



Smiths Aerospace Adopts UML-based Real-time Modeling Tools for new Standard Development Process

Avionics engineers dealing with the science and technology of the development and use of electrical and electronic devices in aviation constantly strive to accelerate time to market for both hardware and software applications without compromising safety or flight critical specifications. Ultimately, the idea is to make things simpler, easier, quicker and less expensive.

Smiths Aerospace was formed from the merger between Smiths Industries Aerospace and TI Group's Dowty. The new company with combined sales in excess of £1.1 billion is a first-tier supplier for Boeing and Airbus and is a major supplier for retrofit and upgrade of commercial and defense aircraft. Replacement of outdated avionics can effectively prolong the life of an aircraft, potentially doubling its length of service. Through continuous research and development investment, the Smiths Aerospace manufacturing facility at Bishops Cleeve, near Cheltenham in the UK, incorporates the latest technologies into leading-edge avionic display products, mission management, and power-switching systems.

In the late 1990s the Smiths software development teams at Cheltenham produced a standard approach to the analysis and design of software. Structured analysis techniques were used to provide a functional breakdown of the requirements placed on the software. However, in place of the structured design techniques traditionally used the company had adopted an Object Oriented (OO) design approach. This technique was seen to offer significant advantages over structured, top down approaches to design and implementation. The OO approach was successfully used even though the languages used for implementation (mainly Ada 83 and C) are not OO languages.

Whilst the analysis and OO design and implementation phases were well specified and successful in isolation, the transition from structured analysis into an OO design and implementation was difficult. Also, the software tools used to support the software development process were becoming dated, requiring the engineers to use dedicated workstations when the rest of their work could be done on their desktop PCs. A better development process was required –

one that would allow a smooth transition from requirements analysis into design and that could be deployed on the desktop PCs.

According to Shaun Cullimore, Smiths Aerospace Software Technology Manager, the process chosen needed to be capable of supporting a wide range of software developments for products in both the defense and civil marketplaces. The software in these products would also vary in size, implementation language and customer. To minimize risk selecting a PC-based tool, the selection criteria required that the vendor be able to provide training and consultancy support. Smiths selected *Real-time Studio* from ARTiSAN, says Cullimore, because of the company's strong focus on real-time embedded applications, their technical expertise in the UK, and the price of the product. The relative maturity of their tool in a volatile market together with the strength of their consulting capability (engineers with experience of real time embedded system development) and emphasis on process were also key factors in making ARTiSAN the preferred partner for Smiths.

Because there was no opportunity to free staff for extended tool and process evaluation exercises, Smiths chose to use *Real-time Studio* on a 'live' project. And, to minimize risk, Smiths incorporated a training and consultancy package from ARTiSAN.

"We needed to adapt ARTiSAN's 'out-of-the-box' lifecycle so we could maintain a separate 'requirements view' and 'design/implementation view' without using two models for every project" comments Cullimore. "Agreement with the customer of exactly what constitutes the software requirements baseline is a key milestone in our programmes. A process which distorts that view through elaboration or pollutes it with implementation detail would not be

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acceptable to us. We also wanted a process that was independent of any tool, though we would obviously be seeking the best tool to support it”.

A single ARTiSAN model is now used to accommodate both the requirements view and the design and implementation view. “This suits us better than maintaining two separate models as it is so difficult to maintain consistency”, says Cullimore. From these discussions Smiths have produced a Code of Practice for OO Analysis and Design that is used across all new projects. Smiths use industry standards whenever they can, and benefit from ARTiSAN’s active participation in the Object Management Group (OMG) that controls UML. ARTiSAN’s Real-time Studio supports Unified Modeling Language (UML) but also provides unique real-time extensions that go beyond UML.

“Since the beginning, we have actually implemented the new methodology and tools on four major real-time projects and many projects developing supporting test equipment”, says Cullimore. Smiths continue to utilize ARTiSAN training and consultancy as engineers begin to use the process on new projects. The tool and process have been employed on projects ranging from equipment to switch electrical loads on military aircraft, to helicopter display systems.

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ARTiSAN continues to develop *Real-time Studio*, and following their initial experience with the tool, Smiths have indicated they are keen to use some of the newer facilities that

it provides. For example, the ‘Package-based Object Repository’ of *Real-time Studio* enables a peerless combination of upstream team collaboration and downstream development stability. Teams now have the flexibility to simultaneously share the centralized project repository as well as partition it for separate controlled development. A new feature of *Real-time Studio* that appeals to Smiths is Configuration Management of the model via package controls that reduces or eliminates problems traditionally encountered with control of a model by numerous engineers.

ARTiSAN supports open systems and industry standards such as UML, which enables prime contractors, sub-contractors and their customers to communicate effectively. Support for automatic documentation generation from templates means that generated documents can be adapted to conform to standards such as MIL-STD-498, J-STD-016, IEEE/EIA 12207 and ISO 12207. This enables developers to focus on engineering activities while highly evolved tools automate the documentation tasks.

Because ARTiSAN’s *Real-time Studio* makes it easy to maintain code and design consistency, and as the development teams become more familiar with the new process and technology, Cullimore anticipates that Smiths will achieve even greater time-to-market acceleration. Additionally, he believes by maintaining greater code and design consistency Smiths will find it easier to leverage the software for future projects because most components developed are in a form that can be readily and easily reused.

Ultimately, this should result in significant development cost reductions.



About ARTiSAN Software Tools

ARTiSAN Software Tools is a leading supplier of innovative software modeling solutions that accelerate the development of real-time systems, giving development teams the “fastest path to the right product”. ARTiSAN is a practical partner offering easy-to-adopt, down-to-earth solutions that enable teams responsible for designing real-time systems to complete them on schedule and within budget. ARTiSAN is the only company today offering flexible, practical tools that facilitate communication throughout an entire development team, helping them visualize, design and validate systems before implementation, and then simplify implementation with code generation and component re-use. ARTiSAN Software Tools Inc., founded in March 1997, is privately held with headquarters in Portland, Oregon and Cheltenham, UK. The company has regional offices and distributors throughout the world.