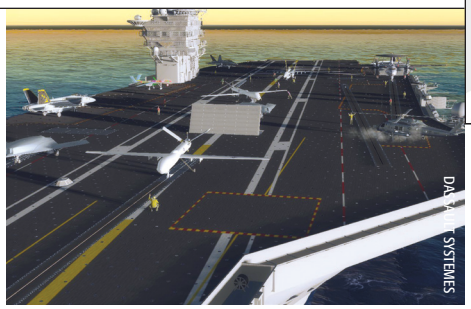
The McGraw-Hill Companies www.aviationweek.com/awst November 19, 2012

AVIATION WEEK & SPACE TECHNOLOGY

Inside Track



COMMENTARY

Head Start

Can better conceptual design tools guarantee program success?

Decisions that determine whether a program can be successful are often made before the contract is even won. But conceptual design is still more art than science, practiced by talented engineers without the sophisticated, integrated tools available for development and manufacturing.

So says Dassault Systemes, the leading supplier of three-dimensional design software, to explain its launch of a suite of design, collaboration, simulation and management tools aimed at the conceptual phase. Called Winning Program, the product brings to the early stages of a program capabilities available in the development phase through its integrated suite of Catia 3-D design, Dymola modeling, Simulia simulation and Enovia product data-management systems.

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"The early phase is still quite unstructured, and an area of opportunity to improve processes," says Mich Tellier, vice president for aerospace and defense. "We have built a product life-cycle management platform to address the early phase and support teams of engineers involved in product definition." Citing the development problems with several defense programs, Tellier says, "It's challenging to deliver on the promise of a proposal." Consequently, when the Pentagon evaluates bids, "they are not just looking for the best configuration, the best proposal, but who is the most credible, who can deliver to budget and schedule, or they throw in a risk factor that skews the proposal."

Winning Program will help tackle the challenges industry faces by providing better tools at an earlier stage, Tellier says. "We have got to deliver programs more effectively. We have got to be better at collaborating, and at proving designs are producible. And we have to capture the institutional knowledge.

"When we talk to the customer, the initial answer is, 'We know how to respond to a request for proposals'," Tellier says. "But how are you at delivering on a promise? Will you be able to do it three years time?" he says, referring to the wave of retirements that faces industry. "These are senior people on the design team, and it's a skill-based process. The retirements have not really hit engineering yet, but it's a ticking clock."

Also, in preliminary design after contract award, there is little reuse of work done during concept design, he says, and no "feedback loop" where difficulties encountered during development are fed back into concept design. This is because the design teams and tools are not connected. Conceptual design teams are "historically populated by the best and brightest engineers. This is not necessarily a community that collaborates effectively," he says.

Winning Program has four major components. A management platform allows the entire process to the program launch and start of preliminary design to be laid out, including conceptual and advanced design, case studies, technical trades and risk management. "It allows us to simulate the program itself and as we look at design trades, to simulate their impact on the program."

A conceptual design platform allows the product to be defined and its performance simulated using a "behavioral digital mock-up." This is an early-phase equivalent to the 3-D digital mock-ups produced using Catia, but focused on optimizing the system-level behavior of a design.

The conceptual model allows engineers to do architecture design using system models. "They can take the requirements, identify the functions needed, such as power, lift, etc., put those into a logical structure, such as propulsion, engine, etc., and mathematically model the design," Tellier says. This virtual functional model can then be "flown" through the flight envelope in simulations to analyze its behavior.

The third element of Winning Program is a simulation platform to prove out virtually the manufacturability of a design, and allow sourcing and production strategies to be decided.

The fourth element is used to simulate operations and demonstrate integration of the design into the customer's environment, "to prove you can deliver effective value in the contexts of what they have," Tellier says, such as simulating unmanned-aircraft operations on a virtual aircraft carrier (see photo).

"Our target is very simple. It's to increase by one to two orders of magnitude the number of trades and iterations they can do," he says. "That's what matures designs, and Winning Program will accelerate design maturity in the early stage."