AdaTEST 95

QA SYSTEMS
The Software Quality Company

**SECTOR** Aerospace & Defence
**STANDARD** DO- 178B

# Case Study

**Saab**

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The JAS39 Gripen Fighter Aircraft

## Background

One of the projects at Saab Aerosystems involved the re-implementation of the Stores Management Unit (SMU) for the JAS39 Gripen fighter aircraft. The SMU is responsible for the safe loading, release and unloading of the weapons (bombs and missiles) carried by an aircraft. The software was developed to the RTCA/DO-178B standard at criticality level A, using Ada95 as the implementation language. The SMU's hardware was also upgraded as part of the re-implementation. As a result of the safety-critical nature of the software, it was decided to adopt the Ravenscar profile of the language, which has various restrictions aimed at promoting safe and reliable code.

The JAS39 Gripen Fighter Aircraft

## AdaTEST 95 Customisation

To meet the stringent testing requirements, AdaTEST 95 was evaluated and selected for both unit and integration testing. Testing took place on the host-native development platform and on the target. Ravenscar's restrictions meant that initial testing with coverage analysis had to be done on the host-native platform.
The same tests were then repeated on the target, to ensure that the airborne code executed in exactly the same fashion as it had on the development platform. The standard AdaTEST 95 product was used for the host-native work (using the Aonix ObjectAda compiler), however a customized form of the tool was provided for target use with the Raven version of the compiler.

## Low-level and Integration Testing

Integration tests involving complex hardware interactions were developed and run on the host, using AdaTEST 95's 'intelligent stubs' to simulate the behavior of the real hardware. This included simulating timers, interrupts, communication links, and memory units. When testing the low-level hardware-dependent code, tests were run directly on the target. Given the differences in the environments, it was a great advantage to be able to use the same tool in both: all the engineers involved in code testing were able to understand the testing approach, and could easily read and interpret the test results.

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## Productivity

One key factor in the successful use of AdaTEST 95 was the short start-up time, which resulted in inexperienced testers becoming productive quickly. The SMU team put some early effort into developing a test strategy and produced a "Test Style Guide". This was beneficial in that it increased consistency within the project, and also boosted productivity when new staff were introduced.

## Testing Issues - Lessons Learnt

Sharing of stubs was used to increase efficiency and minimize maintenance. Where stubs contained significant 'functionality', however, they were not shared for reasons of safety and maintainability. Because the target system did not support Ada exceptions, their use was also restricted in host testing. A modification to the Ada run-time system allowed checking of raised exceptions and the recovery of control before test execution terminated. Since coverage at the source code level was performed by AdaTEST 95 only during host testing, it was still necessary to do a minimum of code coverage measurement on the target. In addition to the stringent MC/DC coverage reporting provided by AdaTEST 95, the DO-178B Level A standard requires object code coverage to be proved on the target. Conveniently, a facility to do this came with the compiler. Thus, the complete coverage requirements of the standard were provided in complementary fashion by the test tool and the compiler.

## Automation and 'Test-on-Demand'

A high degree of test automation, for both host and target testing, was achieved. The main feature here was the ability to analyze the results from both host and target runs, and merge the test results, source code coverage and object coverage into a single overview which was visible to and understandable by everyone in the team. Since the target testing facilities were a limited resource however, the automation was limited to the ability to build the tests, but only execute when the resource was free. A 'Test-on-Demand' feature was developed and integrated with the project Configuration Management system, to force all available tests to be run.

A convincing demonstration of the value of the automated test system came when the target compiler and run-time system needed to be upgraded. Normally, this is a nerve-wracking business but in this case it only took three hours to install the compiler, carry out a complete regression run of all low-level and integration tests, and identify the small number of bugs in the new compiler. This was a fantastic result, and easily justifies all the effort that was put into creating the framework and then writing the tests with AdaTEST 95.

All case study text has been approved by the customer.
QA Systems acquired the AdaTEST 95 business, taking over all development, support and sales, from IPL in 2012.
AdaTEST 95 is the extension of the AdaTEST tool.

## MORE ON AEROSPACE & DEFENCE SECTOR:

Our Sector Briefs provide more information on how AdaTEST 95 was successfully used by other customers in various aerospace & defence projects worldwide.

Sector Briefs can be found on the QA Systems website.

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