



THIRTEENTH AIR NAVIGATION CONFERENCE

Montréal, Canada, 9 to 19 October 2018

COMMITTEE A

Agenda Item 2: Enabling the global air navigation system

2.2: Integrated CNS and spectrum strategy

THE DEVELOPMENT STATUS OF KOREAN SATELLITE-BASED AUGMENTATION SYSTEM (SBAS)

(Presented by the Republic of Korea)

EXECUTIVE SUMMARY

The Republic of Korea is developing a Korean multi-functional satellite-based augmentation system (SBAS), namely, the Korea Augmentation Satellite System (KASS). This paper presents the development status and the key configuration of KASS, which will be planned for aviation use in October 2022.

1. INTRODUCTION

1.1 As one key for transformational change towards future air navigation system, the SBAS can increase not only aviation safety but also navigation capability by improving accuracy, integrity, reliability and availability of satellite navigation. The SBAS can reduce dependence on legacy ground-based navigation systems and increase operational efficiency with reduction of cost and environmental impacts. Supporting performance-based navigation (PBN), it enables localizer performance with vertical guidance (LPV) approaches, which would be equivalent to a Category I instrument landing system (ILS), and more direct en-route flights using point-to-point operations.

1.2 The Aviation System Block Upgrades (ASBU) framework will be upgraded with new operational improvements in the sixth edition of the *Global Air Navigation Plan* (GANP, Doc 9750). The SBAS will be included as a new ASBU element on navigation systems (NAVS) thread to improve navigation capability through implementation of satellite-based navigation systems.

1.3 This paper presents the development status and the key configuration of KASS, as the national SBAS, which will be planned for aviation use in October 2022.

2. DISCUSSION

Overview

2.1 The KASS is the Korean multi-functional SBAS, which is being developed by the Ministry of Land, Infrastructure and Transport (MOLIT), and Korea Aerospace Research Institute (KARI). The KASS program has been initiated in October 2014 and will start its operation for other domains, such as surveying, timing, ground transportation, in July 2020. Extending its service for civil aviation use, the KASS will enable approach operations with the vertical guidance type I (APV-I) in 2022.

2.2 The coverage and service of the KASS will be limited within the Incheon flight information region (FIR) as the national SBAS. More than ninety-nine per cent of APV-I availability is expected within the service area.

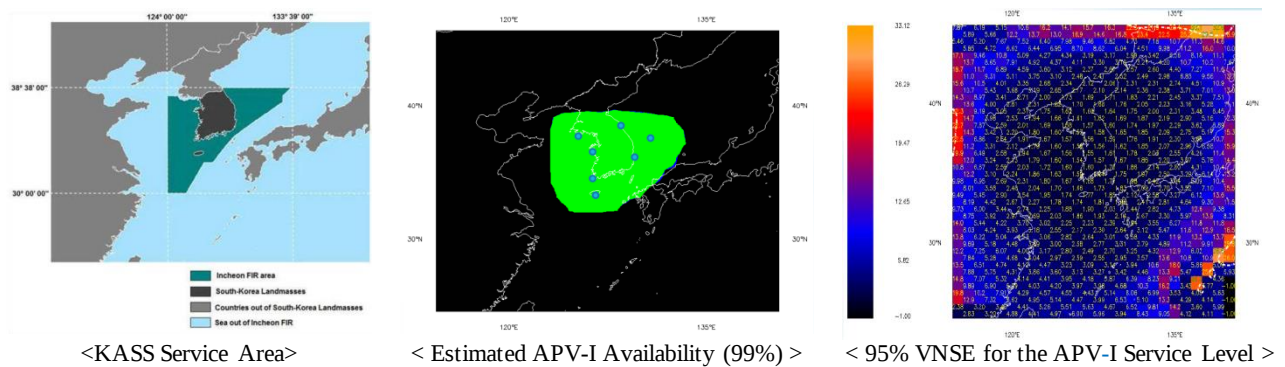


Figure 1. KASS Performance

2.3 To ensure global interoperability and expected navigation capacity, the KASS has been developed in accordance with Annex 10 — *Aeronautical Telecommunications* of the International Civil Aviation Organization (ICAO) Standards and Recommended Practices (SARPs). The KASS will also comply with the signal-in-space performance requirements published in ICAO SARPs.

A Phased Development Approach

2.4 Decided by the Korean Government to initiate the Korean SBAS program in August 2013, KARI was designated as the research and development organization for the KASS development in October 2014. The KASS Programme Office (KPO) under KARI was established to solely conduct research and develop national SBAS system in December 2014.

2.5 The KASS program is planned on a three-phased development approach for eight years, from 2014 to 2022. The details of each phase are as follows:

- Phase 1 (October 2014 – February 2017): system design including establishment of system definition, operational concept and system specifications;
- Phase 2 (March 2017 – December 2019): system development, installation, integration and evaluation; and
- Phase 3 (January 2020 – October 2022): trial operation, certification and commission.

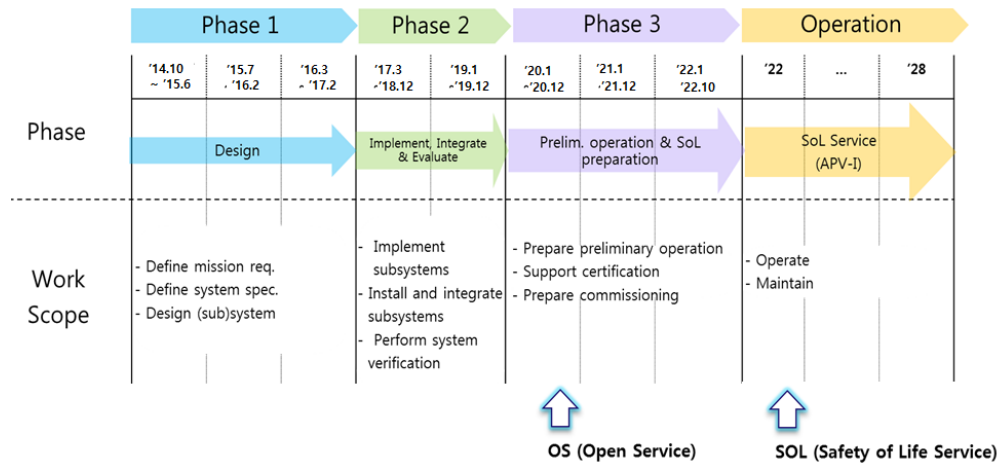


Figure 2. A Phased Development Approach for the KASS

KASS System Configuration

2.6 The KASS system will be composed of two GEO satellites and ground stations, which include seven reference stations, two processing stations, two control stations and three KASS uplink stations. The control stations will monitor and control the whole KASS ground sub-systems. A set of processing station and control station will be located in the same site. However, the configuration may vary based on further analysis on defining key parameters.

2.7 The KASS monitors satellite signals by the network of ground stations. The reference stations receive and process satellite signals, collect data from GPS and GEO satellites, and send the data to processing stations, which then generate correction and integrity information. This information is sent to uplink stations and uplinked along with the GEO navigation messages to GEO satellites. The GEO satellite broadcasts integrity and correction data to SBAS receivers.

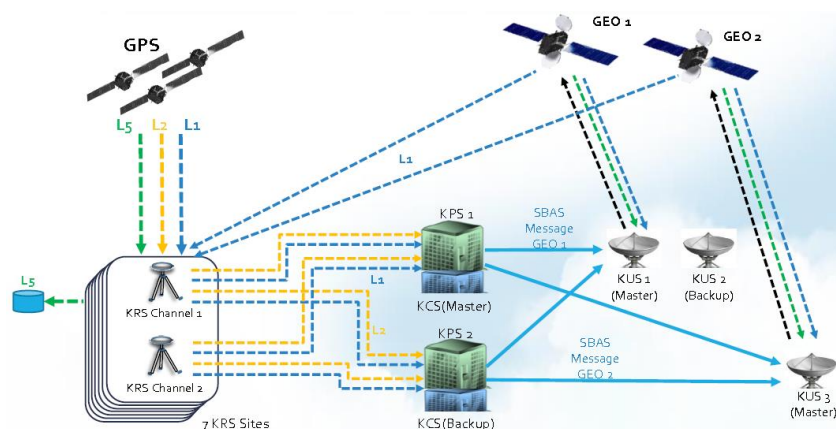


Figure 3. The KASS System Configuration

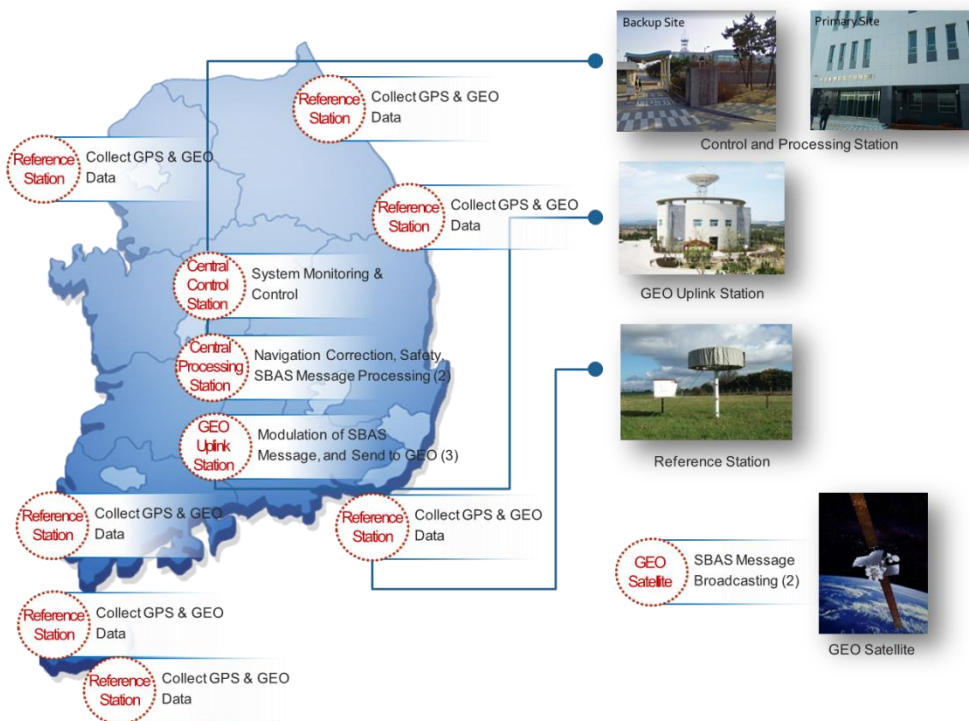


Figure 4. The Preliminary Plan of KASS System Location

The Future Plan

2.8 The KPO performed a system design review (SDR) and a preliminary design review (PDR) in January and March 2017 respectively. Currently, the first critical design review (CDR) is under preparation to determine key parameters and interface, and the second CDR will be carried out in the first half of 2019. The KASS will start its operation for other domains such as surveying, timing, ground transportation in July 2020. After conducting the system qualification review (SQR) and certification from the Korean Government, the APV-I safety of life (SOL) service will begin in October 2022.

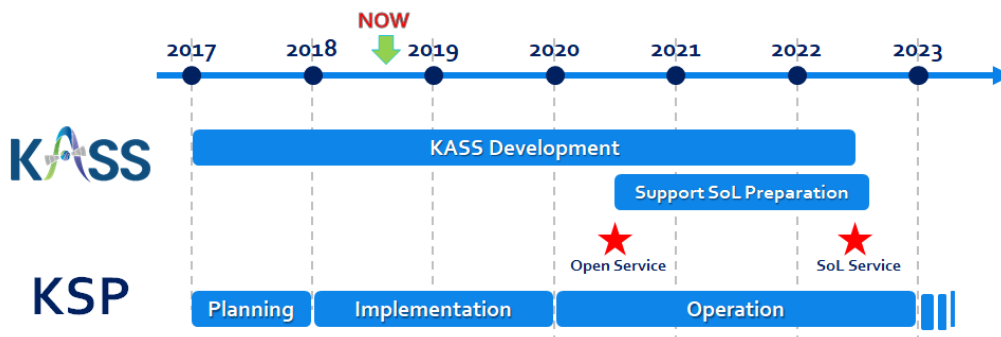


Figure 5. Roadmap of the KASS Program

2.9 For successful implementation of satellite-based navigation, the MOLIT is planning to establish the KASS Task Force in the beginning of 2019, with the objective to establish regulatory basis, operational procedures, a KASS operation organization and training programmes. The KASS service provider (KSP) will be established by 2020 and will operate the KASS after taking over it from the KPO. During the Phase 3 in the development plan, the APV-I SOL procedure will be verified, and the KASS certification will be completed for civil aviation use.

3. CONCLUSION

3.1 The Conference is invited to note the progress status of the KASS project in the Republic of Korea.

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