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DIGITAL TRANSFORMS PHYSICAL

PTC Codebeamer DO-178C, DO-254, and AMC 20-152A Templates

For Airborne Hardware and Software Compliance

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Codebeamer Templates for
Airborne Hardware & Software Compliance

Achieving DO-178C, DO-254, and AMC 20-152A Compliance

Developing airborne products and embedded avionics systems is a challenging undertaking. In order to succeed, teams must create innovative solutions that not only meet market demands for functionality, safety, and performance, but that also comply with multiple regulatory requirements.

To ease your team's regulatory compliance journey, PTC has developed two templates that leverage the capabilities of Codebeamer for avionics teams.

- The Codebeamer DO-178C Software Avionics Template facilitates the fulfillment of DO-178C objectives for building airborne software.

- The Codebeamer DO-254 and AMC 20-152A Hardware Avionics Template facilitates the fulfillment of DO-254 and AMC 20-152A objectives for building airborne hardware.

Each template enables hardware and software engineering teams to reduce the time, effort, and cost of achieving compliance with regulations and standards set by the Federal Aviation Administration (FAA), the European Aviation Safety Agency (EASA), and other regulatory bodies.

Follow aviation industry best practices, simplify compliance, and drive engineering excellence with PTC **Codebeamer's Airborne Hardware and Software Templates!**

What's included in the templates?

The templates contain predefined and easy-to-understand data model guidelines. They include built-in examples to show the vertical breakdown of system requirements down to hardware and software functions.

When using these templates, teams will automatically store a history of changes on all artifacts to simplify delta identification. Features like suspected changes and vertical merge functionality are beneficial when carrying out activities like root cause analysis and change impact assessment.

The templates also implement essential configuration management processes including problem reporting, change review, and best practices for change control. Regarding hardware and software verification processes, the templates cover checklist execution, review management, examples of test cases and test procedures, the execution of test procedures, and much more. Management of baselines and releases is simplified by using Codebeamer with Codebeamer Airborne Hardware and Software Templates.

Benefits for key stakeholders

For Certification Bodies' Audits and Reports

- Fast evidence creation
- Powerful yet simple traceability queries
- Robust and meticulous QA
- Flexible reporting
- Automated change control

For Avionics Project Managers

- Predefined but customizable dashboards and widgets
- Full change control on all artifacts
- Simple requirements reuse to cut costs
- Easy visualization of dependencies
- Ensures project visibility and planning
- Automated process enforcement

For Hardware and Software Development team members

- Powerful, user-friendly team-based development
- Impact assessment and root cause analysis through traceability, hyperlinks, and suspected links
- Fast and efficient collaboration throughout development

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DO-178 Guidelines

Section 2:
System aspects related to software development

Section 3: Software lifecycle

SOFTWARE LIFECYCLE PROCESSES

Section 4: Software planning process

Section 5: Software development processes

- **Software requirements process**
- **Software design process**
- **Software coding process**
- **Integration process**

INTEGRAL PROCESSES

- **Section 6:** Software verification process
- **Section 7:** Software configuration management process
- **Section 8:** Software quality assurance process
- **Section 9:** Certification liaison process

Section 10: Overview of certification process

Section 11: Software lifecycle data

Section 12: Additional considerations

DO-254 Guidelines

Section 2:
System aspects of hardware design assurance

Section 3: Hardware design life cycle

HARDWARE LIFECYCLE PROCESSES

Section 4: Planning process

Section 5: Hardware design processes

- **Requirements capture process**
- **Conceptual design process**
- **Detail design process**
- **Implementation process**
- **Production transition process**

INTEGRAL PROCESSES

- **Section 6:** Validation and verification process
- **Section 7:** Configuration management process
- **Section 8:** Process assurance
- **Section 9:** Certification liaison process

Section 10: Hardware design life cycle data

Section 11: Additional considerations

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Codebeamer Templates for Airborne Hardware & Software Compliance

Integrated Aviation Engineering

Codebeamer Airborne Software and Hardware Templates cover all required objectives via checklists and most outputs via preconfigured artifacts, including examples of hardware and software requirements and design. The checklists and outputs of each template cover all objectives of defined DALs (Development Assurance Levels).

The templates also include examples of hardware and software workflows that cover key configuration management activities--including problem reporting, change review, and change control. Flexible and adaptable workflows and customizable artifacts in the templates allow you to define and enforce the execution of processes that best fit your internal requirements while maintaining compliance with airborne hardware and software regulations.

The system supports the combination of traditional V-model and (scaled) Agile development methodologies (SAFe®, LeSS, or DAD), even in a single project. Preconfigured reports may be easily exported to help monitoring and reporting, while the audit trail dashboard facilitates compliance audits.

Gapless End-to-end Traceability

Since the entire chain of work items can be linked, and associations spanning the entire lifecycle are stored in Codebeamer's central repository, complete bidirectional traceability is simple to achieve. The Traceability Browser enables teams to visualize these links between work items. Visual processes (workflows) and a complete change history log for each artifact further ensure transparency. A Coverage Browser enables adequate test coverage of all requirements.

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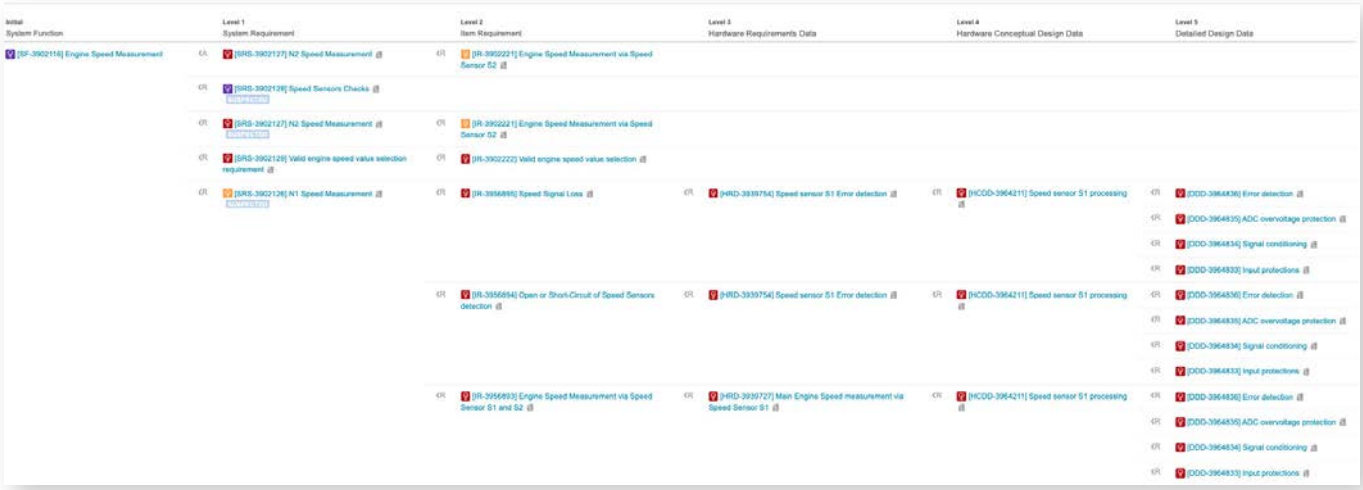
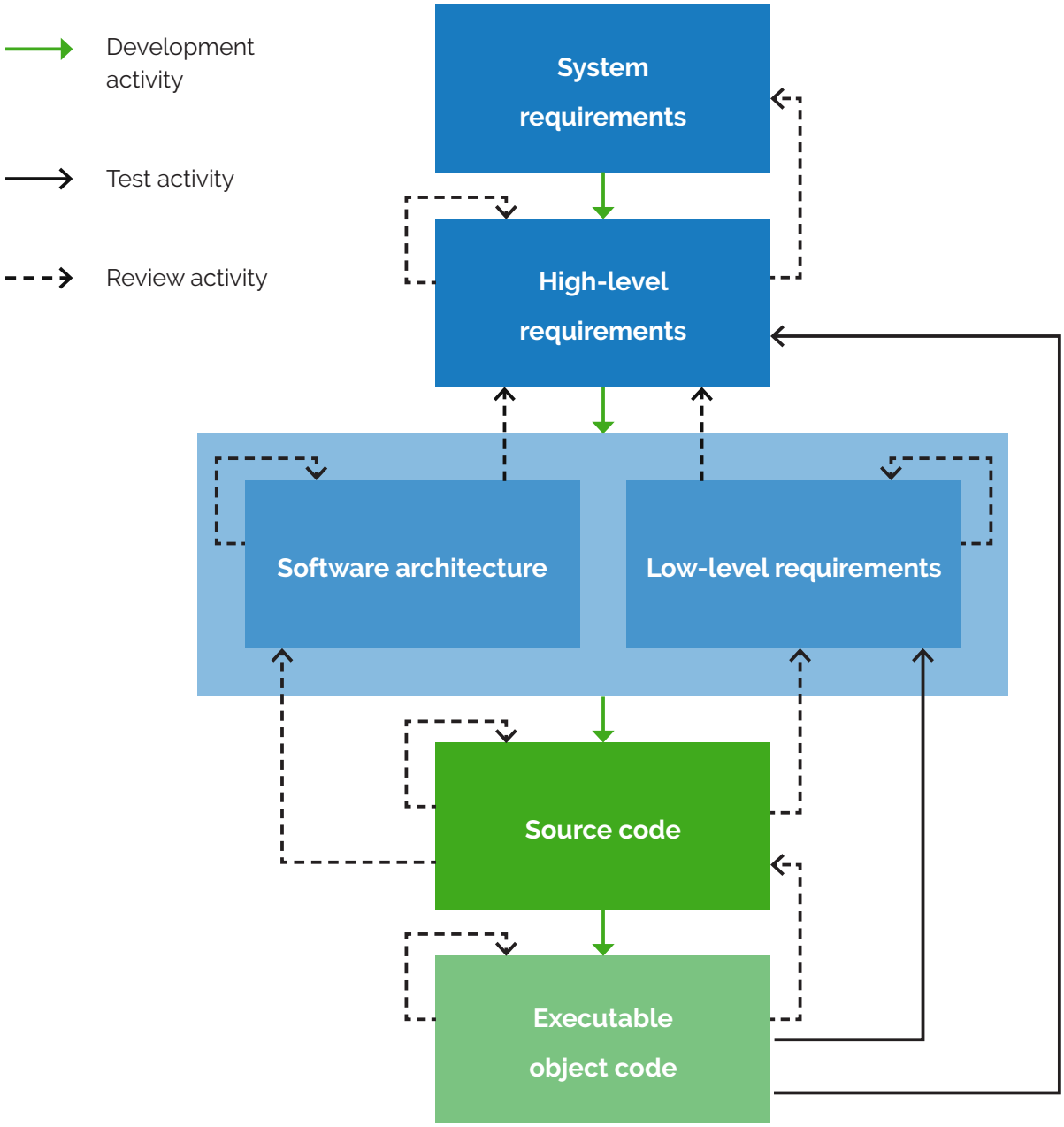
Aviation Requirements Management

Codebeamer allows you to systematically manage functional and non-functional software and hardware requirements throughout the lifecycle, while tracking and controlling all changes. Taking advantage of the solution's advanced requirements management functionality, this template allows you to specify, organize, and document requirements in a collaborative manner, store them in a central repository, and link them to other artifacts. Managing requirements in libraries enables you to easily reuse requirements in other product variants, together with the test cases that verify them. Codebeamer's many integrations & export-import features are available to support collaboration and ensure data consistency across teams and tools.

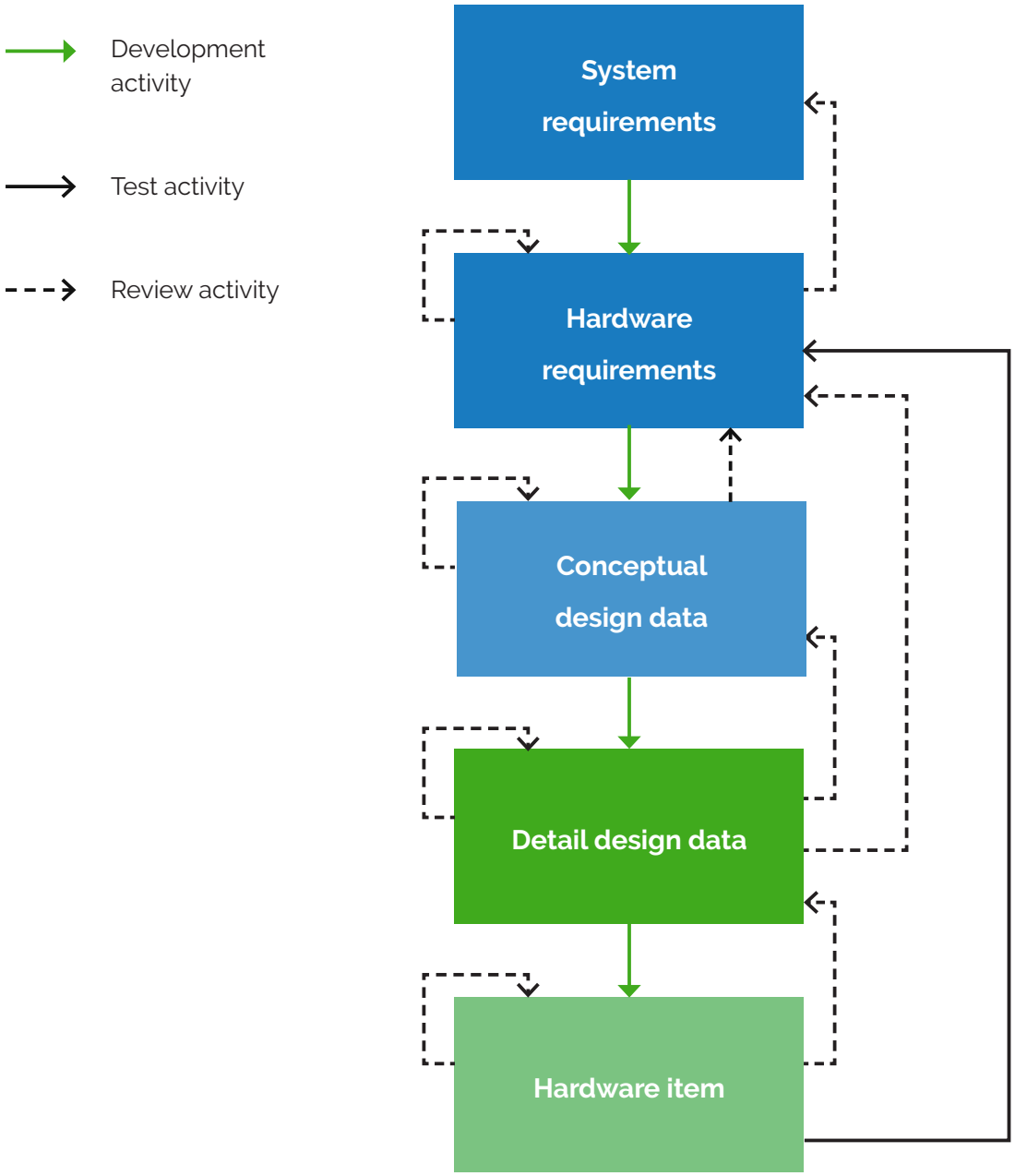


▲
Traceability throughout the lifecycle

DO-178C Workflow



DO-254 workflow



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Link Requirements to Tests and Derive Actionable Work Items

Using Codebeamer, you can derive artifacts such as change requests, defects (bugs), source code, tasks, test cases and more directly from your requirements, establishing links between them to ensure gapless end-to-end traceability. Tasks may then be assigned to team members and their progress monitored on Kanban boards. Risks can be easily identified and mitigated or reduced. Test cases can be executed and their results reported. Traceability is ensured throughout the lifecycle.

Aviation Quality Assurance & software verification process

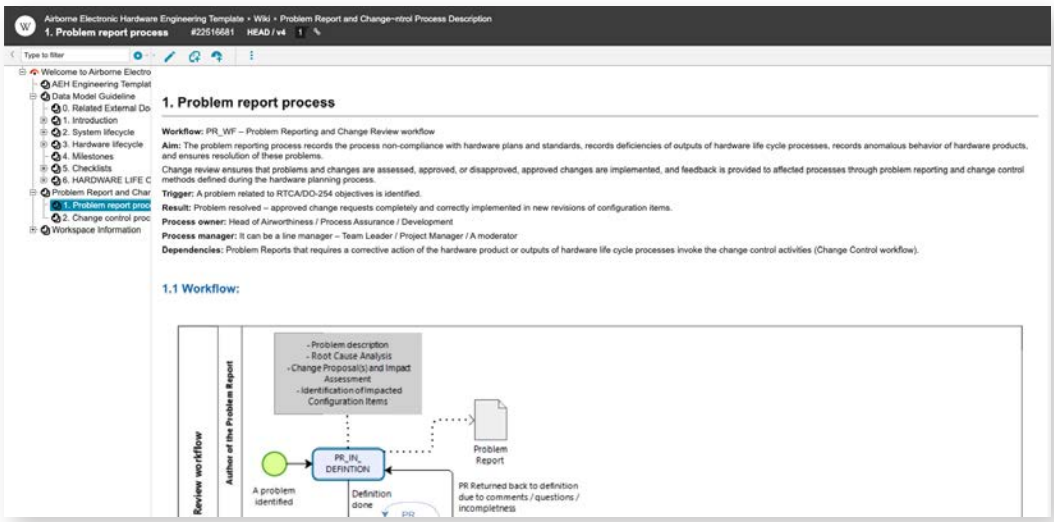
To enable the Software Verification process, each template includes test cases and test procedures, allowing controlled execution of test procedures.

Each template also enables you to connect quality goals to development activities. They support test management by letting you define custom test cases, compose test sets, and execute parameterized tests on multiple hardware and software configurations. Accurate and fast automated testing is available via Codebeamer's integration with Jenkins. A test coverage browser and highly customizable dashboards are available to monitor and report on test coverage, execution, and results.

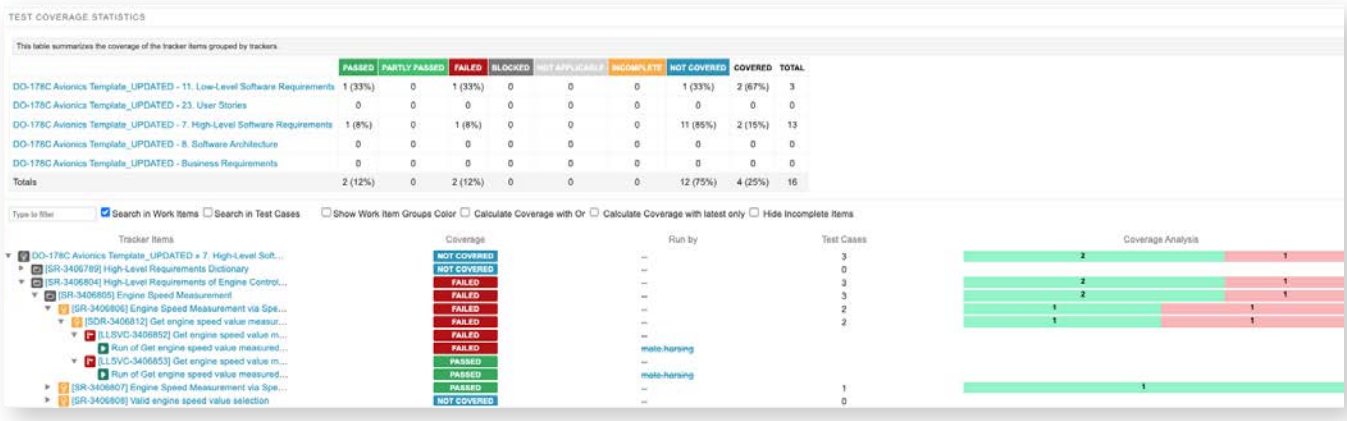
For QA personnel, the templates offer customizable dashboards and all-around access to a single source of truth regarding the development lifecycle. Internal audits are supported by automated documentation and guarded workflows for meticulous process control.

Security and Approval Workflows

In addition to the available preconfigured workflows, you can simply define and enforce the execution of your own custom processes. Codebeamer's project- and role-based security features and conditional logic safeguards (with optional e-signatures) help ensure that only compliant processes are used. Configurable access permissions and e-signatures enable approval processes and access control, while complete change control allows you to monitor and validate security procedures.



◀ Wiki that acts as benchmark or guideline



▲ Test Coverage Browser

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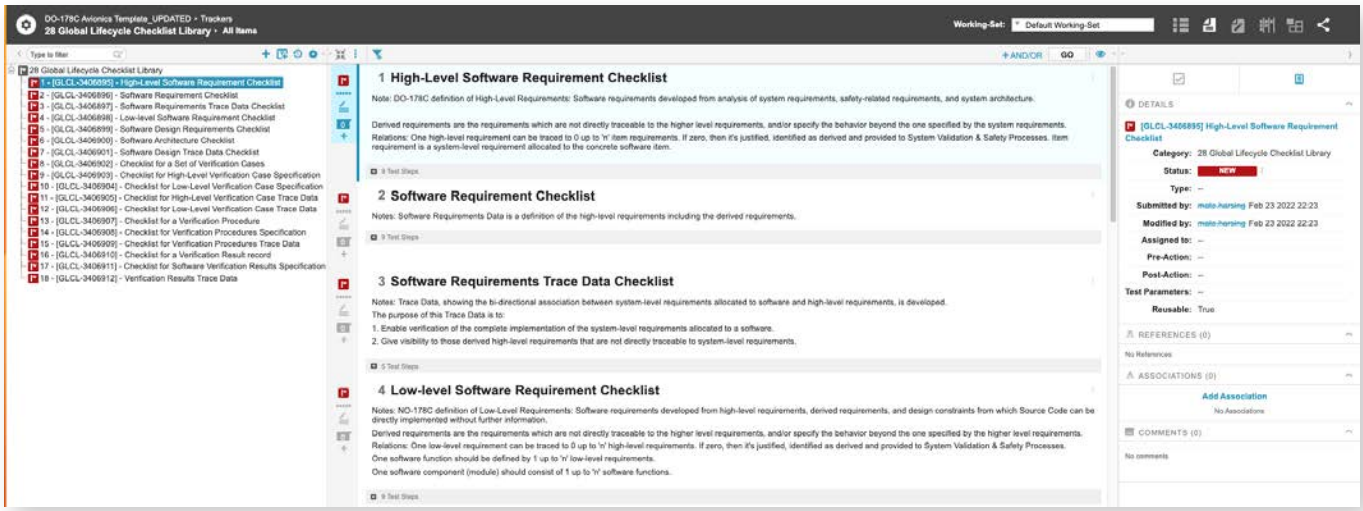
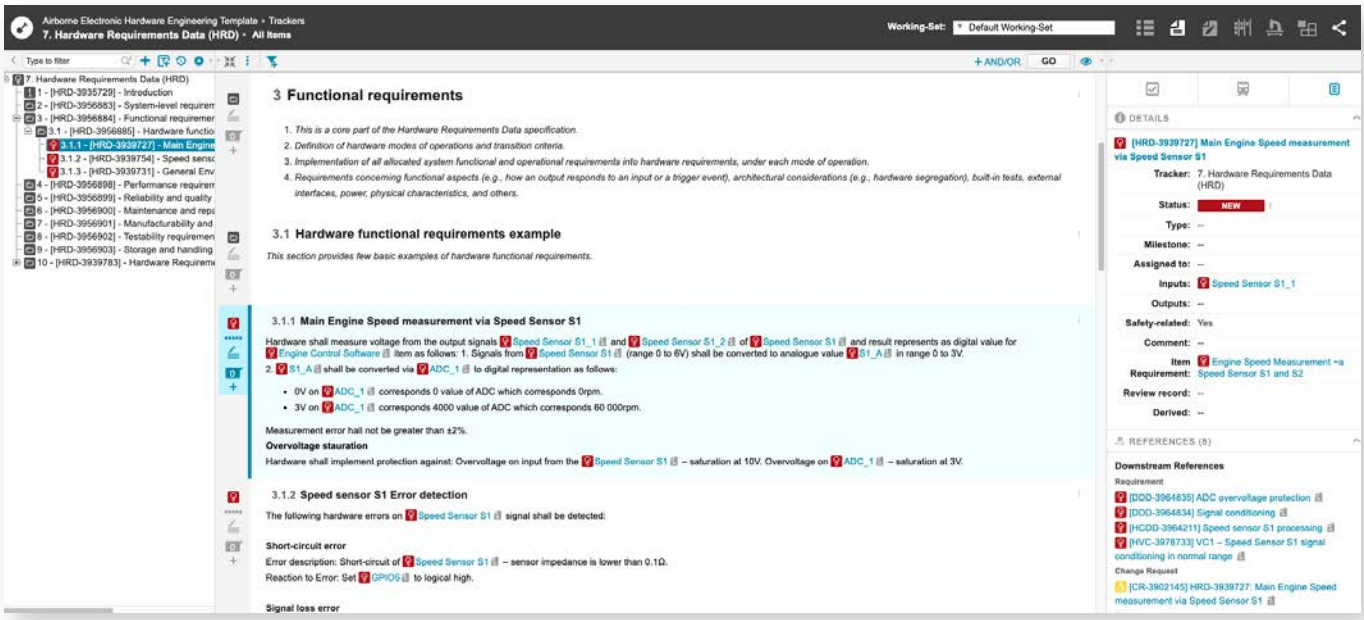
Checklists for all items in scope of the software lifecycle





Real-life examples for all artifact types

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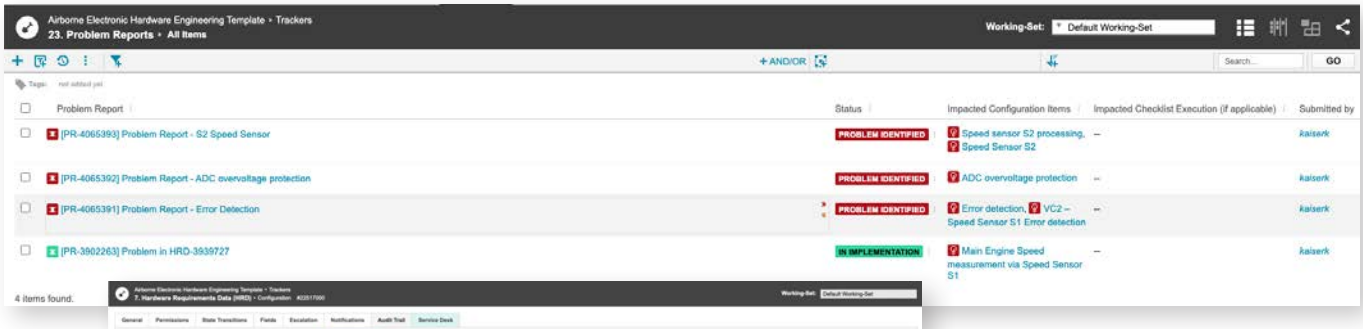
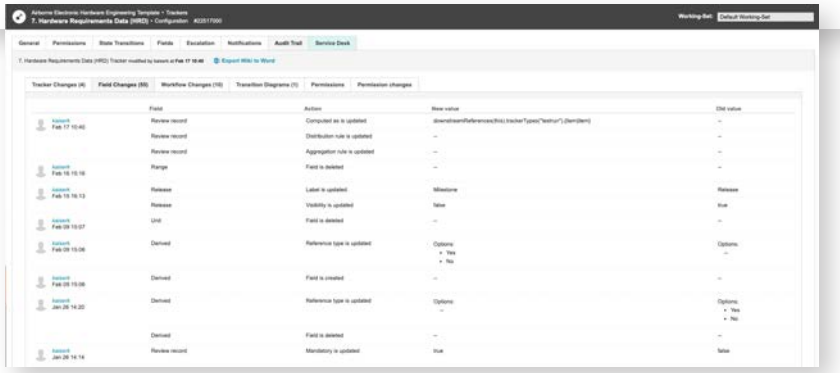
▼ Sophisticated change control process with automation

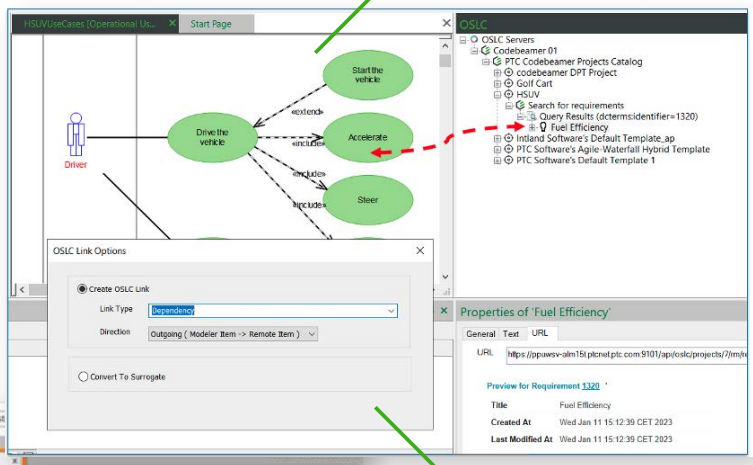


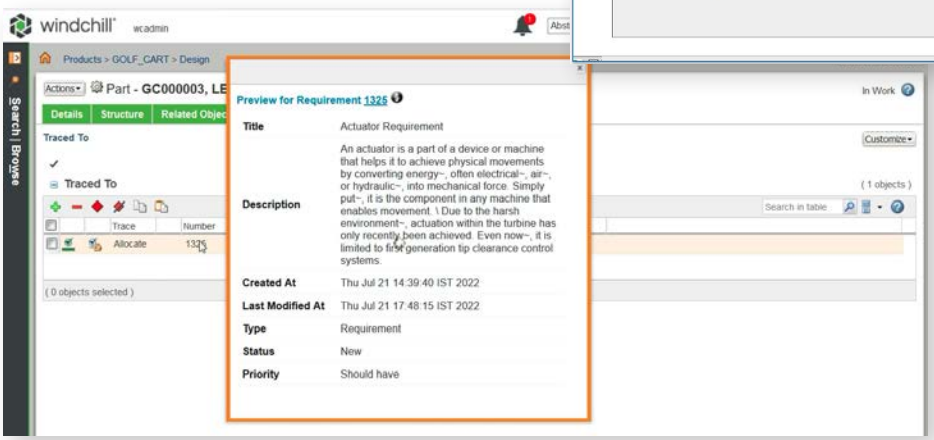


◄ Audit trail capabilities

Familiar, consistent user experience

Windchill Modeler Integration ►





Quick and easy to create OSLC links using Drag & Drop

◄ Windchill PLM integration

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Aviation Compliance & Audit Trail Dashboard

Codebeamer Airborne Software and Hardware Templates leverage advanced process control, documentation and reporting capabilities, and provide pre-configured security and process workflows. These greatly support the enforcement of mature aviation development processes and facilitate compliance with relevant standards.

In addition to advanced and automated reporting options, the solution includes an audit trail dashboard to simplify and accelerate aviation compliance. A lifecycle-wide audit trail is automatically recorded with all changes to work items, fields, workflows and transition diagrams, and an overview of current permissions.

All this is accessible with just a few clicks using the comprehensive audit trail dashboard. Using the dashboard, you can create an automatically updated widget with all lifecycle data, and easily export comprehensive reports to accelerate compliance audits.

Best Practices and Repeatable Processes

Configure PTC Codebeamer to support your company's standard operating procedures and quality standards. Repeatable processes ensure higher product quality, fewer errors, and reduced project costs. Mature re-use processes help cut the time and costs of development. Leverage existing artifacts (for instance, requirements with the test cases that verify them) and processes, and reuse project configurations to accelerate development and product verification. Visualize and automate workflows with automated gates and conditions, and reduce costs in the development of quality aviation products.

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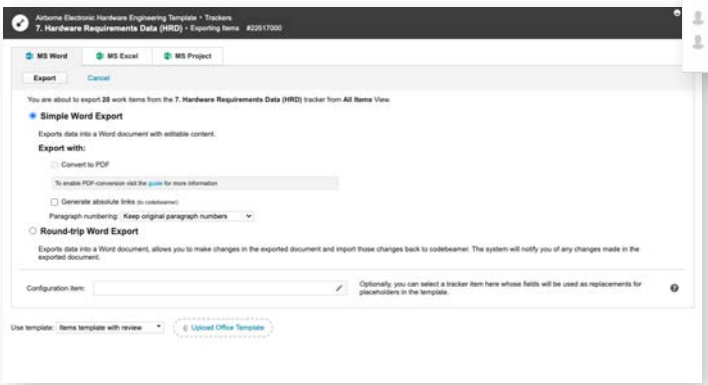
Baselines

PTC Codebeamer's baselining functionality allows you to create comprehensive snapshots of the current state of all your artifacts, capturing the entire set of specifications. To support versioning, baselines include wiki pages, documents, attachments, comments, and all types of work items and data used in the development lifecycle.

Configurable and Extendable

As a flexible and highly configurable solution, PTC Codebeamer integrates with widely used tools, empowering teams to create highly customizable artifacts and workflows.

OSLC (Open Services for Lifecycle Collaboration) is an open community that defines specifications to effectively integrate tools from different vendors. Codebeamer's support for the OSLC standard enables interoperability with any OSLC-compliant tool. Deeper integrations with PTC's Windchill and Windchill Modeler deliver even greater interoperability and convenience. These integrations provide end-to-end linking and tracing across your tooling ecosystem.



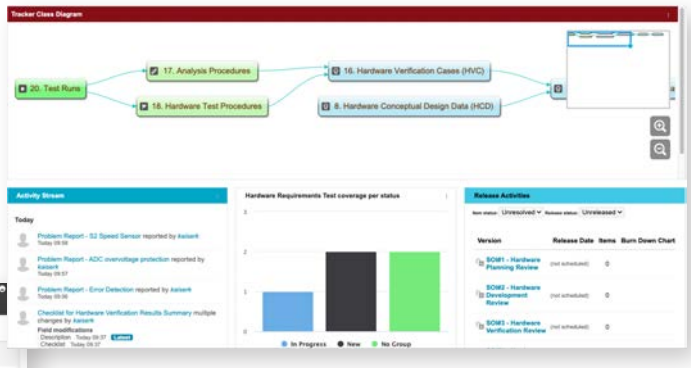
▲ Office (Word and Excel round-trip export/import)

Data Analytics and Reporting

The Codebeamer platform stores all important production and historical data in its repository, from requirements through testing and delivery.

Powerful data analytics and reporting features help make sense of all that data to unlock valuable insights. Search and filter data using queries, visualize it using preconfigured charts and diagrams, send automated reports, and analyze data to support more informed decision-making.

Automatic data visualization enables you to monitor business KPIs effortlessly, letting you oversee, improve, and optimize processes. Dashboards and reports with benchmarks, visualized data, and production insights may be easily created and shared with others.



▲ Data Analytics and Reporting

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PTC Codebeamer templates are successfully used by:

SPHEREA TEST & SERVICES

PRISMATIC

AIRBUS

Stonefield Systems

SONALYSTS

DASSAULT FALCON JET

SAFRAN

Evolito
The Power of Electric Flight

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