Needed: A Model-Based Solution that is Aligned with the FACE™ Technical Avionics Software Standard

The creation of a shared software development standard for avionics systems in 2010 has created new pressures for software engineers in this industry. The future airborne capability environment (FACE™) software technical standard supports the adoption of a common platform for avionics systems delivered to military organizations. It enables defense customers to benefit from a consistent set of technology standards, as well as partner with a wider variety of suppliers worldwide. The FACE standard increases productivity for avionics systems suppliers, as they no longer need to reinvent the wheel for each new customer order — instead, they can re-use many elements of their existing FACE-aligned software architectures. However, many avionics suppliers are struggling to understand and align to FACE requirements. What's needed is a new FACE-specific modeling solution that works in concert with proven avionics modeling packages that are already in use by industry leaders.
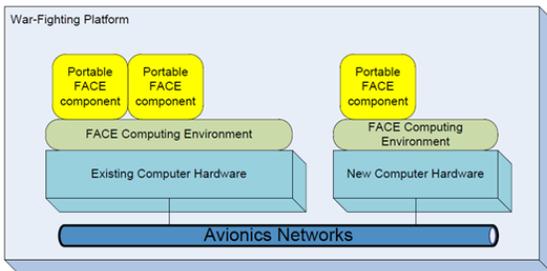
In 2010, a group of avionics systems suppliers, aircraft manufacturers and defense customers came together to create a new business model that would enable the military to purchase affordable avionics systems that were more innovative — as well as more portable, so they can be used across a broad range of aircraft types. At the heart of this model was a shared software technical standard that would guide all future avionics system development.

This common software standard represented a win-win for both military aircraft manufacturers and their global suppliers. Vendors would be able to avoid a complete avionics system redesign for each aircraft order. Previously, they had invested a great deal of effort in developing customized systems for every new order. This required constant rework. The shared software standard would also help the military ensure consistency across all its aircraft and its avionics platforms. Both suppliers and customers would benefit from cost reductions and efficiency improvements.

Today, the future airborne capability environment (FACE™) software technical standard guides avionics suppliers worldwide that sell systems to military customers. The FACE standard is based on three underlying principles:
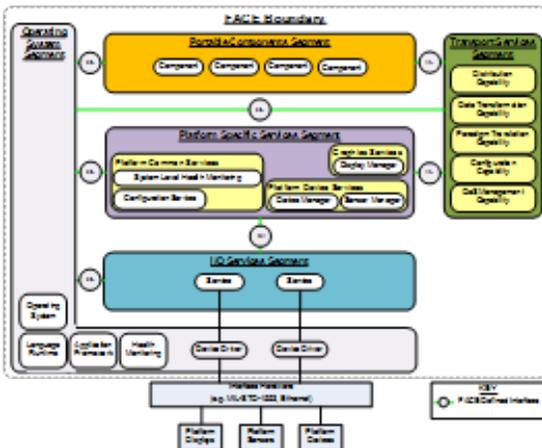
• **An open architecture** necessary to enable rapid deployment and re-use of software code across diverse aircraft platforms

• **Greater flexibility across platforms** so that many software suppliers can be considered, systems have increased interoperability, and new and legacy systems can easily be integrated

• **An industry library** of conforming software code that supports safety, security and rapid adoption of the universal standard

To understand how broadly the FACE standard is advocated, one needs only to look at the list of companies represented in the FACE consortium. It includes such household names and aviation leaders as Boeing, Lockheed Martin, GE Aviation Systems, Bell Helicopter, Honeywell, Northrop Grumman and Raytheon — in addition to major U.S. military organizations such as the U.S. Army's AMRDEC and NAVAIR.

How does the common FACE standard positively impact the development of control software for avionics systems? When avionics systems were based on various technology platforms, there was a significant potential for inefficiencies, communication gaps and an overall lack of compatibility. Today, this tangled web of technology has been simplified with the FACE avionics standard. All suppliers must work with a shared set of guiding principles, ensuring that overall systems will perform predictably, consistently and efficiently when brought together in a military aircraft.

It's no surprise that many military projects today require suppliers to apply the FACE standard, including the U.S. Army's Blackhawk helicopter, the U.S. Navy's Hercules aircraft and Next Generation Jammer pod which interferes with an enemy's ability to access the electromagnetic spectrum for communication.

As FACE is proven to save time and money for both suppliers and defense organizations, conformance with this software technical standard will eventually be required for every military avionics system project.

Understanding and Aligning with FACE: A Challenge for Many Suppliers

There's no doubt that complying with the FACE avionics software standard makes sense for systems suppliers. It enables them to participate in groundbreaking and lucrative military aircraft projects, while also producing a range of cost and efficiency benefits for their own software development teams. Smaller companies can compete on a level playing field with larger, more established avionics suppliers, because now all competitors are delivering systems modeled on a shared set of standards.

However, alignment with the standard is a complicated task. There are many complexities and nuances that must be understood in order to meet every element of the FACE technical standard. In addition, avionics systems must continue to meet other relevant software code standards, including ARINC 661 for aircraft displays or ARINC 653 for integrated modular avionics.

Already understaffed and overwhelmed with pressing customer deadlines, many software development teams are struggling to adapt their previous design methods to comply with FACE. The tedious processes and manual coding they have relied on in the past are proving insufficient to design new

The FACE standard ensures that multiple avionics systems can easily be integrated, because they share a common computing environment and compatible hardware. Portable components can easily be added as a layer on top of this consistent, robust technology foundation. By following this standard, avionics systems designers no longer need to reinvent the wheel for each new order — saving suppliers and customers time and money.

Image from "FACE Components", Figure 1 from Technical Standard for Future Airborne Capability Environment (FACE™), Edition 2.1, is used with permission from The Open Group

The FACE technical standard has many complexities and nuances that make it difficult to interpret and apply via manual processes.

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systems that align to the FACE standard and are certifiable by the military. Unless they find a way to automate and accelerate the development of code that meets the FACE standard, avionics systems developers risk being left behind.

Needed: A New Avionics Modeling Solution, Customized to the FACE Standard

In order to make aligning with the FACE standard easier and faster, avionics suppliers need a new tool — one that is specifically designed to understand the requirements of FACE and generate software code that fully aligns with the FACE standard requirements.

The global avionics industry is already benefitting from model-based solutions that walk them through the various steps of system integration, ensuring certification according to ARINC 653, ARINC 429, ARINC 664 and other standards. These model-based solutions enable software engineers to automatically manage the multiple protocols, many sophisticated and safety-critical functions, diverse hardware and software redundancies, and a high level of network complexity — including multiple configuration switches — involved in designing an avionics package.

What's needed today is a specialized tool that works together with existing model-based solutions — but addresses the FACE standard in particular. By bringing a new custom solution together with industry-standard modeling technology, software developers can be confident that they are aligning with FACE, while not losing sight of the foundational ARINC guidelines that govern all their system development tasks.

In order to add the greatest value, the new modeling solution that aligns with the FACE standard should be.

### Backed by the proven experience and expertise of an industry leader
Any new tool for modeling avionics software and ensuring FACE alignment should be developed by an industry leader in avionics system modeling. Only a proven provider of successful solutions can be trusted to combine the nuances of the FACE standard with all the other relevant certifications in this industry. Ideally the new FACE-specific modeling tool will sit on top of a leading modeling solution.

Based on a clear, step-by-step modeling workflow
To maximize productivity and manage the complexities of FACE alignment, any new tool should include a step-by-step workflow that begins with requirements analysis, operational analysis, and functional and architectural analysis — before moving on to the detailed design of embedded software, electronics and physics hardware.
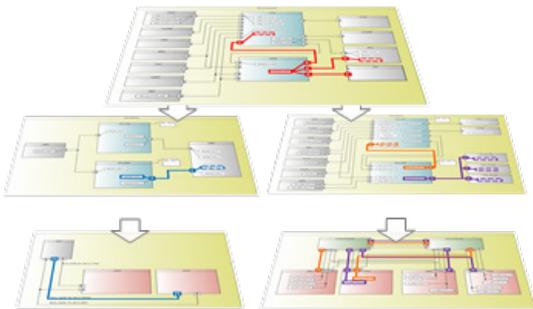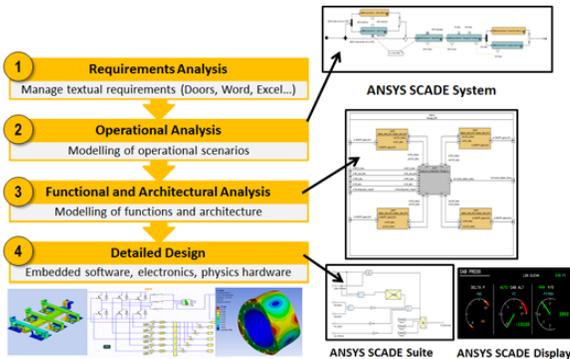

Model-based solutions are already helping avionics system designers create comprehensive architectures that represent the many functionalities and layers of a typical avionics system.
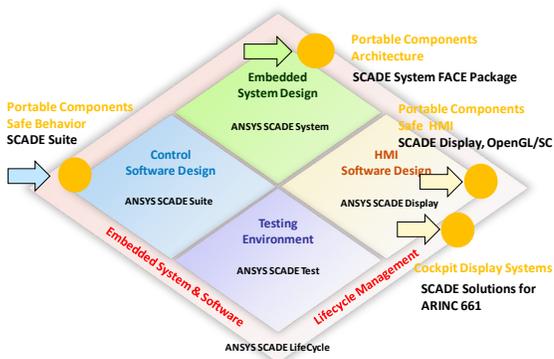
Any new FACE-targeted modeling tool should be developed by an industry leader — and work in conjunction with a broader avionics modeling solution suite.

New-generation modeling tools built for FACE compliance should have clear, step-by-step workflows to guide software engineers through a complete analysis of requirements — before moving on to detailed system design.

Customizable for different engineering environments and processes

Every avionics system supplier works differently. While a standardized, step-by-step approach is needed, a model-based tool still must be flexible and customizable to accommodate differences among software development teams.

Designed with built-in certified code generation

A new FACE-specific solution requires the built-in capability to ensure that all code generated from a software model is fully compliant before it is implemented in a customer's system. This tool needs to automatically ensure that control code is flawless with respect to the software models it implements, and that all avionics systems communicate correctly with one another.

Summary

Backed by the world's leading aircraft manufacturers and military organizations, the future airborne capability environment (FACE) software technical standard is changing the avionics industry. To deliver new systems for such prestigious projects as the U.S. Army's Blackhawk helicopter, avionics suppliers need to ensure compliance with this exacting standard. While many software engineering teams have been challenged to adopt their manual development processes to the complexities of designing for FACE, there is good news. A new generation of modeling solutions is being developed that works in tandem with the industry's leading avionics modeling package. Once these revolutionary solutions are adopted, software teams will be able to comply with the FACE standard in a reliable, accurate and rapid manner — increasing staff productivity and opening new doors for revenue generation with military customers.

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