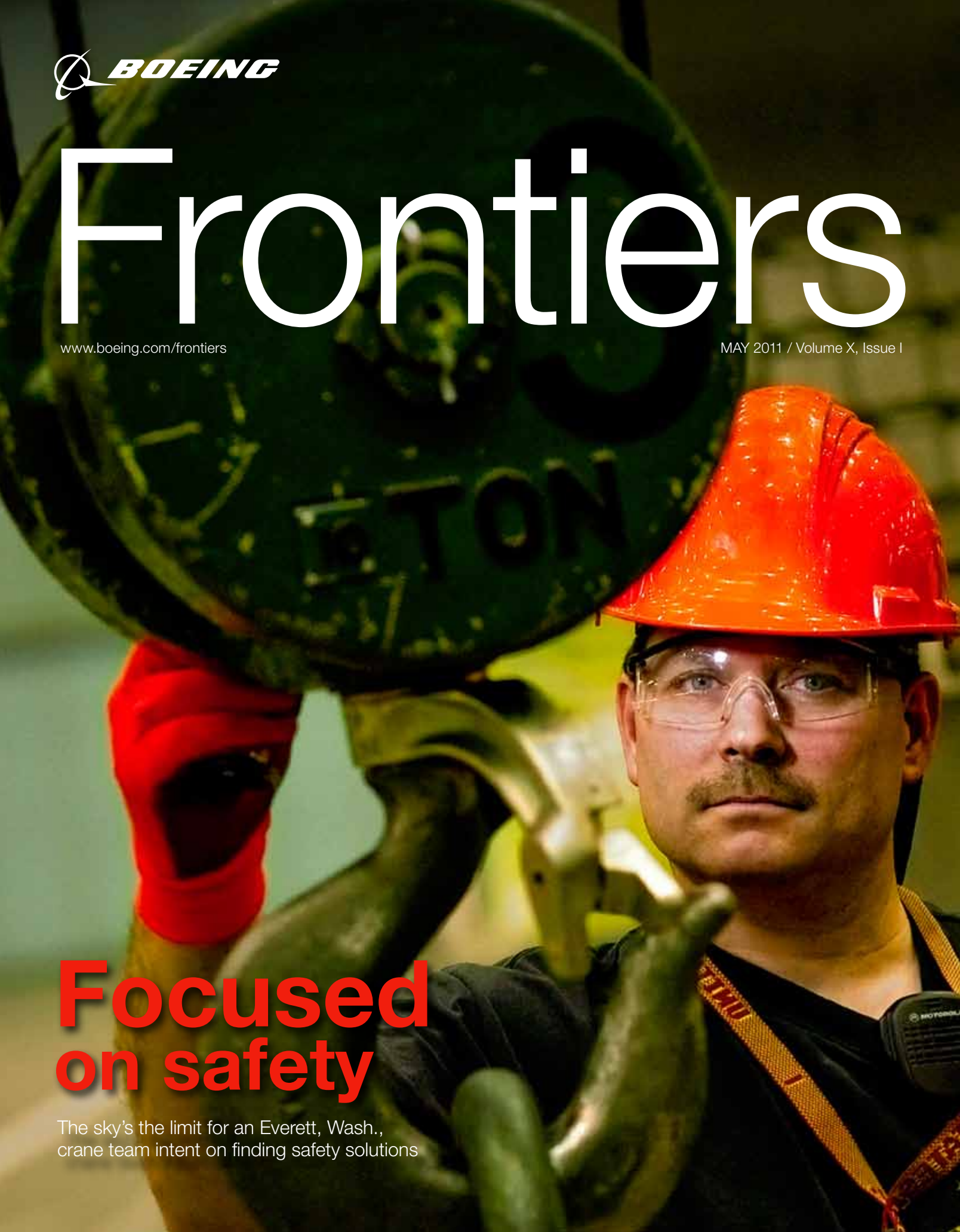

BOEING

Frontiers

www.boeing.com/frontiers

MAY 2011 / Volume X, Issue I

Focused on safety

The sky's the limit for an Everett, Wash., crane team intent on finding safety solutions

Stacking the deck against American industry.

The World Trade Organization has now published final rulings on two landmark cases that reveal the massive market advantage Europe's Airbus has enjoyed from more than 40 years of illegal government subsidies. In twin legal victories for U.S. trade officials, the WTO found Airbus had received over $20 billion in illegal subsidies to develop its family of commercial airplanes, including $15 billion in market-distorting launch aid. In stark contrast, only a fraction of the alleged funds to Boeing – some $2.7 billion – were declared inconsistent with WTO rules or not remedied previously.

This huge illegal advantage to Airbus has cost the United States billions of dollars in lost exports and tens of thousands of high-wage aerospace jobs. Left unchecked, the cost to the U.S. economy and U.S. jobs will continue to rise.

On behalf of 162,000 Boeing employees and our 22,000 suppliers in 50 states, we thank the Office of the U.S. Trade Representative for continuing to press the case for fair competition and a level playing field.

BOEING

Get the facts: ruling comparisons and more at boeing.com/WTO

On the Cover

22

No ceiling on safety

Boeing has made workplace safety a priority, and employees across the enterprise are helping the company meet its target of reducing workplace injury rates by 25 percent over five years. At the jet-making plant in Everett, Wash., the overhead crane team was challenged to come up with a way to reduce injuries and strains from hefting and carrying heavy metal chains. They did.

COVER IMAGE: LEAD HOOK TENDER TROY LABRUM, A MEMBER OF THE OVERHEAD CRANE OPERATIONS GROUP AT THE EVERETT, WASH., PLANT. PHOTO: BOB FERGUSON/BOEING

PHOTO: ADMINISTRATIVE ASSISTANT JILL CANNIFF AND TROY LABRUM WERE ON THE TEAM THAT CREATED INJURY-REDUCING CRANE CHAIN CARTS. BOB FERGUSON/BOEING

Ad watch

The stories behind the ads in this issue of *Frontiers*.

Inside cover:

Part of a series of ads spotlighting recent World Trade Organization rulings on two landmark trade cases on illegal aircraft development subsidies, this ad urges the U.S. government to take action to ensure fair competition and a level playing field. The campaign included print and online components and ran in the Washington, D.C., area.

Pages 11–14:

This year marks the centennial of naval aviation. Created to recognize Boeing's more than 90 years of contributions to the historic milestone, this ad appeared in *The Washington Post* in February and will run in key military and congressional publications. The ad also will be adapted for commemorative books as part of Boeing's sponsorship of the 100th Anniversary of Naval Aviation Foundation throughout 2011.

Back cover:

Air China recently became the first Chinese carrier to offer the Boeing Sky Interior in its Next-Generation 737s. In celebration, Boeing developed this ad to promote the major 737 upgrade and announce first delivery to Air China. The ad was featured in *CAAC Journal*, *China Civil Aviation*, *Trends Traveler*, *Sanlian Life Weekly* and *Modern Weekly*.

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A winning strategy

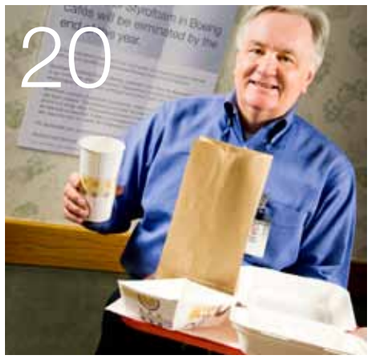
In a wide-ranging interview with *Frontiers*, Dennis Muilenburg, president and CEO of Defense, Space & Security, talks about what's ahead for the business and the strategy for moving forward globally and into new markets. Boeing has great people and a portfolio of products that's best in the industry, he said, but it must also be more competitive and continue to grow core businesses.

PHOTO: BOB FERGUSON/BOEING

Earth Day 2011

From collecting trash at Seattle's Duwamish Waterway to cleaning up a beach in Dubai, United Arab Emirates, to committing to install solar panels atop the new 787 assembly building in North Charleston, S.C., Boeing employees recognized Earth Day last month during more than 100 events worldwide. In this photo essay, *Frontiers* shares some of what they did this day in the community and at work to help Boeing meet its aggressive environmental-performance targets.

PHOTO: ALAN MARTS/BOEING



Chef's special

Boeing cafeterias have been implementing environmentally progressive processes into their daily operations, such as recycling, composting of food waste and the elimination of plastic-foam dining materials. The changes are not only good for the environment but important to diners.

PHOTO: ERIC SHINDELBOWER/BOEING

You need it, we make it

The 13,000 global employees of Boeing Fabrication make millions of parts for the company's commercial jetliners—and for spares. Fabrication also is making sure the company is increasingly competitive while helping develop materials and processes for the airplanes of the future.

PHOTO: BOB FERGUSON/BOEING

Bridges of knowledge

Some of the best and brightest at Boeing, Technical Fellows share their knowledge and experience to solve tough technical challenges—and inspire young people to study science, engineering, technology and math.

PHOTO: MARIAN LOCKHART/BOEING

INSIDE

CORRECTION

The term "snap roll," an aerobatic maneuver, was misspelled in a story about the NA-16 military trainer on Page 11 of the April 2011 issue of *Frontiers*.

Snapshot

THE FUTURE OF TRAVEL

A Boeing 787 Dreamliner climbs into a clear blue sky framed by the first 747-8 Intercontinental, shown painted in “Sunrise” livery, last month at Moses Lake Airport in Washington state. Both of Boeing’s new passenger jetliners, as well as the 747-8 Freighter, have used the airport during ongoing flight-test programs. Moses Lake is located in sparsely populated Eastern Washington and is considered an ideal place to test aircraft. PHOTO: KERRY “KAL” FULTZ/BOEING

Quotables

“That Boeing would lead the way is going to make it easier for other businesses.”

– U.S. Sen. Lindsey Graham on Boeing’s announcement that the roof of its new 787 jet assembly plant in North Charleston will be covered with solar panels and its South Carolina operation will be powered entirely with renewable energy. As reported by the Associated Press on April 19.

“That is the sound of freedom going by.”

– U.S. Air Force Col. Robert Torick Jr., pausing to watch a Boeing C-17 take off on a runway adjacent to the Boeing San Antonio site last month. Torick was at the site celebrating delivery of the first of seven Turkish Air Force KC-135s receiving Global Air Traffic Management upgrades at San Antonio, in April 13 Boeing News Now.

Making the difference

Lean+ has helped Boeing cut costs, increase competitiveness and drive growth—and there’s lots more room to improve

As we mark six years since the introduction of Lean+, we are restaging to better enable us to capture the value of quality. With new enterprise-level tools, techniques and subject-matter experts, and support from our leadership and people around the company, we will continue to build on past and current Lean+ successes.

The grass-roots application of continuous improvement has been vital to Boeing’s growth. Yes, years back there was initial resistance to applying Lean on the factory floor … until people started using it in their daily work and programs started seeing results. (For more on Lean+ and the results it is having throughout Boeing, see the story on Page 40.)

We’re seeing the same great results with one of our latest efforts, Lean+ Design Build Roadmap. There, engineers from across the company took the initiative to bring together engineering, manufacturing and other stakeholders to come up with the best solutions for the design of parts, as well as the processes by which they are fabricated, assembled and installed.

Regardless of your role in the company or the program you support, you can use the Lean+ elements to make a difference—in your job, for Boeing and, ultimately, for our customers. Identify the things in your area you can improve and use Lean+ tools to help make those improvements. You can find more information on Lean+ and related tools on the Lean+ website on the Boeing intranet at http://leanplus.web.boeing.com/index.cfm.

We know that where employees utilize Lean+, we see amazing results and added value. Boeing leaders can help by defining, teaching, modeling and rewarding the utilization of Lean+. Connect the enterprise goals with local business needs and everyday work and help employees understand how Lean+ can help them achieve those goals.

I also encourage first- and second-line leaders to look to Lean+ for techniques to help with daily tasks. The Front-Line Leaders Toolkit, part of the NavTool on the Lean+ website, contains several Lean+ tools that can help you manage meetings, communicate more effectively and engage employees. Check out what it has to offer.

I look forward to seeing the things we can accomplish, improvements we can make and what value we can capture as we work together to apply Lean+. ■

Leadership Message

“Regardless of your role in the company or the program you support, you can use the Lean+ elements to make a difference.”

– Bill Schnettgoecke
Enterprise Lean+ initiative leader and vice president of Operations and Supplier Management, Defense, Space & Security

PHOTO: BOB FERGUSON/BOEING

‘Man, what a ride!’

50 years ago, a McDonnell Aircraft capsule carried the first U.S. astronaut into space ***By Henry T. Brownlee Jr.***

PHOTOS: (Right) The Redstone 3 rocket carrying astronaut Alan Shepard and the Mercury capsule lifts off at Cape Canaveral, Fla., May 5, 1961. BOEING ARCHIVES

(Insets, from left) McDonnell workers help Alan Shepard into Freedom 7. NASA Shepard suited and in the Mercury spacecraft, preparing for his historic flight. NASA Shepard is recovered by a U.S. Marine Corps helicopter after his suborbital flight. BOEING ARCHIVES

A half-century has passed since Alan B. Shepard Jr. climbed into his Mercury capsule in the pre-dawn darkness at Cape Canaveral, Fla., and waited … and waited ... and waited … to take his own small step in the exploration of space.

On the morning of May 5, 1961, Shepard sat atop a Mercury-Redstone 3 rocket for more than four hours, through several delays, until the countdown finally reached zero.

At 9:34 a.m. EST, the rocket rose slowly from the launch pad and then gathered speed as it climbed out over the blue waters of the Atlantic, leaving a white plume in its wake.

The Mercury capsule, named Freedom 7, reached a velocity of 5,134 mph (8,260 kilometers per hour) and an altitude of 116.5 statute miles (187 kilometers) above the earth.

“Man, what a ride!” Shepard would say when he emerged from the capsule after becoming the first American to go into space.

His suborbital flight lasted only 15 minutes 28 seconds.

“In my humble judgment, it far exceeds the short duration of 15 minutes,” James S. McDonnell, the founder and president of McDonnell Aircraft Corp., said immediately after the successful launch and recovery. McDonnell had watched the launch from Cape Canaveral.

“Its significance,” he continued, “is that it has been only two years and seven months since Oct. 1, 1958, when the National Aeronautics and Space Administration was set up … and two and a quarter years since the Mercury capsule contract was signed by our company.”

NASA had notified McDonnell Aircraft on Jan. 12, 1959, that it had been selected as the prime contractor for Project Mercury, the goal of which was to place a human in orbit around the earth and return that person safely. McDonnell signed the contracts in February 1959.

Shepard, a U.S. Navy commander, was well-acquainted with McDonnell Aircraft and its products, having flown the F2H-3 Banshee during test and development of in-flight refueling systems and carrier suitability trials. Shepard also had tested McDonnell’s F3H Demon, as well as Douglas Aircraft Co.’s F4D Skyray and F5D Skylancer.

Even though Shepard was a top military test pilot, he was not just testing a new aircraft when he climbed into the Mercury capsule that morning at Cape Canaveral. The hopes of the United States to effectively enter the space race rested on Shepard—and the McDonnell-built capsule named for the seven Project Mercury astronauts.

The Mercury spacecraft was designed so it could be operated automatically, manually or by ground control. Just over two and a half minutes into the flight, Shepard took manual control of Freedom 7. With the voice of a veteran test pilot, Shepard radioed ground controllers: “Roger. Reading you loud and clear … cabin pressure is holding at 5.5 … fuel is ‘go’ 2.5G … switching to manual control.”

Shepard, in succession, switched to manual control of the spacecraft’s pitch, then roll and then yaw while in zero gravity. He then looked out his periscope at the Atlantic Ocean. “What a beautiful view!” he exclaimed.

“All Americans rejoice in the successful space flight of Astronaut Shepard. This is an historic milestone in our own exploration into space,” President John F. Kennedy said following the flight.

Astronaut John Glenn would soon orbit the earth in his Mercury capsule.

The McDonnell team, working closely with NASA, helped define space exploration for the next 50 years—much of which would be accomplished by Boeing and its heritage companies.

This year not only commemorates the 50th anniversary of Shepard’s flight but also will mark the retirement of the space shuttle. The shuttles followed the Mercury, Gemini and Apollo programs that sent astronauts not only into orbit but to the moon. Boeing, McDonnell, Douglas, North American Aviation and Rockwell played major roles in the development of those programs, as well as the International Space Station.

Boeing continues to explore new frontiers in space. The company’s engineers are designing a new spacecraft to transport people to low Earth orbit destinations such as the International Space Station. Boeing also has plans to work on a new heavy-lift rocket that will be used to explore deep space. ■

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Designs on space

This employee's passion led to a second calling for NASA—patch work *By Sean Elizabeth Wilson*

Boris Berezin is a video engineer on Boeing's Communications and Tracking team for the International Space Station. But Berezin also contributes to the space program in a more personal way. He designs crew mission patches. In this *Frontiers* series that profiles employees talking about their jobs, Berezin explains how he has helped document the significance of missions to the space station.

PHOTO: ELIZABETH MORRELL/BOEING

Each NASA mission has its own patch, or symbol, that represents its significance.

In 1976, when I emigrated to the United States from the Soviet Union, I brought with me a patch from the Apollo-Soyuz docking. Traditionally the artwork is designed by the astronauts themselves. But when the unmanned Russian service module *Zvezda* was about to be launched to the space station in 2000, a patch was not yet designed.

During that time, I was supporting *Zvezda* developments on Boeing's behalf. I mentioned that perhaps a patch should be designed for this mission and one of the NASA launch managers agreed, giving me a few days to come up with an idea.

What started as a star-shaped sketch evolved into the official International Space Station (ISS) mission patch for the launch of *Zvezda*. I began with a star because *zvezda* is the Russian word for star. With the help of my three sons, I added various elements associated with the mission, including red, white and blue stripes representing the colors of the American and Russian flags, with golden orbits uniting the two nations in a singular effort.

I am fortunate that seven patches of mine have flown and are still on board the space station. I had the privilege to design a patch with astronaut Ilan Ramon for Shuttle *Columbia*'s last mission, STS-107. Also, I guided my son Benjamin in his design of the patch for Soyuz TMA-13, the 100th flight of that legendary spacecraft. The remaining five patches include the *Zvezda*, Russian docking compartment *Pirs*, ISS Expedition 3, ISS Expedition 9 and the Shuttle *Atlantis* STS-132/ULF4 mission.

Creating patches is an iterative process and I did not design them alone. I have worked with many astronauts and designers over the years, including Boeing artists Roger Johnson on the ISS Expedition 3 patch, and Rich Doty on the Expedition 9 patch. Their guidance was instrumental, and some became my friends for life as we worked on these very personal projects together.

Knowing that I have had a hand in representing these historic missions is a wonderful feeling, a sense of giving back to people who love aerospace. I want my sons to look up in the night sky, point to the space station star and know that they had a hand in it, too. ■

Questions? Contact Boris Berezin at boris.j.berezin@boeing.com

CELEBRATING 100 YEARS OF NAVAL AVIATION.

From the early years of flight, Naval Aviation has played a critical and enduring role in protecting freedom around the world. And Boeing is honored that we've been part of this great legacy for more than nine decades. We proudly salute the generations of men and women whose commitment, expertise and service have made Naval Aviation all that it is today and will be tomorrow.

BOEING

A winning hand

Defense, Space & Security has great people, products and services, but it must be more competitive to prosper in a tough global marketplace

As Dennis Muilenburg approaches the end of his second year as president and CEO of Boeing Defense, Space & Security, he spoke with *Frontiers* about developments over the past two years and what's ahead for the business.

What has our response been to the increasingly difficult business climate?

We're realistic about the environment we face and aggressive in setting high expectations for the future. While we see a flat U.S. defense budget and even a declining budget in Europe, we anticipate growth in the Middle East and Asia Pacific. This has led us to further globalize our business and hone our strategy.

Could you talk more about the BDS strategic objectives?

No. 1: "People First, Customer Always" speaks to leadership and our core values. We want to invest in our people with the same focus and detail as we invest in the rest of our long-range business plan. "Customer Always" recognizes that it's a privilege to support our customers' missions. The second objective is to drive competitiveness, link productivity to growth and achieve market-based affordability. The third is to grow aggressively into new markets—for instance, we're making great progress in targeted adjacencies like C4ISR (Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance)—and expand internationally. Our fourth objective is to execute flawlessly to satisfy

"I'd take Boeing's hand over any other in the marketplace."

– Dennis Muilenburg, president and CEO of Boeing Defense, Space & Security

“We need to grow our core business while we’re moving into new markets.”

our customers and grow our core business. And the fifth is to selectively invest in vertical capabilities to achieve long-term vertical-horizontal balance. That means we’re not only integrating across a broad supplier base but also deepening our capabilities in design and composite manufacturing, for example, as well as building out in areas like cyber and unmanned systems.

How important is the international market for BDS?

Fundamentally important. In this past year, about 17 percent of our revenues were outside the United States. Five years ago, it was only 7 percent. We had set an objective that 25 percent of our revenue base by 2015 would be international sales, and our latest estimates show we’ll probably be there by 2013.

Assess our overall progress in becoming more competitive.

All you have to do is look at the U.S. Air Force tanker win and the answer is clear. In our tanker bid, we brought all of Boeing to the table, with an innovative production concept and reduced costs. Overall, our team is energized to streamline and drive productivity improvements every day. I’m encouraged on how we’re accelerating change to make us more competitive, but we still have much work to do.

What are a few of the main challenges BDS faces in the next three to five years?

It’s important that we continue to attract, develop and retain the best talent. Also, we need to grow our core business while we’re moving into new markets and expanding the boundaries of our company. Finding that synergy between core growth and investments in adjacent markets is a challenge, but it’s one I’m excited to take on.

What is the value of “One Boeing”?

Our unique combination—of Boeing Commercial Airplanes; Boeing Defense, Space & Security; Engineering, Operations & Technology; and the Boeing enterprise—brings a talent base, a global reach and a customer network that nobody else can match. One of the reasons our defense business is making progress in places like India is because we’re operating as One Boeing. Commercial Airplanes and Boeing International have great relationships in India, going back decades. Those relationships have opened doors for us.

What are some of the other characteristics that make us well positioned?

Our portfolio is the best in the industry. Our backlog is diverse and deep. We have the best talent, we’re driving competitiveness and productivity, we’re investing in growth, and we’re operating as One Boeing on a global scale. I’d take Boeing’s hand over any other in the marketplace. And when we’re in a very tough, high-pressure environment, how we lead is just as important as what we do—leadership matters and differentiates us.

What role does innovation play in our future?

Our company will be 100 years old in 2016 and we have been at the leading edge of innovation throughout our history. We played key roles at the introduction of the jet age and the space age. You see new examples every day. Just this past year, we completed the first airborne laser shoot-down of a ballistic missile and the first supersonic flight of a jet fighter operating on a biofuel mix. We introduced hosted payloads into our satellite business and achieved a world record in hypersonic scramjet flight with the X-51A Waverider. We also are innovating in our business processes and operations. In this environment, a company that can operate with high productivity and competitiveness while bringing innovations to the market has a big advantage.

You meet regularly with employees across BDS. What’s the value of those visits?

Hearing from people doing the day-to-day work improves communication, flattens the organization and allows us to create an open and inclusive environment. We want to make sure that every employee can have a say in our strategy and be able to connect his or her daily work to at least one of our strategic objectives.

What’s the most important thing you’ve learned as BDS president and CEO?

Recognizing how dependent we, as leaders, are on our teams. Our people are engaging with our customers, and delivering our products and services. They set this company’s reputation. My job is to help our team succeed by investing in leadership and our people. I’ve also gained an even greater appreciation for our customers and their missions—missions that provide global and national security, expand the boundaries of exploration, and literally save lives—and the importance of inspiring a sense of excellence and integrity in all that we do.

What one piece of advice would you offer a new Boeing employee?

In coming to Boeing, you’ve made a great choice. We make a difference for important customers globally. Stretch early to experience the breadth of the company. Find areas where you excel, where you can take on the toughest challenges and make the biggest difference. We have an exciting future ahead of us! ■

PHOTOS: (Far left) In this artist’s concept, a KC-46A Tanker is shown refueling an F-22. The recent U.S. Air Force tanker program win was made possible by “One Boeing” collaboration and continued progress in making Defense, Space & Security more competitive. BOEING **(Insets, from left)** International customers for the Apache Longbow Crew Trainer include Kuwait, Egypt, the Netherlands, the United Arab Emirates and Saudi Arabia. RICHARD RAU/BOEING The unmanned Phantom Ray, shown atop a modified 747 on a ferry flight, represents not only technological innovation but innovation in terms of how BDS operates in a period of restrictive customer budgets. BOB FERGUSON/BOEING Contracts administrator Lauren Donnelly meets BDS President and CEO Dennis Muilenburg following an employee meeting with Argon ST, acquired by Boeing last year. FRED TROILO/BOEING Space Shuttle *Discovery* launched on its final mission Feb. 24. NASA

Down to earth

By Lisa W. Wilson

Boeing employees recognized Earth Day in a big way last month, with more than 100 events at more than 40 Boeing sites worldwide—including a commitment to install solar panels atop the new 787 assembly building in North Charleston, S.C. Thousands of employees volunteered with friends and family in community cleanup efforts, complementing the work Boeing employees do each day on the job to help the company meet its aggressive environmental-performance targets. ■

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PHOTOS: (Clockwise, from top left) Ignacio Carrillo and Filomena De Lima collect debris in Charleston, S.C. ALAN MARTS/BOEING Kathleen Gehrett inspects substances at a lab where Boeing does research for biofuels to help reduce aircraft emissions. MARIAN LOCKHART/BOEING Reyna Toyama (foreground) and Xing Liu plant saplings on fire-ravaged slopes of Angeles National Forest in California. PAUL PINNER/BOEING At the Boeing site in Melbourne, Australia, Marion Hillerbrand (from left) from South East Water discusses water usage with Todd Coppins and Jaehee Lee. ANDREW HENSHAW Houston employee Sue Sheffield and her son Matthew build bulrush plantings for the Armand Bayou Nature Center. WINSTON WANG/BOEING Huiqin Jean Chu volunteers at the freshwater tidal marsh cleanup near Philadelphia. FRED TROILO/BOEING





PHOTOS: (Clockwise, from top left) In Charleston, S.C., Ryan Crawford (from left), Kris Hackelman and Bob Lull remove shore debris. ALAN MARTS/BOEING Chris Hladish bagged trash in the National Wildlife Refuge, outside Philadelphia. FRED TROILO/BOEING Mark Labiné (right) and his son Nathan collect garbage in the Duwamish Waterway in Seattle. DANIEL THOMPSON/BOEING Kira Cha and Tony Ham plant indigenous species in Mesa, Ariz. MIKE GOETTINGS/BOEING Troy Bunch and Scott McNaught pour paint into drums for proper disposal in Portland. Ore. JIM ANDERSON/BOEING Becky Lamkemeyer and Shelby Steingraeber sort recyclables in Boeing's booth at the St. Louis Earth Day Festival. RICHARD RAU/BOEING
PHOTO ILLUSTRATION: Grass and soil. SHUTTERSTOCK

PHOTO: Using a recyclable "to go" tray at Boeing's Huntsville, Ala., site cafeteria. ERIC SHINDELBOWER/BOEING

PHOTO: Boeing Huntsville's Theresa Owens fills a recyclable cup. ERIC SHINDELBOWER/BOEING

PHOTO: In Renton, Wash., Cindy Dana, right, explains the recycling kiosk to Sue Irvin, left, and Michael Hoyt. MARIAN LOCKHART/BOEING

Watching our

'waste' line

With employee support, Boeing cafeterias are making changes that are good for the environment

By Bill Seil

Boeing cafeterias are placing environmental responsibility at the top of the menu.

Plastic foam dining materials were recently eliminated from all Boeing cafeterias in the United States. Food service facilities in the Puget Sound region of Washington state are shifting over to compostable plates, trays and bowls.

These efforts are part of a larger plan to move to a fully compostable infrastructure by 2014 at all Shared Services–managed cafeterias where composting facilities exist to support it, according to Terry O'Brien in Shared Services' Facility Operations.

"Boeing is working diligently with our food service providers to implement more environmentally progressive processes into our daily operations," he said. "This is important to our diners, and the direction is embraced by Boeing leadership."

In the Puget Sound region, employees are being asked to toss compostable items—including paper and uneaten food—into special compost containers. These materials are picked up by a composting service that converts them into garden compost. Posters provide instructions for sorting waste into three categories: "compostable," "mixed recycling" and "waste to landfill."

Cindy Dana, Puget Sound food service administrator, said the sorting process becomes routine once employees understand the system.

"Think about how full our cafeteria trash bins have been," Dana said. "In many cases, that's all gone into landfills. If we can divert most of the waste from landfills, we're making an important contribution to our environment and to the next generation."

The number of compostable materials is growing rapidly as food packagers develop new materials for ready-to-go food items. For instance, some vendors offer sandwiches and salads in rigid, plastic-like containers made from a corn-based material that can be processed as compost.

Mixed recycling collection containers are provided for materials such as glass, plastic and tin that will be sorted at a recycling center. Everything that can't be recycled or composted is considered "waste to landfill."

> **"Our volume of trash generated by the cafeteria has dramatically decreased."**
>
> **– John Taylor, Boeing recycling program manager, Huntington Beach, Calif.**

"Our goal is a 95 percent recycle-compost rate for all Northwest cafeterias, and I expect we can achieve that in the next year and a half," Dana said. "It depends, in large part, on employee support."

Similar environmental efforts are taking place at Boeing facilities throughout the company and will expand as the availability of recycling and composting facilities grows.

Recycling is taking place at Southern California cafeterias and studies are under way to begin composting food waste. John Taylor, recycling program manager for Huntington Beach, said cooking oil, cardboard and a commingled stream containing plastics, paper, glass, tin cans and wood from the kitchen are being recycled. Other trash from the site is sorted for recyclables at the nearby Rainbow Disposal Materials Recovery Facility.

"Our volume of trash generated by the cafeteria has dramatically decreased and, ultimately, we are planning to achieve zero-waste-to-landfill capability," Taylor said. "Cafeteria personnel have been enthusiastic in their support for these programs."

Rainbow is currently conducting a pilot program with hopes of developing a composting service. If successful, Taylor said, the Huntington Beach cafeteria could begin composting late this year. Seal Beach recently started composting coffee grounds and vegetable scraps for local gardeners and so far it is working well.

Laurel Bennett, food service manager for the Midwest and East, points to additional recent success stories. Huntsville, Ala., became the first Shared Services–supported site to achieve zero-waste-to-landfill status, and the second site, after Salt Lake City, in the company overall. Boeing South Carolina also recently joined the ranks of the zero-waste-to-landfill sites. Boeing's Philadelphia site was the first to eliminate foam plastic dining materials—a policy implemented on Earth Day 2010—and became Boeing's first major production facility to achieve zero-waste-to-landfill status in March this year.

"The new materials take some getting used to for our employees," Bennett said, "but it's a worthwhile effort to create a cleaner, better environment for future generations." ■

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PHOTO: In Huntington Beach, Calif., vendor Rochelle Groh, right, shows Boeing's John Taylor how trash is sorted. DANA REIMER/BOEING

PHOTO: Julio Feliciano loads used cardboard boxes from the Ridley Park, Pa., cafeteria into an industrial baler. FRED TROILO/BOEING

PHOTO: Rochelle Groh, left, and Boeing's John Taylor with crushed, bundled materials soon to be recycled. DANA REIMER/BOEING

Hooked on safety

Looking to reduce injuries on the factory floor, Everett crane team finds solution—crane chain carts

By Deborah Feldman and photos by Bob Ferguson

For a team that many people associate with huge parts gliding effortlessly high above the factory floor, the Everett Overhead Crane Operations Group has had its share of hard knocks down on the ground.

For years, reports of injuries were all too common, said Bill Fletcher, first-line crane manager.

"Probably a couple times in a week we could have reported injuries of shoulder strains or back injuries," he said, adding that the culprit was clear. "They're from people lifting and carrying sliding chains."

Cranes need bundles of thick, metal chains to lift and carry massive airplane parts all over the Everett, Wash., factory. Just the first few links on some of the larger chains can weigh upwards of 75 pounds (34 kilograms).

"When we took them off the hooks, we'd have to put them on the ground," crane operator Troy Labrum explained. "You've got to bend over to do that since you don't want to drop them or throw them down. Then, to pick them back up, you had to get back down and you had to be really careful. A lot of guys just weren't careful and got hurt."

Late last year, Scott Westby, the senior manager of Overhead Cranes in Everett, decided something had to change.

"Let's face it," Westby said. "We've got an average age of about 50 years old on this team, so we are slower to heal, so to speak!"

Westby challenged his management team to figure out a way to cut back on injuries. To brainstorm for solutions, they gathered all three shifts, from crane operators to administrative assistants. The group quickly realized that the fewer times an employee actually touches the chains, the better.

Their solution is an ergonomically friendly "crane chain cart"

"There's no stress at all. No straining. You don't have to worry about getting hurt."

– Troy Labrum, crane operator

PHOTO: Administrative assistant Jill Canniff observes as lead hook tender Troy Labrum guides a set of chains into a new crane cart. Both were on the team that created the Crane Carts.

that Tooling helped turn into reality. Chains are now placed into simple carts that can hold up to half a ton and can be rolled around the factory. They are crafted to allow the top chain link to rest at an angle so that a hook tender lowered from the overhead crane can easily snag and lift the chains.

Administrative assistant Jill Canniff helped facilitate the project and was impressed by how quickly the team came up with a solution.

"It was special to our group," she said. "No one else has thought of this."

Westby said his group has seen a 47 percent reduction in injuries year to year. Labrum, the crane operator, believes the carts are the reason.

"They are really nice," Labrum said. "There's no stress at all. No straining. You don't have to worry about getting hurt."

The carts are still evolving, with tweaks being made all the time. "And in the future, they might even go through another change," Fletcher said. "Because we're not just going to accept one pattern. Our needs might be different in the future so we'll adjust for that."

The Everett crew hopes the carts now will be used by Overhead Crane teams across Boeing. Westby is working with Boeing crews in Charleston, S.C., so they can use the new tools when final assembly begins there of 787 Dreamliners.

"This cart," he said with a proud smile, "is just the best thing since sliced bread." ■

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PHOTO: Crane operator Bob Soltesz lowers the hoist from inside the crane cab. While ear protection is not mandated, Soltesz chooses to take the extra precaution.

Sharing the dream

Training and knowledge transfer will be key to assembly of 787s at Boeing South Carolina

By Rob Gross

When the first 787 Dreamliner to be assembled by Boeing South Carolina enters line Position 0 later this year, it will be the first time since B-52 production ended in 1962 that Boeing has operated assembly lines in multiple locations for the same airplane model.

But a new approach to prepare the workforce in South Carolina for the start of 787 final assembly is unlike anything that could have been envisioned back then.

High-definition video, computer simulations, 3-D imaging and online training will give employees a significant understanding of how the 787 is built before they begin assembly of the first plane.

"It's an approach to training that has almost unlimited potential, and with the help of our partners across the Boeing enterprise we're continually working to make it even more effective," said Marco Cavazzoni, Boeing South Carolina vice president and general manager for Final Assembly and Delivery.

The training program is known as Installation Plan Knowledge Transfer, or IPKT. It's a comprehensive set of Web-based training tools designed to familiarize final assembly teammates with the data and materials they'll be required to know and use in production.

"We think that Installation Plan Knowledge Transfer is going to give us a tremendous ability to come down the learning curve at a faster pace and we're already seeing some evidence of that," Cavazzoni added.

"One of my favorite things about the training is all our teammates will use it to gain a detailed knowledge of our product."

Starting with approximately 2,600 installation plan documents that dictate the 787 build process, the North Charleston team augments them with photos, high-definition video, computer simulation and 3-D images that demonstrate the "how to."

All Final Assembly and Delivery teammates, including mechanics, support personnel and managers, will complete the training to ensure a detailed understanding of 787 final assembly processes.

Quizzes, based on the training content, are assigned to team members according to the final assembly or delivery position on which they work or which they will support. Passing all tests with a score of 100 percent will be a prerequisite for all team members before work begins on an actual airplane later this year.

The kind of collaboration across Boeing that brought the Installation Plan Knowledge Transfer program into being continues to guide its evolution.

"Our Creative Services and Final Assembly teams in Everett, Wash., are providing high-def video that demonstrates the excellence in final assembly techniques established there," said Sarah Hogenson, Boeing South Carolina Final Assembly Industrial Engineering senior leader, who heads the project.

Manufacturing Engineering in Everett created the final assembly installation plans, she said, and Manufacturing engineers in Huntington Beach, Calif., and Everett are supporting development of virtual simulations. Web support comes from Huntington Beach, too. People at Everett Material Management, Learning, Training and Development, and the Boeing South Carolina Training organization also are contributing to the effort.

While the training is in its early stages, its developers have high hopes for the future.

"It is a brand-new way of thinking and of using technology to train our people," Hogenson said. "It's really exciting. We're developing new solutions that answer the question of how we can be smart about learning how to support the airplane-build process." ■

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"One of my favorite things about the training is all our teammates will use it to gain a detailed knowledge of our product."

– Marco Cavazzoni, Boeing South Carolina vice president and general manager for Final Assembly and Delivery

PHOTO: Boeing South Carolina Final Assembly manufacturing technicians Chris Bermensolo, left, and Sang Nguyen use a training module. A computer-generated simulation details the workflow. ALAN MARTS/BOEING; GRAPHIC: DAVID HENGY/BOEING

From skins to bins

At sites in three countries, Boeing Fabrication employees make jetliner parts—by the millions

By Kathrine Beck

Pop the lid off a model-airplane kit and you'll find a box full of tiny, seemingly unrelated parts. But as any dedicated hobbyist knows, somehow—if you do it right—those disparate bits and pieces come together to form an airplane.

Now imagine the box held parts for the wings, fuselage, interiors and tail sections of a full-sized 787 Dreamliner, 777 passenger and freighter airplanes, the Next-Generation 737, the 767 and new models of the 747. Needless to say, the box would have to be enormous to hold everything from stowage bins to wiring to wing skins to panels. And the number of parts would boggle the mind.

That's the scope of work performed by Boeing Fabrication at 10 sites in three countries.

"If you like creating things, Fabrication is a very rewarding place to work, because we build a lot of products," said Ross R. Bogue, vice president and general manager of Boeing Fabrication.

"A lot" understates just what the more than 13,800 employees of Fabrication build. They make millions of parts, assemblies and kits every year that are delivered to Commercial Airplanes factories in Renton and Everett, Wash., and North Charleston, S.C., or to Commercial Aviation Services, which operates a worldwide Spares organization.

This vast array of offerings, which includes advanced primary and secondary composite structures, precision-machined metal parts, interior parts and the complex wire bundles that form an airplane's electrical system, is a source of pride for those who work at Fabrication.

"Just coming to work and driving by the factory and seeing the airplanes, I feel a part of the team and like I'm contributing to the main objective," said Jessica Sandman of Engineering Tech Support, 787-9, at the Boeing Fabrication Interiors Responsibility Center in Everett.

Boeing Fabrication has several strategic roles.

Emergent support—making sure parts are available when needed to avoid production delays—is one vital element.

"They come in with a 3-D model or a drawing or even a sketch," explained machinist Dave Hedstrom. "And they say, 'I need this part right now. The faster you can get it to me, the happier I will be.'"

The quick turnaround could be necessary because of a design modification, a parts shortage or a replacement for a damaged part.

Emergent support can be crucial to an airplane program.

"When we designed the first 777 Freighters, we had a lot of parts, and many of them were not yet sourced into the supply chain. And for some that were, suppliers couldn't meet lead time," said Larry Loftis, vice president and general manager of the 777 Program. "Fabrication came to our rescue and in a short period of time built thousands of parts for us. We would never have been able to get out the first five airplanes without Fabrication's emergent support."

That kind of help is in addition to the steady stream of parts that are routinely

PHOTO: Larry Wilkens, bend machine operator, works on a duct for the 777.
BOB FERGUSON/BOEING

Boeing Fabrication **at a glance**

Auburn, Wash.
About 4,500 employees*
Airplane component manufacturing including emergent support work, or making sure parts are available when needed to avoid production line delays or shutdowns

Everett, Wash.
About 2,760 employees
Electrical Systems Responsibility Center; Interiors Responsibility Center

Frederickson site, Puyallup, Wash.
About 1,830 employees
Composite Manufacturing Center; skin and spar work

Boeing Portland, Oregon
About 1,450 employees
Titanium, steel, aluminum, stainless steel machined parts; gear systems; and engine mounts, gearboxes, landing gear beams, flap tracks, carriages, flap support mechanisms and flight control systems

Boeing Winnipeg, Canada
About 1,380 employees
Composite structures and subassemblies, specializing in wing-to-body fairings, engine strut fairings and other complex composite parts

Boeing Aerostructures Australia
About 1,120 employees at two sites
A range of products including the moving trailing edge for 787; the movable leading edge for 747; and elevators, rudders and empennage panels for 777

Advanced Developmental Composites, Seattle
About 480 employees
Primarily focused on development work for Commercial Airplanes

Boeing Salt Lake City, Utah
About 475 employees
Fabrication and assembly of a variety of aerospace production parts and kits for all Commercial Airplanes programs as well as Spares.

Boeing Helena, Montana
About 135 employees
Hard metal machining on structures for the 747-8, 767 and 787

North Charleston, S.C.
About 30 employees
Emergent Operations; Interiors Responsibility Center (both are under construction)

**Employment numbers as of January 2011*

delivered to the 777 program and all other airplane programs. They're built at Fabrication sites from Winnipeg, Manitoba, in Canada to Bankstown and Fishermans Bend, Australia, and locations in Utah, Oregon and Washington. The parts vary from wire bundles, horizontal and vertical stabilizers, tubes, ducts and crew-rest areas, to name just a few.

Working with suppliers is another key role for Fabrication.

For example, 787 side-of-body chords start out as a titanium forging weighing 2,460 pounds (1,116 kilograms) from supplier VSMPO in Verkhnaya Salda, Russia. They are then rough-machined at Ural Boeing Manufacturing, a Boeing joint venture on the VSMPO campus, down to 780 pounds (354 kilograms), then shipped to Fabrication's Portland, Ore., site. There they are precision-machined, ending up as a complex part weighing 187 pounds (85 kilograms).

Partnership with suppliers is essential.

"In the past there had been almost a competition between internal manufacturing and suppliers," said Perry Moore, Boeing Portland general manager. "That wasn't a very holistic view. We're working to make sure we're doing the right things for the company throughout the complete global supply chain."

Moore co-leads the Metals Commodity Team, whose members from business units

PHOTOS: (Left) Layo Harvey, composite fabricator, inspects the quality of the composite material on a 787 vertical fin skin panel. **(Insets, from left)** Daniel Johnsen, assembly mechanic, builds a 777 hydraulic reservoir in Auburn, Wash.; assembly mechanic Rosalynda Parkhurst builds a 737 modular wheel well assembly; and John Albin, assembly mechanic, performs seal work on a 787 vertical fin.
BOB FERGUSON/BOEING

within Fabrication and Supplier Management manage about 250 suppliers.

And Moore's team isn't unique. The other main commodity groups—Composites, Interiors and Electrical—have similar teams.

Fabrication also is helping develop materials and processes for the airplanes of the future.

Jim Ockerman is former director of operations of a Fabrication business unit in Seattle called Advanced Developmental Composites, which is integrated with product development, research and technology, and supplier management.

"Our basic charter is to create products and manufacturing processes that give our airplanes a competitive advantage and make Boeing competitive for many years to come," Ockerman said.

Keeping Boeing competitive has long been Fabrication's role. When the 777 program was pioneering use of large composite parts—technology later used on a much larger scale on the 787—Fabrication got the call.

"They were with us every step of way," Loftis said. Just as Boeing Fabrication is today, supplying vital, high-quality parts for development programs, emergent needs, spares and airplane production across Commercial Airplanes. ■

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PHOTOS: (Right) Sandra Tugade, plastic technician, sands and fills the main landing gear door of the 787 just prior to painting at Boeing Winnipeg in Canada. **ASSOCIATED PRESS**
(Insets, from left) Diane Herd, contour tape-laying machine operator, kits 777 ribs; Robert Nantz, a shop-floor mechanic in Salt Lake City, completes work on a 767 forward instrument panel; and Don Hall, assembly mechanic, performs seal work on a vertical fin. **BOB FERGUSON/BOEING**

Catalyst of innovation

PHOTOS: Matt Ganz (shown in left inset), leads Boeing Research & Technology. LUIS MAGÁN The organization is active in many research fields including environmentally progressive technologies such as advanced air traffic management (background photo); biofuels (middle inset) and improved paints and coatings (right inset). BACKGROUND PHOTO: GETTYIMAGES; BIOFUELS: MARIAN LOCKHART/BOEING; COATINGS: JIM COLEY/BOEING

Advanced research & development group is Boeing's engineering, technology integration hub *By Tom Koehler*

As the leader of Boeing Research & Technology, the company's advanced, central research and development organization, Matt Ganz sometimes is asked his definition of "innovation."

His answer?

"If a cool new technology doesn't provide a benefit to a customer and generate enough money to cover its development costs and make a profit, it isn't innovation, it's art," said Ganz, who is quick to attribute the definition to Apple CEO Steve Jobs and other successful innovators.

"True innovation happens when invention and business insight intersect," he said.

Today, nearly 4,000 Boeing Research & Technology researchers, engineers and support staff work at 23 sites across the United States, at five Boeing technology centers in other countries, and with technology partners around the world. Their jobs involve anticipating, shaping, delivering and supporting the insertion of truly innovative technologies that improve the cycle time, cost, quality and performance of Boeing products and services.

Typically functioning in small but interconnected teams, they are closely integrated with people in Boeing Commercial Airplanes and Defense, Space & Security. On their priority lists is technology research pertaining to the environment, new manufacturing and product design processes, more intelligent and autonomous systems, advanced structures and materials, and more.

"We're not interested in advocacy briefings that tend to overplay the potential or hide the risks of a technology or idea," Ganz said. "We want good information so that we can make good decisions on how to invest our resources and provide the right solutions for the success of Boeing and our customers today and in the future."

As a key element of Boeing Engineering, Operations & Technology, which has the charter to establish technical excellence across the enterprise, Boeing Research & Technology serves as an engineering and technology integration hub—driving efficiency and a "One Boeing" approach into product and process standards and maintaining strategically important engineering and technical capabilities, especially during gaps between program starts and stops.

The organization doubled to its present size in January 2010, when nearly 1,000 materials and process technology employees assigned to Commercial Airplanes joined, along with about 1,000 materials, processes and physics and manufacturing, research and development employees from Defense, Space & Security. In addition, experts in product standards from Shared Services Group also became part of Boeing Research & Technology at the time.

The move has saved Boeing millions of dollars through the implementation of common research-and-technology processes and the elimination of redundancy, Ganz said, adding: "It's been a great example of the value and effectiveness of taking a One Boeing approach."

In an example of cross-company teamwork, a team of engineers from Boeing Research & Technology and Commercial Airplanes recently collaborated to create a lightning protection system and health-monitoring system for the leading edge flaps of the 747-8. The innovative solution and the process of developing it earned wide recognition inside the company. It was described by several team members as a highlight of their careers.

What's next for the organization that has been described by people inside and outside of the company as "the catalyst of innovation" for Boeing?

At the top of the priority list is a continued focus on collaborative work with top technical talent at universities, suppliers, and government and private research centers throughout the world, Ganz said. Boeing Research & Technology has more than 300 active international research-and-technology partners, and this number is expected to grow in the years ahead as the organization's technologists continue to scout the world for innovative technologies that can benefit Boeing products.

"During the past several years, BR&T's technology work outside of the U.S. has helped to differentiate Boeing during sales campaigns and provided additional options for the business units to meet industrial participation commitments in countries that have bought Boeing products," Ganz said.

Another high priority will be a continued focus on environmentally progressive technologies—technologies that save fuel and reduce toxic emissions and waste—such as advanced air traffic management systems, lighter-weight materials and structures, improved paints and coatings, and biofuels. ■

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When disaster hits

Emergency and disaster preparedness planning keeps Boeing employees safe and customers in business

By Kathrine Beck

PHOTOS: (Below) A police officer surveys the devastation in the city of Kesennuma in northeastern Japan one week after the March earthquake and tsunami. ASSOCIATED PRESS **(Inset)** From left, Bud Battles, Chris Ely, Maggie Ramirez and Tamara Werner of the Auburn, Wash., site's Emergency Operations Center team use tabletop exercises to help prepare in case of a major emergency at the site. JESSICA OYANAGI/BOEING

The magnitude 9.0 earthquake that hit Japan on March 11, followed by a deadly tsunami, left fishing communities, businesses and towns devastated.

Public transportation across Japan was at a standstill for days, rolling blackouts occurred due to limited power availability, and retail outlets couldn't keep shelves stocked with food and other vital items. More than 900 temblors continued to rock the country in the weeks following the initial quake.

Boeing's Japan offices felt the effects.

"It's a sobering reminder how vulnerable we are to natural disasters," said Mike Denton, president, Boeing Japan, "and an even stronger reminder that planning and preparing is crucial to surviving and recovering."

Boeing Japan has more than 200 employees working in 12 cities, with the largest number in Tokyo. Immediately after the earthquake, Boeing emergency crisis teams reached out to locate all employees living, working and traveling in the area to ensure their safety and determine what help was needed.

It was not the first time Boeing employees have been caught up in natural disasters—or the possibility of one.

In September 2005, Boeing employee Jana Brazzle was working at the Houston site when Hurricane Rita threatened and the site was warned that an evacuation might be needed. She vividly remembers calling the Boeing Emergency Hotline to get updates on building closures and other matters.

She carries that number with her Boeing badge today.

"You knew at any point, you could call this number and know the status," Brazzle said.

Paul Diggins, operations director at the Houston site, said Hurricane Katrina, which had devastated New Orleans, was still fresh in everyone's memory, so "a lot of people were very nervous and there was a high sense of urgency."

He and his team carried out the established Emergency Preparedness plans for the Houston site.

Those plans include specific steps to take when a storm first enters the Gulf of Mexico, through to 24 hours before possible impact, at which point operations are suspended. The plans detail ways to communicate with employees and actions such as moving hardware to higher elevations, closing blinds and unplugging office equipment.

Fortunately, Hurricane Rita veered away from the Houston site. But Brazzle said it was reassuring to have the Boeing preparedness plans in place.

"You knew that we were all in this together," she said.

Today, Brazzle is a Puget Sound Business Preparedness project manager in Washington state for Shared Services Business Continuity. She helps organizations analyze the work they do and prepare plans to support customers during floods, fires, earthquakes and other disruptive events.

"Having been through a natural disaster I can see both sides," Brazzle said. "There's an emotional side as well as the business planning. Emergencies happen. If you're lucky, you can predict them, but most times, you can't."

Last January, Brisbane, Australia, was hit by devastating floods when the river, which winds through the city and its suburbs, overflowed its banks.

Dan Johnson, senior manager, Information Management and Technology, Boeing Defence Australia, got the word Jan. 11, that the building would be evacuated. For the next four days, he served as a key emergency response coordinator.

"Our primary focus was on the safety of our staff and that anyone who needed help was getting it," Johnson said.

A big concern was the data centers that provide services for Boeing operations at 14 sites around Australia. If electrical power went out, as expected, the backup diesel generator that keeps the data centers going is located in the basement parking garage, and might get flooded.

Johnson worked diligently to ensure there would be time to shut down the data centers properly if floodwater was to reach the generator.

Airport authorities advised Boeing to shut down the customer training center located at the Brisbane Airport. Matthew McKenzie, manager of the facility, used established emergency planning and

Ready to help

Whether it's from the consequences of a disaster that makes headlines around the world, or a personal tragedy, Boeing is ready to help employees.

The company's Employee Assistance Program, or EAP, is available to help Human Resources, managers and employees deal with the emotional issues that can be caused by these situations.

"We know from experience that helping employees work through the emotional impact of what they have experienced can head off related problems, such as substance abuse or lapses in workplace safety, which can occur six months or more after the event due to unresolved trauma," said Ellen Walsh, a national and international program manager of the Boeing assistance program.

Through its network of specially trained professional counselors, the program deals with a variety of issues, including:

- Employee deaths, especially those that occur at work or under violent circumstances
- Natural disasters, such as the Japan earthquake and tsunami; Boeing had 200 employees in Japan at the time
- Man-made disasters, such as the Fort Hood, Texas, shootings in 2009, where a gunman killed 13 people and wounded 29 others

In 2010, the Employee Assistance Program assisted in 73 separate incidents, both international and in the United States, according to Rene Vaughan, also a national and

Being prepared, and understanding what's needed to keep Boeing's global businesses running, is critical.

preparedness processes to evacuate and suspend operations. The plans were originally developed by his organization in Washington state in response to a potential flood threat from Howard Hanson Dam.

The earthen dam, located southeast of Seattle, provides flood protection for the Green and Duwamish River valleys, but after a 2009 flood a weakness was discovered. Repairs are expected to take up to five years.

As part of Boeing's emergency preparedness planning, walls up to 12 feet (3.5 meters) high were built around the perimeter of two Boeing sites that could be flooded—the Commercial Aviation Services Training facility, which uses state-of-the-art simulators to train Boeing airline customers, and the Kent Space Center, home to several important defense support programs and the regional emergency communications command center.

"These sites host critical business functions that if damaged by floodwaters, could significantly impact our customers and our ability to monitor the safety of our operations," explained Dave Komendat, Boeing's vice president and chief security officer. "The barriers provided the assurance we needed to protect these crucial areas."

Being prepared, and understanding what's needed to keep Boeing's global businesses running during and after a major disruption, is critical. In Japan, meanwhile, recovery efforts continue—as do Boeing operations there.

Denton, the Boeing Japan president, credits the resilience of the Japanese people and the Boeing teams for being prepared.

"We will recover," he said. "Normalcy will return, and our business will continue. Wiser and stronger. ■

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PHOTOS: (Below) Brisbane, in Queensland, Australia, endured major floods when the river that winds through the city and its suburbs overflowed its banks. SHUTTERSTOCK **(Insets, from left)** Near the Longacres, Wash., site, workers assemble barriers intended to divert potential floodwaters while Howard Hanson Dam is permanently repaired. MARIAN LOCKHART/BOEING Mark Kowalski of the Auburn, Wash., site's Emergency Operations Center team. JESSICA OYANAGI/BOEING

international program manager.

At the time of the Fort Hood shootings, nine Boeing employees, one Boeing contractor and two spouses of deployed employees were on-site at Fort Hood.

"The expedience with which the EAP organized dedicated resources to assist us was phenomenal," said Deneise Lacy, a Human Resources generalist from Boeing's site in Mesa, Ariz., who, along with her teammates, support Boeing staff and families at Fort Hood.

"The fact that employees and managers felt supported and that the company valued their well-being was very important."

To contact the Employee Assistance Program, U.S. employees can call 1-866-719-5788, while those outside the United States can call Canada collect at +1-905-270-7658.

For a list of on-site U.S.-based program counselors and other helpful information, visit http://eap.web.boeing.com on the Boeing intranet.

To reach the International Employee Assistance Program, employees can visit http://eap.web.boeing.com/international, also on the Boeing intranet.

Building value

Employees make great progress with Lean+, but there's much more value still to capture

By Eric Fetters-Walp

If you don't know what Lean+ is, or you don't think it applies to what you do, talk to Jeff Farnsworth.

A technical designer in Payloads and Product Development for Commercial Airplanes, Farnsworth was skeptical how Lean+ applied to him until he attended his first training session years ago on the subject.

He's now persuaded of its value.

"Lean+ is important to the future of engineering," Farnsworth said. "We're evolving toward that at Boeing."

Boeing employees across the company and around the globe are putting Lean+ into action every day, often without consciously thinking about it. But over the next year, Lean+ leaders want to spread the word about how much additional productivity and growth can be realized by focusing on quality. The concept is referred to as Capturing the Value of Quality.

"We've made great progress with Lean+," said Bill Schnettgoecke, Enterprise Lean+ initiative leader and vice president of Operations and Supplier Management for Boeing Defense, Space & Security. "But even with all the great things we've done over time with continuous improvement, we still have a lot of value yet to capture. There still is a tremendous amount of untapped value we are leaving on the table."

You don't have to be steeped in all the terms of Lean+ and related programs to understand the central concept.

In simplest terms, Lean+ is focused on using continuous improvement to increase productivity and growth. As the company's overarching approach to this idea, it provides a "One Boeing" framework with tools, principles and training aimed at moving toward flawless execution.

Examples of how it's being used around Boeing are numerous:

- Supplier Management employees are improving the process they use to manage negotiations over contracts.
- The F/A-18 Flight Simulation group is using Lean+ to address recurring issues and a backlog of problem reports.
- Finance teams are identifying ways to streamline their budgeting processes.

"The results are real," said Rigo Perez, senior manager of the F/A-18 Fatigue and Tracking team in St. Louis. "The time saved lets our engineers focus on solving difficult problems for our customers."

The focus on capturing value is simple at its heart, Schnettgoecke said, explaining that it challenges Boeing employees to think about how much could be saved by making products and going through processes correctly the first time.

"It's about first-time quality and preventing waste, rather than eliminating it later," said Dayde McLaughlin, Lean+ deputy director. "Just think how much better your workday would be if you didn't have to rework problems. Lean+ provides the tools and techniques to help us prevent and eliminate waste—and move toward flawless execution."

The restaging of Lean+ over the next year will include several actions to emphasize its importance to Boeing.

> "Lean+ provides the tools and techniques to help us prevent and eliminate waste—and move toward flawless execution."
>
> *– Dayde McLaughlin, Lean+ deputy director*

Among other things, new Lean+ tools will be rolled out across the company, Schnettgoecke said.

By helping create better, more effective and efficient products and processes, employing Lean+ across the company affects all employees, Schnettgoecke added, citing the benefit to employees' retirement accounts, bonuses and job security when Boeing's competitiveness improves. It is also critical to sustained long-term growth, he said.

Farnsworth said there is even greater incentive to focus on continuous improvement as Boeing faces more competition in the future.

Boeing recently made a winning bid to supply its 767-based tanker to the U.S. Air Force, in large part because of significant and continuous improvements in production efficiency. Winning those kinds of contracts keeps his colleagues employed, Farnsworth noted.

Jon Shaw, Lean+ Design Build Roadmap leader, added he's looking forward to the next phase, focused on capturing value.

"It represents the next step in our continuous improvement evolution," Shaw said, "and a bringing together of the tools, approaches, methodologies and people to make us even more competitive, more capable and more engaged in the work that each of us does every day." ■

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Employees can learn more about Lean+ and Capturing the Value of Quality online at *http://leanplus.web.boeing.com/index.cfmlk*.

PHOTO: Scott Griffith, left, of DRS Technologies, a supplier to Boeing on the KC-46A Tanker, and Danon Drake, a Commercial Airplanes technical designer, construct a tanker console mock-up during a Lean+ Design Build Roadmap session in Everett, Wash.
GAIL HANUSA/BOEING

Employees use Lean+ to reduce Boeing's environmental footprint

It's hard to beat what Environment, Health and Safety employees have done when it comes to the Lean+ concept of preventing and eliminating waste.

"What we do is really a natural ally of Lean+," said Jerry Lancour, Lean+ Integration leader for Environment, Health and Safety, and a member of the Boeing Lean+ Leadership Team.

Boeing has worked hard to reduce the amount of waste going to landfills and reduce workplace injuries.

This spring, Boeing Mobility headquarters in Ridley Township, near Philadelphia, became the company's first final assembly facility to achieve "zero waste to landfill" status. Since then, Boeing South Carolina joined the ranks of the zero-waste sites that also include Boeing facilities in Salt Lake City and Huntsville, Ala. The Philadelphia milestone supports the companywide effort to reduce Boeing's environmental footprint, Lancour said.

Additionally, Environment, Health and Safety is working together with Shared Services' Site Services to help coordinate the use of recyclable materials in cafeterias at Boeing sites and, in some cases, the composting of food waste.

Not so visible is the coordination taking place with engineers to help design products that are more environmentally sensitive and take into consideration ergonomic and safety risk factors as well.

Other organizations within Boeing also are utilizing Lean+ to reduce the company's environmental footprint. For example, energy audits by Shared Services Group Site Services apply Lean+ tools to help Boeing identify and then improve water and energy usage.

The Lean Energy Assessment Team, part of the Utilities Services Group, examines building infrastructure systems to look for efficiency opportunities; it also engages employees and encourages them to reduce energy waste through simple steps such as turning off equipment and lights when possible, explained John Norris of Support Services Group's Corporate Utilities Services.

The group's annual Conservation Awards Program now includes a category called Lean+ and Employee Engagement to recognize activities that reduce energy or water consumption or reduce discarded waste.

– Eric Fetters-Walp

PHOTO: (Above) Dee Baird, a Facilities Plant Maintenance specialist, installs new high-efficiency lamps at the Commercial Airplanes Fabrication facility in Salt Lake City. BOB FERGUSON/BOEING

How a Lean+ concept is improving jet-making

Bringing engineers and manufacturing employees together to work closely on better airplane designs seems like a natural process.

But that's not how it always was done.

During the 1990s, three different groups from around the company thought it was critical to include everyone involved in the design improvement process. What started as a grass-roots effort to team employees from different areas to tackle specific design challenges is now known as Lean+ Design Build Roadmap, one of the 12 Lean+ Continuous Improvement elements.

"I didn't know what to expect coming into it, but now seeing it, it's a great concept," said Brian Stearns, a manufacturing planner with Commercial Airplanes who recently took part in his first design-build workshop.

By bringing together employees to focus on specific issues, much progress can be made, said Jon Shaw, the Lean+ Design Build Roadmap enterprise leader.

During a recent design-build session in Everett, Wash., teams focused on designing a quicker, easier way to install and remove the refueling control console for the new KC-46A tanker. At the end of the first week, three teams created mock-ups of the best ideas they generated that met certain criteria, including varying levels of potential risk and reward.

Stephen Wilhelm, a Commercial Airplanes mechanical and structural engineer, said the team members initially generated more than 200 ideas and then narrowed down to the three best solutions within just five days.

Normally, that process could take weeks or even months.

Robert Jones, a Boeing Defense, Security & Space flight mechanic at the Wichita, Kan., site, said he valued the opportunity to work with employees from different sites and disciplines. "There's camaraderie between the different groups here, and you get so many different ways of finding a solution."

Gayle Hughes, an industrial engineer on the 767 program, said the process allows for ideas that might not otherwise emerge. Some ideas being incorporated on the new tanker's refueling boom, she added, came out of a similar Lean+ session.

After being used primarily with engineering and manufacturing programs, the Lean+ Design Build Roadmap concept is being expanded across the enterprise.

"Every week I get a new team comprising engineers of every sort, mechanics, suppliers, finance, project managers, just about anyone and everyone, and I see them do some amazing things in a very short period of time," Shaw said. "They're always thrilled about what they accomplish."

– Eric Fetters-Walp

PHOTO: (Below) In this artist's concept, a KC-46A Tanker refuels a C-17. Improvements in cost and quality produced by Lean+ could help Boeing as it competes for future contracts. BOEING

Connecting the future

Boeing's Technical Fellows help inspire new generations of scientists and engineers

By Candace Heckman

As a curious high school sophomore, Gary Foss learned how to make a Tesla coil and entered it in the local Spokane, Wash., science fair. The high-voltage, low-current electricity machine won first place. Part of the prize was a 300-mile (480-kilometer) bus trip to Seattle to tour the Boeing manufacturing plant.

"This was in 1966, so I got to see the supersonic transport mock-up, and that was pretty impressive for a young kid to see," said Foss, now an Associate Technical Fellow and structural dynamics engineer for Boeing Test & Evaluation.

Those high school experiences propelled Foss on a life's journey dedicated to engineering innovation at The Boeing Company. Like some 2,200 others in Boeing's Technical Fellowship Program, his calling also drives a commitment to reaching further, such as inspiring young people to study science, technology, engineering and math.

The Technical Fellowship is a network of experts in multiple fields who have experience throughout the life cycles of Boeing products. In addition to their regular engineering and technical jobs, Fellows are tasked with working across the company, bridging teams and organizations to solve major technical challenges.

"Technical Fellows have long been a driving force behind the technical excellence that sets Boeing apart from its business competitors," said Allen Adler, vice president of Boeing Enterprise Technology Strategy. "Fellows are chosen in the first place because of their exceptional success in the programs they're assigned to. Maintaining that level of excellence and meeting the commitments to our customers is Job One."

But being available on the other end of the phone to help is another way Fellows prove their value and fulfill their sense of purpose.

"A lot of people think of a 'Tech Fellow' as a kind of professor—someone who knows a whole lot and is an expert at one specific thing. But in truth, Tech Fellows get to where they are in their careers because of their wide network of knowledge and people, and a keen ability to figure stuff out," said Brian Tillotson, a Senior Technical Fellow and expert in advanced space propulsion in Kent, Wash. "When you raise your hand to be a Fellow, you're asking for the challenge, any challenge."

At any one time, Tillotson, who works for Engineering, Operations & Technology, plays a part in a dozen different projects—getting an engineering team in Florida past a technical obstacle, helping an inventor in California develop a patent disclosure, mentoring a half-dozen young engineers from Seattle to St. Louis, teaching classes and seminars—all in addition to his regular job.

"It's our duty to nurture the future, the new generation of scientists and engineers."

– Gary Foss, Associate Technical Fellow and structural dynamics engineer for Boeing Test & Evaluation

Fellows come from diverse backgrounds and disciplines. In addition to their engineering or technical contributions, all are dedicated to fostering three principles across the company:

- Upholding technical excellence
- Demonstrating innovation
- Sustaining technical knowledge across generational boundaries

For many, this means cultivating a wide network to help the most experienced people transfer their knowledge to new generations of engineers and technical experts.

"Those of us in the Technical Fellowship understand that it's our duty to nurture the future, the new generation of scientists and engineers," said Foss, who also serves as the vice president of the Boeing-sponsored Washington State Science & Engineering Fair.

This year, the program specifically asked Fellows to invigorate the way the company seeks technical solutions, to make themselves more visible, more available, and to actively seek ways to share their know-how and support. This often means reaching across geography, business units and skill codes to identify the right people who will arrive at the right answer.

"There's no way one person, whether you're a Senior Tech Fellow or a senior vice president, can possess all the knowledge Boeing needs—not even a tenth of it," Tillotson explained. "It's not a Tech Fellow's job to know the answer, but it's our job to try to find one." ■

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PHOTOS: (Clockwise, from top left) Tenth-grader Gary Foss with his Tesla coil at the Washington state science fair in 1966. COURTESY OF GARY FOSS Brian Tillotson, right, a Senior Technical Fellow with Boeing Research & Technology, teams with (from left) technical analyst Mark Chisa, and Associate Technical Fellow Tamaira Ross, Defense, Space & Security, in work on a next-generation array of photovoltaic cells. MARIAN LOCKHART/BOEING Associate Technical Fellow Gary Foss listens to a presentation by 6-year-old Hariharan Mulmurugan at the 2011 Washington State Science & Engineering Fair in April. MARIAN LOCKHART/BOEING

All the right moves

Boeing Aviation Safety develops a software tool to better understand how flight-deck crews respond to non-normal events

By Jeff Wood and photos by Bob Ferguson

As the jetliner cruises at 34,000 feet (10,360 meters) above the North Pacific with autopilot on, the engine thrust levers begin creeping forward. The first officer notices this and glances at the airspeed indicators, which show that airspeed is dropping—yet the sound of air rushing past the windshield is getting louder.

Training and experience tell the first officer that these are conflicting indications.

What to do?

How the flight crew responds to a "non-normal" event like this can be crucial to continuing safe flight. Thanks to a two-year collaboration spanning two continents, Boeing safety experts have developed a better way to assess how reliably flight crews would react to the problem: It's called CREW, short for Cockpit operations Reliability Evaluation Worksheet.

"CREW is an excellent example of how Boeing employees work continuously to make flying even safer," said Corky Townsend, director of Aviation Safety, Commercial Airplanes. "It also reflects how safety efforts are evolving in the aviation industry. Today we can use real-world data to identify emerging patterns or potential conditions before accidents occur."

After a non-normal event, Aviation Safety experts use the CREW tool to guide pilots through about 120 detailed yes-no questions designed to pinpoint areas of vulnerability in the flight crew's response. Were the alerting indications too subtle? Was there clear guidance on what actions were most pressing? How easy was it for the flight crew to understand the nature of the problem?

By covering a full range of issues in minute detail, aviation safety analysts can locate and address potential vulnerabilities.

By definition, non-normal events are unexpected, but they do happen. Boeing flight and operations manuals often provide guidance, but exactly how crews respond depends on a complex interaction of factors such as their training and experience, operational procedures, and indications they receive from both the airplane and the environment. These can include messages, lights, sounds, wind noise or even the smell of smoke.

"As part of Boeing's Continued Airworthiness program, we monitor problems that airplanes experience in operation," including non-Boeing airplanes, said Randy Mumaw, human factors expert and Associate Technical Fellow in Aviation Safety, Commercial Airplanes.

When an incident occurs—from a system fault that affects the airplane's capability to an emergency situation such as a damaging bird strike—the team assesses the information and indications that the crew would receive on Boeing airplanes.

"Then we determine which indications help and which hinder the flight crew in restoring the airplane to a safe operating state," Mumaw explained.

Frank Santoni, Boeing Test & Evaluation chief pilot for commercial airplanes, said one of the challenges in assessing airplane design and operational issues

PHOTO: Cab operations technician Robert "Corky" Corcoran (foreground) is at the controls as (from left) Frank Santoni, Boeing Test & Evaluation chief pilot for commercial airplanes, discusses a non-normal scenario with Commercial Airplanes Aviation Safety Associate Technical Fellows Randy Mumaw and Roger Nicholson.

has been trying to account for the human response—"what the pilots would do."

Traditionally, Aviation Safety experts have interviewed pilots using open-ended questions that require pilots to make judgments about how flight crews from different airlines and countries would perform.

"Answers can vary from pilot to pilot," said Roger Nicholson, systems safety expert and Associate Technical Fellow, Aviation Safety. "We recognized that we needed a more objective way to evaluate crew performance."

Mumaw and Nicholson teamed with Lars Fucke at Boeing Research & Technology–Europe in Madrid to develop CREW, which is a form of human reliability analysis.

"We use a flight simulator to understand how the non-normal event develops," Fucke said. "Then we step through the scenario with the pilot, using CREW to assess whether the information coming from the instruments and controls helps or hinders execution of the right actions."

Safety experts then can put together a comprehensive view of how flight crews process the information from the various airplane and environmental indications.

"We want the flight crew to recognize when there is a problem, establish the right priority of remedial actions, choose the procedure associated with the root cause, then perform the actions specified in the procedure," Mumaw said. "The CREW tool identifies any potential hurdles to the desired response at each step."

With each case, CREW is proving its value.

"I can't tell you how many times in my career," said Santoni, "I've been asked, 'How would the pilot react?' or 'How many times out of 100 would a pilot take this action?' CREW is our best tool yet for gathering the subjective human input and quantifying it into a form we can then use in engineering analysis."

Next, the team will revise the tool to guide flight-deck enhancements and support crew training for future airplane designs. The effort demonstrates the benefits of working together as one global company.

"Our collaboration erased the distance and removed organizational barriers between Commercial Airplanes and BR&T-Europe in Madrid," Nicholson said.

"Together we built a tool that is immediately useful to our people as we work to improve aviation safety even further." ■

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For more information about aviation safety at Boeing, visit www.boeing.com/commercial/safety/index.html.

PHOTO: From left, Boeing Test & Evaluation chief pilot for commercial airplanes Frank Santoni and Commercial Airplanes Aviation Safety Associate Technical Fellows Randy Mumaw and Roger Nicholson.

"CREW is an excellent example of how Boeing employees work continuously to make flying even safer."

– Corky Townsend, director of Aviation Safety, Commercial Airplanes

Taking care of business

Administrative professionals are essential members of the global 'One Boeing' team

By Tim Houston and Ann Beach

In today's fast-paced, technology-driven workplace, administrative professionals have become indispensible business partners who make sure a company's moving parts mesh together and its leaders stay on track and on schedule.

"They are critical members of our global Boeing team," said Rick Stephens, senior vice president of Human Resources and Administration.

"They are truly operating on our front lines—often they are the first person our customers and shareholders see or talk to," he said. "They are proven team members whose skills and knowledge are essential to growing our business and remaining competitive."

The 2,200 administrative professionals who work throughout Boeing deserve to be recognized for their contributions every day, not just during Administrative Professionals Week once a year, said Robert Paul, director of corporate administration and executive flight operations.

Paul, who oversees the company's administrative workforce, also serves as enterprise champion for the Administrative Support Process Improvement Network, or A-SPIN, a group formed to promote networking opportunities, training, mentoring, professional development and community of practice for Boeing administrative professionals. To better reflect just how much value the profession brings to the business, Paul and his team are changing the name of the group to Boeing Association of Administrative Professionals.

What follows are the stories of a few of the administrative professionals who exemplify how their profession supports Boeing's global business—every day. ■

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The Boeing Association of Administrative Professionals has 17 teams companywide and always welcomes new members. For more information, visit *http://admin.whq.boeing.com/aspin/Enterprise/index.html#*

Danya Galatioto is thrilled to be part of a group of professionals that adds value to the company and one of its cutting-edge businesses. She supports Boeing Phantom Works President Darryl Davis in St. Louis.

"Phantom Works provides an exciting future as well as a wonderful history, and administrative professionals play a big part in that," said Galatioto, a 24-year Boeing employee. "The work we do shapes innovation and growth for the future throughout the company. It is a pleasure to work with such educated and talented people."

Galatioto chose her career because she likes to plan, organize and work with diverse clients. She's worked with customers from Asia, the Middle East and Europe.

"It has been an enlightening journey to learn so much from these cultures," Galatioto said, adding she's looking forward to helping other members of the Boeing Association of Administrative Professionals grow their skills and better serve the business.

PHOTO: (Left) Danya Galatioto. PETER GEORGE/BOEING

Peregil "Jun" Raymundo spent 15 years in accounting before switching to an administrative career supporting Ahmed Jazzar, president of Boeing Saudi Arabia and vice president of Boeing International.

He credits the Administrative Support Process Improvement Network with helping him enhance his administrative skills.

"It helped shape me up to be a better and more effective office administrator," Raymundo said. "It has a vast network of professionals who can provide help or advice. This was especially true when my manager traveled for the first time in the U.S. and I needed help arranging logistics for him."

Raymundo also supports Boeing Industrial Technology Group, a joint venture of Boeing and other U.S. and local contractors that invests in and supports the Saudi Arabian aerospace industry.

He said he's looking forward to the Boeing Association of Administrative Professionals playing a more active role in international locations "as we work together to ensure continued success of our administrative professionals."

PHOTO: (Below) Peregil "Jun" Raymundo. ASSOCIATED PRESS

Jasmine Li's position with Boeing Research & Technology in China is challenging and rewarding.

"Being an administrative professional allows me to use skills such as time management, communications and flexibility," said Li, who has worked at Boeing for four years. "It gives me the satisfaction that comes through helping others."

Li sees her work and her involvement with what is now the Boeing Association of Administrative Professionals as a way to build on her talents and interests. She also has taken classes through Boeing's Learning Together Program.

PHOTO: (Right) Jasmine Li. ASSOCIATED PRESS

In Wichita, Kan., a group of office professionals took what they learned from an A-SPIN program on Lean+, formed the Wichita Office Supply Cost Reduction Team, and began what is being adopted across the company as a significant cost-reduction technique.

In 2005, when the Defense, Space & Security site was amid a cost-cutting initiative, Sandy Greenstreet and a few other administrative professionals volunteered to help reduce the facility's annual office supply budget by 50 percent.

"This seemed like a good opportunity to use my experience and help the site at the same time," said Greenstreet, a 25-year Boeing veteran.

Using the principles of Lean+, they created a standardized office supply list, consolidated stores, reduced inventory and introduced process efficiencies. The changes resulted in a 56 percent reduction in expenditures—more than $200,000 for the first year and another $62,000 in the second.

The team has continued to reduce the total spent on office supplies by looking for and implementing other efficiencies.

"It's been a wonderful experience helping other sites follow our processes and see their own cost reductions," Greenstreet said. "The positive feedback we've received across the company has been overwhelming and has made all of our hard work worthwhile."

PHOTO: (Below right, from left) Mary Armstrong, Sandy Greenstreet and Charlie Brown. BEVERLY NOVAK/BOEING

Jodi Thomas supports the site director and leadership team at the Commercial Airplanes Fabrication facility in Salt Lake City, Utah. She began her 10-year Boeing career at the Huntsville, Ala., facility, where she first became interested in A-SPIN, now called the Boeing Association of Administrative Professionals.

The network organization is both an outlet for creativity and a way for administrative professionals to grow and learn new things about themselves and their abilities, Thomas said.

"My work with A-SPIN changed my outlook on being an office administrator—it showed me what a difference I could make through my position," Thomas said. "It also inspired me to be better organized and a team player, and reinforced the importance of sharing ideas and talents through networking and supporting other administrators."

The opportunity to go to the Boeing Leadership Center in St. Louis and attend A-SPIN meetings was one of the greatest experiences of her life, she added. "It's another pathway that A-SPIN gives us to progress and grow our careers."

PHOTO: (Left) Jodi Thomas. BOB FERGUSON/BOEING

In El Segundo, Calif., administrative professional Debra Turner is one of four A-SPIN members who started an Office Supply Cost Reduction team at the Space & Intelligence Systems facility in 2009.

"We've followed in the footsteps of teams like the one in Wichita and have applied their cost-saving approach to our site," explained Turner, who has worked at El Segundo for eight years. "We didn't know the process was 'Lean' at the beginning—we started out just wanting to save money and reduce duplication."

The team began by consolidating the site's five ordering processes into one, a significant achievement considering the sprawling nature of the 2-million-square-foot (186,000-square-meter) facility. It also limited the frequency of ordering and established central order stations across the site, a move that helped take the task off the administrative professional's plate to a large degree, Turner said.

Through these and other measures, the team was able to reach its goal of reducing supply expenses sitewide by 50 percent in 2010.

Turner credits this and other best practices gained through the Administrative Support Process Improvement Network, now the Boeing Association of Administrative Professionals, with opening doors for her and fellow administrative professionals.

"I've been able to meet and learn from others by networking through A-SPIN and have also developed my project management skills," she said. "It's been a great experience."

PHOTO: (Below, from left) Debra Penny, Charlene Hirokawa and Debra Turner. SALLY ARISTEI/BOEING

SPIRIT IN THE SKY

Boeing's high-altitude, long-endurance unmanned airborne system known as Phantom Eye is reassembled at its new home at Edwards Air Force Base, Calif., after being shipped there from St. Louis in late March. The Phantom Eye team is preparing the vehicle for first flight later this summer. Developed by Boeing's Phantom Works organization, Phantom Eye is powered by a pair of 4-cylinder hydrogen engines. It has a 150-foot (46-meter) wingspan, will cruise at approximately 150 knots (170 mph, or 280 kilometers per hour) and can carry up to a 450-pound (200-kilogram) payload for up to four days at 65,000 feet (19,800 meters). Phantom Eye's missions will include communications relay and intelligence, reconnaissance and surveillance. PHOTO: NASA


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