuracy. Operational testing can be conducted by setting up an irregular flight situation such as MSAW. By conducting the tests against aircraft in services, it has been reported that 80% of commercial aircraft at Incheon Airport are equipped with ADS-B and there are 70 aircraft equipped with ADS-B per day at Gimpo Airport. 90% of Korean Air's commercial aircraft and 60% of Asiana Airline's are equipped with ADS-B, which all have NIC / NAC_P quality of 7 to 8. There is a very small number of low cost carriers broadcasts INS data instead of GPS as an ADS-B which results in low target accuracy.

(2) Operational testing item

Operational testing check list item includes general coverage, airways/route coverage, fixed/map accuracy, Modes/Codes, MSAW. Post-data analysis will cover update rate, latency, position/velocity accuracy, validation, NIC/NAC_P and altitude. En-Route testing covers aircraft traveling via route G597, B576, A582, G585, B467. For approach testing, both departure route(SID) and arrival route(STAR) evaluation will be performed in Gimpo Airport.

(3) Operational testing environment

Operational testing will be performed with the aid of ADS-B and TIS-B server. ADS-B server collects ADS-B targets from ADS-B GS, and TIS-B server gathers radar targets mainly SSR radar. Monitoring system will function as to display both targets. The server is capable of storing target data for more than 30 days, which makes sufficient data to perform post-data analysis.

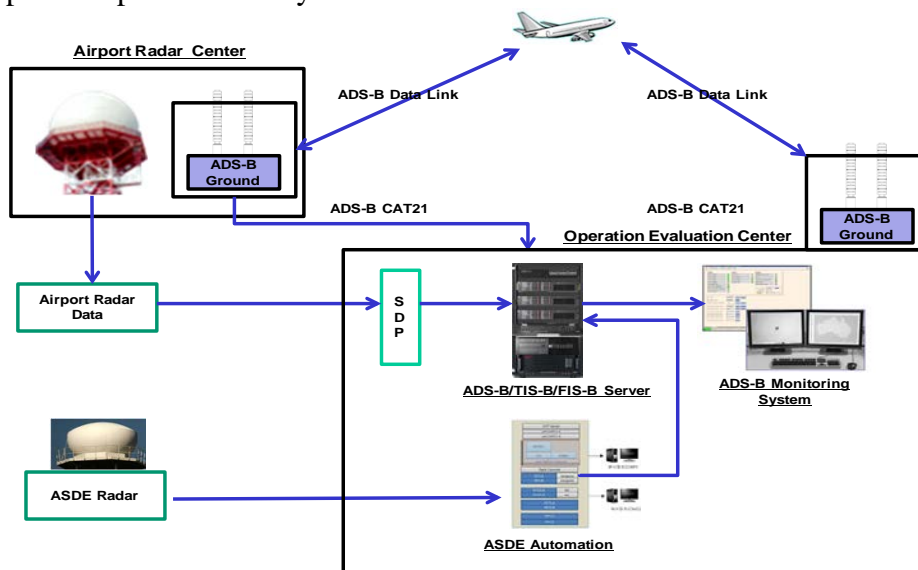


Figure2. ADS-B operational test-bed

2.3 ADS-B deployment for Airport enhancement

(1) Details of Implementation

Selected research group will analyze a coverage of current ground surveillance radar installed on an airport, and examine the coverage gap area. Then next-gen surveillance system ADS-B/MLAT will be installed to fill the gap, providing complete picture to ATC.

- Gimpo international airport : ADS-B system test-bed has been installed and currently undergoing Operation testing ('13~'16)
- Incheon international airport: Promotion on Air transportation modernization and safety business and three phase business is going on.('14~'17)
- Other airports: A research group is planned to perform validation survey on deployment, and promote Next-gen program(ADS-B, MLAT, ASDE-X) to improve aircraft landing efficiency and increase air-traffic capacity.

(2) Promotion plan

- Validation Survey for ADS-B deployment on airport and deployment plan('14~'15)
- ADS-B, TIS-B, FIS-B service deployment on airport ('16~'20)

2.4 Establishment of next-gen air traffic surveillance system for air routes

(1) Details of implementation

- Upgrading of next-gen surveillance system (ADS-B) to improve flight flexibility and aviation safety and to provide surveillance data of aircraft in service.
- Establishing a step-by-step plan that will prevent and eliminate disturbance in air traffic flow even in case of radar failure and fill the gaps of low altitude radar coverage areas.

(2) Implementation plan

- Planning the installation of ADS-B for en-route surveillance('14~'15)
- Installation of ADS-B for en-route surveillance ('16~'20)

2.5 Light aircraft aviation safety network

(1) Background

In November 2013, a commercial helicopter crashed against a high tower apartment due to foggy weather condition. From this incident, the Korean government set an Aviation Safety Network deployment program for light aircraft surveillance. A main purpose of the program is to detect light aircraft location and provide pilot with necessary alert message and information in case the aircraft enters a hazardous area.

(2) Details of implementation

Aircraft location sensor are planned to be installed at key points across the country which will disseminate GPS data of small aircraft to related institutions every second.

Since the next-gen surveillance system(ADS-B) of UAT holds great advantages in providing FIS-B services and fading with its frequency modulation technology, building of new ground stations for UAT services on 978MHz frequency is in schedule.

(3) Implementation plan

- Installation in Seoul metropolitan area: '15~'16
- Nationwide coverage and start of operation : '16~'17

3. Action by the Meeting

3.1 This paper is to share the ADS-B development and installation plans of the Republic of Korea with the member states.