

Case Study: Vibro-Meter



Vibro-Meter:

Engine Interface and Power
Monitoring (EIPM) unit for the
Airbus A380 aircraft

Seven Years of Software Testing at Vibro-Meter

Vibro-Meter is one of the world's leading providers of vibration monitoring systems, as used in commercial aircraft, helicopters, and other military aerospace, industrial and marine applications. Vibro-Meter is a wholly owned subsidiary of Meggitt PLC, employing over 450 staff. Since its foundation in 1952 it has become a major supplier of complex measurement and diagnostic systems for engine health monitoring. Vibro-Meter's customers include most of the world's major aerospace corporations such as Airbus, Boeing, Embraer, UTC, General Electric and Rolls Royce.

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Mr Philippe Lomazzi, Head of Software development.

Critical Software Testing Requirements

Recently, Vibro-Meter has been developing two major products; the Engine Interface and Power Monitoring (EIPM) unit for the Airbus A380 aircraft and the Engine Monitoring Unit (EMU) for the Trent 900 engine from Rolls Royce. One of the main challenges of these developments was to deliver reliable software that had been fully tested to meet the stringent safety demands of the civil avionics industry standard known as RTCA/DO-178B.

The full name of this standard is 'Software Considerations in Airborne Systems and Equipment Certification'. It describes the techniques and methods needed to ensure the integrity and reliability of such software. Several levels exist for this standard, each of which is defined by the level of safety required. For example Level A refers to software whose failure could cause a 'Catastrophic' accident, Level B software failure could involve a 'Severe – Major' accident, and so on.

The DO-178B standard mandates the use of dynamic testing at both unit and integration levels. Test coverage analysis and static analysis also need to be undertaken. In 1999, Vibro-Meter's engineers started putting together a development kit to support the future projects. A high priority for the engineers was to find tools that would support the testing techniques required by this stringent standard. Due to previous successful experience with Cantata's sister tool for the Ada language, AdaTEST, Vibro-Meter rapidly identified Cantata as the strongest candidate. This was because of the close mapping of Cantata's specification to the requirements of DO-178B

Evaluation

Following a detailed technical evaluation, it quickly became clear to Vibro-Meter that Cantata was the right choice for a DO-178B development. Cantata was not only fully effective for this standard, particularly in terms of supporting all forms of coverage analysis required, but was also complete in terms of automation, usability and integration within their own environment. An initial order for Cantata was placed in 2000, and a training session for 20 engineers over three days followed soon after.

A380 – Program EIPM

Vibro-Meter has been supplying equipment to Airbus since 1970, the first project being for the A300 aeroplane. Since then the company has designed and supplied engine monitoring and interface units for all Airbus aircraft programmes. The function of the A380 EIPM system is to supply and monitor power to engine-mounted systems (Electronic Engine Control, Engine Monitoring Unit, Igniters, etc) and to provide Electronic Engine Control parameters to the aircraft systems.

Mr Carl Burton, Director of the Electronic Department, and Mr Philippe Lomazzi, Head of Software Development, were in charge of this project. The software was produced entirely in C by Vibro-Meter using a team of six software engineers. The processing unit was based on a Motorola/Freescale chip and the software development environment was the GreenHills Multi IDE. The software integrity level assigned was Level B. Cantata was used to perform the unit tests and provide evidence of 100% coverage at statement and decision levels.



EMU123 for the A380

Vibro-Meter was required to perform the unit tests and coverage analysis both on a target simulator as well as on the real target. For those purposes IPL engineers customised Cantata for the Vibro-Meter environment, which was then supplied and installed without any significant difficulty. *“Cantata can be used, after purchase of the related libraries, for different targets without problem. We have done this for both our A380 EMU and EIPM systems.”* says Philippe Lomazzi. This requirement was facilitated by Cantata’s target features as the test script can be run unchanged in the target environment.

The first component of the EIPM was successfully delivered to Airbus in December 2003.

Trent 900 – Rolls Royce

Vibro-Meter has been working for Rolls Royce for the last 20 years. Over the last four years Vibro-Meter has been developing the Engine Monitoring Unit (EMU) for the Trent 900 engine. The EMU monitors several advanced parameters such as engine vibrations, pressure, temperature and implements advanced algorithms for engine maintenance purposes. It also acquires engine vibrations for an on-board engine balancing process. The software integrity level assigned was Level C.

For this project, Vibro-Meter decided to use the TI TMS320C33 and Freescale PowerPC chips. The Green Hills Multi IDE and the TI Code Composer environments were used and the application was coded in C. Cantata was used in order to comply fully with the DO-178B standard and Vibro-Meter’s engineers particularly praised the easy use of the tool and its technical solutions to enable straightforward module testing.

Conclusion

Both projects have been a real success and Cantata has proved itself in a mission critical environment. Vibro-Meter’s confidence in IPL for the last seven years has been justified by the tool’s successful deployment on both programs. Mr Philippe Lomazzi has the final word: *“The systematic use of Cantata has enabled us to have the shortest unit tests phase possible with great efficiency in term of cost.”*

IPL wishes to thank Vibro-Meter for their participation in this case study. We wish them well in future projects.

The text for all IPL product case studies is agreed and approved by our customers.

Tool qualification and Auditing (DO-178B) Information

A white paper **IPL: Tool Qualification and Auditing** is available at: <http://www.ipl.com/include/download/Download.php?FileID=p0838>

FURTHER INFORMATION

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