Plans for Deploying RNSS in Korea

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Contents

KPS (Korea Positioning System)

❖ Background

- GPS is a key component of the Korean national infrastructure
  - Such as roads, power grid, timing, and national security
- In the case of a looming crisis such as a conflict, signals can be blocked by countries with own GNSS system to prevent their enemy forces from using them
- However, Korea does not have any navigation satellites, so totally depends on GNSS systems of other countries like GPS
- This possibility necessitated the development of KPS

KPS (Korea Positioning System)

❖ Status

- Mid and Long-term Plan of National Space Development was established in 2013
- Ministry of Science and ICT finalized the third Space Development Promotion Plan at National Space Committee on Feb. 5 2018
  - The plan includes the construction of the KPS, which provides services from 2035
- Now, a preliminary steering committee for embarking the KPS project has been organized.

KPS (Korea Positioning System)

❖ Concept

- Regional Navigation Satellite System complementary to other GNSS systems
- Total 7+ satellites constellation
  - GEO Satellite 3
  - EIGSO Satellite 4
- Free of direct user charges
- Services for augmentation of existing GNSS systems are also considered
  - These services have the advantage of ramping up the accuracy of the existing GNSS such as GPS, GLONASS, Galileo, and BeiDou less than one meter.

KPS (Korea Positioning System)

❖ Deploying Schedule

- Pre-Phase
  - FY 2018-19 Research
  - FY 2020-21 Preliminary Design
    - Including frequency coordination/assignment in ITU
- Phase 1
  - FY 2022-23 System Design and Core Technology Development
  - FY 2024-26 System Development
  - FY 2027 1st Satellite Launch
- Phase 2
  - FY 2028-29 In-Orbit-Validation
  - FY 2030-31 System Development & Expansion
  - FY 2032-34 6 Satellites Launch

KASS (Korean SBAS)

❖ Overview

Goal

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

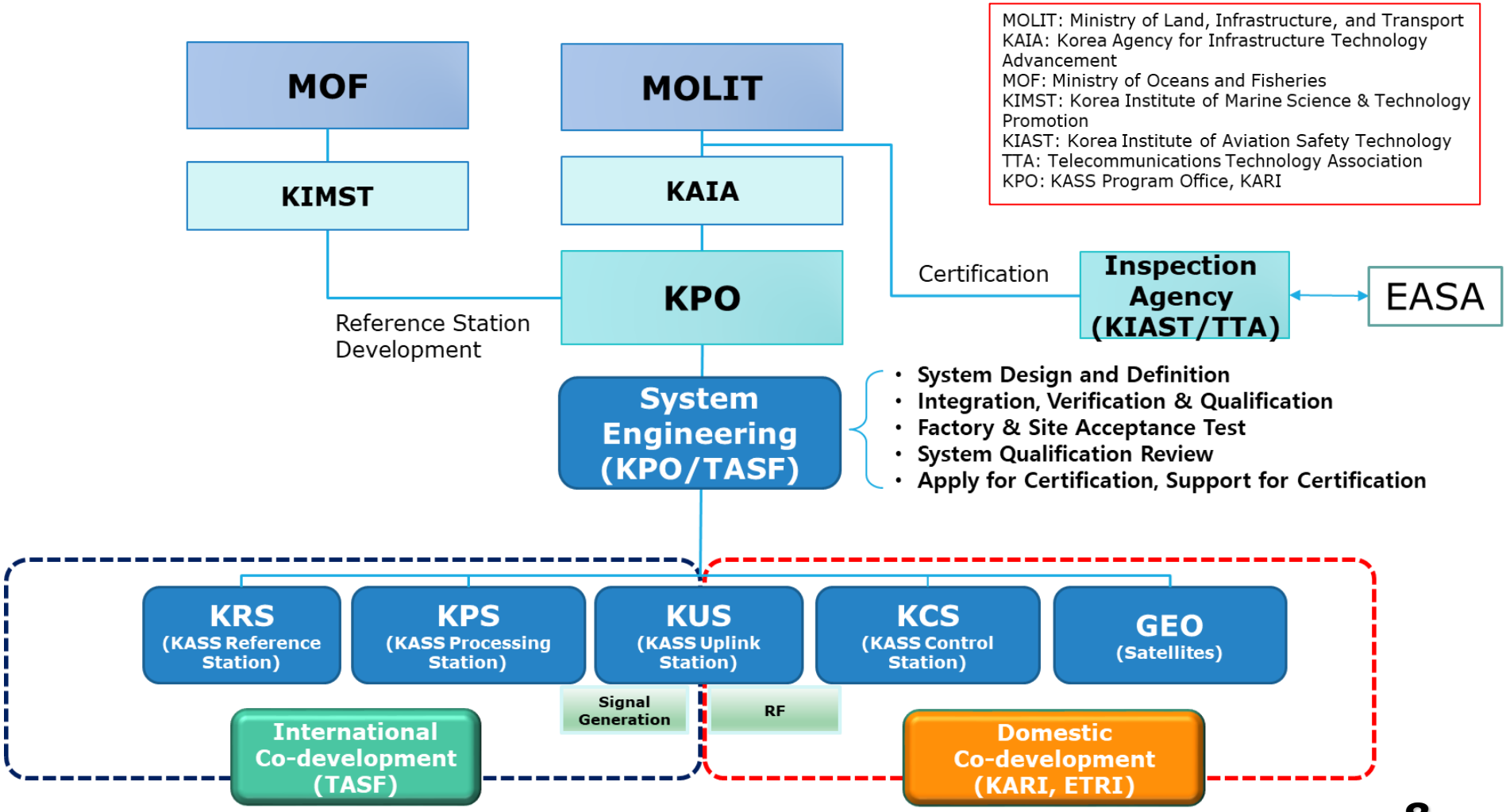
1. Provide APV-I SoL Service to Airports located in South Korea
2. Initiate Open Service in 2020 and APV-I SoL Service in 2022

[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**

KASS (Korean SBAS)

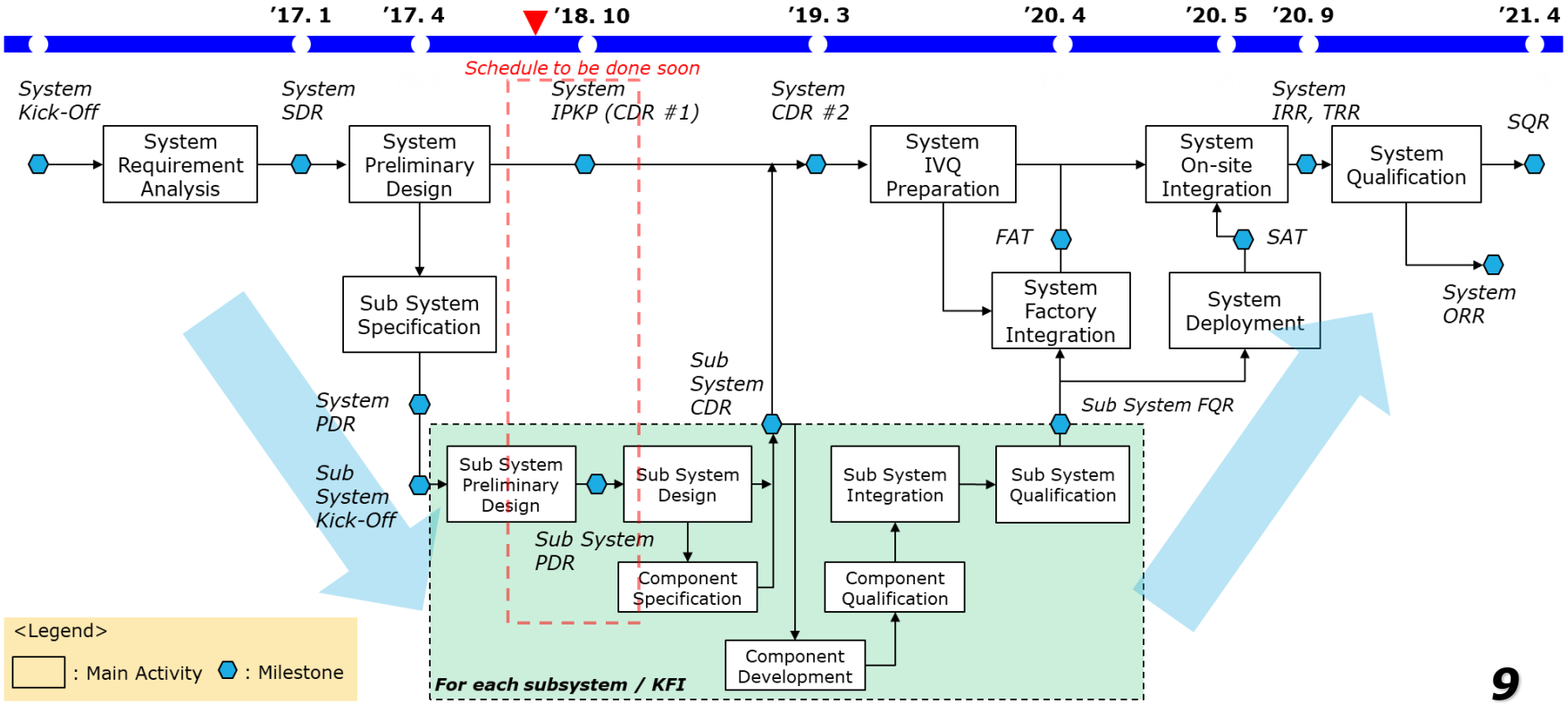
❖ Organization for Development



KASS (Korean SBAS)

❖ Development Process

- Requirement analysis and the preliminary design
- Subsystem PDR
- System CDR / System deployment / System qualification



KASS (Korean SBAS)

❖ PRN Code Acquisition

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

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.

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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)			
134	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			
134	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.

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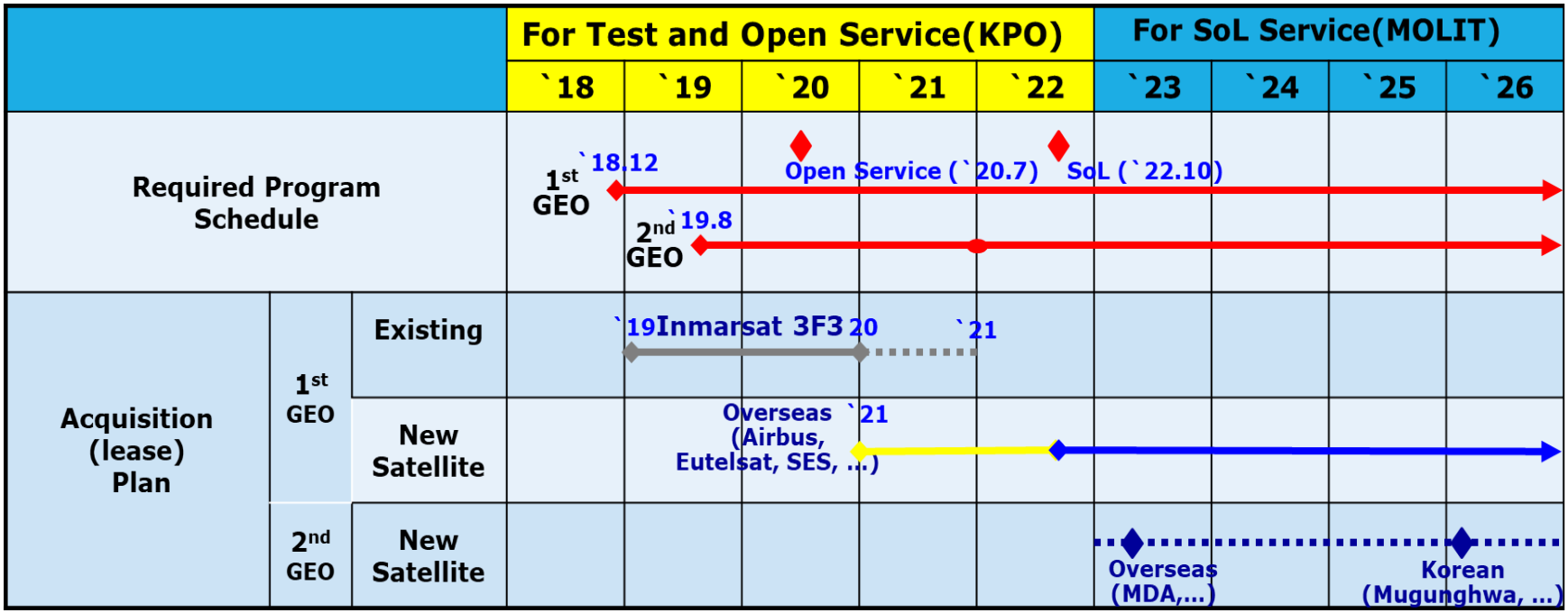
KASS (Korean SBAS)

❖ GEO & SBAS Payload Acquisition Plan

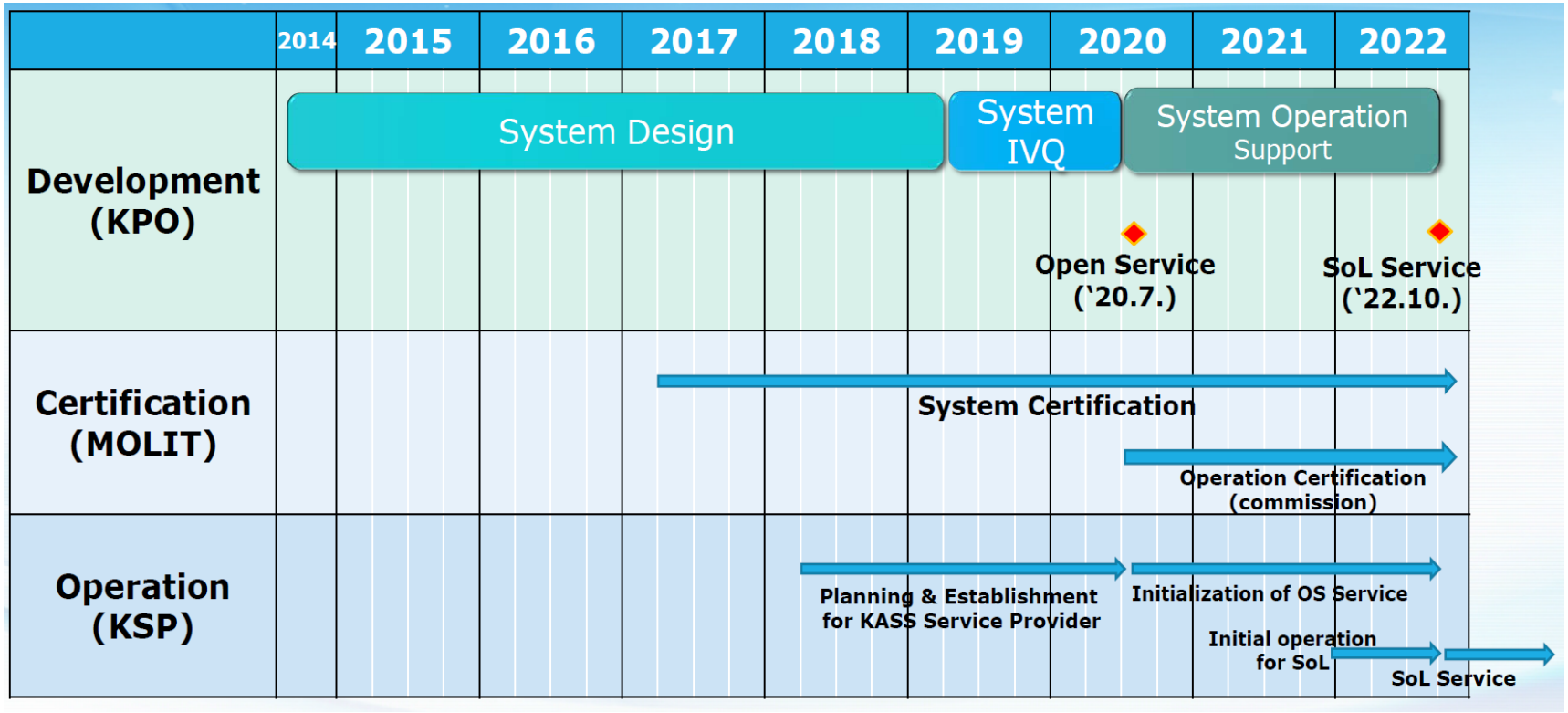
- KPO had plan to lease Inmarsat 4F1, 4F2 used by Australia and EC
- But, Australia and EC extended the duration of the contract, so KPO has changed GEO acquisition(lease) plan as below :



KASS (Korean SBAS)

❖ Future Plans

- Open service by July 2020
- SoL service by Oct. 2010



Thank you for listening !