

Certification of Airborne Software/Complex Electronic Hardware

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Development and Certification

- **Extensive use of well established industry standards:**
 - ED-12/DO-178 for software
 - ED-80/DO-254 for complex hardware
- **Supplemented by additional guidance detailed in EASA Certification Memorandums:**
 - SWCEH-002 Software Aspects of Certification (111 pages)
 - SWCEH-001 Development Assurance of Airborne Electronic Hardware (66 pages)
- **Utilising well established Rolls-Royce processes, tools and resources - developed and proven over multiple engine certification programmes**



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Criticality of Electronic Systems

The Design Assurance Level (DAL) applied depends on the criticality of the component/system function:

EEC	Control & Protection	DAL A
EMU	Cockpit display (vibration)	DAL C
EMU	Health monitoring	DAL E

EASA Oversight

- **EASA determines its Level of Involvement in the certification of software and complex hardware based on: complexity, novelty, scale of change and potential safety impact**
- **Oversight based on the Stages of Involvement (SOI)**
- **The Level of EASA Involvement is agreed and reflected by:**
 - The number of EASA SOI audits to be carried out
 - The extent of those SOI audits: remote (reviewing requested documents) or on-site face-to-face
 - The number of certification compliance reports where EASA make the retained finding of compliance vs. those delegated to the Rolls-Royce Airworthiness Office to make the finding of compliance



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Software Development Stages

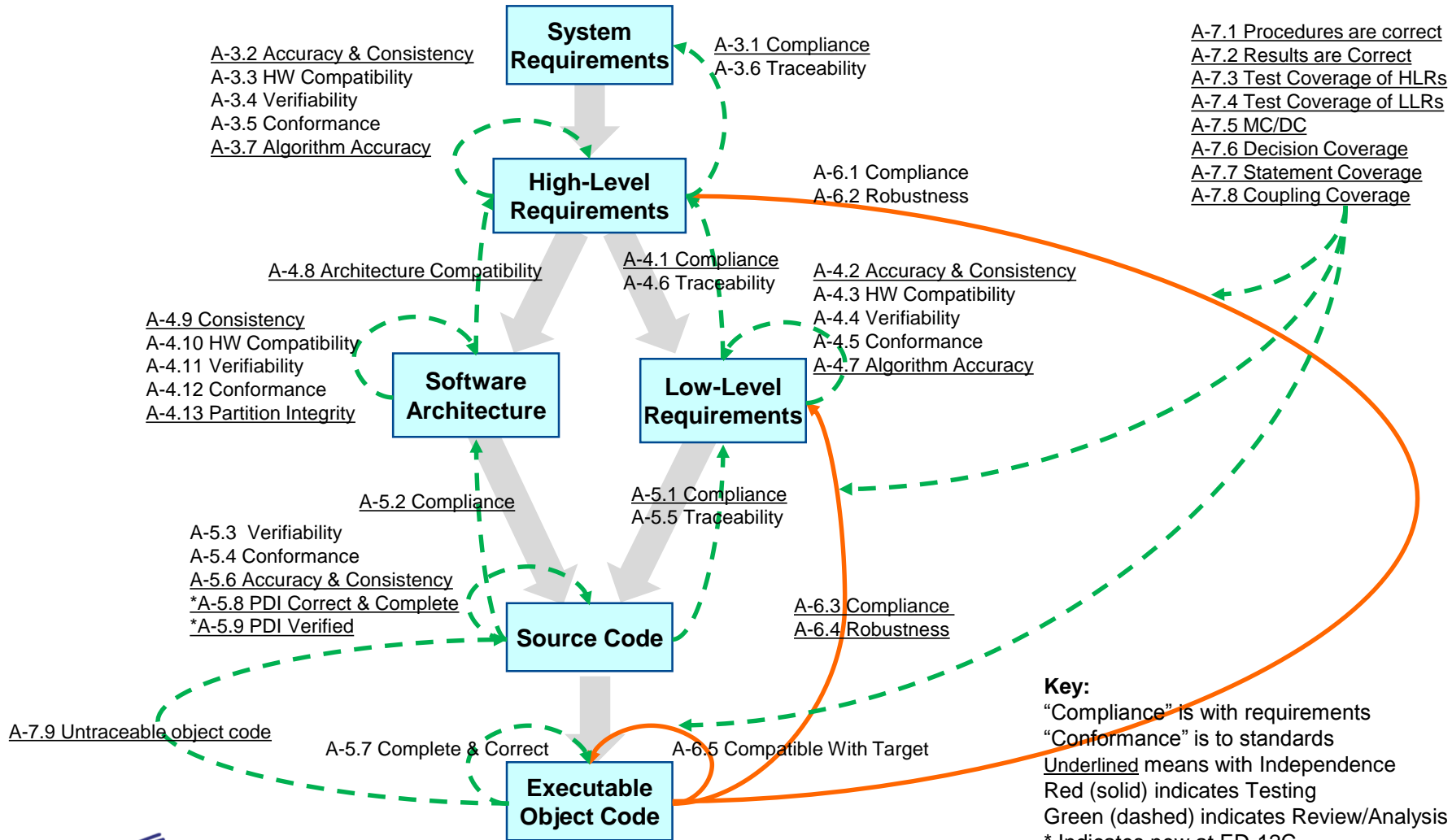
Stage	Activity	Artefacts
SOI-1	Planning	Plan for Software Aspects of Certification Verification & Validation Plans Configuration Management Plan Lifecycle Environment Definition
SOI-2	Development	Requirements validation High Level Software Requirements Low Level Software Requirements Source code
SOI-3	Verification	Verification against High Level Requirements Verification against Low Level Requirements Requirement coverage achieved Structural coverage achieved
SOI-4	Final	Analysis of open problems Software Accomplishment Summary Configuration Management records Process Assurance Records

Equivalent staged process for complex hardware



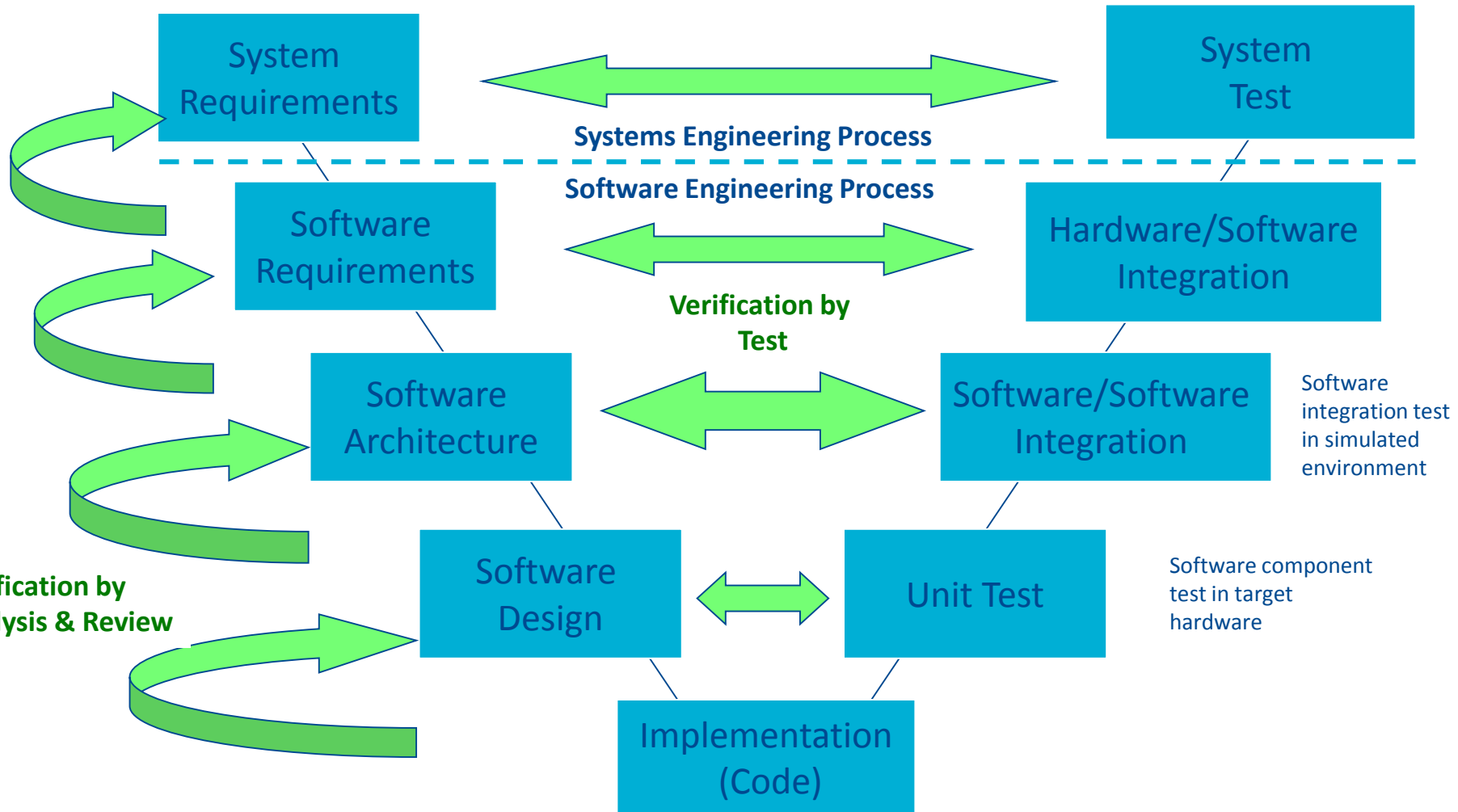
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ED-12C Level A Software Development



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RR “V” Development Lifecycle



Future Developments

- **Rolls-Royce specialists participate in industry committees to develop industry standards for software and complex hardware**
- **Rolls-Royce specialists also participate in EASA and industry regulatory development working groups**
- **Rolls-Royce adopts a Continuous Improvement approach to processes, tools and resources used throughout the development lifecycle**
 - Fundamental changes to processes, tools and resources must be brought to the attention EASA (DOA obligation)



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