

A satellite with large solar panels and a parabolic dish antenna is shown in space against a blue background with a bright light source.

Software Certification Status of KASS

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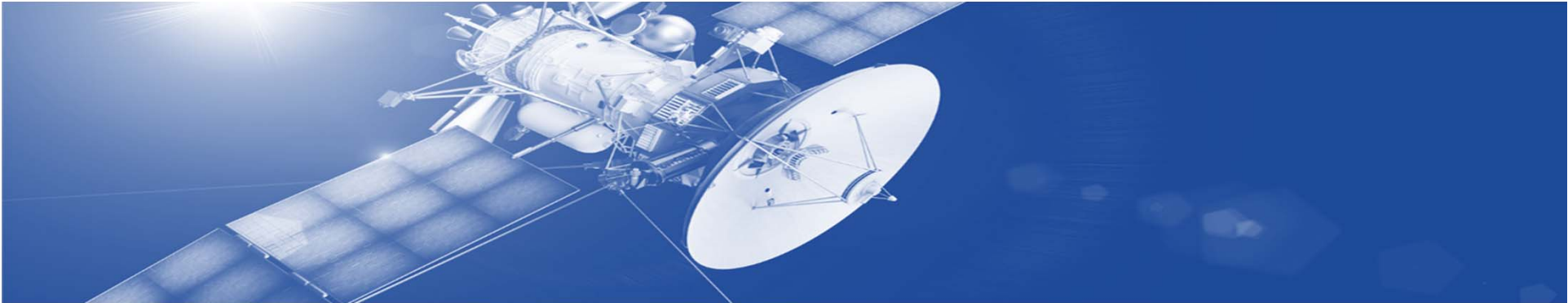
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A satellite with large solar panels and a parabolic dish antenna is shown in space against a blue background with a bright light source.

Introduction to KASS Software Certification

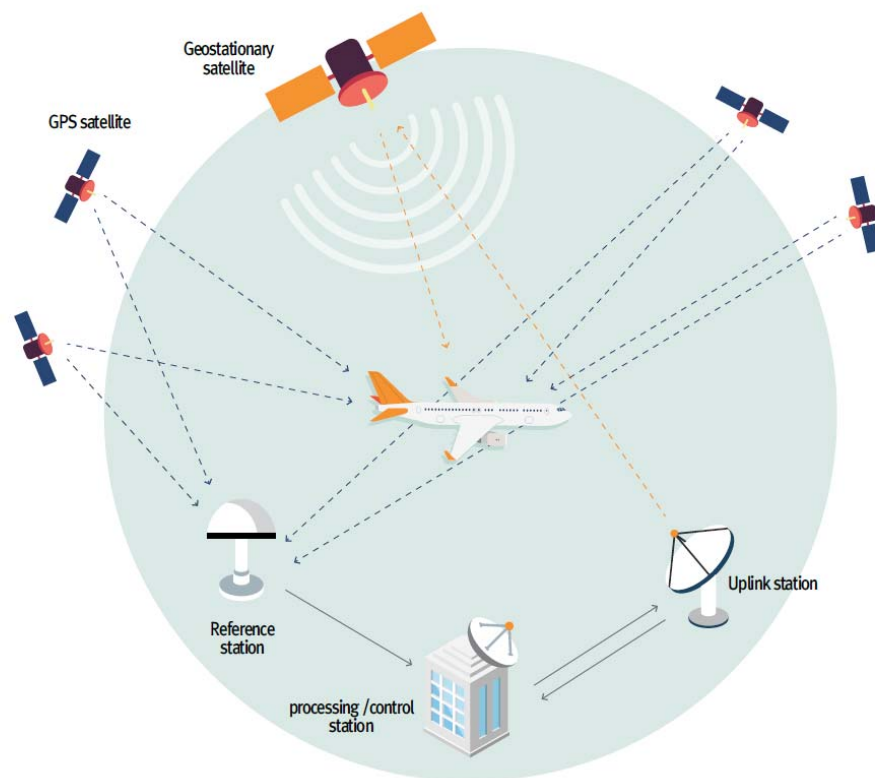
About TTA

■ Services

- Support SMEs by proposing international and domestic standards in ICT fields
- Perform testing and certification
 - ICT
 - Software including aviation
- Support globalization and localization of software products



KASS Introduction



Subsystem

#

KRS
(KASS Reference station) 7

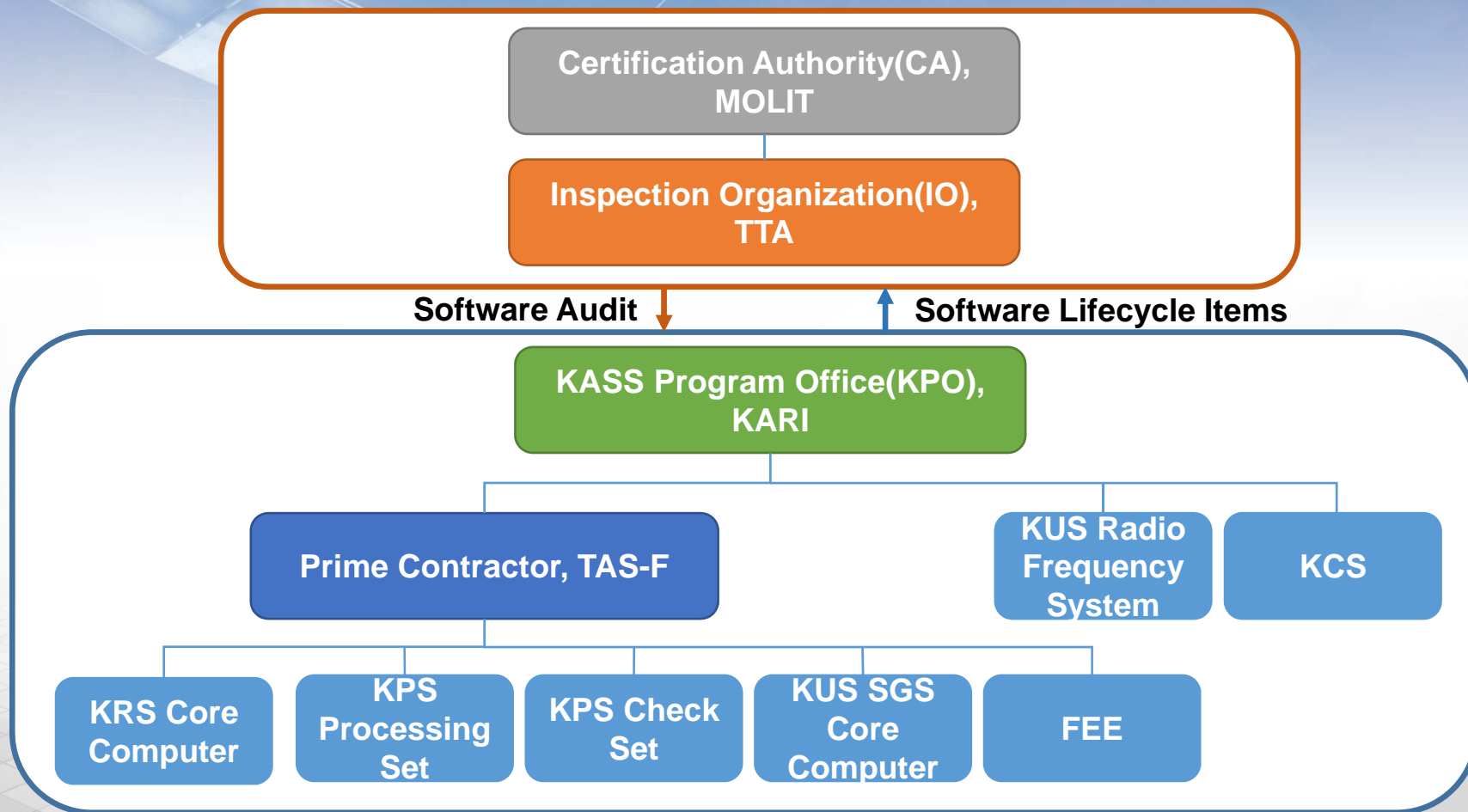
KPS
(KASS Processing station) 2

KCS
(KASS Control station) 2

KUS
(KASS Uplink station) 3

GEO
(Geostationary satellite) 2

KASS Software Certification Interface



KASS Software Certification Interface

- Inspection Organization (IO)
 - IO audits developers on behalf of the certification authority, *Ministry of Land, Infrastructure and Transport (MOLIT)*
 - IO reviews KASS software if it is appropriately developed and conforms to the objectives of DO-178B.
- Tasks are:
 - Reviewing DO-178B outputs
 - Conducting field audits to validate the compliance of DO-178B processes

KASS Software Certification Interface

- KASS Program Office (KPO)
 - KPO manages the entire KASS program and related contractors.
 - Tasks are:
 - Establishing PSACs for KPO Furnished Items
 - Coordinating certification with CA/IO
 - Preparing certification artifacts
 - Preparing SOI phase's outputs and activities
 - Reviewing outputs and development activities
 - Reviewing all certification artifacts before submission to CA/IO
 - Applying for certification
 - Supporting for CA/IO to review certification artifacts

KASS Software Certification Interface

■ Prime Contractor

- The Prime Contractor provides the entire system integration and develops none KPO furnished sub-systems.
- Tasks are:
 - Establishing PSACs for none KPO furnished sub-systems
 - Preparing certification artifacts
 - Preparing SOI phase's outputs and activities
 - Supporting for KPO to review certification artifacts
 - Delivering a Declaration of Suitability for Use to the KASS Service Provider

Subsystem to be Certified w.r.t. Software

Sub-System	Functionality
KPS Processing Set	To compute the Navigation Overlay Frame based on raw measurement from the KRS
KPS Check Set	To monitor the integrity of the provided data
Front End Equipment	To isolate KASS application software (of KPS, KCS and KUS) from all network-related software
KRS Core Computer	To do central monitoring and control element of the KRS channel
KUS SGS Core Computer	To synchronize all KUS SGS equipment with the KASS ground segment
KUS Radio Frequency System	To ensure the transmission and reception of signals to/from the GEO satellite, and provides calibration paths
KCS	To monitor and control system functions and status

Certification Regulations and Standards

- Regulation: MOLIT Public Notice 2017-266
 - Make certification applicants follow international software criteria
- RTCA DO-178B
 - KPO selects DO-178B standard for software certification
 - Software level B, C and D will be applied
- Additional Standard
 - Tailored ECSS-Q-ST-80C is considered for software level E for quality assurance

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KASS Software Certification Plan and Status

Software Certification Objective and Activities

- Objective of certification
 - Ensure that KASS software is appropriately developed and conforms to the objectives of DO-178B.
- Activities
 - Determination of the level of the IO Involvement
 - PSAC review and approval
 - Software field audits (stage of involvement)
 - SAS review and approval
- MOLIT delegates the authority of approval PSAC to IO.

Level of IO Involvement

- Following criteria are tailored and applied to determine Level of IO Involvement



FAA Order 8110 49 Change 2



EASA CM SECEH 002 (Software Aspects of Certification)



Conducting Software Reviews Prior to Certification Job Aid - Rev1



Software Review Job Aid – Supplement #3

Factors of LOI Determination



Software level

Software attribute (e.g. complexity)

Use of new knowledge

Applicant's experience



LOI Result

- LOI will change whenever developers change

Sub-System	Level of Involvement
KPS Processing Set	Medium
KPS Check Set	Medium
Front End Equipment	Low
KRS Core Computer	Medium
KUS SGS Core Computer	Medium
KUS Radio Frequency System	Medium
KCS	Low

Stage of Involvement (SOI)

- IO has been involved in following SOI stages

PDR

S/S
KOM

S/S
CDR

S/S QR

SQR

SOI #1

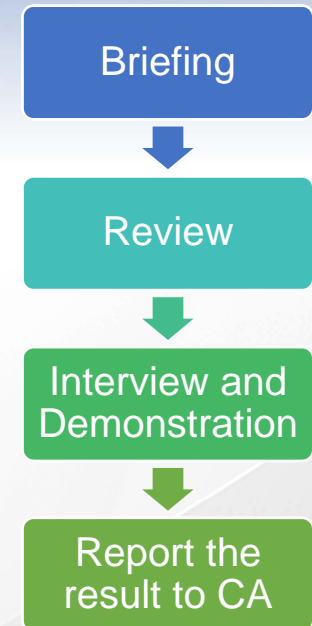
SOI #2

SOI #3

SOI #4

Software Field Audit

- Schedule
 - Oct. 1st 2018 – Oct. 12th 2018
- Target S/S
 - KPS-PS: combined SOL#1 and #2
 - FEE: combined SOL#1, #2 and #3
 - KRS-CC: combined SOL#1 and #2



SOI #1 Activity

■ Software Planning Review

- Objectives

- Assure plans and standards meet DO-178B objectives and address other applicable software policy, guidance, and issue papers.
- Assure that the processes described in the applicant's plans meet the objectives of DO-178B and address other applicable software policy, guidance, and issue papers.
- Obtain agreement between CA and applicant on the plans, standards, and proposed methods of compliance.

- Schedule

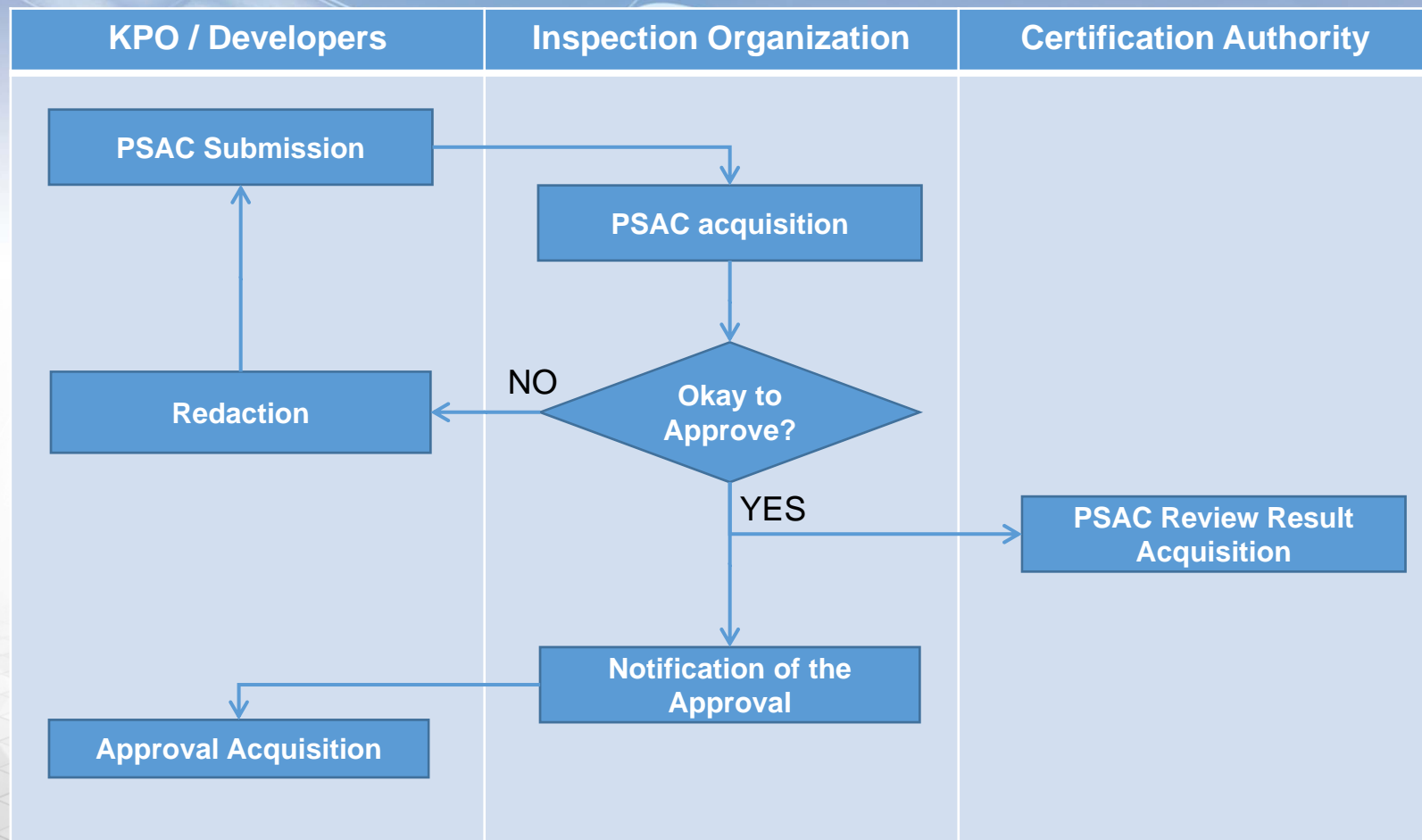
- Performed when planning process is complete

- Target S/S: KPS-PS, KRS-CC, and FEE

SOI #1 Data Reviewed

- Plans including PSAC
- Development Standards
- Safety Assessment Data
- Additional Considerations
 - COTS(Commercial off-the-shelf) Software
 - PSH(Product Service History)
 - PDS(Previously Developed Software)
 - OSS(Option-Selectable Software)
 - UMS(User-Modifiable Software)
 - FLS(Field-Loadable Software)
 - MVDS(Multiple-Version Dissimilar Software)

PSAC Approval Process



SOI #2 Activity

■ Software Development Review

• Objectives

- Assess implementation of plans and standards for the software requirements, design, and code, and related verification, SQA, and SCM data.
- Assess and agree to plans and standards changes.
- Assess implementation of new technology and methods to ensure compliance to plans, standards, and agreements.
- Assure life cycle data satisfies DO-178B objectives and other applicable software materials.

• Schedule

- Performed when the function of the software is 50% complete

• Target S/S

- Combined with SOI #1 (KPS-PS, KRS-CC, and FEE)

SOI #2 Data Reviewed

- Development Standards
- Software Requirements and Traceability Data
- Design Description
- Source Code
- Software Verification Results
- Problem Reports
- Software Configuration Management Records

SOI #3 Activity

■ Software Verification Review

• Objectives

- Assess implementation of verification and test plans and procedures.
- Assess completion and compliance of all associated SCM and SQA tasks.
- Ensure software requirements are verified.
- Ensure robustness testing is planned and is being performed.
- Ensure analyses (including timing, memory, test coverage, structural coverage, and data and control coupling) are being performed, as required by DO-178B.
- Ensure verification activities satisfy DO-178B objectives.

• Schedule

- Performed when the V&V is 50% complete

• Target S/S

- FEE

SOI #3 Data Reviewed

- Software Requirements Data
- Design Description
- Source Code
- Software Verification Cases and Procedures
- Software Verification Results (including review results, analyses results, and test results)
- Problem Reports
- Software Configuration Management Records
- Software Quality Assurance Records

A satellite with large solar panels and a parabolic dish antenna is shown in space against a blue background with a sun flare. The satellite is positioned diagonally across the frame.

SOI #4 Activity

- Software Final Review

- Objectives

- Assure final software product meets DO-178B objectives and is ready for certification.
- Address any open items.

- Schedule

- Before the applicant submits the certification package to CA

Next Software Field Audit

- Schedule
 - Aug. 2019 – Sep. 2019 (tentative)
- Target S/S
 - KPS-PS: SOI#3
 - FEE: SOI#4
 - KRS-CC: combined SOI#3 and #4
 - KUS-SGS-CC: SOI#1

Software Audit Status

S/S	SOI Stage
KPS-PS	2 -> 3
KPS-CS	-
KRS-CC	2 -> 4
Front End Equipment	3 -> 4
KUS-SGS-CC	1
KUS-RFS	-
KCS	-

A satellite with large solar panels and a parabolic dish antenna is shown in space against a blue background with a bright sun. The image is split horizontally, with the top half being dark blue and the bottom half being a lighter blue gradient. The text "Thank you" is centered in the middle.

Thank you