International Civil Aviation Organization

THE FOURTH MEETING OF THE ASIA/PACIFIC GBAS/SBAS IMPLEMENTATION TASK FORCE (APAC GBAS/SBAS ITF/4)

(Video conference, 11-12 May 2022)

Agenda Item 2: Updates from States/Administrations about GBAS/SBAS Implementation

KOREAN SBAS IMPLEMENTATION STATUS

(Presented by Republic of Korea)

SUMMARY

The Republic of Korea is in progress on developing Korean SBAS (KASS, Korea Augmentation Satellite System) led by the government (MOLIT, the Ministry Of Land, Infrastructure and Transport). This paper presents the SBAS implementation status in the Republic of Korea.

1. INTRODUCTION

1.1 The Korean SBAS (Satellite Based Augmentation System) program has been initiated in October, 2014. Korea Augmentation Satellite System (KASS) will be a national navaid system to be owned and operated by the Ministry Of Land, Infrastructure and Transport (MOLIT) in the Republic of Korea.

1.2 The KASS Program Office (KPO) in the Korea Aerospace Research Institute (KARI) selected a prime contractor in October, 2016 for the joint development of KASS and full-fledged development has been ongoing.

2. DISCUSSION

2.1 Overview

2.1.1 The Republic of Korea is developing the SBAS, named KASS, which will provide navigation services to various users in Korea - including aviation, transportation (road, rail, maritime), timing, and others. The development of KASS will also benefit the technological advancement of Korean industry. The implementation of KASS is managed by the KPO hosted within the KARI. The prime contractor has been selected for the joint development and implementation of KASS, and local Korean contractors have been selected for supplying the several sub-components of KASS. KASS will comply with the SBAS requirements from the International Civil Aviation Organization (ICAO) published in Annex 10. The KASS signal-in-space will also comply with the corresponding requirements in the SBAS Minimum Operational Performance Standards (MOPS) published by RTCA (Radio Technical Commission for Aeronautics). It will augment GPS L1 signal for L1 SBAS users to improve navigation performance in order to perform APV-I approaches in the Incheon FIR.

2.1.2 KASS will be certified by the MOLIT with supports from experts in certification, safety and software domain. The European Aviation Safety Agency (EASA) provides them with general technical advice in the certification process.

2.2 **KASS Configuration**

2.2.1 The KASS system has four ground subsystems and two GEO satellites. The configuration of KASS ground subsystems comprises of seven KASS Reference Stations (KRSs), two KASS Processing Stations (KPSs), two KASS Control Stations (KCSs) and three KASS Uplink Stations (KUSs). The subsystems communicate each other over the Wide Area Network (WAN) with low latency and high availability, continuity and integrity performance.

2.2.2 The KRS collects measurement data and broadcast messages from all GPS and GEO satellites in view and delivers the data and the message to the KPS. The KPS performs correction processing, safety processing, and SBAS message processing. The KUS generates "GPS-like" signals combined with the SBAS messages from the KPS and transmits them to the GEO satellites. The GEO satellites receive signals from the KUS and transmit GPS compatible signals. The KCS controls and monitors whole KASS subsystems except the GEO satellite.

2.2.3 The seven KRS hosting sites consist of four inland and three island sites to ensure the satellite observability as much as possible. The two KPSs and two KCSs (jointly placed in two hosting sites) and three KUSs in two hosting sites have been selected to prevent common cause failures in order to maintain system continuity and availability during operation.

2.2.4 The first KASS GEO satellite will be MEASAT-3d (located at 91.5° E), which was planned to be launched in 2021 but can be postponed until the second quarter of 2022 due to COVID-19 impact. Regarding the second GEO, the contract negotiations are currently underway.

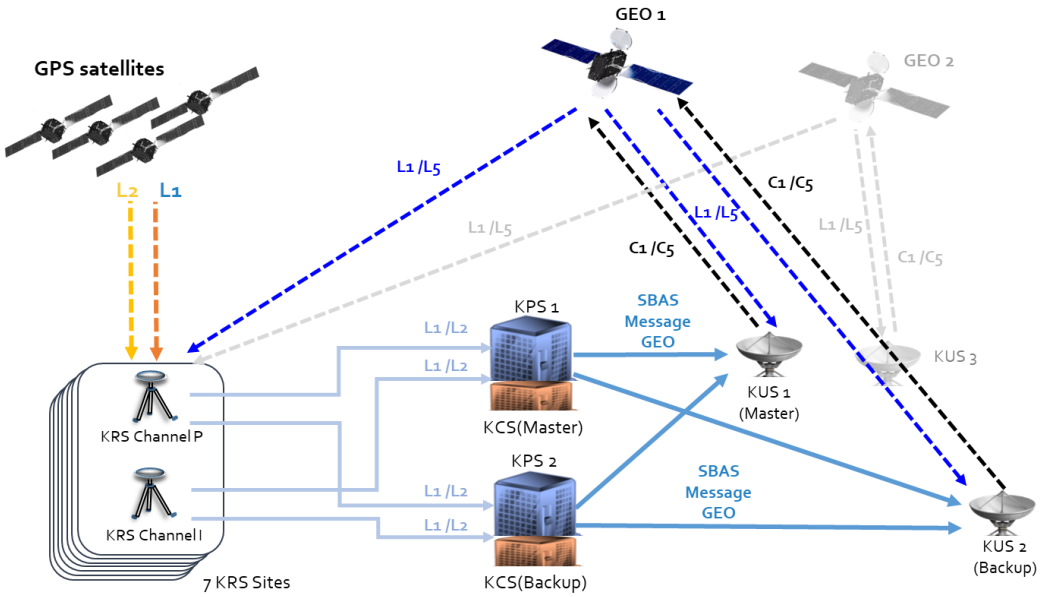

Figure 1. KASS System Configuration

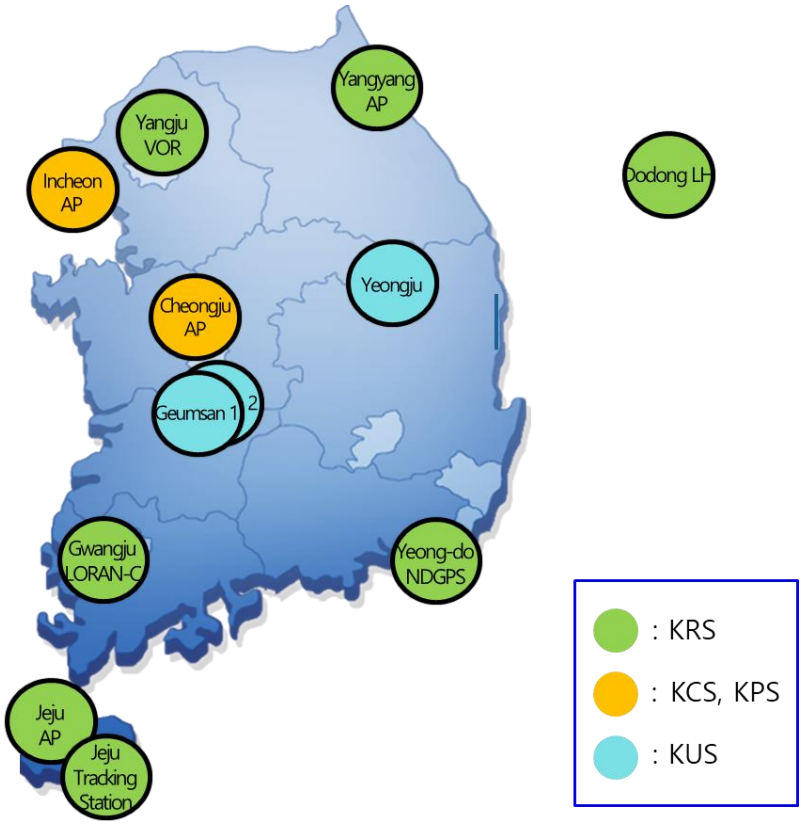

Figure 2. KASS Subsystem Hosting Sites

2.3 **KASS Implementation Status**

2.3.1 In August 2013, Korean Government decided to launch the Korean SBAS Program. In October 2014, KARI was awarded as the management body for the program and the KASS Program Office (KPO) was officially established in December, 2014.

2.3.2 In October 2016, the KPO has signed a contract with an overseas contractor for the joint development of KASS. A couple of months later, a kick-off meeting was taken place in order to begin the formal development process.

2.3.3 In January 2017, the KPO performed System Design Review (SDR). And the KPO has carried out the Preliminary Design Review (PDR) in April of 2017.

2.3.4 In June 2018, PRN 134 has been allocated to the first KASS GEO.

2.3.5 In October 2018, the first Critical Design Review (CDR) focusing on the algorithm design and system performance was undertaken. Since then, all the subsystem CDRs have been performed which led to the finalization of system CDR by July 2020.

2.3.6 In December 2018, the seven KRS hosting sites have been selected over one and half year site survey process.

2.3.7 In July 2020, the amendment 92 to the ICAO SARPs Annex 10, Volume I has introduced a new SBAS service provider ID 6 allocated to KASS.

2.3.8 In December 2020, The KRS subsystem equipment deployment was completed with Site Acceptance Tests (SAT) and maintenance activities have been being performed periodically.

2.3.9 In February 2021, the KASS Service Provider (Korea Air Navigation Satellite Center) organization was established by the Korean government, which has tasks to prepare for the handover and operation of the KASS system.

2.3.10 In June 2021, the infrastructure such as directional antennas, GNSS antennas, power, shelter, rooms, air conditioning, etc. for all the KASS hosting sites (KRS, KCS/KPS, KUS) have been prepared.

2.3.11 In April 2022, the Factory Test Readiness Review (TRR) was completed and Factory Acceptance Test (FAT) will be finalized by July 2022.

3. FUTURE PLANS OF KASS PROGRAM

3.1 In-orbit test of the 1st KASS GEO will be performed and the integration test between GEO and KUS will be performed in the third quarter of 2022.

3.2 All the subsystems including KCS, KPS and KUS will be deployed in 2022 and their site acceptance tests with integration among them will be performed by the first quarter of 2023.

3.3 The system integration and verification activities including all the subsystems will be finalized in 2023.

3.4 The KASS System Qualification Review (SQR) is planned by the end of 2023, thereafter, the certification process which began in 2017 will be completed for the provision of the Safety of Life (SoL) service across the designated coverage.

4. ACTION REQUIRED BY THE MEETING

4.1 The meeting is invited to:

a) note the information contained in this paper; and
b) discuss any relevant matters as appropriate.

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