

Achieve DO-178C compliance with the LDRA tool suite®

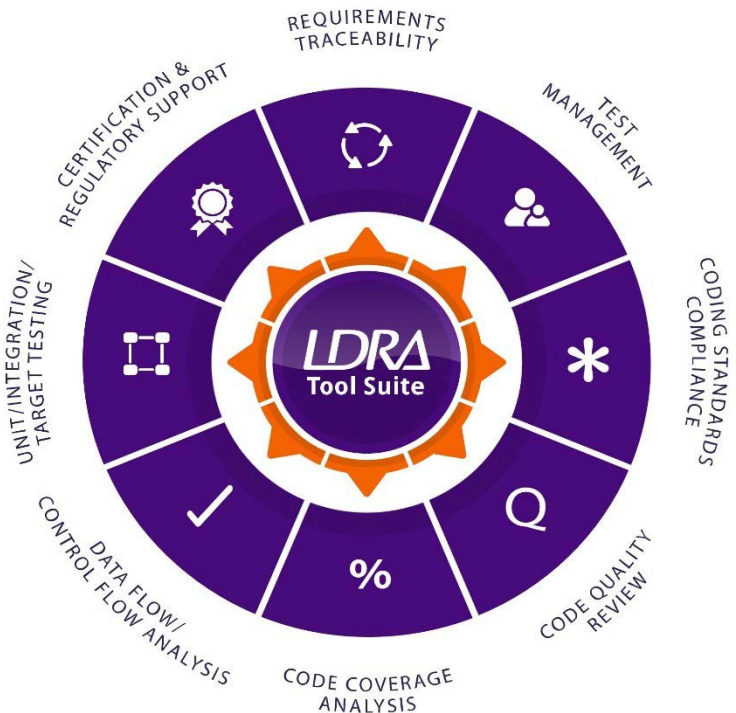
RTCA DO-178C (also known as EUROCAE ED-12C) is the primary document referenced by certification authorities to approve all commercial software-based civil aviation avionics systems. The document recognizes that to ensure correctness, control and confidence in software, safety must be addressed systematically throughout the software development life cycle.

LDRA is a pioneering company in the field of software quality and security, renowned for its contributions to aerospace. It is instrumental in shaping industry standards as evidenced by involvement in DO-178C and its predecessors. That expertise has underpinned the LDRA tools that have been used in hundreds of successful and compliant projects over the past four decades.

Today's LDRA tool suite is designed to support the key software development and verification activities specified in DO-178C from Design Assurance Level (DAL) E through to A. Features including requirements traceability, static analysis, dynamic analysis, unit test, on-target testing, execution time analysis, and source to object code traceability. Collectively, they provide a means to achieve compliance in an efficient, timely and cost effective manner.

Support throughout the development life cycle

The LDRA tool suite plays a crucial role in achieving DO-178C compliance for software projects in the aerospace industry, providing comprehensive support for the achievement of objectives throughout the software development life cycle. Static and dynamic analysis capabilities allow developers to identify and rectify issues early in the development process in accordance with the standard.



Static analysis

LDRA static analysis tools automate the scanned “inspection” of the source code. They make compliance checking easier, less error prone, and more cost effective, and they highlight non-conformances as required by DO-178C §6.4.3d. Static analysis is valuable both for catching errors as code is written, and for highlighting those issues that only become apparent during integration. These include interface mismatches, timing issues, and unexpected interactions between modules (DO-178C §5.4).

Dynamic analysis

LDRA dynamic analysis involves executing the Executable Object Code (EOC) piecemeal or in its entirety. The aim as detailed by DO-178C is to demonstrate the correct functionality of the entire source code base in its native (target) environment.

DO-178C identifies objectives to achieve test coverage of high- and low-level requirements, and to achieve appropriate test coverage of the software structure and of the data and control coupling. The “test cases and procedures” supported by the LDRA tool suite and referenced in the standard include low-level tests, integration tests, and system tests in accordance with DO 178C §6.4.4.2.

For Level A systems, structural coverage at the source level isn’t enough. Compilers often add additional code or alter control flow, and often their behaviour is not deterministic. LDRA Object Code Traceability fulfil the source to object code traceability requirements of DO- 178C §6.4.4.2.b.

Keeping track of progress

LDRA provides a range of tools to support project managers as comprehensively as developers and testers, particularly through Stage of Involvement (SOI) reviews. The tools offer:

A desktop traceability solution leveraging the integration of ALM & PLM tools with the LDRA tool suite’s code review, data and control coupling analysis, low-level testing, and code coverage capabilities.

A web-based, enterprise level solution, aggregating managing certification artifacts across projects and programs to provide visibility into the development and verification process.

A standard-specific solution which includes comprehensive compliance documentation, process and document review tools, together with Level A FAA Designated Engineering Representative (DER) and EASA Subject Matter Expert (SME) support.

Supplements and guidance documents

The LDRA tool suite supports the core DO-178C objectives, the DO-33x series of supplements, and guidance documents. These include:

- **DO-330/ED-215** concerns tool qualification. It is supported by means of LDRA's Tool Qualification Support Packs (TQSPs)
- **DO-331/ED-216** concerns model-based development. LDRA tool suite integration with the modelling tool of choice eases adherence to DO-331 guidance.
- **DO-332/ED-217** concerns object-oriented programming and complementary practices. The LDRA tool suite supports the C++ language and the object-oriented practices that go with it.
- **AC 20-193/AMC 20-193** (collectively **A(M)C 20-193**) concerns the application of multi-core processors (MCPs). The LDRA tool suite facilitates a practical, compliant approach to execution time analysis and other MCP-related objectives.
- **AC 20-170A/AMC 20-170A** concerns the development of Integrated Modular Avionics (IMA) systems. The LDRA tool suite supports their development in accordance with DO-178C.

Productivity package

The LDRA Productivity Package for Aerospace and Defense is a set of targeted capabilities drawn from the LDRA tool suite enabling customers to achieve DO-178C compliance through to DALA, the highest level of assurance for airborne software.

Table A-7 Verification of Verification Process Results

Table	Objective	Ref	Applicability by Software Level				Compliance
#	Description		A	B	C	D	
A-7	Verification of Verification Process Results						
1	Test procedures are correct.	6.4.3.b	SI	S	S		n/a
2	Test results are correct and discrepancies explained.	6.4.3.c	SI	S	S		n/a
3	Test coverage of high-level requirements is achieved.	6.4.4.a	SI	S	S	S	n/a

LDRA Productivity Package for Aerospace & Defense Control Coupling Overview Report
System Set: RMABL950_Safe_Utility
DO-178C Level A

Date of Analysis: Fri Apr 12 2024 13:16:52
Report Produced on: Wed Aug 7 2024 15:51:38
LDRA Version: 10.2.1

Files

Name	Control Couples	Control Coupling Coverage
main.c	12	0%
safe_compress.c	0	n/a
safe_sprintf.c	5	100%
safe_string.c	0	n/a

Showing 1 to 4 of 4 entries

The package collates LDRA's best in class capabilities to enhance collaboration across large and small teams, making it ideal for use throughout the software development lifecycle.

Benefits

- Extensible solution providing automated verification and validation, building quality into software from requirements through to deployment.
- Comprehensive reporting and collates evidential artefacts.
- Supports DO-178C, its supplements, and related additional guidance.
- Tool Qualification support.
- Proven in use on hundreds of successful DO-178C compliant projects, up to and including DAL A.
- Configurable to allow focus of analysis on a task-by-task basis.
- Supports almost any target device.*
- Unique breadth and depth of capabilities facilitate seamless project development.

Summary

The LDRA tool suite offers extensive benefits for DO-178C compliant projects, including automated verification and validation, comprehensive reporting, and seamless integration with other tools. It supports model-based development, data and control coupling analysis, and is scalable for projects of varying sizes. Additionally, it provides bi-directional traceability, static and dynamic analysis, and structural coverage analysis, ensuring thorough testing and compliance. Proven in numerous successful projects, the LDRA tool suite builds quality into software from requirements through to deployment, supporting almost any target device and facilitating seamless project development.

*Contact LDRA for further information relating to your tool chain.

Solution details

- Modular tool suite with options including:
 - Foundational static and dynamic analysis engine.
 - Visualization platform.
 - Coding standard compliance checking.
 - Complexity analysis.
 - Automated execution of unit & integration tests.
 - Test case management.
 - Structural coverage analysis.
 - Data and control coupling analysis.
 - Source to object code traceability.
 - Execution time analysis.
 - Hardware interfaces to target devices.*
 - Standard-specific objectives & requirements traceability.
 - Integration to ALM & PLM tools.
 - Evidential artifact collation.



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