



TWELFTH AIR NAVIGATION CONFERENCE

Montréal, 19 to 30 November 2012

Agenda Item 1: Strategic issues that address the challenge of integration, interoperability and harmonization of systems in support of the concept of “One Sky” for international civil aviation

1.1: Global Air Navigation Plan (GANP) – framework for global planning

ADS-B DEVELOPMENT AND DEPLOYMENT PLAN IN THE REPUBLIC OF KOREA

(Presented by the Republic of Korea)

1. INTRODUCTION

1.1 The Republic of Korea provides air traffic control service based on radar surveillance to aircraft flying within the Incheon Flight Information Region (FIR), in order to secure safety of aircraft and expedite air traffic flow. Although the Incheon FIR has a very limited airspace compared to other FIRs, the number of aircraft operating in the region has been steadily increasing every year.

1.2 There have been multiple demands for air safety improvement by filling radar coverage gaps and surveillance performance upgrades. Increases in the number of light aircrafts flying in visual flight rules (VFR) is another issue for Korean air traffic control. Such aircraft in VFR may mostly operate beyond radar coverage, increasing air traffic accidents.

1.3 To increase air traffic control efficiency, the Republic of Korea has been working on Automatic Dependent Surveillance-Broadcast (ADS-B) system development since 2010.

2. ADS-B DEVELOPMENT STATUS AND DEPLOYMENT PLAN IN THE REPUBLIC OF KOREA

ADS-B development status

2.1 The Republic of Korea's ADS-B research and development group consists of four industries, one research institute and three academic organizations. The research and development group had completed the ADS-B system requirement analysis, subsystem preliminary design and critical

designs. Currently ADS-B research and development is in the prototype fabrication stage which started in August 2012. After the prototype fabrication, the demonstration and verification test on the prototype will be carried out at Gimpo International Airport. It is expected that a complete ADS-B prototype will first come up by March 2013 and a verification test be conducted by August 2013. The verified prototypes will be installed at Gimpo airport for an operational field test (September 2013 – August 2014).

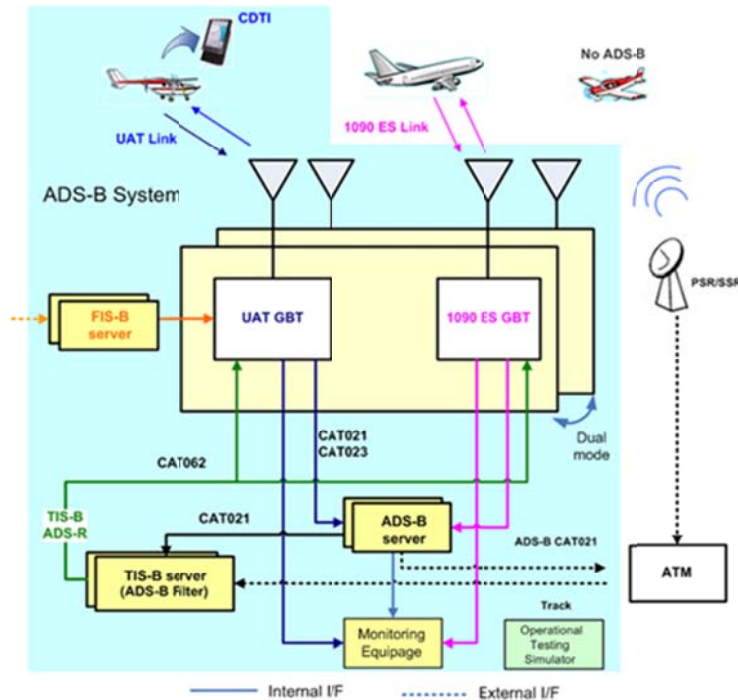


Fig. 1 ADS-B system overview

2.2 The ADS-B prototypes to be released in the near future include ADS-B ground station, ADS-B airborne equipment, ADS-B ground vehicle transmitter, ADS-B/TIS-B/FIS-B server, monitoring system, and ADS-B validation tool. Basic performances of the prototypes are:

- a) ADS-B ground station capable of a multi-link surveillance of 1090ES and UAT. For every second, it can transmit up to 1000 TIS-B and ADS-R messages and receive more than 400 targets;
- b) ADS-B server to support storage/filter/dispatch of surveillance data received from ground stations;
- c) TIS-B server to collect radar data from the ATM systems and send to ADS-B ground stations;
- d) FIS-B server to provide weather and airport information to UAT equipped aircraft;
- e) monitoring system to provide the operator with a remote control and monitoring service to the ADS-B ground stations; and

- f) AVS (ADS-B Validation System) to verify the system's compliance with up-to-date ICAO Standards and Recommended Practices (SARPs).

2.3 The verification test covers ADS-B function and performance testing prior to operational field test. Details of the testing are as given below:

- a) ADS-B test plan, procedures and testbed setup documentation;
- b) function and performance testing for each equipment; and
- c) interoperability testing between multiple equipment (ADS-B and radar system).

2.3.1 Building an entire testbed for verification testing is also included in the test plan.

2.4 The operation testing is in the final research and development stage prior to deployment. The purpose of the testing is to verify operation management in ground and air surveillance field. Details of operation test are:

- a) ADS-B in radar airspace (ADS-B-RAD) test is to perform en-route surveillance using an ADS-B system with the radar system; and
- b) ADS-B-based situation awareness on the airport surface (ATSA-SURF) test is to perform an airport ground surveillance test focused on airport surface movement.

2.4.1 During the ADS-B-RAD and ATSA-SURF operational testing, each test will include operational safety assessment (OSA), operational performance assessment (OPA) and an evaluation test on interoperability. Each test will be verified with simulation results. AVS implementation is also included in this test plan.

2.5 As mentioned above, the ADS-B ground station will be compatible to version 0, 1 and 2 (DO-260B) message formats, which will decode data from all aircrafts equipped with ADS-B. The development scope covers ADS-B transmitter and receiver to support non-ADS-B equipped aircraft surveillance. The ground station will provide 1090ES datalink for aircraft.

2.6 UAT datalink, using frequency modulation, is designed to enhance receiver sensitivity and be robust against multipath fading. The UAT design scope also covers the weather and flight information service for light aircraft. The ADS-B server, to improve ADS-B data integrity, provides filtering two same tracks from multiple receivers and smoothing discontinuous tracks due to track jumping. An operator can change the ASTERIX versions in the ADS-B ground station to be compatible with conventional air-traffic control system.

2.7 The monitoring system is designed to receive ADS-B and radar track data and compare them. The system allows the pilot to verify the integration of the ADS-B system. The map and track information are displayed in dual screen; one screen for airport surface and the other for en-route. It also provides prediction of collision risks and airspace intrusion and alerts to the pilot.

ADS-B deployment plan

2.8 China, Europe, the United States and many States in the Asia/Pacific regions including Australia have been deploying ADS-B. The deployments are expected to be completed between 2015 –

2020. Considering that it took several years for most States to install ADS-B, the Republic of Korea has planned to develop an ADS-B system by 2014, and to deploy the system in airports in the Republic of Korea.

2.9 In the first phase of deployment, by 2014, ADS-B ground station prototypes will be installed at Gimpo International Airport where approximately 70 ADS-B equipped aircraft per day can be found. The purpose of the installation is to demonstrate “approach control service” and “en-route monitor”. Besides that, UAT ground station prototypes will be installed in airports where light aircraft are mostly used. The purpose of the UAT installation is to demonstrate detection of light aircraft flying at low altitude in VFR.

2.10 In the next phase during the year 2015 to 2016, an ADS-B ground system will be installed in airports as a supplement to a conventional radar system. Airports which have already been using the radar system for terminal control purposes will also utilize the ADS-B system for extension of the surveillance coverage by filling radar coverage gap and for emergency use in case of radar system failure. For the last phase of the deployment during the years 2017 to 2020, the plan is to deploy ADS-B for entire en-route and terminal control purposes in the Incheon FIR.

Expected Outcome

2.11 It is expected that through this project, the Republic of Korea will be more involved with next-generation CNS/ATM by accumulating deeper knowledge of the ADS-B technology and operation technique. Secondly, the system coming up in the near future will fill the radar coverage gap and extend the surveillance coverage to include the low altitude aircraft and ground traffics on airport surface.

2.12 Lastly, it is expected that the interoperability between the conventional ATC system and the ADS-B planned to be developed can improve the surveillance accuracy and the efficiency of air traffic management and increase the capacity of the air traffic management process.

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