

Simplifying complexity

A new approach is improving capabilities that made Boeing famous

By Jay Spenser

Customers worldwide depend on Boeing for advanced aircraft, electronic and defense systems, satellites and spacecraft, launch services, information and communication systems, and environmental technology solutions. These high-tech products and services depend on the company's proven ability to develop, field and support complex systems.

The new Systems Engineering and Analysis Domain is improving this Boeing strength. Responsible for technologies including modeling and simulation, complex systems integration and operations analysis, the domain also is tasked with examining how Boeing uses its knowledge in support of these vital activities.

The Systems Engineering and Analysis Domain is one of eight technology domains created in 2008 under the Enterprise Technology Strategy. The ETS seeks to ensure that the right technologies are developed at Boeing, now and in the future (see Page 40 in the May 2008 *Boeing Frontiers*). These domains, which cover the many areas of Boeing research and development and draw talent from Integrated Defense Systems, Commercial Airplanes and Phantom Works, implement this strategy. The domains, guided by the ETS, are working to maximize the yield of Boeing technology investments to create a sustainable technical competitive advantage.

CORE TECHNOLOGIES

Very few companies in the world contend with the degree of complexity that Boeing takes in stride. For Marc Nance, Systems Engineering and Analysis Domain leader, and his team of experts, this success is the point of departure as they collaborate enterprisewide to define a more efficient future. Like the seven other domains, they are developing an enterprise-level domain technology plan—something that's never existed before—that will link and leverage the best of Boeing technology to more effectively meet the company's business goals.

"Right now we're turning the technology spectacles back on ourselves to see how we can improve our productivity and grow the business," Nance said. "Ultimately, our goal is to support the company's functions and programs with technologies, processes and tools that make it easier, simpler, more efficient, and more cost-effective for all of us to continue doing what we do best: designing, developing, producing, and supporting high-tech products and services."

Based on inputs received in a June requirements workshop and subsequent discussions at senior levels of Commercial



Shannon Sheridan and Cecil Fields review a process model at the Product Lifecycle Management Laboratory in Huntington Beach, Calif. The Systems Engineering and Analysis Domain identifies PLM as a focus technology under the Enterprise Technology Strategy. MICHAEL GAIL/BOEING

Airplanes, IDS and Phantom Works, two high-level core technology groups stand out within this domain as being particularly crucial to Boeing's success: Affordable Complex Systems Integration (ACSI) and Modeling, Simulation and Analysis (MS&A). Here's a look at these groups.

Affordable Complex Systems Integration. The domain's ACSI activities will improve the company's system-of-systems engineering, architecture, tools and processes to enable breakthrough performance and affordability across product life cycles.

"Defining high-quality processes and tools is crucial, but it's not the entire challenge," said Senior Technical Fellow Bill Seidler, who leads the ASCI Core Technology Team. "When you're exploring uncharted technical territory, you also need high-quality people with the right skills, and you need to grant them access to the right information. That's why the ETS and the domains also focus heavily on knowledge management."

Product Lifecycle Management (PLM)—a business methodology that tracks all aspects of a product through its creation, use and eventual disposal—is the key tool here. Widely used at Boeing, PLM falls within the this domain's purview. Because it already tracks people, processes, tools and information, PLM offers exciting opportunities for major improvements in knowledge management.



“The ETS and its domains help maximize the return on our R&D investments,” said Darryl Davis, president of IDS’ Advanced Systems organization. “One way we determine where we put our dollars is to understand our customers’ future capabilities needs through experiments with their operators in facilities like the Virtual Warfare Center (VWC) in St. Louis (see story on Page 25). In turn, those experiments provide us with feedback to help the ETS and its domains focus on the right key technologies to deliver these future capabilities.”

The VWC is the epicenter of customer-in-the-loop simulations at Boeing. This facility lets Boeing and military experts work side by side in tests employing high-fidelity models and state-of-the-art simulation technology.

“This domain isn’t just about creating better products; it’s also about creating these products better,” said AMSE Vice President Guy Higgins.

The Systems Engineering and Analysis Domain’s efforts synergistically complement other Boeing improvement activities as well, among them IDS Engineering’s 10X Lean+ Initiative. “Because the domain and 10X both focus on increasing productivity and reducing cost, both are critical to making the business more competitive,” said IDS Vice President of Engineering Charles Toups.

Mike Denton, vice president of Commercial Airplanes Engineering and leader of the Enterprise Engineering Function, likewise sees value in the domain’s efforts. “This domain is important to us because it helps us structure our requirements and implement large-scale processes and tools central to our commercial airplane development activities,” Denton said. “These processes and tools will let us reduce cost, shorten flow times, and leverage skills across the enterprise for more effective solutions to future challenges.” ■

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Aerospace engineers rely on computer-based design, modeling and simulation technologies that produce prodigious amounts of data. The PLM Function and Information Technology are supporting the domain’s work to identify critical processes and tools for managing this information more effectively.

“Executing an airplane program on time, within budget and with performance promises met is a classic complex-integration challenge,” said Pat Blanchet, the domain’s Commercial Airplanes focal. “Our domain is all about the processes, tools and focused technologies needed to execute flawlessly.”

Modeling, Simulation & Analysis. As computing technology developed over the decades, Boeing invested in capabilities that allow products and services to be modeled, simulated and analyzed more accurately. These fast-evolving capabilities are increasingly important across the enterprise.

In IDS, highly skilled engineers and analysts know how to employ and interpret the results of advanced simulation technologies. Their expertise lets Boeing military customers experiment with operational concepts and scenarios earlier than was previously possible. Because MS&A enables making informed decisions near the outset of a program that accurately and inexpensively frame requirements, it’s a powerful tool for reducing cost and mitigating risk.

What it’s made of

Each of the Technology Domains under the Enterprise Technology Strategy manages a portfolio of Boeing technologies. For the Systems Engineering and Analysis Domain, these technology focus areas are:

Affordable Complex Systems Integration

- Enterprise Framework and Infrastructure
- Product Lifecycle Management
- Virtual Enterprise Environment

Modeling, Simulation & Analysis (MS&A)

- Customer-in-the-Loop Simulation
- External Customer Engagement MS&A
- Product, Process, and Resource MS&A