

Detail Focus

New design tools tackle increasing complexity in aerospace programs

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Whether it is the Airbus A380, Boeing 787 or Lockheed Martin F-35, program issues leading to delays and redesigns have some in the aerospace industry arguing that traditional systems engineering is broken. But Dassault Systemes, a leading supplier of product development software, attributes the problem to design tools that have failed to keep pace with program complexity.

The company has launched a suite of program management, product modeling and design engineering tools to tackle what it sees as a trend toward “increasingly complex systems, overly aggressive plans and the premature incorporation of new technologies.” Targeted at the detailed design phase,

Functional mock-up includes requirements and behaviors as well as aircraft geometry and system models.

Co-Design to Target is a companion to the Winning Program product the company launched late last year to bring sophisticated integrated tools to conceptual design.

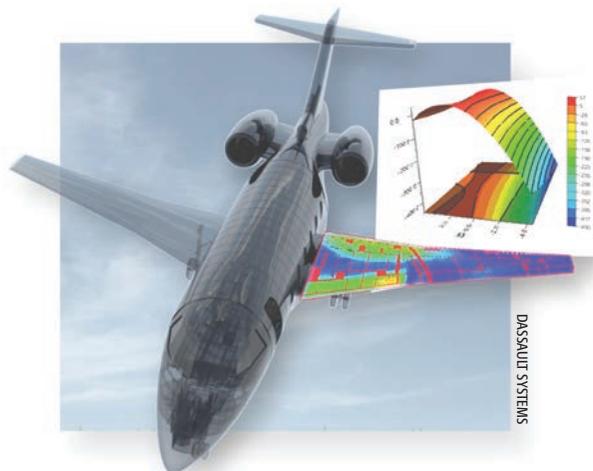
“They were designed together,” says Michel Tellier, vice president for aerospace and defense, with the goal of moving design work earlier to increase definition and reduce risk going into detail design, where much of the non-recurring expense (NRE) is incurred. “Detail design should focus on execution—efficient sourcing, certification, assembly, delivery, etc. You should not be doing trades in detail design. If you are not near your requirements and are having to innovate, then the advanced design was too weak,” he says.

“You need to run through the risk early on and not carry a lot of risk into execution. You should not be reinventing in detail design, which is about implementation of the design and optimization of the NRE.”

Where Winning Program is intended to improve the design decisions made prior to product launch that can determine program success, Co-Design to Target is focused on driving efficiency

into detailed design. “You still have to execute the program. This solution provides three new things: visibility into the state of the program; a stronger bridge from preliminary design into detail design; and improved technology for individual processes, discipline by discipline,” says Tellier.

To improve visibility, the system allows design reviews to be conducted weekly, instead of quarterly. “Now they are held every 3-4 months; it takes 3-4 weeks to prepare for and a week to go



through,” he says. Co-Design to Target automates the roll-up of program metrics against the key performance indicators (KPI) to provide a “real-time” status. “It can track earned value automatically, audit the weight database and tell us where we are on weight, or where we are against specifications and completion rates. It can calculate aircraft range and forecast NRE.”

The “functional mock-up” introduced in Winning Program for conceptual and preliminary design is extended to detailed design. This is an expansion of the three-dimensional geometric mock-up produced using Dassault’s Catia computer-aided design software to incorporate the design’s behavior. “The traditional digital mock-up is a collaborative tool for form and fit. Catia V6 introduced the functional mock-up as a collaborative tool for advanced

design,” says Tellier.

As a bridge between advanced and detail design, the functional mock-up includes the inner and outer mold lines, structural skeleton and load paths, system architectures and functions, interface control zones, and embedded requirements and specifications. Released from preliminary design into detail design at the start, to serve as a guide, the functional mock-up has data to track aircraft behavior, such as altitude and range, as the design matures.

The third new element of Co-Design to Target is a set of tools to optimize the “value stream”—from design and analysis to fabrication and inspection—in individual disciplines such as composite, machined and sheet-metal components, electrical, hydraulic and control systems. “A value stream is an end-to-end process. We make sure

the data flow is aligned, from design to numerical-control programming, to reduce the cycle time and effort to get from end to end,” says Tellier. Dedicated applications for composites or sheet metal, for example, include subroutines to optimize hand lay-up or tape laying, tune hydroforming or optimize tool reuse.

Dassault Systemes’ new software suite already is in use on three programs: Dassault’s Super Mid-Size business jet, Bell Helicopter’s Model 525 medium twin, and an undisclosed Cessna aircraft. A launch application for Winning Program, “Bell 525 is pioneering this approach,” says Tellier. “We did a lot of work with them on budget, schedule and specifications. They are running design reviews weekly, automatically rolling up 25 KPIs and tracking earned value.”

Co-Design to Target is not about automating key design decisions, says Tellier. “It’s about knowing where program progress is, and building recovery plans if you are not where you think you are. Weekly design reviews are less imposing, and more precise,” he says. “It allows you to steer the ship more precisely.”