

하늘로 띄운 꿈, 우주에서 찾는 미래

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)

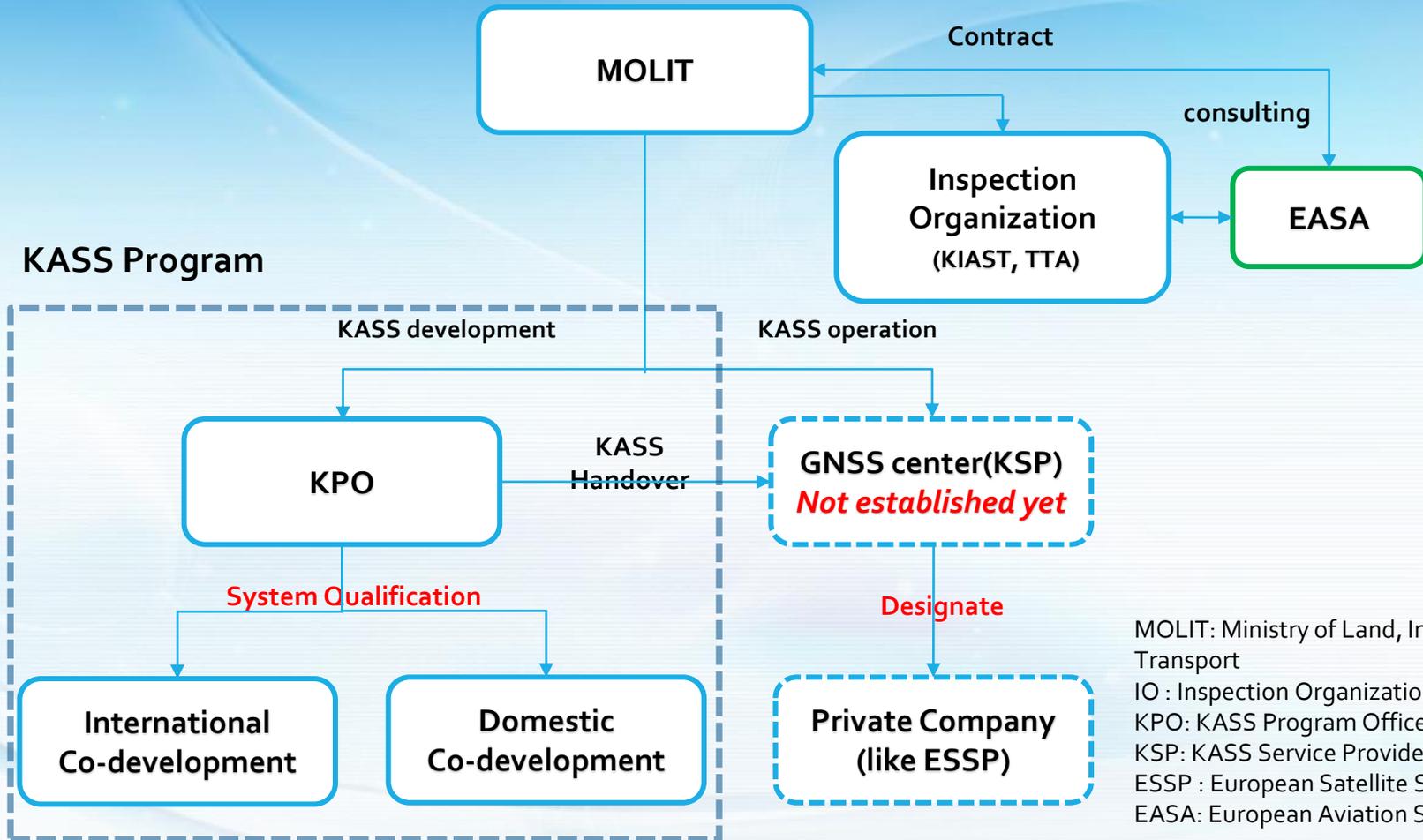
- Phase A (Oct. 2014-Jun. 2015): System Definition
- Phase B (Jul. 2015-Mar. 2017): System Design
- Phase C (Apr. 2017-Mar. 2019): Critical Design
- Phase D (Apr. 2019-Jun. 2020): Integration and Verification
- Phase E (Jul. 2020-Oct. 2022): Initial Operation and Approval Process

[Program Participants]

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

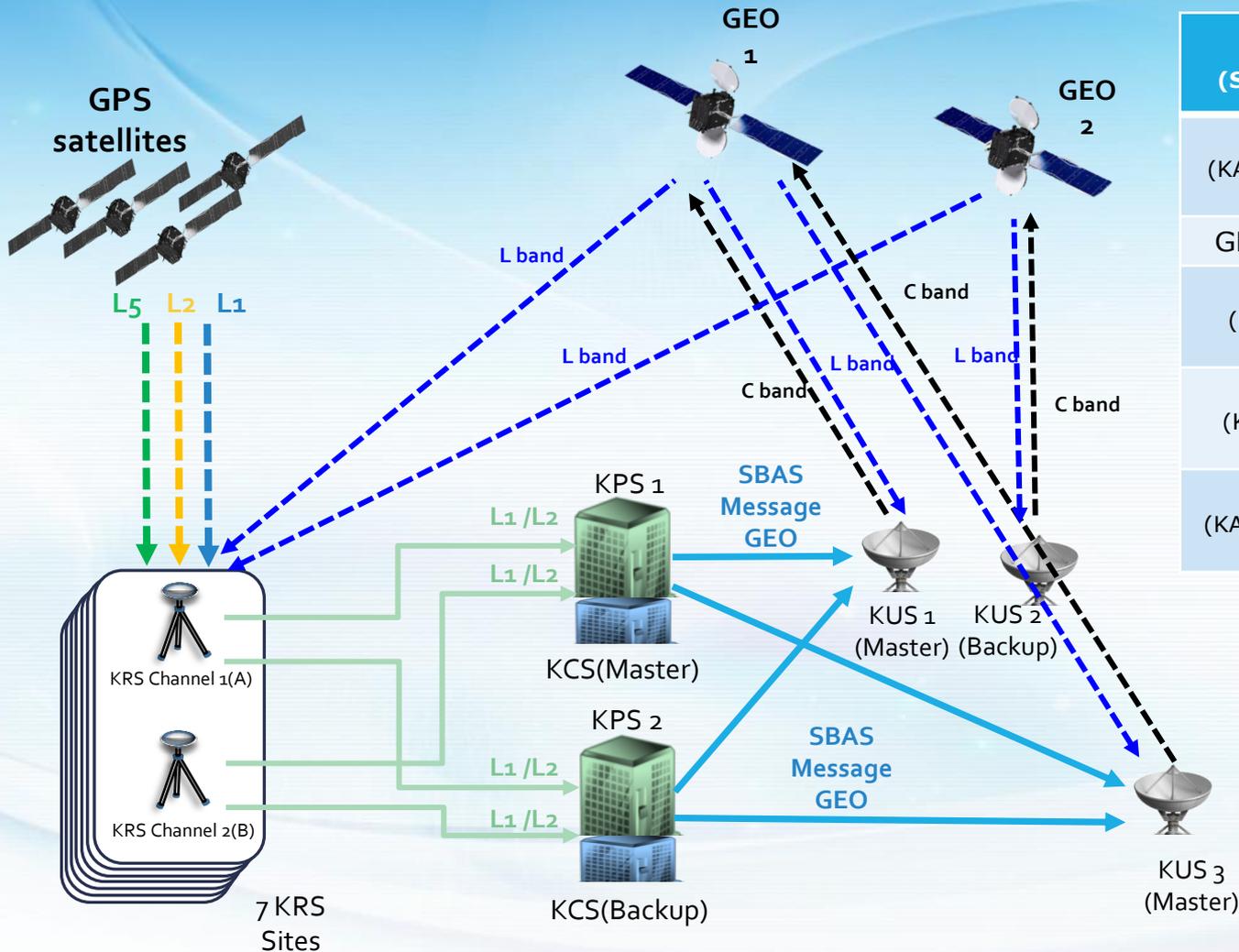


Organizational Structure related with KASS



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



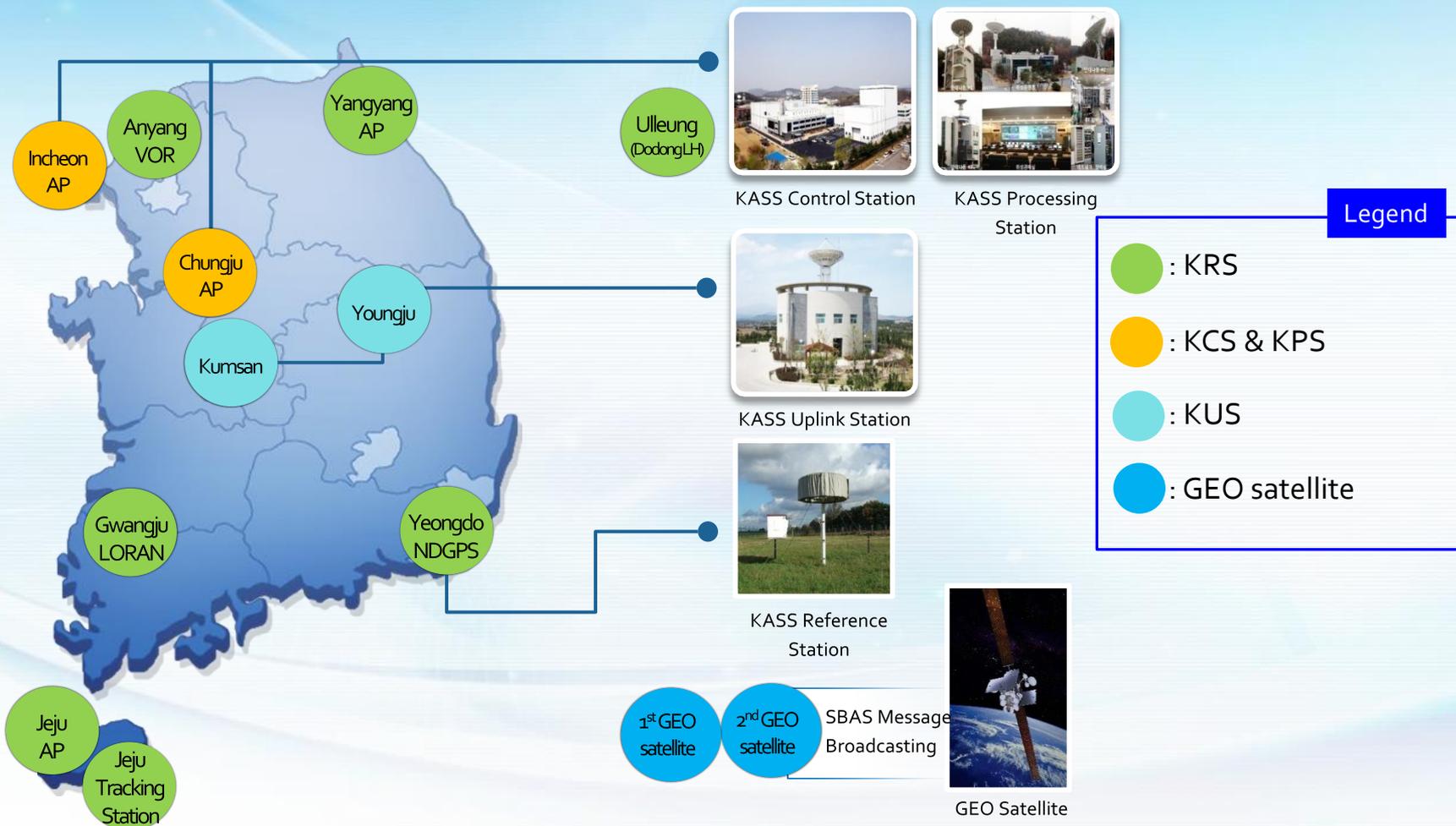
S/S (Sub System)	Qty. (Baseline)
KRS (KASS Reference Station)	7
GEO satellite	2
KUS (KASS Uplink Station)	3
KCS (KASS Control Station)	2
KPS (KASS Processing Station)	2



Sites and Satellites for KASS system

❖ 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

		For Test and Open Service(KPO)					For SoL Service(MOLIT)			
		'18	'19	'20	'21	'22	'23	'24	'25	'26
Acquisition (lease) Plan	1 st GEO					◆ SoL (Oct., 2022) OS (2Q, 2022)				
	2 nd GEO								◆ Korean GEO (Not Confirmed)	

A blue arrow labeled "ktsat-Airbus" points from the '21 column to the '26 column, with "3Q, 2021" written above it.



PRN code acquisition

SMC/GP has assigned the PRN code (134) to KASS for use on L1 C/A & L5



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS SPACE AND MISSILE SYSTEMS CENTER (AFSPC)
LOS ANGELES AIR FORCE BASE, CALIFORNIA

5 Jun 18

MEMORANDUM FOR KOREA AEROSPACE RESEARCH INSTITUTE
ATTN: NAM, GI-WOOK
EXECUTIVE DIRECTOR SBAS PROGRAM OFFICE
169-84 GWAHAK-RO
YUSEONG-GU, DAEJEON 34133, KOREA

FROM: SMC/GPE
483 North Aviation Blvd
El Segundo, CA 90245-2808

SUBJECT: KASS Pseudorandom Noise (PRN) Code Set Assignment

1. The purpose of this memorandum is to assign the Korea Augmentation Satellite System (KASS) temporary use of PRN code set 134 on the GPS L1 C/A signal centered at 1575.42 MHz, GPS L1C signal centered at 1575.42 MHz, GPS L2C signal centered at 1227.6 MHz, L5I5 signal centered at 1176.45 MHz, and L5Q5 signal centered at 1176.45 MHz. This assignment follows correspondence between representatives from the United States and Korea.

2. The KASS representative stated that the KASS system will only make use of the PRN code on the GPS L1 C/A and L5 signals. PRN code 134 on the L1C and L2C signals will be held in reserve by the GPS Directorate to prevent another system from using PRN code 134 on those signals.

3. The KASS PRN assignment is subject to the following conditions:

a. KASS will implement protective measures to preclude interference with operational SBAS systems providing safety of life services. Prior to operational certification and during periods of testing or other activities which may pose a risk to aircraft operations, KASS will transmit the "Type 0" message, in accordance with ICAO Annex 10 standards.

b. KASS will cease transmission of the L1 C/A and L5 PRN codes 134 immediately if it is determined by any ICAO or RTCA/EUROCAE member that the KASS transmissions impact operational SBAS safety of life services.

4. Please note that per the GPS Directorate PRN code assignment process, these preliminary PRN code assignments will expire in three years unless a renewal application is filed. As such, the PRN code assignments to KASS, as described in the tables below, will expire on 6 Jun 2021. The GPS Directorate will extend the PRN assignments as long as KASS requests an extension, continues completing objectives in its development schedule, and keeps the ICAO Navigation Systems Panel informed of the KASS development progress.

5. The following PRN codes have been assigned to KASS for use on L1 C/A and L5:

L1 C/A PRN Code Number	C/A			PRN Allocations	Orbital Slot	Effective Date
	G2 Delay (chips)	Initial G2 Setting (Octal)	First 10 Chips (Octal)			
<u>134</u>	130	0706	1071	KASS (INMARF3)	178° E	Active Until Jun 2021

L5 PRN Code Number	XB Code Advance (Chips) ⁱ		Initial XB Code State (Octal) ⁱⁱ		PRN Allocations	Orbital Slot	Effective Date
	I5	Q5	I5	Q5			
<u>134</u>	2380	4721	15425	11366	KASS (INMARF3)	178° E	Active Until Jun 2021

7. Although the GPS Directorate conducts an initial check on PRN code requests with respect to potential interference issues, the issuance of a PRN code does not convey the authority to radiate in the band. In order to radiate in the GPS L1 and L5 bands, the applicant shall obtain the necessary frequency assignment(s) from their national authority.

8. The GPS Directorate assumes no responsibility for ensuring systems using GPS Directorate spreading codes follow national radio frequency regulations or other applicable laws or regulations, or for ensuring that systems using GPS Directorate codes do not cause radio frequency interference. This responsibility rests with the requesting agency and the applicable national and/or international regulatory body.



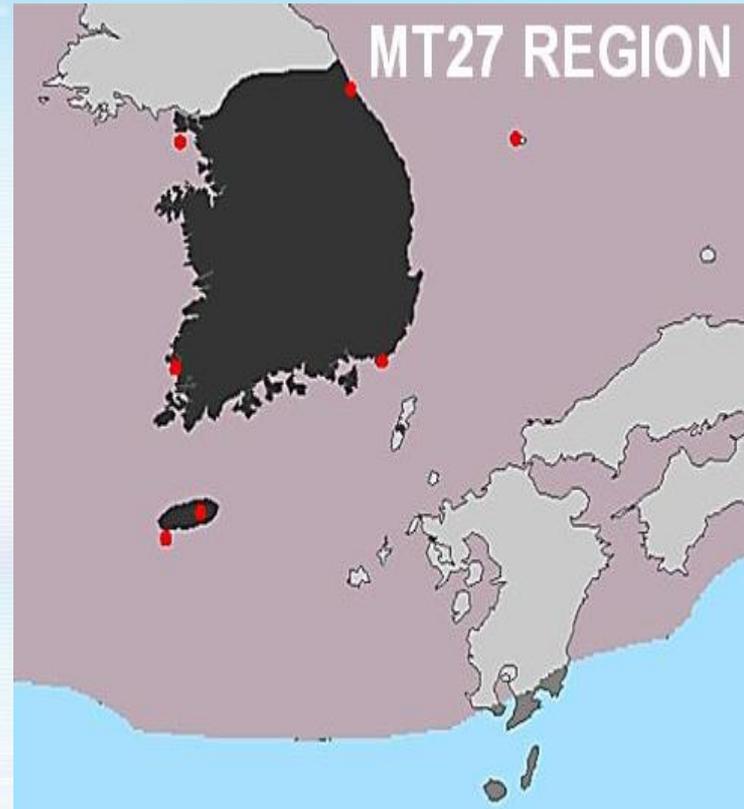
IPKP - Open Service Performance

❖ 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).

Performance	Best on LM*	Mean on LM*	Worst on LM*
Assessed availability performance	99.763 %	99.743 %	99.703 %
Assessed HNSE (95%)	0.87 m	0.92 m	0.97 m
Assessed VNSE (95%)	1.57 m	1.61 m	1.64 m

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



※ KASS APVI 99% availability Region



Republic of Korea's SBAS Concept



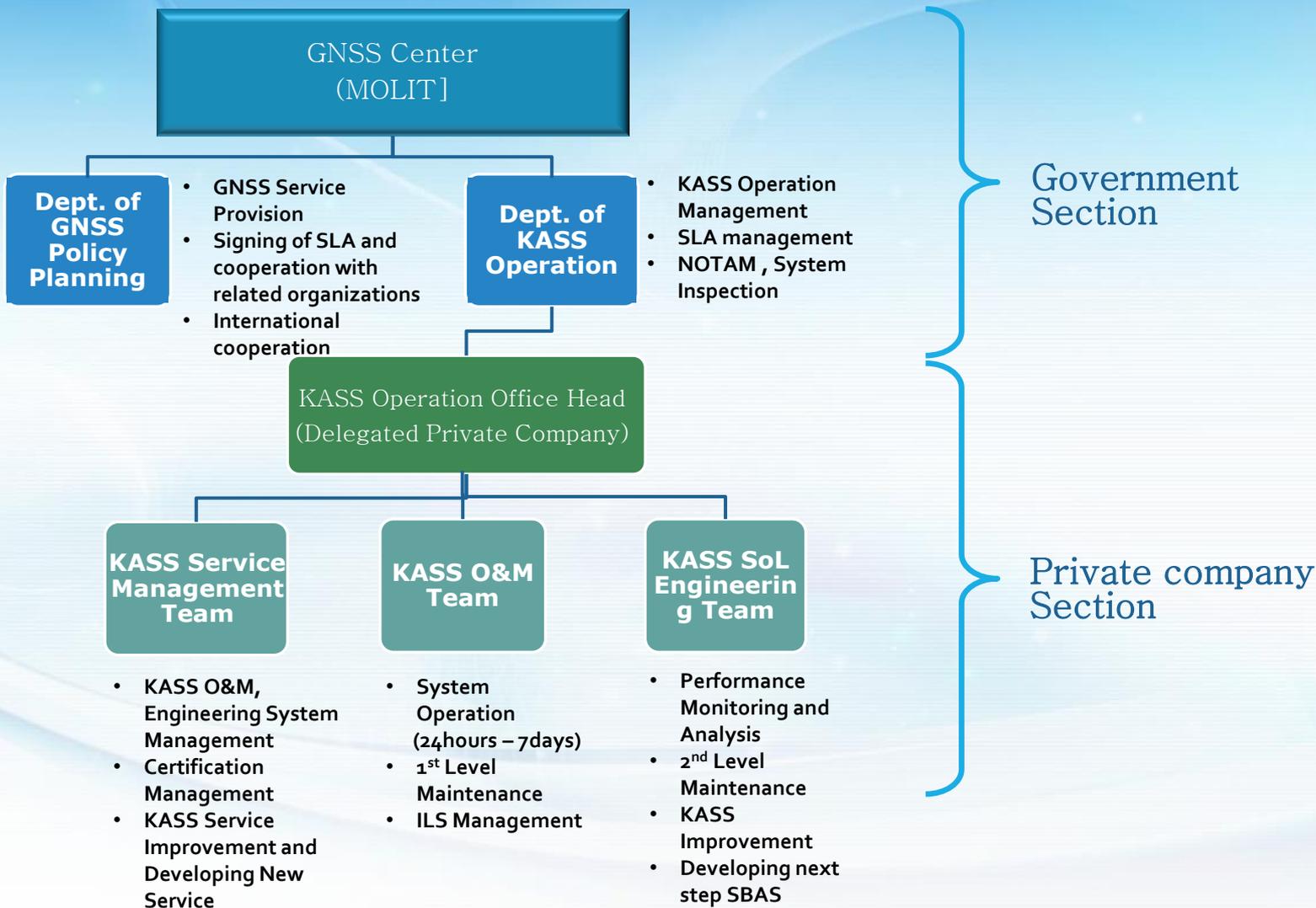
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Organizational Structure of KASS Operation

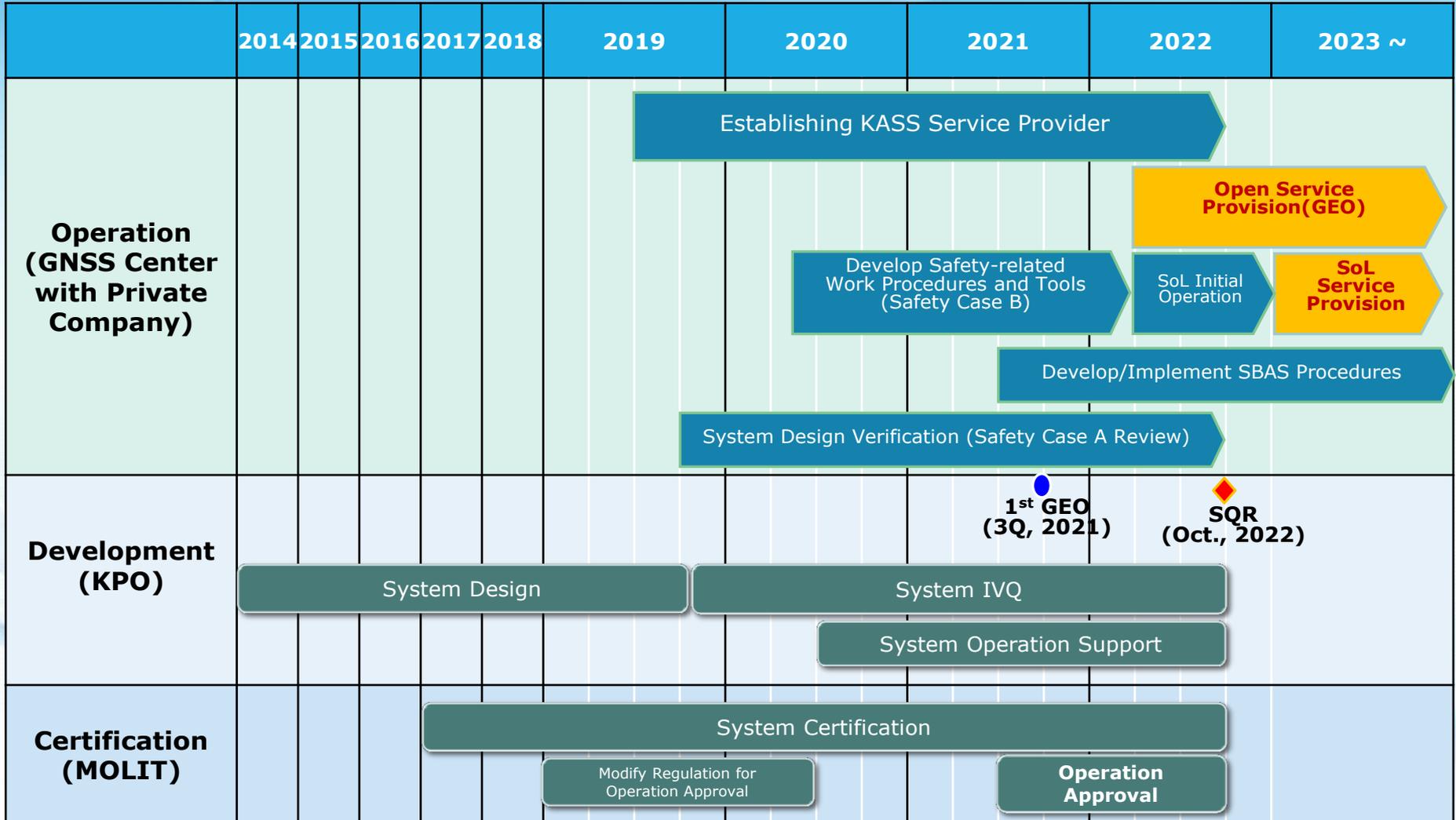
❖ KSP(KASS Service Provider) organization chart - Draft





Future Plan

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



Thank You!





❖ KASS Operation Approval(Designating Operation Company) - Draft

