DREAM)LINER

How do we avoid problems in the development of crucial Boeing programs that will one day be the lifeblood of the company? Today's focus on development process excellence provides an answer.

Getting it Right at the BEGINNING

BY JAY SPENSER

When does any aerospace product face the greatest opportunity for success and risk of failure? Boeing engineers know that it's during the product's creation.

Today, Boeing is fundamentally reinventing how it plans, measures and executes its product developments. Still at an early stage, this transition to better business practices is changing how development program engineers do their work and interact with their Boeing, customer and supplier teammates.

"Development programs are by definition difficult and we know we'll run into problems," says John Tracy, Boeing Senior Vice President of Engineering, Operations & Technology. "That's why we're defining and implementing business processes that let us do things more quickly, give us greater visibility earlier and enhance our ability to respond to unexpected challenges as they arise."

At the heart of this transformative activity is the Development Process Excellence Initiative, which is designed to maximize the yield of Boeing's R&D investments and improve the efficiency and effectiveness of its development program processes. One of the other four enterprise initiatives, Lean+, applies to everything Boeing does, including development programs, and provides powerful tools for reducing cycle time and eliminating rework.

Today's focus on development process excellence dovetails with engineering and manufacturing activities that are leveraging Boeing's experience on current and past programs to benefit new ones across the enterprise. The aim of these activities is to integrate identified management best practices into Boeing development programs, provide optimized tools and processes for companywide use, set in place a skilled and a motivated team, and ensure that new technology is ready when needed by the programs.

"We're making excellent progress," states Jim Morris, vice president of Engineering and Manufacturing for Boeing Commercial Airplanes, who is also a leader of the enterprise Program Management, Engineering and Manufacturing functions within EO&T. "If we simply keep on improving in all four of these areas, we'll be in great shape for the future."

Nan Bouchard, Boeing Integrated Defense Systems vice president of Engineering and Mission Assurance, describes development excellence as a continuing journey because processes

Corky Townsend, chief project engineer on the 747-8 development program, says lean product development "means doing the right things and in the right order as quickly as possible."

can always be further improved. "It takes time to see results when you change processes and tools," says Bouchard, who is also aligned with EO&T as a leader of the enterprise Engineering function. "But we're already seeing how our efforts are helping us give customers the capabilities they need, on time and at the promised cost."

By way of example, Bouchard – who until recently led the Development Process Excellence initiative – points to development programs across Boeing. A few are presented below.

A new development paradigm

When the Boeing 747-8 enters service in late 2009, it will be the first Boeing airplane developed at the program level using a Boeing-invented tool called *process-based program planning.* An alternative to standard milestone-driven schedules, process based program planning has no fixed milestones beyond the hard-and-fast dates that can't be moved.

This program planning tool employs a dynamic database of rigorously integrated requirements to shine light on the entire value stream and identify solutions. It leverages Boeing's knowledge about which tasks are the most critical and what information is needed by whom in what sequence to achieve program goals.

Tasks dependent on other tasks are linked so downstream impacts can be understood and managed. Critical events that drive the program are identified so priorities can be set and needless work avoided. Constraints are also identified up front so that they can be effectively managed.

"Lean product development means doing the right things and in the right order as quickly as possible," says 747-8 Chief Project Engineer Corky Townsend. "Conventional planning leads people to rush their work and hand things off that aren't complete just to meet a deadline. Under process-based program planning, the idea is to do it right the first time even if it takes a little longer. The schedule adapts dynamically to highlight where help is needed."

"This represents a major paradigm shift," states Steve Holt, lean product development implementation manager for Boeing Commercial Airplanes. "In the past, program managers would set milestones for their integrated product teams, and then keep asking them whether their parts would be ready on time. Now we instead ask them, 'how much time will you need to create your part?' This alternative approach shines light on constraints from the very start. That's an enormous advantage because you can make plans to recover when you're two years out, whereas your recovery options are limited if you only find out late in the game."

Defining the future

The Boeing 787 Dreamliner program is creating an ultra-efficient jet transport that will redefine air travel. Development excellence and Lean+ processes and tools are central to this ambitious program and have been from the beginning.

"Defining a new aircraft is difficult because each time one design parameter changes so do all the rest, which requires recalculation and reevaluation," says Ed Petkus, leader of the 787 airplane development team. "It's a critical phase at the outset of development programs that we call lines, loads, and laws."

Fortunately, significant Boeing investment over the past 15 years gave Petkus and his engineering team a host of improved processes, capabilities and computational tools. They combined these with process-based planning to complete the 787's lines, loads, and laws definition in record time, shaving three full months off an 18 month time flow across two loads cycles.

"We did it by taking these new processes and tools and blending them into a seamless system based on process-based management principles," says Petkus. "It was a learning experience and an incredible performance by the team."

Rewarding the messenger

In St. Louis, the Boeing EA-18G Growler program also illustrates how Boeing is today developing its products more efficiently. Derived from the F/A-18F Super Hornet, the Growler airborne electronic attack airplane brings new capabilities to the Navy, including the ability to keep up with strike aircraft and communicate while actively jamming to suppress enemy air defenses.

Functional discipline and best practices are hallmarks of the Growler program, which surmounted technological and schedule challenges to deliver the first EA-18G to the Navy ahead of time and under budget. Effective development, supplier management and lean processes played starring roles in this success.

The Growler program brings customers and suppliers into the fold. Weekly program management meetings link all participants by phone and Internet-based collaborative tools so that everyone can see and discuss the same data charts. Because Boeing, supplier, and Navy personnel are all developing parts for the EA-18G, they are fully integrated into these meetings.

"Morale on the EA-18G program is excellent because we focus on the data," says Bob Feldmann, vice president for F/A-18

Functional discipline and best practices are the hallmarks of the EA-18G airborne electronic attack aircraft development program. Here key engineers John LaFiore, Roy Saffold and John Keaveny are pictured with the antenna test model of the aircraft in St. Charles, Mo.

programs, Boeing Integrated Defense Systems. "When you do that, it removes personalities and politics from situational reviews so that intellectually honest discussions take place."

Growler program engineers look forward to these meetings because they can talk of what they and their teams have accomplished each week. They know that any issues they raise will be dealt with.

"Today, our improved development processes have removed the 'shoot the messenger' threat,'" says Feldmann. "In fact, it's 'reward the messenger' these days because everybody knows that not raising concerns or identifying trends early enough is what can bite us."

"I don't think I've ever seen as much openness and honesty," agrees EA-18G Avionics Engineer John LaFiore. "We invite our customers to every meeting and we don't try to hide anything. In fact, we also trained Northrop Grumman – our prime subcontractor – in our business processes, and they in turn trained their suppliers, so we're all working within a consistent set of metrics."

This sharing of best practices benefits the Navy by lifting the EA-18G program to new heights of efficiency. "We now have the same visibility with our key suppliers that we have monitoring our own performance," adds LaFiore. "Our subcontractors like this new way of doing business because it helps them measure and improve their own performance."

The P-8A Poseidon: Out front

Development excellence takes many shapes. Just ask Brandon Ray, a structural design engineer on the P-8A Poseidon program in Renton, Wash. Now being developed for the U.S. Navy,

the P-8A multi-mission maritime aircraft is based on the 737-800, a member of today's Next-Generation 737 twinjet family.

"As a Lean+ initiative, my P-8A integrated product team pioneered the use of data package visibility boards that display, prioritized and in one place, all the work packages we designers are responsible for," Brandon says. "All the Poseidon IPTs are using these visibility boards now because they show information at a glance that we used to have to go around and collect from different sources."

For all the benefits of standardization on optimized tools and processes, of course, a one-size-fits-all approach doesn't serve the best interests of every development program. Consequently, Boeing strives to give its engineering leaders the flexibility they need to tailor these standard best practices to the specific needs of their programs.

P-8A's Brandon Ray and team pioneered new work package visibility boards.

"After all these years and all this experience, we have a pretty good idea of what works best on the development front," says Steve Goo, vice president for Program Management and Business Excellence, at Integrated Defense Systems. Goo is also aligned with EO&T as a leader of the enterprise Program Management function. "We've also identified the things that set past developments up for failure or limited their success, so we can avoid repeating those mistakes in the future." ■