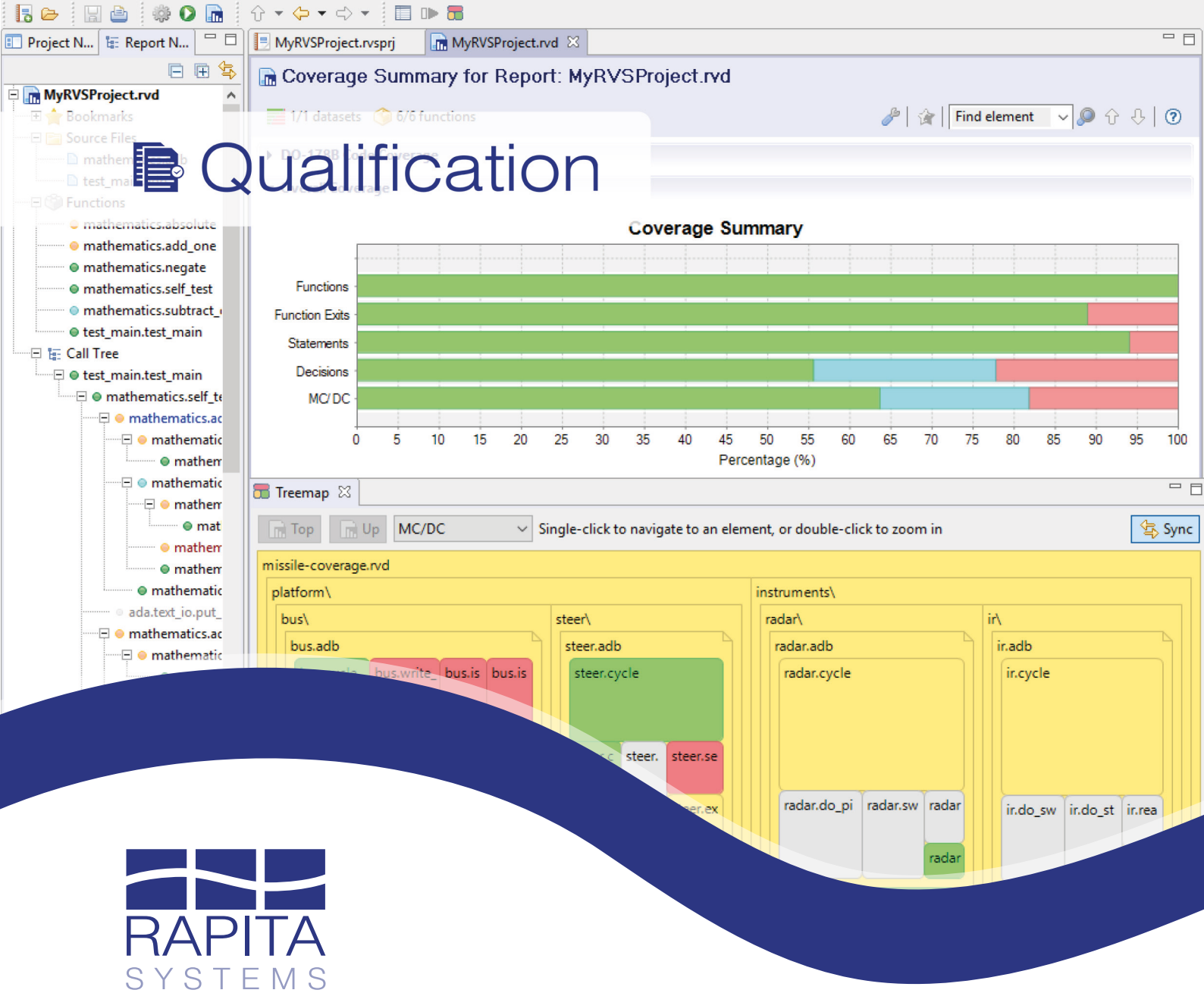


RAPITA SYSTEMS
A DANLAW COMPANY

Safety through quality

PRODUCT BRIEF

Rapi**Cover** Tool Qualification for DO-178C

Copyright © Rapita Systems Ltd. All rights reserved.

Product brief: Rapi**Cover** Tool Qualification for DO-178C

Tool qualification is essential in the development of critical embedded systems, and should be a key consideration from the earliest stages of DO-178C projects.

Our comprehensive tool qualification solution provides the resources and expertise you need to qualify Rapi**Cover** for use in DO-178C projects. Adopting our approach to qualification early on in your development process means you will benefit from:

- Early access to our expertise and experience in defining advanced tool workflows, and communicating with certification authorities.
- Comprehensive documentation and support that allows you to refine your qualification workflows and evidence ahead of time, as well as coordinate with your certification authority to reduce potential delivery delays.
- A flexible, collaborative approach to qualification that works for your project and organization and reduces costs and effort.

For background information on DO-178C and its objectives, see *About DO-178C and tool qualification*.

Qualification Kit

A Qualification Kit is a comprehensive documentation package that provides evidence that Rapi**Cover** meets the guidance given in DO-330 for commercial off-the-shelf (COTS) products. Our Qualification Kits include two sets of documents: Developer Documents and Tool User Documents. They also include checklists against which to check your compliance with DO-330 tool user objectives.

Developer Documents contain DO-330 tool qualification evidence, including a summary of the requirements, test plans and test results demonstrating that Rapi**Cover** complies with its requirements as per DO-178C (Figure 1 right).

Tool User Documents are template versions of documents that must be provided by a tool user to support their qualification of a COTS tool (Figure 2 right). These are pre-filled with cross-references to our Developer documents, further reducing the effort needed to complete your DO-330 tool qualification evidence.

The documentation and processes we use to produce our Qualification Kits for Rapi**Cover** follow the guidance in DO-330 for a TQL-5 COTS tool. DO-330 complements DO-178C by providing specific guidance for tool qualification, and defines the Tool Qualification Levels (TQL) 1-5.

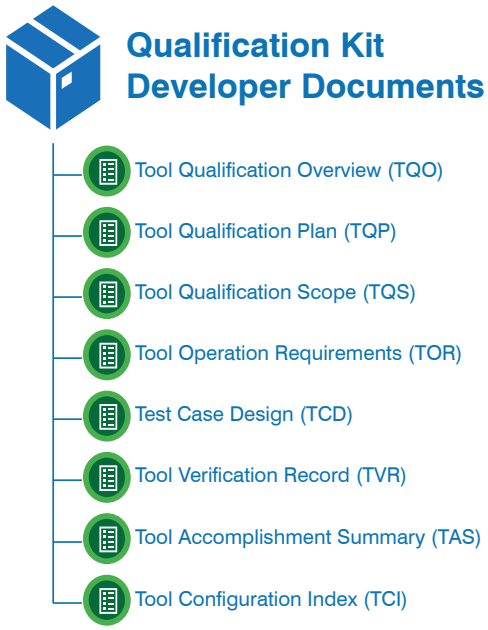


Figure 1. Qualification Kit Developer Documents

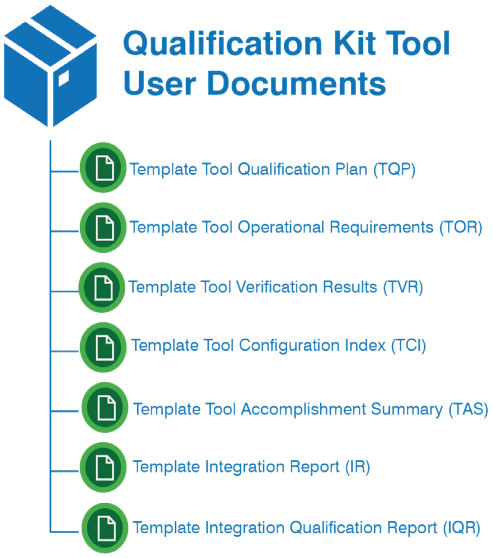


Figure 2. Qualification Kit Tool User Documents

Qualified Target Integration Service

To meet DO-178C guidance, you must provide evidence (in addition to our Qualification Kit documents) showing that the tool has been correctly installed and integrated into your specific development and target environment. To support you in this, we also offer a *Qualified Target Integration Service*.

Our Qualified Target Integration Service is delivered by Rapita Field Application and Software Quality Assurance

experts, and includes comprehensive reporting, tests and expected results demonstrating that the integration works correctly.

Figure 3. Qualifiied Target Integration Service

Combined with the documentation provided in our Qualification Kits, the materials generated during the Qualified Target Integration Service complete the evidence you need for tool qualification.

Delivery process

A Qualified Target Integration Service is delivered in three stages, as shown in Figure 4:

- Preliminary assessment
- Testing and interim reporting
- Final delivery

Note: See the *Rapi**Cover** Tool Qualification for DO-178C Order Information sheet* for a more detailed version of this process, including key milestones and responsibilities.

Preliminary assessment

Rapita engineers review your integration and produce:

- A repro: An in-house integration that replicates your instrumentation and export settings as closely as possible.
- On-site tests: A suite of tests that exercise the integration in your specific build and target environment.
- A test oracle, which shows the expected output of the tests when run on your configuration.
- Preliminary Integration Qualification Report (IQR): A report which documents any issues that may affect the qualification of the tool.

Testing and interim reporting

Rapita engineers work with you to configure your integration and obtain correct results from the onsite tests. During this stage, we may produce one or more iterations of the IQR and the onsite tests. The number of iterations, and the length of time it takes to reach the final stage, depends on the complexity of your integration and whether your configuration changes during the process.

Before moving to the final stage, your integration is frozen for submission, so no more changes can be made to it.

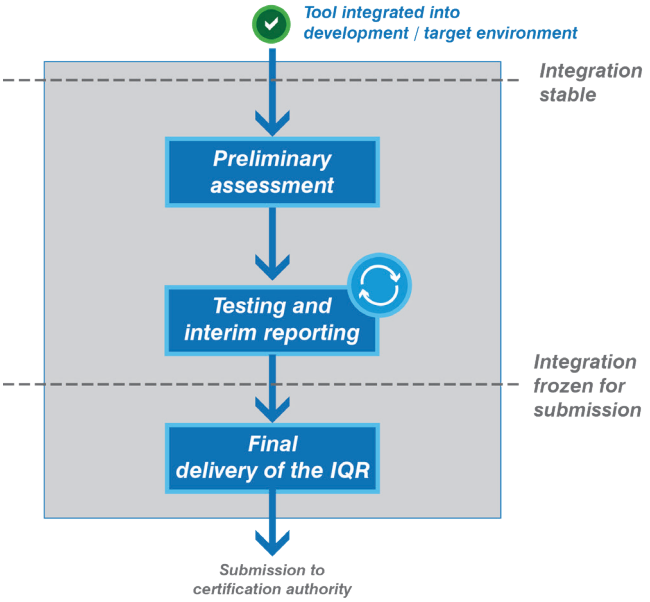


Figure 4. Qualified Target Integration Service - delivery process

Final delivery

We deliver the final version of the Qualified Target Integration Service deliverables, including the final IQR.

About DO-178C and tool qualification

DO-178C contains guidelines that deal with safety-critical software in airborne systems. Certification authorities (including the FAA in the US, and EASA in Europe) use DO-178C to assess these software systems.

According to DO-178C, you must qualify the software tools used in your project if:

- The tool could potentially insert an error or fail to detect an existing error.
- The tool's output will not be verified or confirmed by another verification activity.
- Processes necessary for certification are eliminated, reduced or automated by the tool.

You are responsible for qualifying the software tools you use in DO-178C projects. This means you have to provide detailed evidence not only that the tools meet their functional and robustness requirements, but also that they have been correctly integrated into your development and target environment.

Our Qualification Kits, along with our expert Qualified Target Integration Service, reduce the costs and effort required throughout the process.

Qualification options

We offer a flexible qualification approach for Rapi**Cover**, as shown in Table 1 below. We recommend that you choose our comprehensive qualification solution (Option 5); however you may choose to undertake some of the qualification work yourself.

We can only provide a Qualified Target Integration Service if we have first integrated Rapi**Cover** into your development and target environment, via a *Target Integration Service* (TIS). See our *Target Integration Service Product Brief* for more information.

If you have undertaken the target integration work yourself, contact us to discuss your options.

Compliance checklists

Checklists are included in our qualification kits that help you check your compliance with DO-330 tool user objectives in each step from planning to approval.

Table T-0 - Tool Operational Processes

Objective	Details	Completion
T-0:1 The tool qualification need is established.	{{See developer TQP [QD/C1C/TQP 3.14] section 6 "Qualification Considerations."}}	
T-0:2 Tool Operational Requirements are defined.	{{Cross-reference developer TOR [QD/C1C/TQP 3.14] for individual requirements.}}	
T-0:3 Tool Executable Object Code is installed in the tool operational environment.	{{Cross-reference to the Integration Report.}}	
T-0:6 Tool Operational Requirements are correct and sufficient.	{{Reference your criteria. Also use TQS [QD/C1C/TQS 3.14] to scope the review.	
T-0:7 Software life cycle needs are met by the tool.	{{See developer TQP [QD/C1C/TQP] section 6 "Qualification Considerations.}}	

Figure 6. Compliance checklists help you check your compliance progress

Table 1. Qualification options

		Tool		Qualification	
		*Rapi**Cover** tool*	*Target Integration Service*	*Rapi**Cover** Qualification Kit*	*Qualified Target Integration Service*
Option 1	Provided by:	Rapita	Customer	Customer	Customer
Option 2		Rapita	Rapita	Customer	Customer
Option 3		Rapita	Customer	Rapita	Customer
Option 4		Rapita	Rapita	Rapita	Customer
Option 5		Rapita	Rapita	Rapita	Rapita

Key features

Clear qualification guidance

Our qualification kits include clear guidance on what to do during your tool qualification, including a qualification timeline.

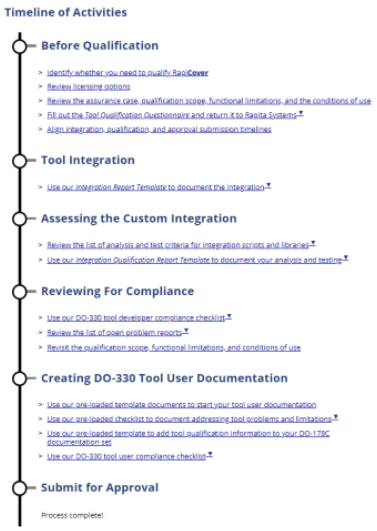
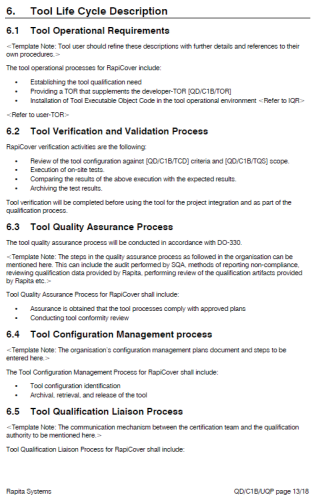


Figure 5. Qualification timeline

Tool User Documents

Template Tool User Documents reduce the effort needed to develop your DO-330 tool user documents for Rapi**Cover** qualification. These are pre-filled with cross-references to Rapi**Cover** DO-330 Developer documents in the Qualification Kit.


6. Tool Life Cycle Description

6.1 Tool Operational Requirements

<Template Note: Tool user should refine these descriptions with further details and references to their own procedures.>

The tool operational processes for RapiCover include:

- Establishing the tool qualification need
- Providing a TOR that supplements the developer-TOR [QD/C1B/TOR]
- Installation of Tool Executable Object Code in the tool operational environment <Refer to IQR>

<Refer to user-TOR>

6.2 Tool Verification and Validation Process

RapiCover verification activities are the following:

- Review of the tool configuration against [QD/C1B/TCD] criteria and [QD/C1B/TQS] scope.
- Execution of on-site tests.
- Comparing the results of the above execution with the expected results.
- Archiving the test results.

Tool verification will be completed before using the tool for the project integration and as part of the qualification process.

6.3 Tool Quality Assurance Process

The tool quality assurance process will be conducted in accordance with DO-330.

<Template Note: The steps in the quality assurance process as followed in the organisation can be mentioned here. This can include the audit performed by SQA, methods of reporting non-compliance, reviewing qualification data provided by Rapita, performing review of the qualification artifacts provided by Rapita etc.>

Tool Quality Assurance Process for RapiCover shall include:

- Assurance is obtained that the tool processes comply with approved plans
- Conducting tool conformity review

6.4 Tool Configuration Management process

<Template Note: The organisation's configuration management plans document and steps to be entered here.>

The Tool Configuration Management Process for RapiCover shall include:

- Tool configuration identification
- Archival, retrieval, and release of the tool

6.5 Tool Qualification Liaison Process

<Template Note: The communication mechanism between the certification team and the qualification authority to be mentioned here.>

Tool Qualification Liaison Process for RapiCover shall include:

Rapita Systems QD/C1B/UQP page 13/18

Figure 7. Tool user documents

Streamlined qualification material

The documentation, requirements and tests included in our qualification kits are custom depending on your specific development environment, helping you minimize your review effort.

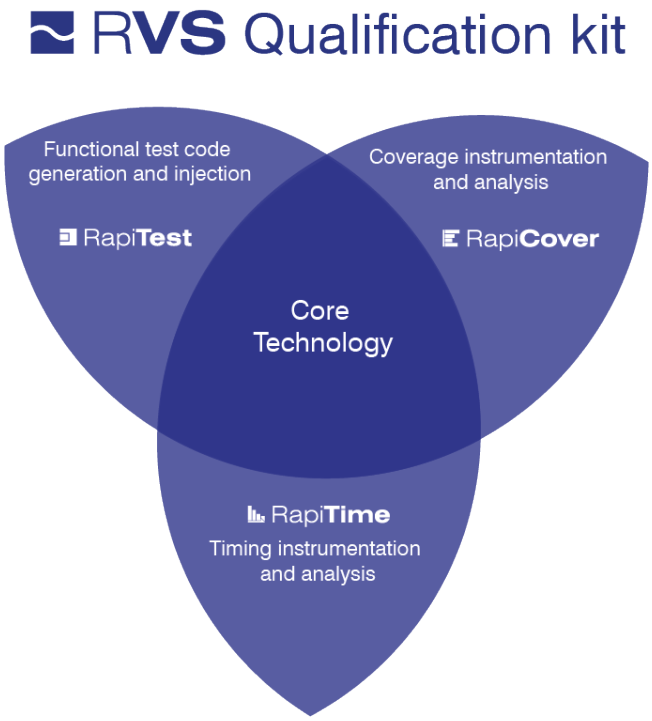


Figure 8. R**VS** qualification kits are streamlined to how you are using the tools

Assurance issue notification

We notify you when we discover any assurance issues that might cause false positive results or introduce functional changes to your software. We keep you updated with the status of assurance issues regularly.

Figure 9. Example assurance issue

Qualified instrumenters

The instrumenters used by R**VS** tools are qualified, so there's no need to manually qualify them.

RAPITA Systems
A DANLAW Company

About Rapita

Rapita Systems provides on-target software verification tools and services globally to the embedded aerospace and automotive electronics industries.

Our solutions help to increase software quality, deliver evidence to meet safety and certification objectives and reduce costs.

Find out more

A range of free high-quality materials are available at:
rapitasystems.com/downloads

SUPPORTING CUSTOMERS WITH:

Tools	Engineering Services	Multicore verification
Rapita **Verification Suite**:	V&V Services	**MACH**[178]
Rapi**Test**	Integration Services	Multicore Timing Solution
Rapi**Cover**	Qualification	
Rapi**Time**	SW/HW Engineering	
Rapi**Task**	Compiler Verification	

Contact

Rapita Systems Ltd.
Atlas House
York, YO10 3JB
UK
+44 (0)1904 413945

Rapita Systems, Inc.
41131 Vincenti Ct.
Novi, Mi, 48375
USA
+1 248-957-9801

Rapita Systems S.L.
Parc UPC, Edificio K2M
c/ Jordi Girona, 1-3
Barcelona 08034
Spain
+34 93 351 02 05

rapitasystems.com

linkedin.com/company/rapita-systems

info@rapitasystems.com