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One company
One technology plan

JIM ANDERSON PHOTO

An integrated technology strategy promises to give Boeing a competitive advantage—as well as deliver growth and productivity

It's been the "opportunity of a lifetime." That's how Amy Buhrig described her work with the team that's been developing and implementing Boeing's Enterprise Technology Strategy.

Late last year, Buhrig was selected to lead the Enterprise Technology Strategy team, reporting to John Tracy, Boeing senior vice president of Engineering, Operations & Technology and chief technology officer. In this capacity, Buhrig leads the Enterprise Technology Board, whose members from Commercial Airplanes, Integrated Defense Systems and EO&T collaboratively developed the strategy in 2007 as another step toward making Boeing the world's best-integrated and most competitive aerospace company.

Part of this plan involves creating Enterprise Technology Domains, which let similar technical communities develop a shared understanding of technology needs, capabilities and investments across the enterprise. "Amy and her team are working to maximize the leverage of our technology investments and ensure that the right technologies are available at the right place at the right time, both today and in the future," Tracy said.

'TEAM OF ALL-STARS'

Buhrig has been on a series of trips and briefings to communicate the plan. "Everyone on our team is thrilled about the opportunity to contribute to the future of Boeing," she said. "I feel as if I'm playing on a team of all-stars."

A recent addition to this team are enterprise domain leaders, who have a crucial role in developing integrated plans for Boeing's eight technology domains, established by consolidating all the various technology pursuits within BCA, IDS and EO&T. The domains are Environment, Manufacturing, Structures, Platform Systems, Platform Performance, Networked Systems, Support and Services, and Systems Engineering and Analysis (see story on Page 42). The leaders will play a crucial role in helping to advance the plan's strategic objective: create a sustainable competitive advantage for Boeing.

Intense competition in the marketplace is something that Buhrig knows about firsthand, having held strategic planning positions in IDS, BCA and Phantom Works. "Having technology that adds value for our customers is the key to our future at Boeing," Buhrig said, "along with meeting our execution commitments at an affordable price and maintaining the safety and integrity of our products."

But achieving that technological advantage is going to demand an efficient, cohesive and focused one-Boeing strategy. And that's why Buhrig described the plan's creation and implementation as a golden opportunity for Boeing's top technical experts.

Each domain leader has an enterprise team to leverage the best of Boeing. These teams are composed of domain focals from IDS and BCA and technical representatives from EO&T's Phantom Works, Intellectual Property Management, and Global Technology and Industry Assessment organizations. In addition, to utilize the talent from the Technical Fellowship, a Senior Technical Fellow has been aligned with each domain to tap the expertise of the Fellowship.

Historically, Buhrig said, each business unit invested in technology projects independently, resulting in some duplicative investments and some gaps in investments. The new strategy is designed to eliminate these inefficiencies and maximize the yield of Boeing's investments.

"It is vitally important," she said. "When we look at the company investment in aggregate, we can see how much we're investing in concept development, processes and tools, and technology, as well as the expected time frame for transitioning technology to our next generation of products and services. And, we've always got to be looking out for disruptive technologies that can give us a competitive advantage in the future. The unifying plan will optimize technology investments at the enterprise level to ensure we're delivering the right capability to the businesses, at the right time."

No matter how sophisticated the plan might be, Buhrig said, research begins and ends with what the customer needs. "Understanding how technology can add value for our customers through Boeing products and services is the foundation for our plan," she said.

Although the domain leaders don't have day-to-day execution responsibility for the projects they plan, they have oversight responsibility to ensure that the commitments promised to businesses and programs remain on track, Buhrig said. From a process perspective, the primary objective is to make sure the strategy's planning and oversight processes are transparent, efficient and responsive to changing environments.

NEW GOVERNANCE STRUCTURE

The Enterprise Technology Strategy has brought with it a new governance model for technology integration. The Boeing policy known as POL-1, which sets out the company's functional and business unit responsibilities, states that the Boeing chief technology officer and the business-unit presidents and CEOs jointly approve each year's technology plan. To ensure strategic alignment and integration at multiple levels within the company, a series of integration boards also have been established (see story at the bottom of Page 43).

"We spend a lot of time these days talking about the Enterprise Technology Strategy because it's new," Buhrig said. "But the most important ingredient in this formula is the part that translates the strategy into action: the technical community of Boeing.

"In this industry, technology is the key to our future, and there are thousands of men and women who are turning imagination into reality at Boeing every day," Buhrig added. "With all the quantifiable benefits of this endeavor, I think the most powerful will be the communities of practice this architecture will enable. Sharing understanding of needs and capabilities across the enterprise will open new doors for sharing ideas and solutions—and that's Boeing at its best." ■

Photos

Boeing's Enterprise Technology Strategy covers many technical and operational aspects across Boeing, including Support and Services. Above, Mohammad Redha performs work on a C-130 at Edwards Air Force Base, Calif., in support of Boeing's C-130 Avionics Modernization Program duties. Leading the Enterprise Technology Strategy is Amy Buhrig (below, right), who has been meeting with technical teams across Boeing to communicate this strategy.

The Technology Domains and how they work

One of the first steps in the creation of the Enterprise Technology Strategy was to develop a framework that would allow similar technical communities to develop a shared understanding of technology needs, capabilities and investments across the enterprise.

The eight Enterprise Technology Domains were developed by integrating the Phantom Works thrusts, the Boeing Commercial Airplanes technology themes and Integrated Defense Systems key program technologies into a manageable number of technical areas that span Boeing product and service needs. Their definition is still evolving, but they give Boeing a common language to communicate with colleagues, as well as a baseline structure, as the team develops the planning and process infrastructure necessary to achieve enterprise integration.

The domains represent one of three complementary dimensions in the technology development process. Here are the other two dimensions:

- Business-unit programs and company R&D groups such as Phantom Works define customers' capability needs.

- Boeing's functional organizations infuse functional excellence into both technology and the planning for the skills, expertise and experience needed for a particular project or program. They also provide the people—the leading engineers and scientists—who execute the plans.

The domains complement these efforts with an integrated set of technology roadmaps, focused on providing strategic capabilities at the right time to influence Boeing's long-range business plan.

The domain leaders report to Amy Buhrig, Enterprise Technology Strategy leader, and Boeing Chief Technology Officer John Tracy. In addition to developing the technology plans for their domain, each leader is responsible for finding ways to collaborate with other domain members in replicating common technologies, leveraging Contract Research & Development, and drawing capabilities from the global R&D community.

Here's a brief look at each domain:

Environment

Leader: **Vanessa Gemmell,** formerly BCA Technology Collaboration leader

The Environment domain enables Boeing to be a leader in aerospace environmental responsibility. The focus is on energy efficiency, reduced emissions, resource utilization and recycling, and understanding the life-cycle impact of all phases of Boeing's products and processes. Key technology programs address aircraft emissions, efficient aircraft operations, noise reduction, passenger comfort, alternative fuels, green and sustainable manufacturing processes and materials, and recycling and reuse of Boeing products. Given the integrated nature of environmental issues, the Environment domain works closely with the other domains and technology teams.

Networked Systems

Leader: **Faye Francy,** formerly Phantom Works' Network-Centric Operations Thrust leader

This domain develops discriminating networking technologies and infrastructures to dramatically improve mission effectiveness. The domain's technology investments focus on providing secure, adaptive networked systems enabling ubiquitous connectivity; networked information and knowledge; smart mission management; optimized decision making; intelligent systems; and dynamic planning with performance prediction. The premise of this domain is that a robustly networked environment improves information sharing, that information sharing and collaboration enhances the quality of information and shared situational awareness, and that shared situational awareness enables collaboration and speed of decision, resulting in increased mission effectiveness.

Platform Systems

Leader: **Doug Swanson,** formerly Phantom Works' liaison to BCA Technology

The Systems and Subsystems domain is driven by business-unit strategies to provide a competitive advantage for Boeing through the addition of features and functionality for platform systems. The goal: provide value while minimizing cost, weight, volume and power. Internally, the domain works on the development of innovative technologies for systems architecture definition, integration, validation and verification. Selective investments are also made in associated subsystems. Externally, the domain collaborates with global partners, suppliers and technology providers to produce leading-edge solutions for subsystems and components.

Platform Performance

Leader: **Don Leopold,** formerly Huntington Beach, Calif., site leader for Phantom Works Flight Sciences Technology

This domain enables development of advanced, affordable platforms with superior performance that will create a competitive advantage and greater value for the customer. Such platforms include air vehicles, space vehicles, and weapons systems in support of commercial and military applications, as well as space exploration. To achieve this objective, the domain aligns research and development across the enterprise in areas that influence overall vehicle performance. Among these areas: concept and configuration development; aerosciences; propulsion; guidance, navigation and control; flow control; computational sciences; and advanced conceptual design processes.

Manufacturing

Leader: **Mike Vander Wel,** formerly 787 Final Assembly senior production engineering leader

The Manufacturing domain focuses on four areas of technology development. **Integrated design/build** focuses on the future production-system architecture, driving manufacturing requirements into future product design and development. **Prototyping and simulation** lets Boeing validate designs early in product development. **Product Integration** includes processes vital to final integration and product validation, such as drilling, bonding and inspection. Within **Materials Transformation,** metallic technologies examine each step of the transition of a raw material to a finished product.

Woven into all areas are quality, ergonomics, and environmental factors.

Support and Services

Leader: **Steve Swaine,** formerly Training Technology leader at IDS Support Systems' Training Systems and Services Division

This domain focuses on enhancing readiness for both military and commercial aircraft, which means providing trained people and available equipment at the right place, at the right time and for the minimum cost. The domain covers areas such as advanced maintenance and modification, materials management, technical data, ground support equipment, and training—along with myriad associated technologies, from nondestructive evaluation to reverse engineering to real-time virtual simulation and networking. Integrating these technologies is Network-Centric Logistics, complementary technologies that form a seamless operational environment in which the aircraft and its support environment are totally integrated.

Systems Engineering and Analysis

Leader: **Marc Nance,** formerly Airborne Early Warning and Control Program Planning and Execution manager at IDS

This domain provides Boeing with the systems engineering knowledge, processes and tools to design, build, deliver and support complex systems that fly, float and soar into space. Key areas in the domain include modeling and simulation, operations and systems analysis, cross-functional integration, and the knowledge management and processes and tools that support them all. The domain plans to achieve a common set of processes and tools that will create greater efficiency for Boeing.

Structures

Leader: **Andy Bicos,** formerly Phantom Works Manufacturing, Structures and Materials Technology Thrust leader

The Structures domain has four key areas of technology development. **Cross-functional architectures** develops structural systems that have additional functionality beyond load bearing, such as multifunctional structures that have antenna and sensor systems incorporated into them for higher weight efficiency and greater sensitivity. **Structures/interiors architectures** develops technologies for low-cost, weight-efficient airframes and interiors. **Materials and processes technologies,** developed with materials suppliers, includes composites, metals, and ceramic materials—and materials developed at the molecular level for next-generation products. **Methods, tools, and validation** develops the processes and tools needed to design and analyze materials and structural systems and for certification and qualification of the materials and vehicle airframes.

Structure for technology integration

The Enterprise Technology Strategy features a new governance model for technology integration. Here's a look at this structure, starting with the highest level and working down.

Enterprise Technology Steering Team

- Meets quarterly to reinforce engagement across the enterprise and ensure the strategy is aligned with company direction
- Chairman: John Tracy, chief technology officer and senior vice president of Engineering, Operations & Technology
- Representation: Team includes high-level representatives from Integrated Defense Systems, Commercial Airplanes, Phantom Works, and Business Development and Strategy

Enterprise Technology Board

- Meets monthly to ensure strategy and investment process integration, as well as manage change and risk at an enterprise level.
- Chairwoman: Amy Buhrig, Enterprise Technology Strategy leader
- Representation: Team includes members of Intellectual Property Management, IDS, BCA, Phantom Works and the Office of the Chief Technology Officer