Regulation
for KASS Certification

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KIAST

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KASS Certification

Overview of KASS Certification

- ## KASS Certification Procedure

System Certification

Establish MoC

- Identify CRB
- Discuss Applicability
- Establish MoC

Inspection/Audit

- Function and Interfaces
- Performance and Safety
- Software Qualification

KASS APV-I System Certification PASS / FAIL

Currently in Progress

Operation Certification

- Training Status of Operator/Maintainer
- Manual, Record Form
- Result of Ground/Performance/Flight Inspection
- Spare Parts, Plan for Preventive Maintenance
- Plan for Quality Management
- Environment of Facility, Equipment, etc.

NOT Confirmed

MOC : Means of Compliance
CRB : Certification Regulatory Basis

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Overview of KASS Certification

- ## KASS Development and Certification Process

Implement Field

System Development
= KASS KPO/TASF

Service (Preliminary) Operation
= KSP (TBD)

PDR   CDR   TRR/SQR   OQR

Preliminary Design	Detail Design	Production and Integration	Establish operating Organization and Procedures	Operational Implementation

Certification Field

SoL (Safety of Life) Service

Verification of Specification	Design Verification	Integrated System Verification	Integrated System Operation Verification

System Certification
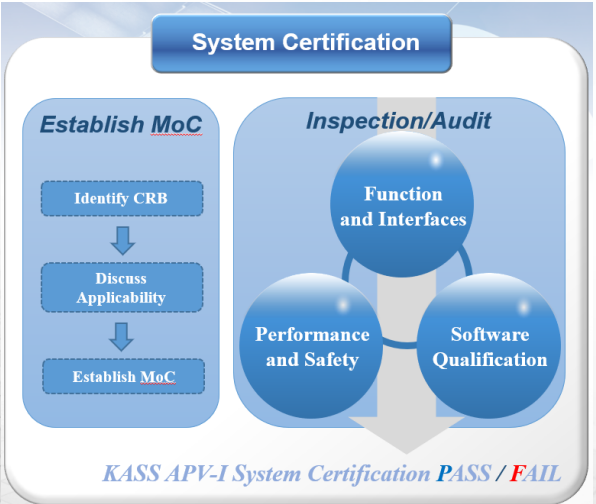= KIAST & TTA

Operation Certification
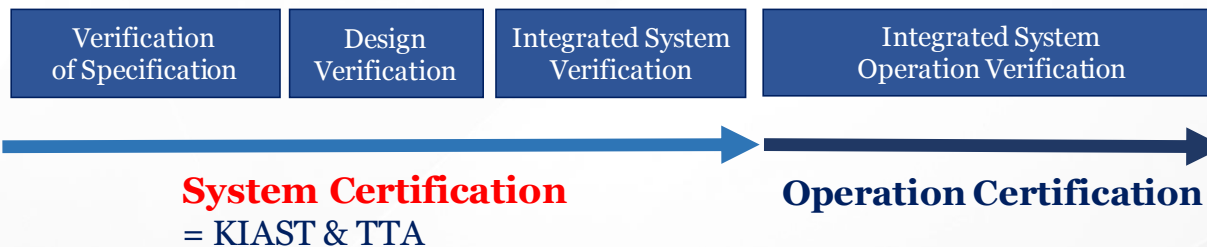
PDR : Preliminary Design Review
CDR : Critical Design Review
SQR : System Qualification Review
OQR : Operation Qualification Review

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KASS System Certification Framework

System Certification

Establish MoC
- Identify CRB
- Discuss Applicability
- Establish MoC

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- Function and Interfaces
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KASS APV-I System Certification PASS / FAIL

Certification Field

Verification of Specification	Design Verification	Integrated System Verification

System Certification
= KIAST & TTA

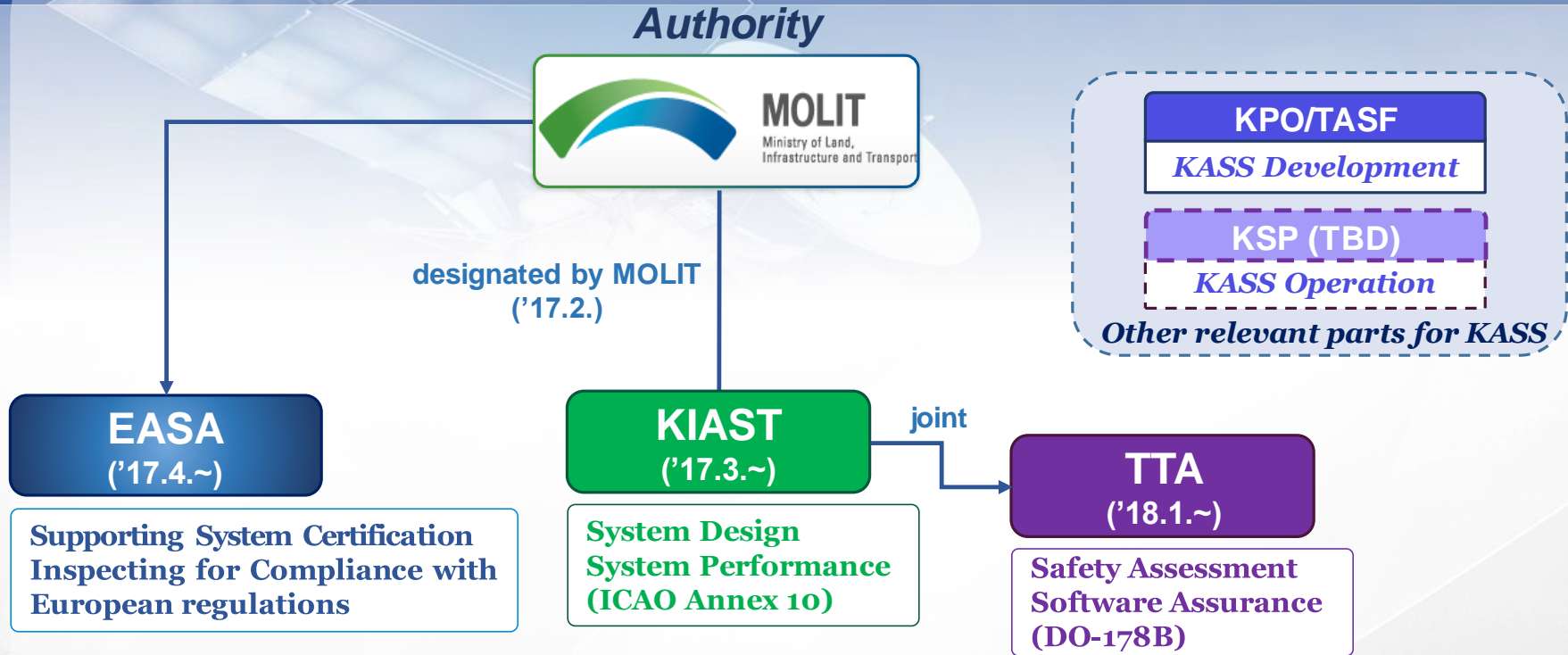# KASS System Certification Framework (1/4)

- **For the CNS System certification in Korea,**
  - In general, system certification is performed for fully completed CNS systems.
    - Exceptionally, KASS certification is in progress at the same time as system development considering the complexity of the system.

- **What is the System Certification?**
  - Check if the CNS facilities are manufactured in accordance with the technical standards or not

- **The main focus to certify KASS systems**
  - Satisfy requirements for SIS performance (APV-I)
  - Develop in proportion to design assurance level
  - Satisfy requirements for safety performance

- **KASS Inspection Organization for System Certification**
  - Primary IO : KIAST / Joint IO : TTA

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Authority

MOLIT
Ministry of Land,
Infrastructure and Transport

KPO/TASF

KASS Development

KSP (TBD)

KASS Operation

Other relevant parts for KASS

**designated by MOLIT
('17.2.)**

**EASA
('17.4.~)**

**Supporting System Certification
Inspecting for Compliance with
European regulations**

**KIAST
('17.3.~)**

joint

**System Design
System Performance
(ICAO Annex 10)**

**TTA
('18.1.~)**

**Safety Assessment
Software Assurance
(DO-178B)**

MOLIT (Ministry of Land, Infrastructure, and Transport)
KAIA (Korea Agency for Infrastructure Technology Advancement)
KIAST (Korea Institute of Aviation Safety Technology)
TTA (Telecommunications Technology Association)

■ **Specific role for KASS system certification**

Certification Authority (MOLIT)

• KASS Certification Management
• Issue Certificates

Inspection Organization (KIAST, TTA)

• Prepare Inspection Plan
• Discuss MoC(Means of Compliance with applicant
• Review Certification Evidence
• Report SoC(State of Compliance) in line with KOREA Regulation

KASS Certification

Applicant (KPO) (↔ TASF)

• Propose and configure MoC(Means of Compliance)
• Prepare Certification Plan (CP)
• Prepare Qualification Plan (QP) and Qualification Review (QR)
• Prepare Certification Evidence (Documentation, Plan, Procedure)

External Specialist (EASA)

• Report SoC(State of Compliance) in line with EU Regulation
• Support for Inspection Organization

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KASS System Certification Framework (4/4)

- **The relation between KIAST and EASA**
  - EASA provides technical support for KASS system certification
    - KIAST, TTA and EASA share on issues related to KASS certification.
    - EASA consults on KASS System Certification.
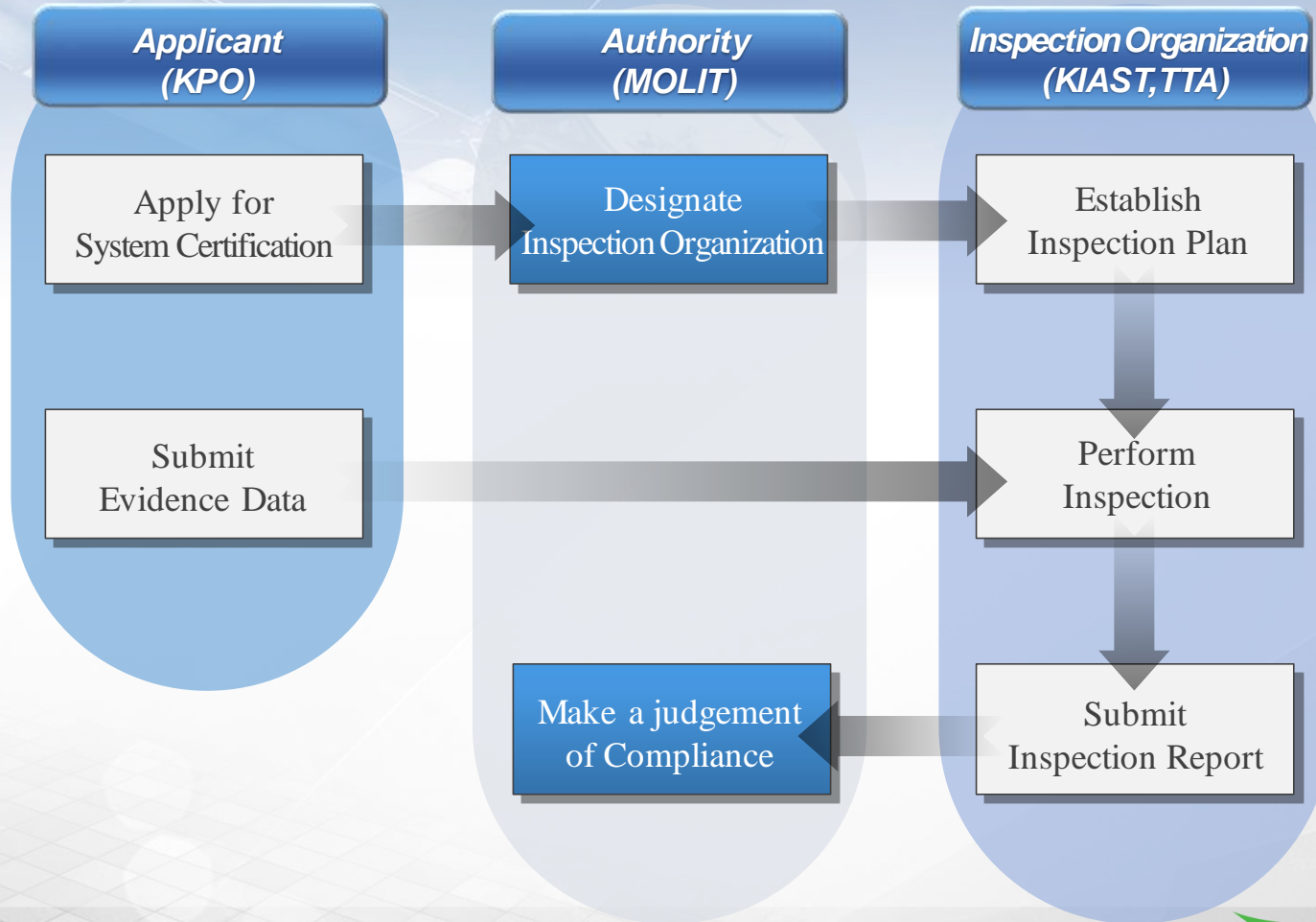   - EASA issues a SoC(State of Compliance) on if KASS is properly designed and implemented or not.

3 Procedure for System Certification

▪ General System Certification Process

Applicant (KPO)	Authority (MOLIT)	Inspection Organization (KIAST, TTA)
Apply for System Certification	Designate Inspection Organization	Establish Inspection Plan
Submit Evidence Data		Perform Inspection
	Make a judgement of Compliance	Submit Inspection Report

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Step1	Step2	Step3

SYSTEM CERTIFICATION PROCEDURES

1 Establish Means of Compliance

- Identify Certification Regulatory Basis (CRB)
- Assess the applicability of each regulatory requirement for KASS
- Establish the Means of Compliance (MoC) for each regulatory requirement

2 Preliminary Inspection

- review development documents
  - check analysis method and data
  - check environmental test data (EMI/EMC)
  - review interpretation of performance and risk analysis using modeling and simulation techniques
  - review the ground/flight test procedures, verify its suitability and safety
- perform software audit
- If necessary, witness domestic and overseas testing site

3 Formal Inspection

- inspect the completed KASS system
- check each regulatory requirement according to Means of Compliance(MoC)
- check the compliance with the final function
- check the compliance with the final performance
  - accuracy, integrity, availability, continuity

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- **Identification Certification Regulatory Basis(CRB) for KASS (1/2)**
  - ① 『**MOLIT NAVAID Notification 2016-122**』

    국토부 고시 제2016-122호 항행안전시설 성능적합증명 검사 기술기준

    ### 항행안전시설 성능적합증명 검사 기술기준

    [시행 2016.3.16] [국토교통부고시 제2016 - 122호, 2016.3.16, 일부개정]

    제3조 (적용기준) ① 항행안전무선시설의 기술기준은 항행안전무선시설 설치 및 기술기준(국토교통부 고시)중에서 기술기준을 적용한다.

    ② 항공정보통신설의 기술기준은 항공정보통신시설 설치 및 기술기준(국토교통부 고시)중에서 기술기준을 적용한다.

    ③ 제1항 또는 제2항의 검사 시 ICAO 기술 기준은 필수로 하고 해당 시설이 소프트웨어를 포함하는 경우 미국 또는 유럽의 공인화 된 항공관련 소프트웨어 개발 기술기준 최소 1개를 적용한다. 다만, 미국 또는 유럽 기술기준의 경우는 성능적합증명 검사 신청자의 선택으로 한다.

  - ② This includes 『**ICAO SARPs Annex 10 Vol.1 (SBAS part)**』

■ **Identification Certification Regulatory Basis(CRB) for KASS (2/2)**

- ③ 『**Worldwide Industrial Software Qualification Standard**』
  - If the facility includes software, apply at least one of authoritative guideline/standard widely recognized in USA/EU.
  - Applicant should select one guideline(or standard) to apply there system.
    - (ex> DO-278A (ED-109A), ECSS-Q-ST-80C, DO-178C (ED-12C), NASA-STD-8739.8 etc.)

⟹ In case of KASS, applicant selects 『**DO-178B (ED-12B)**』 .

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- **Establish the Means of Compliance (MoC)**

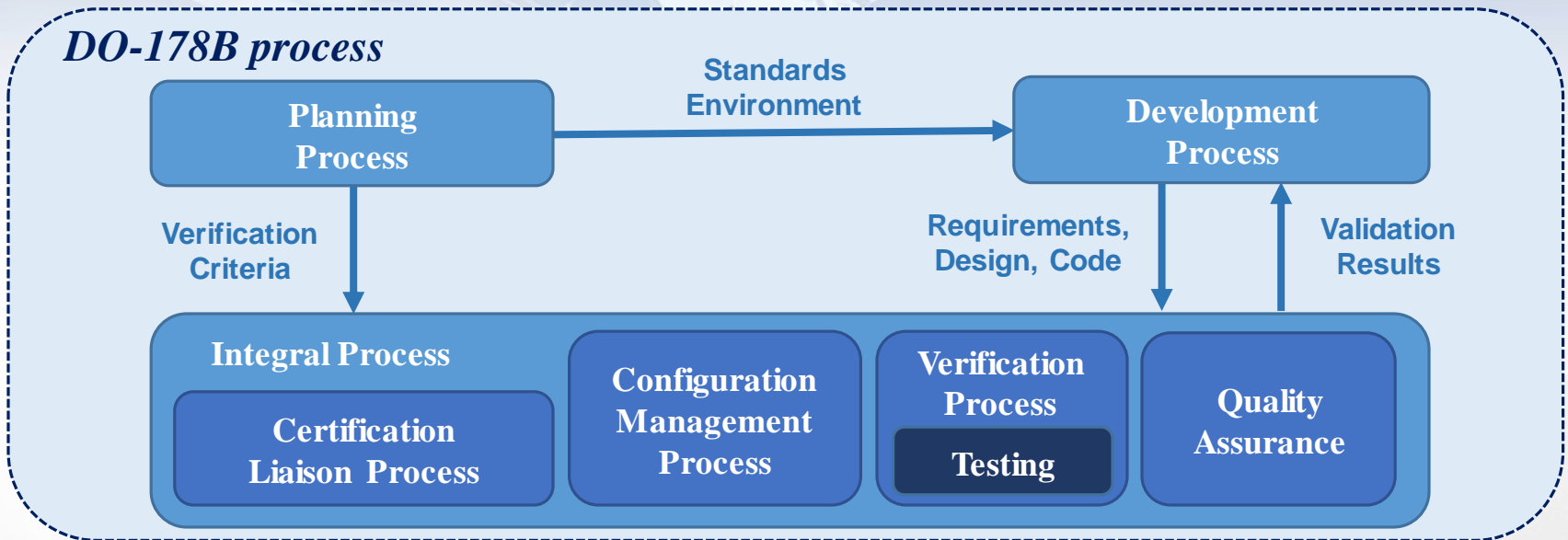| Identification CRB	Applicability	MoC (Means Of Compliance)
Domestic Regulation (MOLIT NAVAID) **International Standard (ICAO Annex10 Vol.I)**	▪ Assess applicability for each regulatory requirement. ▪ If regulatory requirements are not applicable, enter reason for not applying.	▪ Discuss how to show compliance ▪ Choose one of the following method of verification - Review - Analysis - Test - Simulation

- **Applicability Discussion**
  - The following table is the examples if some regulatory requirements are not applicable for KASS.
    - It is necessary to clarify the reasons why it does not apply instead of the MoC.

Regulatory Requirement		Applicability	Reason for not applying
Domestic Regulation (MOLIT NAVAID)	International Standard (ICAO Annex10 Vol.I)		
1)위성항법시설의 구성요소 위성항법시설의 항법업무는 지상시설, 위성 및 항공기에 탑재된 다음 각호의 장비들의 다양한 결합에 의해 제공되어야 한다. 나) CSA를 제공하는 GLONASS	3.7.2.2.1 The GNSS navigation service shall be provided using various combinations of the following elements installed on the ground, on satellites and/or on board the aircraft: b) Global Navigation Satellite System (GLONASS) that provides the Channel of Standard Accuracy (CSA) navigation signal as defined in 3.7.3.2;	N/A	This is for other navigation facilities
(1) 대기의 영향을 제외하고, SBAS 위성으로부터의 거리오차는 25미터 (95%)를 초과하지 않아야 한다	3.7.3.4.2.1 Ranging 3.7.3.4.2.1.1 Excluding atmospheric effects, the range error for the ranging signal from SBAS satellites shall not exceed 25 m (82 ft) (95 percent).	N/A	Optional Regularity Requirement (GEO ranging)
	3.5.8 AIRCRAFT ELEMENTS	N/A	User Segment (Ground, Space segment is not for system certification in Korea)

▪ Check the Compliance

- The following table is an example if some regulatory requirements are applicable for KASS.
  - Compliance is determined separately for each applicable CRB.

Certification Regulatory Basis (CRB)	Applicability	Means of Compliance (MoC)	Item List to check in accordance with MoC	Compliance/ Not compliance
2) 공간 및 시간 기준 가) GNSS에 의해 이용자에게 제공되는 위치정보는 전 세계 측지시스템(이하 "WGS-84"라 한다) 좌표를 적용하여야 한다. 다만, WGS-84 좌표 이외의 것을 사용하는 GNSS 장비는 적절한 전환 파라미터가 적용되어야 한다. 3.7.2.3 Space and time reference 3.7.2.3.1 Space reference. The position information provided by the GNSS to the user shall be expressed in terms of the World Geodetic System - 1984 (WGS-84) geodetic reference datum.	A	Analysis Test	Analysis Document → Analysis 1, Analysis 2, Analysis 3 ⋮ Test Document → Test Procedure, Test Result, Test Plan ⋮	Compliance

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- ## Software Assurance
  - DO-178B : Software Considerations in Airborne Systems Equipment Certification
    - To determine if the 5 "Software Level" of software safety, requirement-based testing focus

DO-178B process

| Planning Process | Standards Environment → | Development Process |

- Verification Criteria
- Requirements, Design, Code
- Validation Results

Integral Process

| Certification Liaison Process | Configuration Management Process | Verification Process — Testing | Quality Assurance |

- During the DO-178B certification, the Inspection Organization takes part in the development process to review the output associated with certification.
  - The audit process is carried out in 4 stages(SOI, Stage of Involvement) in sequence

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- **Software Development and Assurance V-model**

Project / CERT Planning

System Spec.

SOI 1
Software Planning Review

SW / HW High Level REQs

Preliminary Design

SW / HW Low Level REQs

SOI 2
Software Development Review

Implementation

Low Level V&V

SW/SW SW/HW Integration

High Level Integration V&V

SOI 3
Software Verification Review

Post Development

SOI 4
Final Certification Software Review

Pre-CERT

Installation / Operation

SOI : Stage of Involvement
(FAA Order 8110.49 Software Approval Guidelines Chg.1)

4 KASS Operation Certification

KASS Operation Certification (1/2)

- **What is the Operation Certification?**
  - The purpose is to check that the service provider has sufficient ability to operate, and check compliance with requirements to provide navigation service.

  ### Check Item

  - Training Status of Operator/Maintainer
  - Manual, Record Form
  - Spare Parts, Plan for Preventive Maintenance
  - Plan for Quality Management
  - Result of Ground/Performance/Flight Inspection
  - Environment of Facility, Equipment, etc.

  - Currently, there are no more specific regulatory requirement for above items.
  - It is important to improve regulatory requirement for operation certification because operational factors have a significant impact on SBAS performance and safety.

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KASS Operation Certification (2/2)

- **Scheme for Improvement of Operation Certification**
  - The reference from EU regulation
    - *EC (No. 550/2004, 482/2008, 552/2004, 1034/2011, 1035/2011)*

Service Provision	SW safety Assurance Approval	Interoperability	ANSP Safety Oversight	ANSP SMS and QMS

ANSP : Air Navigation Service Provider
SMS : Safety Management System
QMS : Quality Management System

  - These regulations are consolidated *by **EU 2017/373*** (2017.3.1)

    Commission Implementing Regulation

  - **This may be used to improve the specific of regulatory requirement for operation certification.**

  - The Inspection Organization for Operation Certification will be designated by MOLIT after improvement of the regulation for Operation Certification.

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Thank you

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