KASS program status

Korea Aerospace Research Institute

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EGNOS Workshop, Rome, Italy

24th Sep. 2019
Goal and Period of KASS Program

**Goal**: Develop a Satellite-Based Augmentation System in Compliance with ICAO Annex 10 Performance Requirements

[**1**] Provide APV-I SoL Service to Airports located in South Korea

[**2**] Initiate Open Service and APV-I SoL Service in 2022

**[Period] 5 Phases in 8 Years (2014 - 2022)**


**[Program Participants]**

- Supervising Agency (MOLIT, KAIA), KASS Program Office, KARI, ETRI, TASF, KT, Ktsat
Organizational Structure related with KASS

KASS Program

- MOLIT
- Inspection Organization (KIAST, TTA)
- EASA

KASS development
- KPO
- System Qualification
- International Co-development
- Domestic Co-development

KASS Handover
- KASS operation
- GNSS center (KSP)
- Designate
- Private Company (like ESSP)

MOLIT: Ministry of Land, Infrastructure, and Transport
IO: Inspection Organization (KIAST, TTA)
KPO: KASS Program Office, KARI
KSP: KASS Service Provider
ESSP: European Satellite Services Provider
EASA: European Aviation Safety Agency
KASS System Architecture

<table>
<thead>
<tr>
<th>S/S (Sub System)</th>
<th>Qty. (Baseline)</th>
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<tbody>
<tr>
<td>KRS (KASS Reference Station)</td>
<td>7</td>
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<tr>
<td>GEO satellite</td>
<td>2</td>
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<tr>
<td>KUS (KASS Uplink Station)</td>
<td>3</td>
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<td>KCS (KASS Control Station)</td>
<td>2</td>
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<tr>
<td>KPS (KASS Processing Station)</td>
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GPS satellites

KUS 1 (Master)

KUS 3 (Master)

KUS 2 (Backup)

KPS 1

KPS 2

KPS 3

KRS Channel 1(A)

KRS Channel 2(B)

7 KRS Sites

L1 /L2

L band

C band

L1 /L2

L band

L5 L2 L1
The survey was conducted for about 2 years in order to select the best sites.

(KRS: 60 locations → 7 locations, KUS: 14 locations → 2 locations)
### GEO and SBAS payload Acquisition Status

<table>
<thead>
<tr>
<th>Acquisition (lease) Plan</th>
<th>For Test and Open Service (KPO)</th>
<th>For SoL Service (MOLIT)</th>
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<tbody>
<tr>
<td>1(^{st}) GEO</td>
<td><code>18 </code>19 <code>20 </code>21 `22</td>
<td><code>23 </code>24 <code>25 </code>26</td>
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<tr>
<td>2(^{nd}) GEO</td>
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</table>

- **For Test and Open Service (KPO):**
  - `18: ktsat - Airbus
  - `22: "For Test and Open Service (KPO)"

- **For SoL Service (MOLIT):**
  - `23: SoL (Oct., 2022)
  - `24: OS (2Q, 2022)
  - `25: 3Q, 2021
  - `26: Korean GEO (Not Confirmed)
SMC/GP has assigned the PRN code (134) to KASS for use on L1 C/A & L5.
Assessed availability performance is more than 99%

- Availability, HNSE and VNSE are calculated applying failure ratio of GPS, GEO and Ground segment (KR, KPS, KUS and Data Networks).

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<tr>
<th>Performance</th>
<th>Best on LM*</th>
<th>Mean on LM*</th>
<th>Worst on LM*</th>
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<tr>
<td>Assessed availability performance</td>
<td>99.763 %</td>
<td>99.743 %</td>
<td>99.703 %</td>
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<tr>
<td>Assessed HNSE (95%)</td>
<td>0.87 m</td>
<td>0.92 m</td>
<td>0.97 m</td>
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<tr>
<td>Assessed VNSE (95%)</td>
<td>1.57 m</td>
<td>1.61 m</td>
<td>1.64 m</td>
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</table>

※ LM (Land Mass): South Korea Peninsula + Jeju Island

※ KASS APVI 99% availability Region
Republic of Korea’s SBAS Concept

SBAS Sat.

Aviation

Personnel/Smart Phone/Time Sync.

Land Tract

LBS/Logistics

KUS

KRS

KPS

DRONE

KRS

KRS

KRS
Organizational Structure of KASS Operation

- System Operation (24 hours – 7 days)
- 1st Level Maintenance
- ILS Management

- 1st Level Maintenance
- ILA Management
- Certification Management
- KASS Service Improvement and Developing New Service

- KASS SoL Engineering Team
  - Performance Monitoring and Analysis
  - 2nd Level Maintenance
  - KASS Improvement
  - Developing next step SBAS

- GNSS Service Provision
- Signing of SLA and cooperation with related organizations
- International cooperation

- GNSS Center (MOLIT)

- KASS Service Management Team
- KASS O&M Team

- KASS Operation Office Head
  (Delegated Private Company)

Government Section

Private company Section

KSP (KASS Service Provider) organization chart - Draft
Future Plan

- MOLIT will perform system and operation certification (commission) in 2022

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<td>System Design Verification (Safety Case A Review)</td>
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| SQR (Oct., 2022)    |      |      |      |      |      |      |      |      |      |        |
Thank You!
KASS Operation Approval (Designating Operation Company) - Draft

System (Design) Certification

KPO

Complete Safety Case A

Safety Case A submission

Inspection Organization

Performance Inspection (ICAO ANNEX 10, DO-178B)

Operation Approval

Private company (Applicant for KASS Operation)

Complete Safety Case B

Safety Case B submission

GNSS Center (MOLIT)

Designate of Operation Company By Inspecting Safety Case B (EC Regulation 1035, 552, 482, etc)

Safety Case A Take Over From KPO

Safety Case B Take Over From Private Company

Safety Case A Handover