Software Certification
Status of KASS

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Telecommunications Technology Association
Introduction to KASS Software Certification
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

<table>
<thead>
<tr>
<th>Subsystem</th>
<th>#</th>
</tr>
</thead>
<tbody>
<tr>
<td>KRS (KASS Reference station)</td>
<td>7</td>
</tr>
<tr>
<td>KPS (KASS Processing station)</td>
<td>2</td>
</tr>
<tr>
<td>KCS (KASS Control station)</td>
<td>2</td>
</tr>
<tr>
<td>KUS (KASS Uplink station)</td>
<td>3</td>
</tr>
<tr>
<td>GEO (Geostationary satellite)</td>
<td>2</td>
</tr>
</tbody>
</table>
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 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
• 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
### Sub-systems and Their Functionality

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

<table>
<thead>
<tr>
<th>Sub-System</th>
<th>Level of Involvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>KPS Processing Set</td>
<td>Medium</td>
</tr>
<tr>
<td>KPS Check Set</td>
<td>Medium</td>
</tr>
<tr>
<td>Front End Equipment</td>
<td>Low</td>
</tr>
<tr>
<td>KRS Core Computer</td>
<td>Medium</td>
</tr>
<tr>
<td>KUS SGS Core Computer</td>
<td>Medium</td>
</tr>
<tr>
<td>KUS Radio Frequency System</td>
<td>Medium</td>
</tr>
<tr>
<td>KCS</td>
<td>Low</td>
</tr>
</tbody>
</table>
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. 1\textsuperscript{st} 2018 – Oct. 12\textsuperscript{th} 2018

- **Target S/S**
  - KPS-PS: combined SOI#1 and #2
  - FEE: combined SOI#1, #2 and #3
  - KRS-CC: combined SOI#1 and #2
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)
<table>
<thead>
<tr>
<th>KPO / Developers</th>
<th>Inspection Organization</th>
<th>Certification Authority</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSAC Submission</td>
<td>PSAC acquisition</td>
<td>PSAC Review Result Acquisition</td>
</tr>
<tr>
<td>Redaction</td>
<td>Okay to Approve?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Notification of the Approval</td>
<td></td>
</tr>
<tr>
<td>Approval Acquisition</td>
<td></td>
<td></td>
</tr>
</tbody>
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### 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
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
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**

- **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

<table>
<thead>
<tr>
<th>S/S</th>
<th>SOI Stage</th>
</tr>
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<tbody>
<tr>
<td>KPS-PS</td>
<td>2 -&gt; 3</td>
</tr>
<tr>
<td>KPS-CS</td>
<td>-</td>
</tr>
<tr>
<td>KRS-CC</td>
<td>2 -&gt; 4</td>
</tr>
<tr>
<td>Front End Equipment</td>
<td>3 -&gt; 4</td>
</tr>
<tr>
<td>KUS-SGS-CC</td>
<td>1</td>
</tr>
<tr>
<td>KUS-RFS</td>
<td>-</td>
</tr>
<tr>
<td>KCS</td>
<td>-</td>
</tr>
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</table>
Thank you