

Issueless qualification of RapiCover for 777X flight control system

Collins Aerospace, a Raytheon Technologies subsidiary, is one of the world's largest suppliers of aerospace and defense products, with its headquarters in Charlotte, North Carolina. Within the company, the Flight Controls group produces solutions focused on aircraft stability and safety, including cockpit control and flight control systems.



Collins Aerospace were awarded the contract to develop the flight control system for the brand-new Boeing 777X aircraft. This system was rated at DAL A, under which DO-178C guidance requires the production of structural coverage evidence including MC/DC, the most onerous and computationally-intensive coverage metric.

The Collins Aerospace Flight Controls team selected Rapita Systems' RapiCover tool for this work based on the proven track record of RapiCover when used in complex, critical aerospace projects. As part of the delivery, Rapita delivered a robust integration and qualification service.

RapiCover

Challenge

Needing to deliver the complex flight software embedded in the Boeing 777X fly-by-wire application, Collins Aerospace's Flight Controls team required a reliable and high-performance Structural Coverage Analysis solution to meet DO-178C DAL A objectives in a timely manner. Having been frustrated with alternate commercial solutions, the team asked Rapita Systems to deploy RapiCover to meet their coverage analysis needs. To fully test the system in this project, it was necessary to power cycle the target hardware during testing. A solution that allowed coverage data to be collected in real-time was therefore needed so that the target could be power cycled without losing coverage data.

Summary

Challenge

- DO-178C DAL A code coverage analysis and evidence for complex flight control system.
- Target needed to be power cycled without losing coverage data.

Solution

- Integration of the RapiCover tool for structural coverage analysis including MC/DC.
- Development of a highly efficient real-time data collection strategy using the Nexus interface which supported the testing strategy by allowing the target to be power cycled without losing coverage data.
- Qualification kit and service to qualify the use of RapiCover as per DO-330.

Benefits

- RapiCover's low on-target overheads allowed our customer to reduce the number of builds needed to collect coverage results.
- Real-time coverage data output and collection allowed the target to be power cycled without losing coverage data.
- Qualification service reduced the cost and risk of tool qualification.

Solution

Rapita delivered an integration of RapiCover, our structural coverage solution that has a long track record of successful deployments on DAL A DO-178B/C projects. Using RapiCover enabled Collins Aerospace Flight Controls team to automatically collect structural coverage metrics during their software testing. Furthermore, advanced features of RapiCover such as merging coverage from multiple builds and semi-automatic migration of justifications, both of which are qualifiable for DO-178C, addressed the inefficiencies found with alternate tooling.

Our technical team were able to overcome the challenge of retaining coverage data in the presence of power cycles thanks to the level of customisation offered by RapiCover. This allowed data to be output continuously through the Nexus on-chip tracing interface. Duplicate data was filtered “on the fly”, dramatically reducing the size of the captured data and speeding up post-processing. This strategy had the added benefit of further reducing the on-target overheads.

Finally, Rapita provided a complete qualification service to support DO-178C tool qualification by providing evidence that RapiCover worked as expected in the customer’s host and target environments.

Benefits

Rapita’s involvement contributed to a reduction in the program risk and the time and testing effort needed to satisfy certification objectives.

- Rapita delivered an innovative solution for real-time coverage extraction for the customer’s specific needs.
- RapiCover’s low on-target overheads reduced the number of builds needed to produce coverage results as more code could be instrumented simultaneously without compromising the timing behavior of the software.
- Our seamless qualification service for RapiCover, including qualification documents and services, made qualification as simple and efficient as possible for our customer.
- Efficient test management and traceability enabled rapid regression testing and test rework when new software and requirement revisions were released, keeping the project on track.

“Rapita’s highly-optimized instrumenter has allowed us to measure software coverage without costly and burdensome changes to our testing process. We use the tool on some of the world’s most complicated flight control systems. Compared to previous tools we’ve used in the past, RapiCover’s performance has been much more reliable and robust. Rapita’s technical customer service team has been consistently helpful and responsive.”

Collins Aerospace Flight Controls

Next steps

To learn how RapiCover can help reduce the cost and effort of code coverage analysis, see our product page at www.rapitasystems.com/products/rapicover.

To enquire about what Rapita can do for you, contact us at enquiries@rapitasystems.com.



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