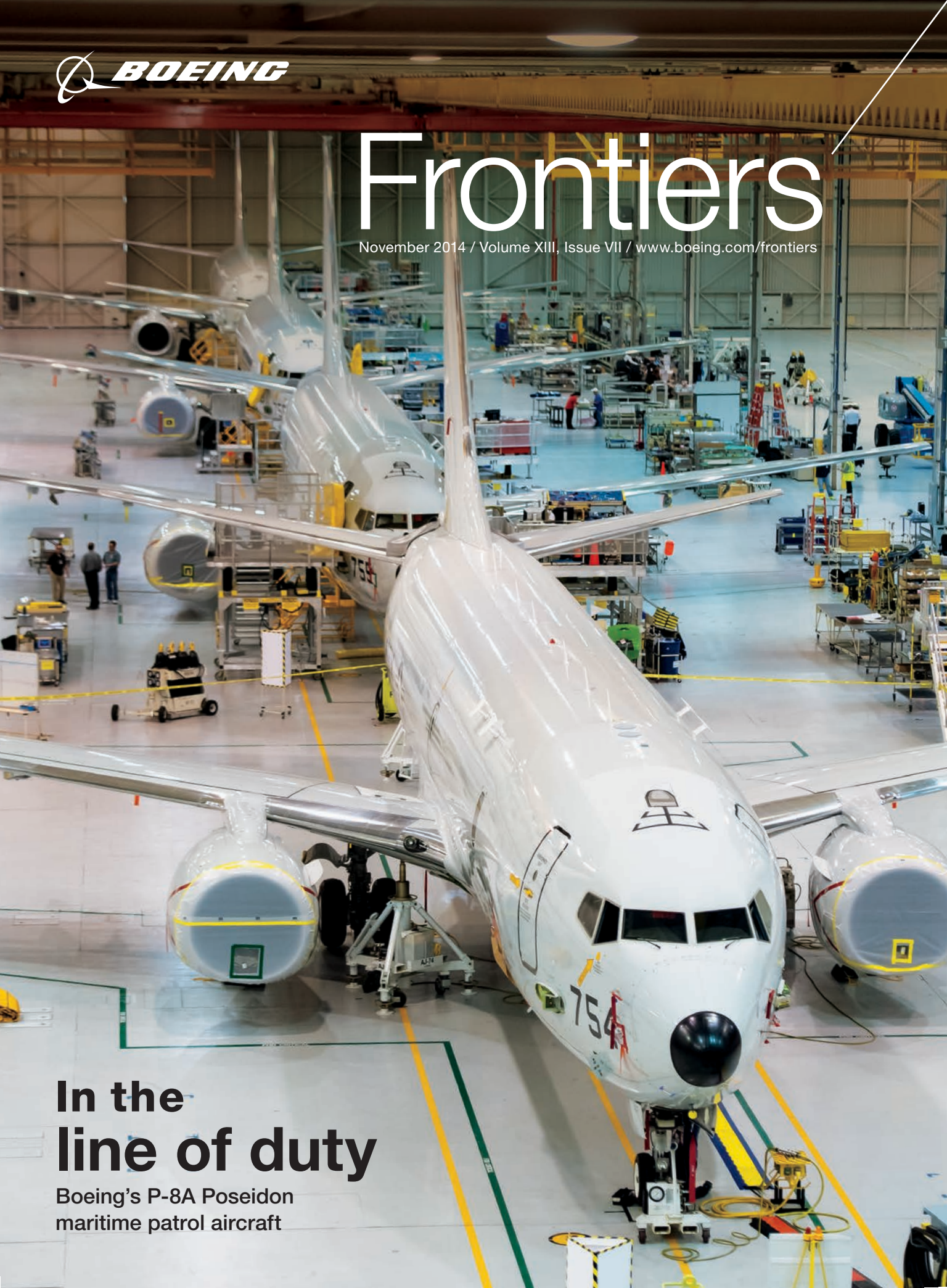

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Frontiers

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In the line of duty

Boeing's P-8A Poseidon maritime patrol aircraft

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ADVERTISEMENTS

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

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This ad was created to demonstrate Boeing's appreciation and gratitude to veterans and will run in *The Washington Post*, *The Seattle Times*, and more than 50 regional and trade papers. The campaign also will feature TV digital components and an online destination, boeing.com/tribute.

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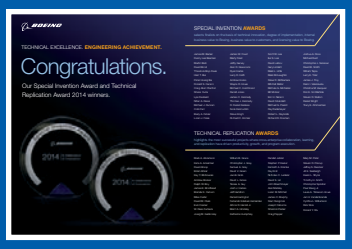

Celebrating technical excellence and engineering achievement is the theme of this ad as Boeing congratulates winners of the 2014 Special Invention Awards and Technical Replication Awards, which were presented at a ceremony last month.

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This new ad highlights Boeing's partnership with NASA to build the Crew Space Transportation, or CST-100, passenger spacecraft as part of the Commercial Crew program. It appeared in congressional and trade publications in September.

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IAM PROMOTIONS

No promotions listed for periods ending Sept. 26 and Oct. 3, 10, 17 and 24.

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Every branch.
Every war.
Every story.
Today, we honor those who served
and those who serve.
For all they have given to the country,
we can never thank them enough.
BOEING
Thank
You

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PHOTO: Christopher Graham, a manufacturing manager in the P-8 mission systems installation and checkout facility in Seattle, prepares a P-8 sidewall for the installation of a cabinet. **BOB FERGUSON/BOEING**

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Boeing’s innovative 702SP, the first all-electric satellite, uses a xenon-ion propulsion system that is significantly lighter than chemical-based systems.
PHOTO: BOB FERGUSON/BOEING

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Serving as ambassadors for the company isn’t in the official job description, but it’s an important part of what Boeing pilots do when training airline flight crews on newly delivered jetliners. **PHOTO: MARIAN LOCKHART/BOEING**

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PHOTO: GAIL HANUSA/BOEING

INSIDE

See center of magazine for the 2014 Boeing Store Holiday Shopping Guide.

LEADERSHIP MESSAGE

Dennis Muilenburg
Boeing vice chairman, president and chief operating officer

Stronger leaders,

Our strength as a company stems from employees' leadership, innovation and ongoing commitment to excellence

In a Q&A with *Frontiers*, Dennis Muilenburg shares his views on leadership, its importance to Boeing, and ways all employees can demonstrate and grow their leadership skills, regardless of title.

Why is developing leaders so important to Boeing?

We emphasize leadership at all levels because there's a direct link between effective leadership and the strength of our company. In a globally competitive world, leadership development is an investment Boeing makes to set us apart.

Boeing builds products and delivers services that matter; people's lives depend on their quality—and our integrity. Ultimately, customers choose Boeing because of the leadership, innovation and ongoing commitment to excellence of our employees.

Leadership is not about job title. It's about making a difference, helping others learn and improve, and demonstrating the Boeing leadership attributes and company values in our current roles, every day.

Do other companies devote as many resources to leadership development as we do?

Yes. In fact, organizations that invest in leadership talent show increased shareholder return, higher employee engagement, and greater performance overall. That's according to a recent Aon Hewitt Top Companies for Leaders study—which ranks Boeing's leadership-development program among the best.

Are good leaders born, or can they learn the skills?

Both. We all have inherent leadership skills we need to recognize and amplify. And just as you can develop technical skills for your job, it's possible to develop your leadership capabilities—but it takes ongoing effort and daily practice. We emphasize continuous leadership development because it's always possible to improve, whether a person is a new leader, in a senior leadership position or anywhere else along the spectrum.

As we look to Boeing's second century, we have tremendous growth opportunities. Building the right leadership capabilities will be crucial to our success. We'll need to leverage the entire Boeing enterprise, strengthen our global orientation, manage business diversity, measure ourselves against other companies that excel where we want to (in first-time quality and workplace safety, for example), deliver innovation and disciplined execution, and demonstrate both personal accountability and shared responsibility across our company. These are leadership skills that we can, and must, grow and hone at all levels of our organization.

Why do we have the Boeing Leadership Center?

It's an important part of our leadership-development strategy. The BLC serves as a forum where employees from all levels and locations gather to learn from one another, share best practices, tackle important business issues and build our "One Boeing" culture. They develop skills, gain new tools, and grow their leadership capacity and networks. It's also a place where our executives coach, share feedback and model the behavior we expect of leaders.

We constantly look to improve and update courses using feedback from participants.

That's why, this year, we've

stronger Boeing

revamped the basic BLC courses into transition-focused programs that target new first-level, midlevel and executive leaders. (See story, Page 22.) We're also re-energizing programs to accelerate leader development and rolling out advanced programs to focus leaders on their role in driving cultural change. This includes leveraging companywide initiatives like Lean+/Capturing the Value of Quality, or CVQ, which ask us to think about what it would look like if we did everything right the first time—and then pursue first-time quality, which leads not only to greater productivity but, even more important, to vastly improved workplace safety and customer satisfaction. The BLC also will keep building employees' functional expertise and leadership capabilities with refreshed and new Functional Excellence courses. We also are building capabilities to deliver courses not only at the BLC but also at targeted business locations in the U.S. and around the globe.

Not everyone wants to be a manager. Why should we all care about leadership development?

We need leaders at all levels of the organization—because we want people who make the right decisions for the right reasons, every day. Everyone—from our team members on the factory floor to engineers, Information Technology experts and other office workers—needs to operate with the greatest ethics, integrity and decision-making abilities.

Ultimately, any employee can be a capable leader and take advantage of development opportunities—whether he or she is interested in management, a technical career or a different path. Serving as a project or team lead, helping colleagues and taking the initiative to get things done are all examples of leadership.

How can I develop my leadership and other skills?

The first step is to engage in an honest discussion with your manager to identify your strengths as well as areas that need improvement, and pinpoint opportunities in your daily work to model the Boeing leadership attributes.

The majority of development—70 percent—takes place on the job. That's why it's important to take assignments that present new challenges and stretch your skills.

Boeing offers many development resources for employees. You can grow through mentoring relationships, whether formal or informal; participate in rotation programs; or explore educational opportunities through Learning, Training and Development's career-development resources and our Learning Together Program.

Ultimately, it's up to each of us to take ownership of our development paths and use the tools Boeing provides to reach our respective career goals. I encourage all employees to work with their managers to create and execute robust development plans so they—and Boeing—can continue to grow and succeed. ■

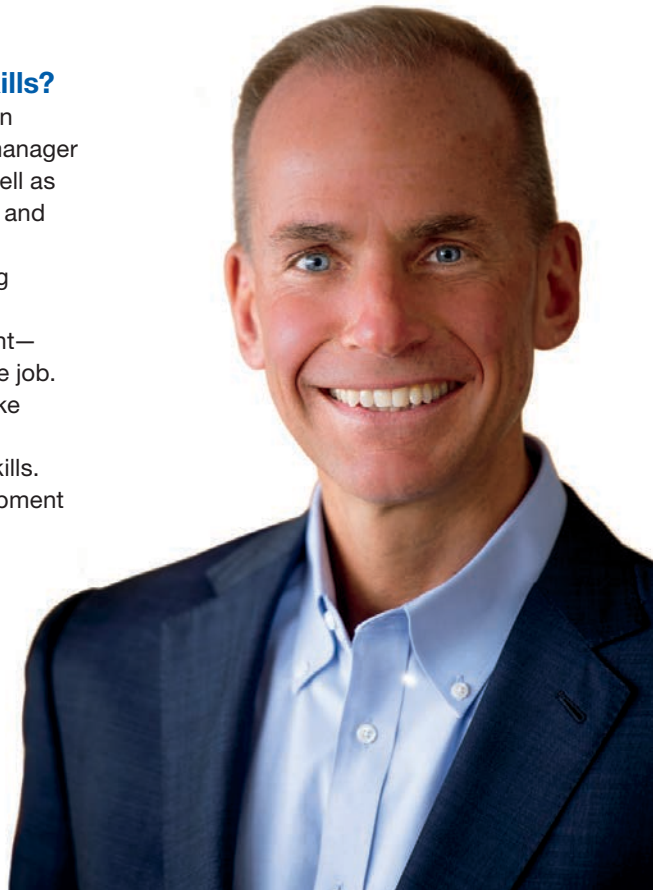

PHOTO: BOB FERGUSON/BOEING

SNAPSHOT

Star of China

The first of seven 747-8 Intercontinental passenger jets ordered by Air China is unveiled in a dramatic light-show ceremony last month in Beijing. Boeing's partnership with Air China, the flag carrier of the People's Republic of China, dates back to the 1970s. Through the years the airline has ordered almost every Boeing airplane model and now flies more than 260 Boeing jets.

PHOTO: ZHANG YUWEI/XINHUA NEWS AGENCY

QUOTABLES

"It's a knife fight for market share."

—Scott Fancher, senior vice president and general manager for Airplane Development, on the urgent need to drive down new airplane program development costs in an increasingly competitive market. *Boeing News Now*, Oct. 15

"There are billions of passengers waiting to fly."

—Temel Kotil, chairman of the Association of European Airlines and CEO of Turkish Airlines, commenting on the emerging airline passenger market in Africa and dynamic growth of Asian markets. He was speaking at a conference on aircraft maintenance, repair and overhaul. *AviationWeek.com*, Oct. 8

Tommy Walker Jr.

HAS WORKED FOR BOEING:
3 years

ORGANIZATION:
Global Services & Support

HOW DEEP UNDERGROUND HE WORKS:
Down to 80 feet (24 meters)

Keeping the 'birds' ready

Working underground in a missile silo in Alaska that's critical to U.S. defense

As told to Ashley Johnson

Tommy Walker Jr. is an on-site engineer in Fort Greely, Alaska, with Global Services & Support, part of Defense, Space & Security. In this *Frontiers* series that profiles employees and their jobs, Walker describes what it's like to support the Ground-based Midcourse Defense system, designed to detect, track, intercept and destroy long-range ballistic missile threats against the United States.

My work environment isn't like most at Boeing. Instead of being in an office or a factory, I'm usually working up to 80 feet (24 meters) underground in a missile silo or silo interface vault—the adjacent room.

I'm part of a small team that performs corrective and preventive maintenance on the equipment that makes up the Ground-based Midcourse Defense system. I maintain the missile and controls (including missile testing), the racks that control the missile and its launch functions, and the environmental controls and their systems, such as heating, cooling and humidity. Our customer is the U.S. Defense Department's Missile Defense Agency, and we have been the system's prime contractor since 2001.

When I joined Boeing three years ago, my family and I moved from sunny Florida to Alaska. Imagine going from the beach to snow and winters that can reach 60 below zero (-51 Celsius). The cold wasn't even the worst part of winter—it was the extended hours of darkness. You leave for work when the sun is down, eat lunch when the sun is down, and come home with the sun still down. But my team helped me get acclimated to the weather as well as the work.

Not only was I new to Boeing, but I'd never performed this type of work. I knew I had to maintain intense focus and pay careful attention to the details fellow technicians and engineers were showing me. I really enjoyed being trained on the system and learning how it operates. Now I can troubleshoot and correct issues without direction from other engineers.

The silos and silo interface vaults are underground, so I spend a good portion of my workday below the surface of the earth wearing a body harness for fall protection and any other personal protective equipment that the job requires. Being down there for five or six hours at a time took some getting used to; now it's just a normal day for me climbing down the ladder and doing my job.

One of my favorite parts is working in the silo using our elevated work cage system. Working in the silo requires a high degree of training and dedication to safety. You're working right alongside an interceptor while standing in a cage suspended by a cable. It's an eerie but exciting feeling. You can literally reach out and touch the "bird," or missile, while you travel to the bottom or wherever your task is directed.

With the excitement comes the understanding that you must focus on the task at hand because there isn't any room for error. We're maintaining mission-critical equipment, and that gives me a great sense of accomplishment. I may not be in the military, but I'm still helping defend freedom. ■

ashley.s.johnson@boeing.com

PHOTO: ASSOCIATED PRESS

HISTORICAL PERSPECTIVE

Wreaking Havoc

The Douglas A-20 attack bomber saw action in WWII with many air forces

By Henry T. Brownlee Jr.

When it came to inflicting damage on enemy forces during World War II, the A-20 Havoc lived up to its name.

"Cry 'havoc' and let slip the dogs of war," Shakespeare wrote in *Julius Caesar*. In that spirit, the A-20 certainly proved to be a fierce dog of war in its time. Built by Douglas Aircraft, a Boeing heritage company, it was used in many World War II campaigns in Europe and the Pacific for a variety of missions and by a number of allies, including the Soviet Union. It earned a reputation for surviving extensive battle damage and returning crews to their bases.

The A-20 had its roots in a U.S. Army Air Corps request for proposals that was issued in 1936. In response, Douglas began designing the Model 7B and continued prototyping until it produced the DB-7, a fast and versatile midwing, twin-engine attack bomber. It had separate, small compartments for the pilot and two gunners. The aircraft made its first flight in August 1939. Less than a month later, Germany invaded Poland. The next day, Britain and France declared war on Germany.

Leading up to WWII, the United States had maintained a position of neutrality, but President Franklin Roosevelt led the nation through a succession of agreements that increasingly allowed the U.S. to sell arms "cash and carry" to other countries. Eventually, the U.S. Lend-Lease program provided significant armaments, aircraft, military supplies and other assistance to the Allies, starting in September 1940.

Production of the DB-7 began during this period of neutrality, but the French were permitted to see the secret bomber project at the Douglas plant in Santa Monica, Calif., and ordered the first 107 aircraft, which were to be delivered by ship to Casablanca. The French followed with an order for 270 more. But only about half the total ordered had been delivered before France fell to the Germans in June 1940. Sixteen of the bombers that were en route to France were delivered to Belgium's Aviation Militaire.

More than 160 that were to have gone to France went instead to the United Kingdom. Those aircraft built for the U.K. were called the "Boston."

Initially, as a result of low military funding because of the U.S. policy of isolationism, the U.S. Army Air Corps had decided not to purchase the aircraft. But in June 1940, with war escalating in Europe, the Army Air Corps ordered 143. This version was designated the A-20A Havoc. Interestingly, it was the British that came up with the nickname Havoc because the airplane consistently wrought havoc on German forces.

The A-20 Havoc was produced in several variants including the P-70 night fighter and the F-3 photo reconnaissance aircraft. The Army Air Corps would order more than 6,000 in seven production models. In all, 7,477 DB-7s and A-20s were built—the majority at the Douglas plant, but 380 by Boeing in Seattle. And heritage company McDonnell Aircraft in St. Louis built 11,075 ring cowlings for the A-20.

The A-20G model, which was intended for the U.S. and the Soviet air forces, was the most produced of all the variants—2,850 were built. This model was used extensively in the European and Pacific theaters of operation, including the Allied invasion of France in 1944. In the Pacific, the A-20 was used for strafing attacks against Japanese ships and airfields.

The Havoc saw action in every major theater of World War II and it was the most produced attack bomber of the war. For Douglas Aircraft, the continuous improvement of the A-20 Havoc would pay dividends with the company's development of the A-26/B-26 Invader, a light attack bomber that also saw extensive action during WWII. The B-26 went on to serve in the Korean and Vietnam conflicts. ■

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PHOTOS: (Clockwise from far left) DB-7B aircraft, destined to the Royal Air Force as Boston IIIs, on the flight line at Boeing Field in Seattle; A-20s await modification at the Douglas site in Tulsa, Okla.; an A-20A Havoc in flight. **BOEING**

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‘Charged’

From idea to reality: How Boeing developed the first all-electric satellite

By Joanna Climer and photos by Bob Ferguson

On a February day nearly four years ago, two employees in Boeing’s satellite-making business in El Segundo, Calif., met to tackle one goal: how to capture a key market potentially worth billions of dollars.

Not that Boeing’s satellite business was struggling.

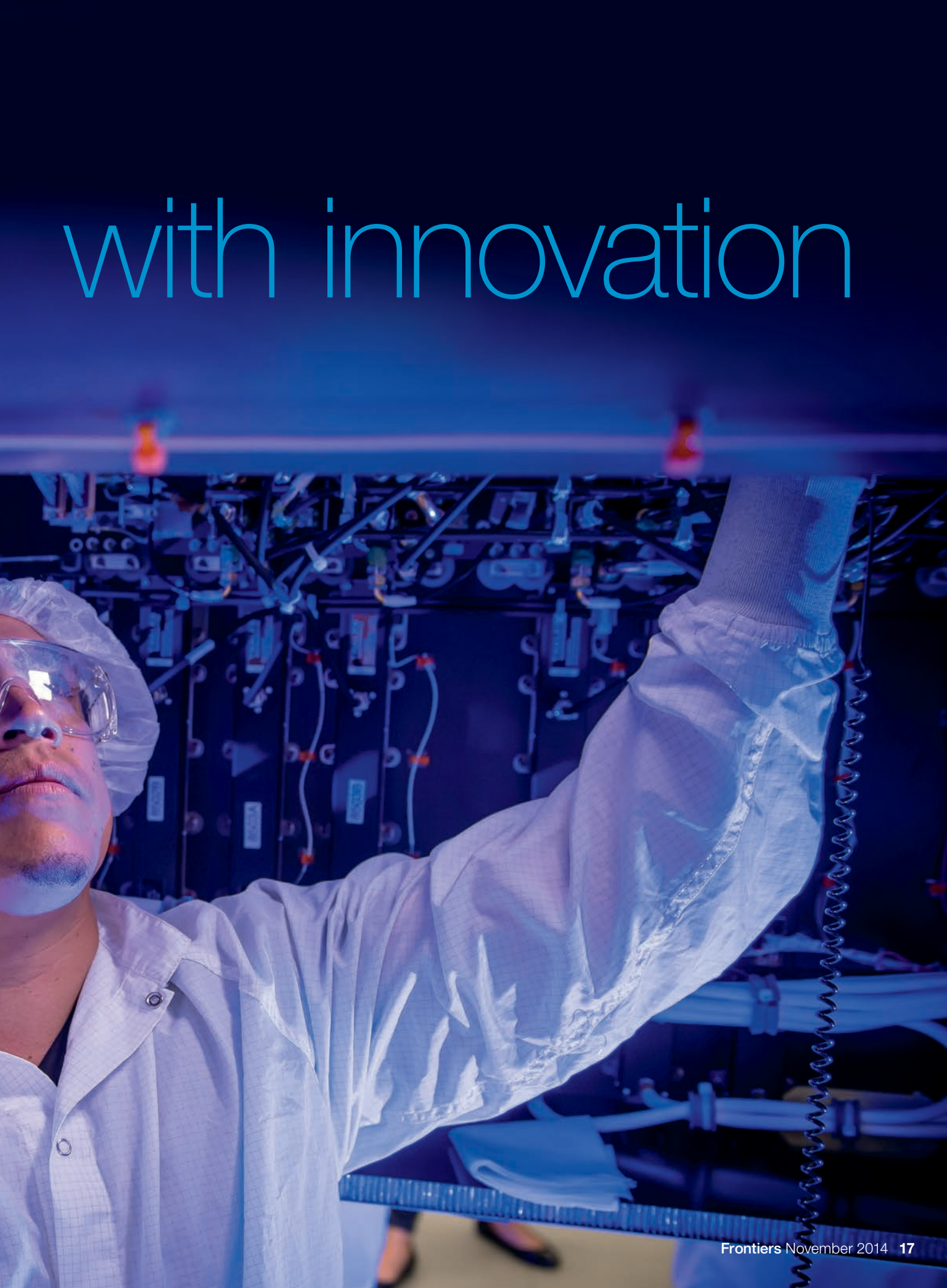
Jim Peterka, then the SmallSat Development program manager, and colleague Glenn Caplin, chief engineer and a Senior Technical Fellow, had witnessed the company’s business rebound after Boeing introduced the 702HP (high power) satellite in the late 1990s and the 702MP (medium power) in 2009. The 702HP’s innovative and more robust design had proved ideal for customers looking for a more powerful satellite. The 702MP also successfully filled a need in the midrange power market.

But some customers were now seeking cost-saving launch options using newer, smaller rockets to carry their satellites to space. Smaller rockets require less fuel and are less expensive. But they also can’t lift as much into orbit.

Sitting in Caplin’s office that day, Peterka and Caplin discussed how

PHOTO: Oscar Dominguez. harness technician, inspects a 702SP (small platform) communications payload.

with innovation



to devise a satellite that was small enough to fit on the newer rockets but would still deliver the capability and power their customers needed.

"Why not all-electric?" Peterka mused.

The comment was the spark, the beginning of an idea that eventually would become the 702SP (small platform) satellite—the newest 702 model designed by the Boeing satellite businesses and Phantom Works.

Electric propulsion was not new. The 702HP uses a hybrid propulsion system—chemical propulsion to get the satellite to the intended orbit after launch, then electric propulsion for station keeping. Some Russian-made satellites also use hybrid propulsion.

But no one had developed an all-electric-propulsion satellite. Boeing would be the first.

"It was time to take the training wheels off," explained Peterka, who today is manager of Boeing's first 702SP commercial satellite program.

Their idea was to re-invent the classic Boeing 601 satellite platform, a smaller predecessor of the 702HP, to fit the new satellite onto smaller rockets. If they could shed the weight of a chemical propulsion system by going all-electric, Peterka said, they could use the lower-cost rockets and

have “a winning system.”

But an all-electric satellite that uses tiny ion particles for thrust would have trade-offs. The satellite’s mass, and corresponding launch costs, would be significantly less. But its lower thrust meant it would take much longer to get the satellite to the proper orbit, or to reposition the satellite later to another orbit if the customer wanted.

“A satellite propelled with xenon is like having a vehicle that gets 300 miles per gallon—it’s way more efficient,” said Danny Howard, a team lead responsible for developing the avionics subsystems on the 702SP. “It might take longer to get there, but you burn a fraction of the fuel to reach the final destination.”

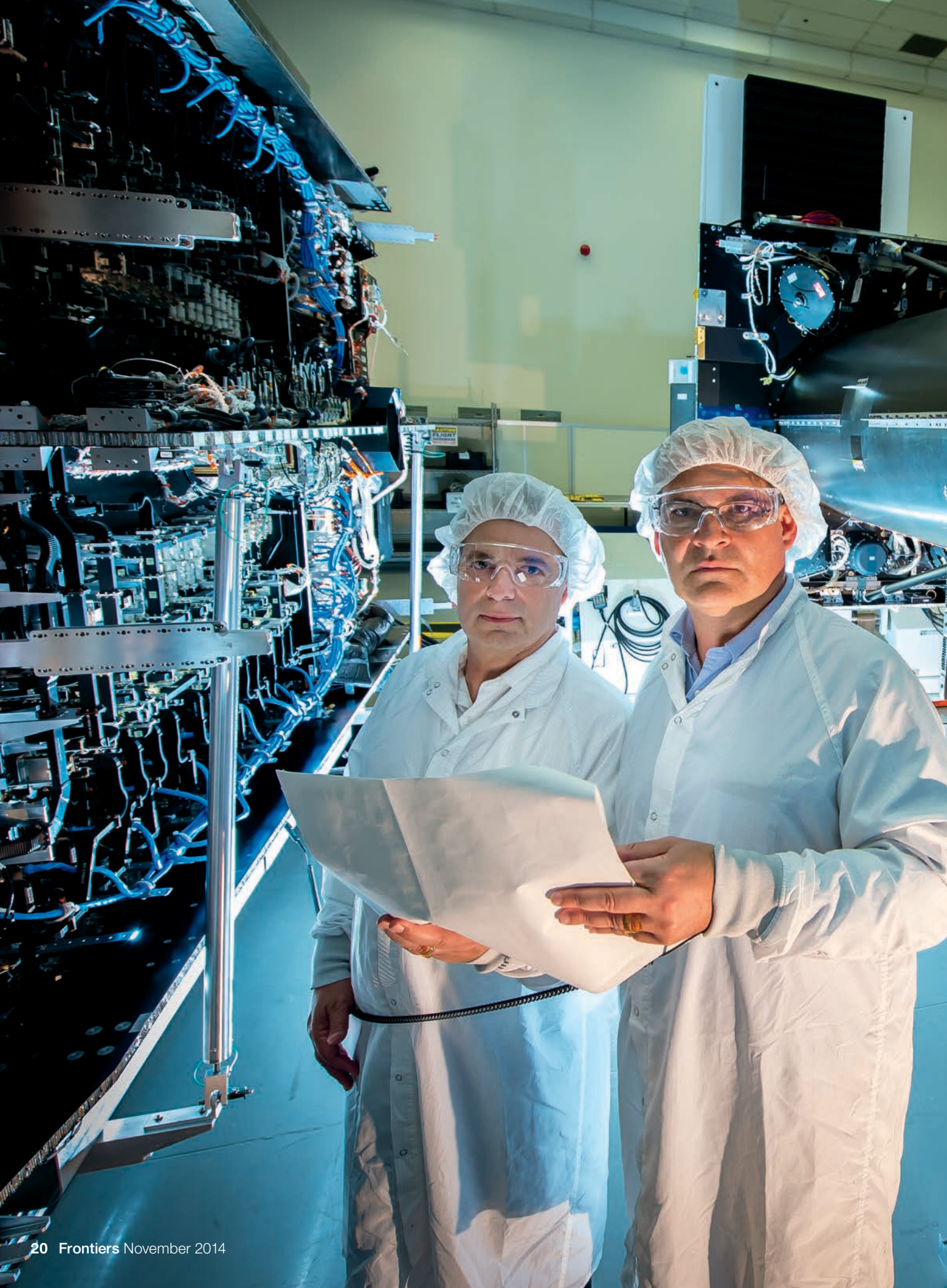
Using a satellite’s on-board chemical propulsion system, it typically can take one to three weeks to maneuver a satellite from where the rocket drops it off in space until its final position. Depending on the launch vehicle used, this can take from three to eight months with an all-electric satellite. And a satellite doesn’t start producing revenue until it’s in the proper orbit and the signal has been acquired by the customer.

Would customers want to wait that long?

The solution, explained Holly Murphy, 702SP platform integrated product team lead and one of the original members of the development team, was to reduce manufacturing cost and time in the factory by optimizing the design—everything from developing new flight software and avionics hardware to changing the way

PHOTO: (Far left) Matt Herrmann, left, vehicle engineer, and Carolyn Kim, manufacturing planner, look over a satellite communications payload.

GRAPHIC: (Below) An artist’s concept of the Boeing 702SP satellite. ABS-2A is scheduled to launch in late 2015. **BOEING**



a satellite gets built and launched.

A traditional satellite has two main parts—the "bus," which contains the structure, propulsion and control systems, and the "payload," which generates revenue for the customer. In previous designs, the bus and payload were assembled separately, and later joined in the satellite assembly area. With the 702SP design, the bus and payload components are assembled together.

This allows certain work to occur in parallel rather than in different stages, said Doug Mushet, 702SP payload and bus integration and test integrated product team lead.

"We are using only one team to do the work, as opposed to one bus team and one payload team," he said. "This saves time and cost."

The first two 702SP satellites, part of a four-satellite order placed by ABS and Eutelsat, are in final production. Boeing also signed one additional customer for an all-electric satellite earlier this year. Boeing has not disclosed that customer.

"There is a lot of interest in all-electric propulsion among satellite operators. The economics of the lower-weight satellites are pretty compelling," said Mark Spiwak, vice president of Boeing Commercial Satellite Systems. "For satellite customers that have a need for the lower-power range, we believe it is a growing market with more orders to come."

Aviation Week & Space Technology magazine called the development of all-electric satellites "the next big thing" in the commercial satellite industry in a recent article. But Boeing is no longer alone. Several competitors, including the space division of Airbus, are developing all-electric satellites for customers.

Meanwhile, Boeing employees in El Segundo recently completed important project milestones—integration and test, as well as spacecraft thermal vacuum testing.

For Victor Espinosa, thermal engineer for the 702SP product line, completing the thermal testing activities for the first-ever 702SP satellites was a pivotal moment. "There has been considerable invention applied, along with a level of disruption, to the established standard of spacecraft building," he said. "I am truly proud to be a part of the team that is making a reality of a new-product-line dream."

Boeing employees also designed the two satellites to be in a "stacked" configuration during launch. With the lighter-weight and stacked design, two satellites can be launched together on a smaller rocket. This represents another cost savings for customers, along with environmental advantages.

"By delivering two satellites at one time, customers are basically getting a two-for-one price on the launch," said Murphy, the team manager.

The first two satellites are scheduled to be launched together in early 2015 aboard a Space Exploration Technologies Corp. (SpaceX) Falcon 9 rocket.

"It's really cool to see something go from PowerPoint or a drawing to real life," Murphy said. "You get to see all the hard work you put into the product and have the realization that your design was in fact good."

Added Mushet, the team lead responsible for bus and payload integration: "Getting to work on a product that hasn't been built before is exciting. The whole team has been focused and supportive of new ideas and ways to improve our product.

"It's amazing," he said, "all the new technology and innovation we are putting into these satellites." ■

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PHOTO: Glenn Caplin, left, chief engineer, and Jim Peterka, 702SP program manager, review an engineering schematic next to a satellite communications payload and bus.

A big white board in Vonda Davis' office in St. Charles, Mo., lists the many important projects that the new Boeing Military Aircraft manager is responsible for—and one of them has Tony Salt's name on it.

Salt, a production lead, wants to be a manager someday. To aid his development, Davis assigned him one of the big tasks on her plate: setting up an entire production area for a new weapons derivative. This entails coordinating resources ranging from manufacturing engineering, production and industrial engineering, to facilities, production electrical support, parts management and scheduling.

Salt said he looked forward to this opportunity, yet he kept seeing Davis at the meetings he led for the project. That made him wonder whether she thought he could achieve the project goals.

"Vonda's very hands-on, like me," Salt said. "We face the same struggle—of learning not to finish a project all by yourself, and how to delegate parts of it."

Boeing provides many opportunities for employees such as Salt, who want to become managers, but it also is helping new managers such as Davis be better leaders in the eyes of their employees.

Developing current and future leaders is a priority for Boeing, which counts on managers like Davis to challenge and stretch their teams, said Dennis Muilenburg, Boeing vice chairman, president and chief operating officer.

"We give them the tools to develop themselves and the people they lead," Muilenburg said. "In return, we become a stronger, more competitive company that's better able to meet our growing global business challenges."

Developing effective leaders is also important to Boeing because a large segment of the employee population will be eligible to retire within five years. Cultivating the next generation of leaders ensures the company can continue to meet customer and market demands, while providing development opportunities for current and future employees, Muilenburg said. (See Page 6.)

Davis had spent 27 years at Boeing

TAKING THE LEAD

Employees gain opportunities to grow as managers

By Geoff Potter

honing technical skills. As a new manager, however, she said she found it challenging, as Salt had noted, to delegate tasks she could do—and formerly did—herself.

But after completing a leadership-development course at the Boeing Leadership Center in August, she better understood how to develop teammates by empowering them to lead projects and complete tasks in their own way.

Boeing revamped courses at the center this year to target new first-level, midlevel and executive leaders and better prepare them for their new roles.

"Delegating is an uncomfortable feeling at first, but it's really rewarding once you see the progress and success your team actually can perform," Davis said. And it freed her to spend more time coaching Salt and helping him develop his own career, she said.

Like Salt, Sascha Ruegamer, a flutter lead on the 777X program for Commercial Airplanes in Everett, Wash., started working for a new manager. That was late last year, just as the new manager was establishing a Lines, Loads and Laws team to integrate the aerodynamics, flight controls, loads and dynamics disciplines for the program.

When her manager returned from the new leadership-development program, Ruegamer saw the positive impact. "He took time with our interim performance reviews to understand where we wanted to go in our careers, and he acted on what we discussed."

Ruegamer noted that when she wanted to gain project-management experience, her manager taught her how to build an integrated schedule for the team and to resolve prioritization and scheduling conflicts between team members.

She credited him for taking time to listen, to understand what her goals were and to help her succeed.

"That was a great experience," Ruegamer said, "one of the things I'll take away from the group." ■

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PHOTO: Delegating helped new manager Vonda Davis, left, focus on teammate Tony Salt's development. **RON BOOKOUT/BOEING**

Butterflies to biofuel

Around the world, Boeing is finding solutions for environmental challenges

By Patrick Summers

Gazing across what was once a chemical storage facility, Joe Flaherty watched as bees and butterflies moved gracefully from flower to flower on the acre of now blooming pollinator habitat.

"It still blows me away," he said of the transformation from hazardous waste site to community garden. "It's become a sanctuary and a real community asset."

Flaherty coordinates the cleanup of the former Chemical Commodities Inc. Superfund site in Olathe, Kan.

"It shows what can be accomplished when we work together with our neighbors and partners," he added.

The site cleanup is one example of Boeing's approach to improving its environmental performance that partners and regulators alike say is setting new standards for environmental responsibility and stewardship.

It's part of Boeing's global environmental strategy, which is improving communities and creating opportunities for responsible growth worldwide, explained Ursula English, vice president of Environment, Health & Safety.

"Our goal is to find the best-possible solutions to environmental challenges—for our company, the industry and our neighbors," English said. "Closely collaborating with a wide array of partners is a key to success."

The Chemical Commodities site near Kansas City operated as a chemical brokerage and recycling facility for nearly 40 years. Rocketdyne, which was briefly part of Boeing, shipped wastes to the site for recycling in the 1960s. Boeing completed cleanup in 2011, a full year ahead of schedule.

"We wanted to take the cleanup an extra step and build something that would bring extra value to the community and the environment," Flaherty said.

His team discussed options with the community, which led to the creation of a special habitat called the Pollinator Prairie with gardens of native plants that support pollinator species, including birds, bees and butterflies. Neighbors volunteer to help with garden maintenance.

"It's an educational site for the whole community, with kiosks of information at each garden," Flaherty said.

The Environmental Protection Agency in 2012 presented Boeing its Leading Environmentalism and Forwarding Sustainability award for its work at the site. The pollinator habitat "extends beyond" the agency's requirement to clean up hazardous waste in communities, the agency noted.

Involving the community in remediation work also is being used in one of Boeing's largest remediation projects: cleanup and restoration of the Lower Duwamish Waterway near what was Boeing's Plant 2 in Seattle.

The former Plant 2 facility was torn down in 2011 and construction of a new shoreline fish and wildlife habitat was completed in 2013. Work is underway to remove an estimated 165,000 cubic yards (126,000 cubic meters) of contaminated sediment from the waterway and replace it with clean sand along a half-mile stretch of the waterway.

"The neighboring community needed a personal face on such a big project," said Brian Anderson, environmental engineer and project manager. "We provided our phone numbers to call if anyone had questions or concerns. It was important for us to be there over and over and respond to their input."

Anderson said Boeing also works

PHOTO: Community volunteer Mariruth Gruis, left, and Boeing remediation coordinator Joe Flaherty tend to the neighborhood garden and pollinator habitat. It replaced a chemical processing facility in Olathe, Kan. **TAMMY LJUNGBLAD**

closely with the local Muckleshoot Indian Tribe to ensure waterway access for fishing during cleanup and restoration activities.

Anderson recalled a point when he knew the public had developed confidence in Boeing as a responsive neighbor.

"A local resident stood up at a public meeting and said he trusted Boeing because we kept the public informed and responded to concerns," Anderson said. "The project's success has set a standard for public involvement."

On the other side of the United States, in South Carolina, this willingness to pursue creative environmental solutions has won the support of key conservation groups and government agencies for an ambitious wetlands mitigation effort near the Boeing South Carolina site in North Charleston.

The U.S. Army Corps of Engineers and the South Carolina Department of Health and Environmental Control recently approved the comprehensive plan to preserve nearly 4,000 acres (1,600 hectares), including more than 2,000 acres of wetlands, on three separate tracts in the South Carolina Lowcountry.

The mitigation plan is part of the permitting process for 468 acres (190 hectares) in North Charleston that Boeing will lease from the state for potential future growth.

"We call this plan our jewel. It will protect the land, water quality, and rare and endangered wildlife species," said Wes Wilson, civil engineer and project manager. "It's unique because it preserves far more land than people expected on a project this size."

Elizabeth Hagood, executive director of the Lowcountry Open Land Trust, described the plan as "a true collaboration and victory for all citizens in protecting what is unique to our way of life in the Lowcountry and one of South Carolina's most significant landscapes."

Adding value and expanding opportunity for the company and for local communities are at the heart of another environmental collaboration in Brazil, where Boeing is nurturing new markets for plants that can be used to make sustainable aviation biofuel.

"I show farmers in small communities in rural Brazil how they can supply feedstocks for biofuel in a way that won't necessarily change how they do things but add to them," said Onofre Andrade, senior aviation biofuel coordinator at the Boeing Research & Technology center in Sao José dos Campos, Brazil.

"We show them how to meet global sustainability standards as a group," Andrade said. That work, he added, helps build a sustainable aviation biofuel industry.

In Brazil, sugar cane already is being turned into aviation biofuel and research is underway on potential feedstocks, such as the native macauba tree. When produced sustainably, aviation biofuel reduces carbon emissions by 50 to 80 percent compared with petroleum jet fuel on a gallon-for-gallon basis, Andrade said.

English, Boeing's Environment, Health & Safety leader, noted the variety of environmental projects such as those in Brazil, South Carolina, Seattle and Kansas involve collaboration with diverse partners. These projects have something in common, she said: "They go above and beyond the standard and create something communities embrace and Boeing can be proud of." ■

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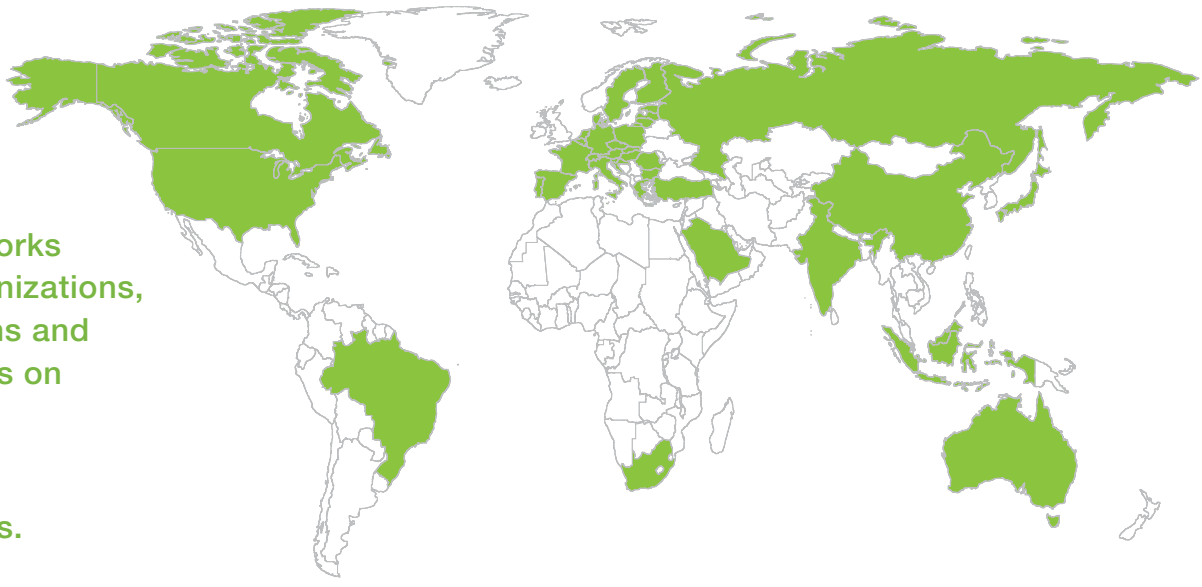
Boeing is continually researching and developing innovative technologies to improve the environmental performance of its products and operations, as well as of the aerospace industry. Learn more about Boeing's environmental strategy and performance in the company's 2014 Environment Report, available at boeing.com/environment.

PHOTO: Sugar cane straw is one feedstock that can help support a sustainable aviation biofuel industry in Brazil. **ASSOCIATED PRESS**

Boeing works with organizations, institutions and customers on

six

continents.



"I show farmers in small communities in rural Brazil how they can supply feedstocks for biofuel."

—Onofre Andrade, senior aviation biofuel coordinator at the Boeing Research & Technology center in Brazil

Training

Most pilots don't land a commercial airplane dozens of times a day on the same airport runway, but it's common for Tony Nogales and his colleagues.

As Boeing pilots on the Flight Training–Airplane team, part of the Flight Services business within Commercial Aviation Services, they train airline pilots how to fly specific Boeing airplane models. Much of their time lately is spent training pilots on the new 787 Dreamliner, as Nogales and Brian Carlisle did earlier this year when they worked with Aeromexico's flight crews.

"We would take four pilots at a time and fly them to Acapulco, where we did touch-and-go landings in the airplane for four or five hours," said Nogales, the Flight Training team's deputy chief pilot. "We racked up over 160 landings in four days."

When an airline buys a new airplane from Boeing, it receives pilot training hours as part of the package. The pilots who conduct this training often are the "face of Boeing" for airlines after receiving a new airplane.

"When you see a brand-new 787 flying away from a Boeing site, a majority of the time, we're on board that airplane, flying it either by ourselves or with a customer pilot on that initial delivery," Nogales said. "As everyone else leaves after the delivery ceremonies, we're still there, interacting with the pilots and airline."

Serving as an ambassador for the company isn't in the official job description, but it's a role that pilots who work with Boeing's customers keep in mind, said Darren Champlin, chief pilot, Flight Training–Airplane.

"Our pilots are right there with the customer, working with everyone from its pilots to CEOs and directors of operations," Champlin said. "Sometimes, we are just training them on touch-and-go exercises, sometimes it's training between airports. Other times, it's revenue service training, where delivery pilots will fly the route system with the airline's pilots."

Between flights, Boeing's training pilots lead on-the-ground technical training as well, often working on location for months.

day

These pilots are the 'face of Boeing' for airline customers

By Eric Fetters-Walp

"When you're with customers for 30 days or more, you really get to know them," said Rich Brown, a Boeing instructor pilot who spent a month and a half with a small airline in Africa earlier this year. He said the training pilots rely on the expertise across Boeing when a customer question stumps them. "If I don't know an answer to one of their questions right away, we have the resources to get the answer to the customer."

The Flight Training–Airplane team, which provides short-term training services negotiated as part of the airplane sale, employs three dozen pilots. Boeing Pilot Services, a separate team of 28 pilots within Commercial Aviation Services, provides extended training that can last for months or even years when requested by customer airlines. The two groups work together to offer "seamless services" for the airlines, said Suzanna Darcy-Hennemann, chief pilot and director of Flight Training at Boeing Flight Services.

Both groups of pilots are especially busy these days as a growing number of airlines take delivery of their first 787s, she said.

"That is the primary driver right now," Darcy-Hennemann said, adding that the Pilot Services group expects all its pilots to be deployed full time at various airline assignments by early 2015. Meanwhile, nearly all of the Flight Training–Airplane pilots are spending at least half the year deployed with airlines worldwide.

While spending that amount of time away from home isn't always ideal, the pilots say they are used to it. Most of them had similar travel-intensive schedules in previous jobs as commercial and military pilots, Darcy-Henneman said. Boeing looks for that type of experience and a strong background in instruction, as not all pilots can teach as well as they can fly an airplane. Especially as Boeing works with more internationally based airlines, the trainers have to know how to

PHOTO: Record deliveries of jetliners such as the 737 and 787 Dreamliner (shown) are keeping pilots busy at Boeing's Flight Training–Airplane and Pilot Services. **BOEING**

communicate in simple aviation-related English, as well as observe local customs when interacting with airline pilots.

"It's definitely about serving the customer and really helping identify and understand their needs," said Bill Scanlon, assistant chief pilot, Pilot Services.

Wayne Ridenour, another instructor captain for the 737, 777 and 787, said even after the pilots return home from an assignment with an airline, they continue to receive questions from their customer.

His favorite part of the job, however, is working with relatively new pilots as they first sit down in a 737 flight deck.

"Training a 737 co-pilot, they're typically new to flying and they usually have minimal flight experience, so you're often their first jet experience," said Ridenour, who flew U.S. Air Force transport aircraft for 20 years.

Another pilot, Ian "Rocky" Sullivan, said he finds satisfaction in the moments when he can help pilots who are already good improve their knowledge. "Lots of times, when we're out flying with the airlines, we're flying with senior managers," he said. "It's nice and rewarding when you can still teach something new to someone who's a pretty experienced pilot."

Murray Strom, chief pilot, 777/787, Air Canada, said his pilots lauded the Boeing training pilots who recently taught them on the 787.

"It has been a great experience for our pilots, and they have let us know about it," Strom said, explaining that such praise is unusual.

Boeing's training pilots also work closely with the company's flight-test pilots in Boeing Test & Evaluation when testing and validating new airplane models and simulators. For example, they participated in validating the 787 simulator, Nogales said. But the pilots' priority is with the company's customers, especially as commercial airplane deliveries hit record highs.

Brian Carlisle, who trains pilots on the 787, 777 and 747 models, said the Boeing pilots know that an airline has much invested as it takes ownership of a new airplane.

"There is a lot of stress on them to make their delivery successful," Carlisle said. "So doing our part to make that go smoothly for them is rewarding." ■

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PHOTO: At the controls in a Boeing 777 simulator cab are Boeing instructor pilots Rich Denton, foreground, and Rich Brown, background, with simulator cab integrator Tom Kmitta. Denton and Brown are with Commercial Aviation Services; Kmitta is with Boeing Test & Evaluation.

2014 HOLIDAY SHOPPING GUIDE

BOEING STORE
Official Merchandise

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Our jet snowflake, based on an original Boeing design, unites several design elements—a snowflake, a circle of 787 jetliners, a six-pointed star—into one deceptively simple shape.

Jet Snowflake Slouch Beanie
$10.00
This soft, slouch-style beanie adds sparkle to your cold-weather wardrobe. Made from acrylic and polyester in charcoal gray with sparkling silver thread, it will keep you warm and stylish through the colder months of the year. Adorned with our exclusive jet snowflake patch on the outside and the Boeing logo on the inside. One size fits most. 98% acrylic/2% polyester. Measures 9.5"L x 9.5"W x 5"D. Hand washable.
Item No. 225025010033

Jet Snowflake Touchscreen Glove
$10.00
These special gloves are warm, stylish and technology savvy. Knit from soft acrylic and polyester with spandex for a snug fit, these gloves feature stylish sparkling silver threads and our exclusive jet snowflake patch on the cuff. A special coating on the first three fingers enables you to operate a touchscreen on any electronic device without removing your gloves. One size fits most. 75% acrylic/23% polyester/2% spandex. Measure 8.5"H x 3.5"W x 0.25"D. Hand washable.
Item No. 225025040074

Jet Snowflake Circle Scarf
$10.00
Wrap yourself in this soft, knit infinity scarf to add sparkle to your cold-weather wardrobe. Made from acrylic and polyester in charcoal gray with sparkling silver thread, it will keep you warm and stylish in cold weather. Adorned with our exclusive jet snowflake patch and the Boeing logo on the label. Wear long or short, one size fits all. 98% acrylic/2% polyester. Measures 54"L x 12"W. Hand washable.
Item No. 225025040073

Goldtone Jet Snowflake 2014 Ornament
$50.00
This deluxe limited-edition ornament for 2014 is handcrafted from white metal casting with a satin gold finish by Reed & Barton. Accented with genuine Swarovski crystals, this tarnish-resistant ornament is tied to a white satin ribbon and comes in a gift box with explanatory leaflet. Ornament measures 3.25"H x 3"W; box measures 4"L x 4"W x 0.75"H. Made in U.S.A.
Item No. 460060030202

Silvertone Jet Snowflake 2014 Ornament
$10.00
This limited-edition ornament for 2014 is handcrafted in zinc alloy with nickel plate and a silvertone finish by Reed & Barton. Tarnish-resistant ornament is tied to a Boeing Blue satin ribbon and comes in a gift box with explanatory leaflet. Ornament measures 3.25"H x 3"W; box measures 4"L x 4"W x 0.75"H.
Item No. 460060030204

When we opened our Custom Hangar in 2012, our first collection of genuine aviation artifacts sold out within a week. Now we're back with some old favorites and a new, expanded line of limited-edition merchandise designed for true aviation fans.

B-25 Mitchell Magneto Switch and Turn-and-Bank Indicator
$950.00

See history from your desk. The North American B-25 Mitchell was a twin-engine medium bomber used widely during World War II. It was named after General Billy Mitchell, who was considered to be the father of the U.S. Air Force. This piece from a genuine B-25 instrument panel includes magneto switch and turn-and-bank indicator. The magneto supplies ignition power to the spark plugs in an airplane piston engine; the turn-and-bank indicator displays the rate of turn. The instruments have been hand-refurbished and set in a housing made from plasma-cut 11-gauge hot-rolled steel, in a shape inspired by Boeing propeller planes of the 1940s. The entire assembly was then hand-polished and powder-coated with a vintage finish. Measures approximately 11.5"L x 8.5"W x 8"H. Made in U.S.A. Item No. 667066010196

747-400 Window Frame
$595.00

Get the 30,000-foot view through an actual window from the Queen of the Skies: the Boeing 747 jumbo jet. Since its first flight on February 9, 1969, the 747 fleet has flown 3.5 billion people — the equivalent of more than half the world's population. This passenger window is from a 747-400 operated from 1997 until its retirement in 2013, logging 46,883 flight-hours and 33,333 flight cycles. Refurbished and polished by hand, this window is one of a limited number available for private purchase at this time; it would make a striking wall display or picture frame for home or office. Certificate of Authenticity included. Actual window frame may vary slightly from photograph. Measures approximately 21.5" x 15.75" x 1.5" (size and weight may vary). Made in U.S.A.
Item No. 667066010001

T-6 Texan Rear Throttle
$1,250.00
Get your hands on aviation history. The North American T-6 Texan trainer was the in-air classroom for most of the Allied pilots who flew in World War II. The two-place T-6 trained hundreds of thousands of pilots from 34 countries over a period of 25 years. This artifact is a genuine rear throttle from a T-6 Texan. The throttle enables the pilot to control an aircraft engine's power setting by specifying the ratio of air to fuel supplied to the engine. This throttle has been refinished by hand and set in a housing made from plasma-cut 11-gauge hot-rolled steel. The entire assembly was then hand-polished and powder-coated with a vintage finish. Certificate of Authenticity included. Each piece is unique and may vary slightly from photograph. Measures 11.25" x 9.25" x 12". Made in U.S.A.
Item No. 667066010260

707 P&W JT3D Engine Blade
$395.00
As graceful as a modern sculpture, this striking piece is made from a genuine Pratt & Whitney JT3D engine blade that once powered a Boeing 707 jetliner. This aviation artifact is set into a solid piece of machined, hand-polished 6061-grade aluminum for display. The Boeing Custom Hangar logo is etched on the bottom. Certificate of Authenticity included. Each piece is unique and may vary slightly from photograph. Measures 7.375"L x 7.0625”W x 15"H. Made in U.S.A.
Item No. 667066010139

Boeing Aircraft Kites

Now you can fly your favorite Boeing aircraft! All you need is a little wind. Each single-line polyester kite comes with a 200-foot spool. For ages 5 and up. Measures 53" x 27".

AH-64 Apache Kite
$24.00
Item No.
540040100118

787 Dreamliner Kite
$24.00
Item No.
540040100115

737 MAX Kite
$24.00
Item No.
540040100117

Plush Airplane Trolley Bags
$30

Little travelers will love packing for a trip with this charming rolling trolley bag. They can carry it as a backpack or use the adjustable locking telescoping handle to wheel it like a suitcase. For a special touch, it's decorated with our adorable Jetsi Bear (pink) or Jumbo Jet (blue) characters. 100% polyester. Measures approximately 11"H x 8"W. For ages 3 and up.
Item No. 598098100007 (Pink)
Item No. 598098100008 (Blue)

Plush Airplane Slippers
12.50

These cleverly detailed slippers feature wings, engines and even cockpit windows for snuggly fun. A textured nonslip sole provides secure footing for future pilots and flight crew. Made of soft polyester plush. Sized for toddlers and children only (sorry, adults!).
Item No. 332032080001 (Pink)
Item No. 330030080002 (Blue)

Aircraft Window Key Chain
$6.00
We've captured the romance of flight with this miniature replica of a shiny riveted airplane window. It's made from zinc alloy with a brushed nickel finish. Measures approximately 1.5"H x 1.2" W.
Item No. 580080100231

Aircraft Window Luggage Tag
$8.00
Your luggage will stand out when you tag it with this miniature replica of a shiny riveted airplane window. It's made from aluminum with a brushed finish and sturdy stainless steel wire. Measures approximately 3.2"H x 2.4"W.
Item No. 590090070195

Aircraft Window Picture Frame
$12.00
Get a new view when you put a treasured photograph into this frame that's a miniature replica of a shiny riveted airplane window. It's made from zinc alloy with a brushed nickel finish and mineral glass with a pressboard easel stand. Measures approximately 3.75"H x 2.5"W x 0.5"D; holds a 2" x 3" photo.
Item No. 460060030203

Men's Nylon Flight Jacket
$55.00

Our sharp flight jacket has authentic styling; the Boeing signature is embroidered tone-on-tone on the left chest for a custom touch. The nylon shell has thick polyester fill for added warmth and an international orange lining with two snapped flap pockets outside, one snapped pocket inside, and a zipped pocket on the sleeve. It's styled with knit cuffs, collar and waistband; heavy-duty brass zipper; and durable topstitched seams. Available in olive green, navy blue and black.
Item No.112012020001

Women's Down Soft Shell Jacket
$79.00

Enjoy the luxurious warmth of down in a lightweight soft-shell jacket. Stylish quilted jacket has a stretchy 93% polyester/7% spandex shell and 100% polyester lining. Features include an attached hood, lower zipped pockets, zipper guard on collar, and open bottom hem and cuffs. Body fill is 50% down/50% waterfowl feathers. Hood fill is 100% polyester. Available in black/black and blue/indigo.
Item No. 222022070046

DUTY, HONOR, COUNTRY

By Eric Fetters-Walp

More than 21,000 veterans work at Boeing, representing about 14 percent of the global workforce. *Frontiers* salutes them, recognizing the value that service members, veterans and military families bring to their communities and jobs. Here, Boeing veterans share stories about their service, and reflect on what "duty, honor, country" means to them. In a speech to the corps of cadets at the U.S. Military Academy at West Point in May 1962, Gen. Douglas MacArthur said, "Those three hallowed words reverently dictate what you ought to be, what you can be, what you will be."

For **Matt Thomas**, duty to his country meant using his law degree in a different way. That decision would lead him to advising military commanders in Iraq and Afghanistan as a member of the U.S. Army Judge Advocate General's Corps.

Thomas, now a contracts administrator with the P-8 program in Seattle, said his father served in the Army during World War II and then in the Navy Medical Corps. "He had

Matt Thomas

PHOTO: MARIAN LOCKHART/BOEING

always encouraged me, saying for a professional it was a great route to go and a totally different atmosphere, which it is," Thomas said.

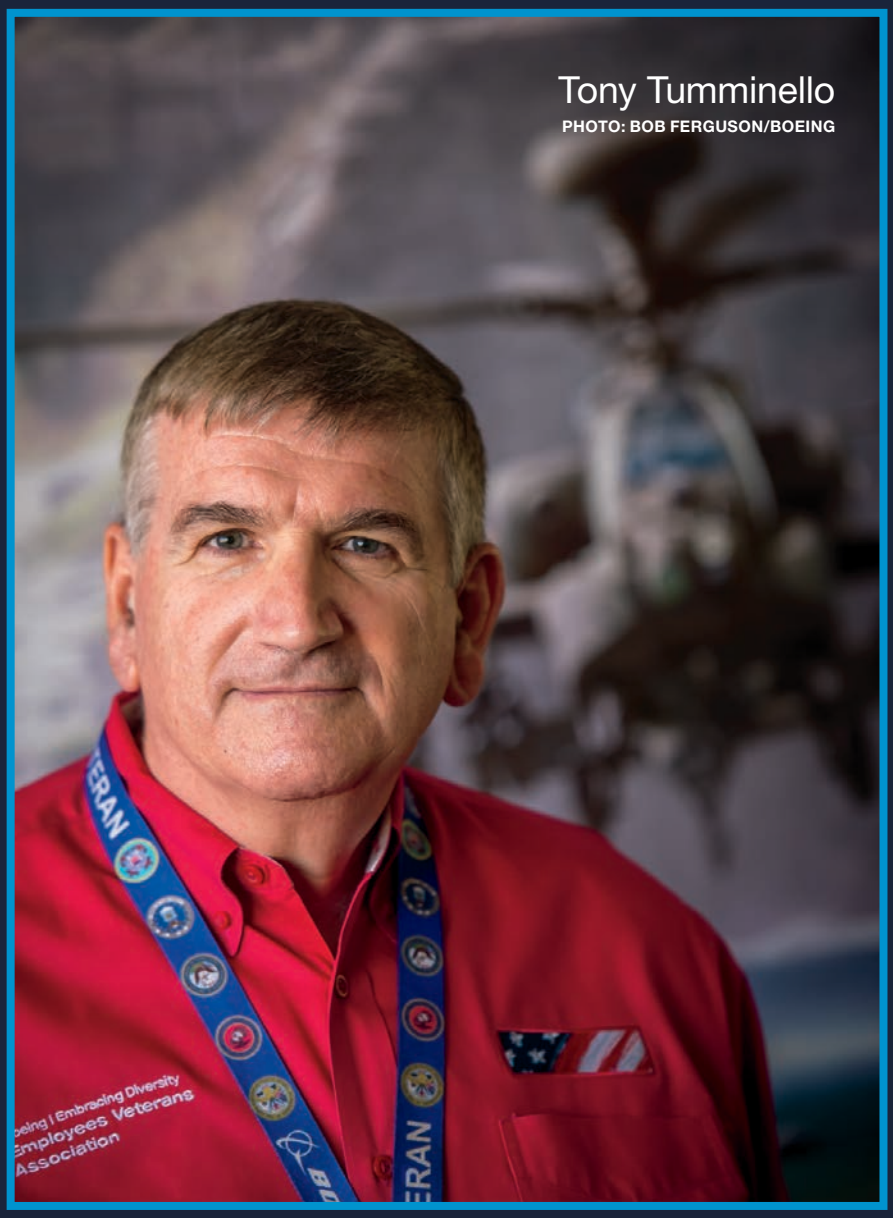
So, at age 27, Thomas applied for and was accepted into the Judge Advocate General's (JAG) Corps. In his first year, he worked in a legal clinic for military members, where he helped them deal with everyday legal issues. He also served as a military prosecutor and as the chief of claims for U.S. Forces in Iraq, where he would decide on restitution for claims of incidental damage done by the military during the war there.

During the last two of his five years of active-duty service, Thomas was assigned to accompany the 2nd Battalion, 3rd Special Forces Group (Airborne) in Afghanistan. As a legal adviser, Thomas wasn't sure how he would be accepted by these elite warfighters. "The most pleasant surprise to me in that special operations community was that I was sought out by the commanders to give input on a wide range of combat decisions," Thomas said. Even when split-second decisions were needed, mission leaders wanted to make sure they were following international laws of war and fighting honorably, he said.

Thomas ended his active duty in June of this year, and started the next month at Boeing, which interviewed him via a teleconference while he was on deployment in Afghanistan. Thomas said he's proud of his service to his country, and it helps him do his job today.

"It gives me a background and a reference so that when I'm dealing with the government's auditing agency, I know where they're coming from," he said.

Forty years before Thomas decided to serve, **Steve DeSantis** made the same decision. He enlisted in the U.S. Marine Corps in 1968, an unusual choice during the Vietnam conflict. But he considered it his duty—joining the military was the continuation of a family tradition and part of his conviction to help his country. His father landed on the shores of Normandy during World War II and



Tony Tumminello
PHOTO: BOB FERGUSON/BOEING

Steve DeSantis
PHOTO: FRED TROILO/BOEING

Joni Bretthauer
PHOTO: GAIL HANUSA/BOEING

fought in Europe the rest of the war. Nearly all of his uncles fought in either World War II or Korea.

"So I grew up in a family that believed that freedom is not free. I believed then and now that there is no greater honor than to serve in our military to protect our way of life," said DeSantis, a manager in Support and Test Equipment Design at the Boeing site near Philadelphia.

Because of his passion for aviation, DeSantis used his four-year enlistment to train and serve as an avionics technician. During that time, he spent 14 months in Vietnam. "Although the separation from my family and the living conditions were difficult," he said, "I never questioned why I was there or if these people needed our help."

After his discharge from the Marines, DeSantis pursued a degree in electrical engineering while also supporting the U.S. Air Force's Air Defense Command within the federal civil service. Having recently marked his 35th anniversary with Boeing, DeSantis said he's honored to still support the U.S. military in what he does.

"My position is not only rewarding by allowing me to play a role in aerospace, but it also uses my experience to give something back to the warfighter in the quality of the products Boeing delivers," DeSantis said, mentioning that he thinks of the past and present aircraft and their roles in history-changing events every time he looks at his collection of Boeing aircraft models. His stories from his tour of Vietnam include memories of A-4 Skyhawks, F-4 Phantom fighters and even the DC-3, he said.

"Each aircraft teems with untold numbers of stories of warfighters using these aircraft to defend our nation, as well as the armies of engineers and manufacturing people who dedicated their lives to build these machines, which means something to me. It makes me take pride not only in my nation but also in The Boeing Company."

Joni Bretthauer also served in the Marine Corps. Military service gave her direction for her life and career, she said. Bretthauer, an Information Security analyst with

Boeing Defense, Space & Security, admits she had no idea what she wanted to do upon graduating from high school. After working in a U.S. Marines recruiting office in 1978, she joined the Marines—without telling her parents. Even though her father was an Air Force veteran, her parents weren't excited their only daughter had enlisted. To be sure, women were not nearly as common in the Marines, or the U.S. military in general, at the time.

"Everywhere I served, I was either the only female Marine or there were just one or two others," Bretthauer said.

In 1981, Bretthauer found herself assigned for three months to Marine Air Group 42 at Whidbey Naval Air Station in Washington state. While the corporal administrative clerk toured the air station's facilities, she was introduced to a fellow Marine who worked in classified materials. After learning more about him, they went out for lunch and dinner almost every day.

"At this time, I was the only female Marine attached to the unit, and everyone thought we made a cute couple," said Bretthauer, who lives in Mukilteo, Wash. "Because of this, we were asked to pose for a Marine Corps recruiting flier that was handed out at schools and other events on Whidbey Island."

The two married in the summer of 1982, and just marked their 32nd anniversary. Meanwhile, Bretthauer has worked at Boeing for 28 years. She said her interest in IT started during her six years in the Marines. While her parents had misgivings, she credits her military service for giving her direction and a full appreciation for the country in which she lives.

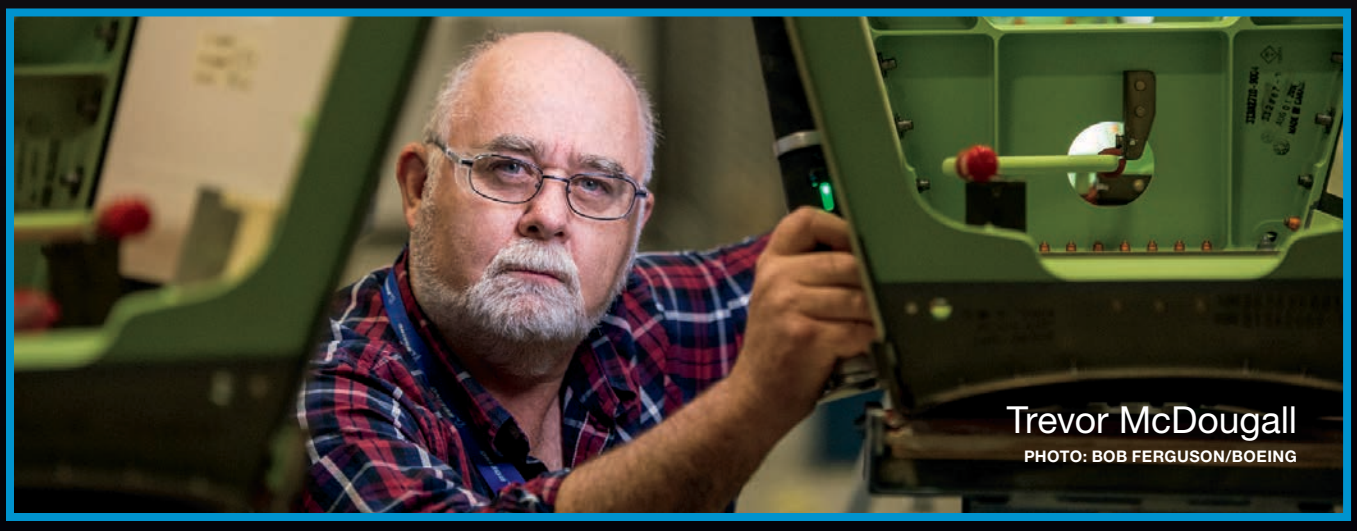
Tony Tumminello entered active service near the end of the Vietnam conflict. In his own words, he describes his military service as "not the kind of heroic, adventurous experience most folks think of." He served four years as a captain in the U.S. Air Force at Hanscom Air Force Base in Massachusetts, which hosted no aircraft at the time.

"Yet it had a profound effect on the rest of my life," Tumminello said. "During my time in service, I personally observed the dedication that my fellow airmen and officers brought to their assignments and the pride they took in what we were doing for our country."

Tumminello was there as a military lawyer in the JAG Corps, which he joined after graduating from law school. He was assigned to the major procurement base, where he learned about military contracting. That, he

John White

PHOTO: BOB FERGUSON/BOEING



Trevor McDougall

PHOTO: BOB FERGUSON/BOEING

said, steered him into the aerospace field instead of private law firms.

Now, years later, Tumminello said he is happy to see how the United States honors and respects its warfighters, something he didn't see during his military years. There is no doubt his military experience set the direction for the rest of his life, he said.

"I believe that as much as our service members give and do for America, their time in service will serve them well in their future lives," said Tumminello, now senior counsel at the Boeing Mesa, Ariz., site. "The discipline, pride and ability to adapt to the new places and people they experience in the military will stay with them, and they will be the better for it."

John White grew up in St. Louis, well away from any ocean, but he ended up patrolling the coastlines of North and South America while serving in the U.S. Coast Guard for six years.

Following in the footsteps of their father, White and two of his brothers joined the Coast Guard and all ended up based in Alameda, Calif. During his half-dozen years of service, White was part of a crew on a 378-foot-long (115-meter) ship that chased illegal drug smugglers.

"We would board high-speed drug boats in the middle of the night, trying to keep them from opening specially made valves that could sink the ship along with all of the cargo within minutes," White said. "Sometimes I would race to the engine room to find water pouring through the holes and sinking the ship."

That type of work taught him how to trust his colleagues, he said. And in between patrol missions, the ship's team would stop in places like Costa Rica and Panama, where they would do volunteer work, set up soccer games for young people, and perform other goodwill duties. White, who went to the Coast Guard Damage Controlman School, later was stationed with an industrial support unit, where he added to his technical knowledge.

Upon leaving the Coast Guard five years ago, White followed a friend's recommendation and applied at Boeing. He now is in Production Control, supporting the F-18 and F-15 programs, the C-17 program, and Phantom Works.

"It was an easy transition, and I was overwhelmed with how much Boeing honors veterans. I was surprised at how many vets there are in the company," he said.

Trevor McDougall spent much of the Cold War years of the 1970s and '80s in the air, keeping a wary eye out for Soviet submarines. He served 20 years in the Royal Canadian Air Force, including five years of studies at the country's Royal Military College.

"I was immersed in an atmosphere typified by the college motto 'Truth, Duty, Valour,'" McDougall said, adding that the demanding institution taught him how to prioritize and accomplish tasks quickly.

After his graduation, the newly commissioned first lieutenant spent more than a decade as tactical coordinator and air navigator aboard Canada's anti-submarine aircraft. Those flights, in coordination with other NATO allies, often lasted 18 to 20 hours and involved flying only a couple hundred feet over the ocean. "There's a real camaraderie within the military, especially when you're flying for hours with a crew over the ocean. That's your family," he said. "The military ingrained in me a sense of honor, duty, hard work and dedication to my co-workers that has served me well in my transition to civilian life."

Since leaving the RCAF, McDougall has worked extensively in the aerospace sector and now works in Quality Assurance for Boeing Commercial Airplanes' site in Winnipeg, Manitoba, the same city he trained in years ago. Echoing other veterans at Boeing, McDougall said he's proud of his service, but he also values it for what it taught him about honor and duty.

"To me, honor and duty means having self-pride in the work you do," McDougall said. "It means going beyond what you need to do." ■

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TRIDENT TRUE

P-8A Poseidon has become a model for military acquisition—and future Boeing jetliner derivatives

By Eric Fetters-Walp

The P-8A Poseidon maritime patrol aircraft revolutionized the way Boeing designs and assembles military aircraft based on commercial airplanes well before the first production model was delivered in 2012.

Now, with more than two dozen P-8s delivered to the U.S. and Indian navies, the anti-submarine and anti-surface warfare aircraft is proving itself in service. Since the U.S. Navy formally introduced it into service late last year, the P-8 has taken part in military exercises around the globe, joined in the international search for missing Malaysia Airlines jetliner MH 370 and been deployed to patrol the Pacific Ocean. In July, the U.S. Navy's first operational P-8A Poseidon squadron returned to Jacksonville, Fla., from Kadena Air Base in Okinawa, completing the aircraft's first deployment.

That Navy squadron, VP-16, used the aircraft's intelligence, surveillance and reconnaissance capabilities conduct anti-submarine and anti-surface warfare patrols.

"From the very beginning of deployment, the P-8A far exceeded any expectation that we had," said Cmdr. Daniel Papp, VP-16 squadron commanding officer. "We could not be happier with the P-8A's performance. We got more out of the capability, and

PHOTOS: (Left) A P-8 fuselage moves through final assembly in Renton, Wash. (Right) Hector Serrano, a Commercial Airplanes electrician, mates connectors for mission systems on an aircraft. **BOB FERGUSON/BOEING**

PHOTOS: (Clockwise from top left) A P-8 undergoes final assembly in the Renton, Wash., factory; electrician Ben Cervantes installs wires on the flight deck of an airplane in final assembly; Christal Nesby installs cooling air ducts in the mission systems installation facility in Seattle. **BOB FERGUSON/BOEING**

"The P-8A far exceeded any expectation that we had."

—Cmdr. Daniel Papp, VP-16 squadron commanding officer

P-8 AT A GLANCE

LENGTH	129.5 feet 39.5 meters
WINGSPAN	123.6 feet 37.6 meters
WEAPONS UNDER WING AND IN BOMB BAY	More than 22,000 pounds (10,000 kilograms) including Harpoon anti-ship missiles, torpedoes and depth charges
SPEED	490 knots 564 mph, or 790 kilometers per hour
RANGE	More than 1,200 nautical miles 1,380 miles, or 2,200 kilometers
CREW	Nine

we did more on station with this aircraft than I have seen in my entire career. It's a great aircraft."

Meanwhile, the P-8 program has achieved every major milestone to date and, according to the U.S. Navy, saved the government $2.1 billion compared with the initial cost projections.

James Detwiler, the P-8 program's Business Development director with Boeing Defense, Space & Security, said the U.S. Navy has shared overwhelmingly positive feedback about the aircraft's performance.

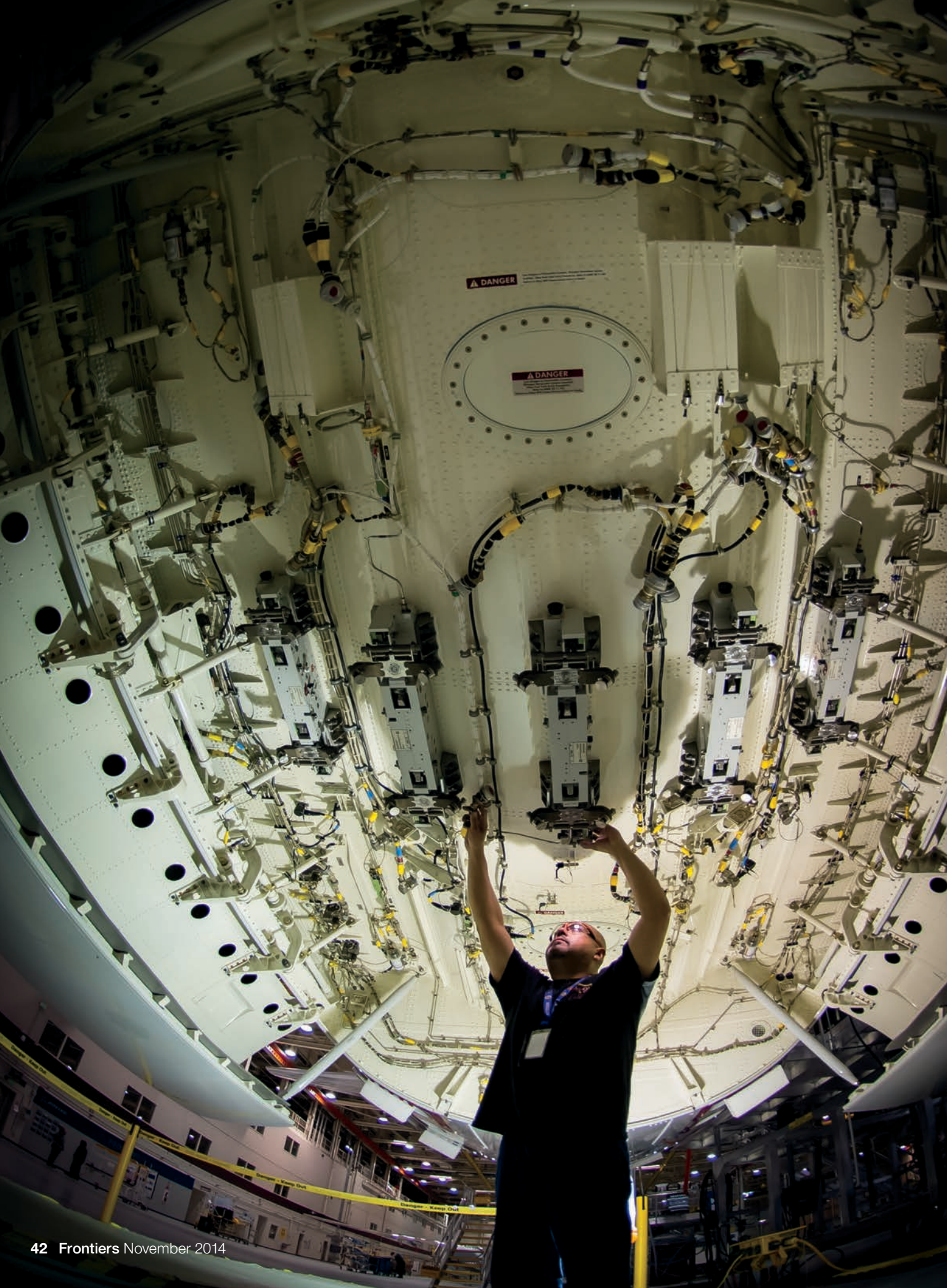
"The crews laud the speed, endurance, handling comfort and reliability of the 737-based platform," Detwiler said. "In the case of the search for MH 370, the U.S. Navy chose to deploy a second P-8A in the search, due to the fact that the P-8A was achieving an additional two-plus hours of search time over the other airborne platforms—which is critical for long-range search and rescue."

Based on the Next-Generation 737-800, the P-8 replaces the propeller-driven P-3 Orion, which began service with the U.S. Navy more than 50 years ago. Boeing is on contract to build and support 53 P-8A aircraft to the U.S. Navy, which plans to purchase 117 of the aircraft.

The program changed the way military derivatives of commercial airplanes are produced by Boeing by adopting an in-line production system. Instead of completely modifying the 737 fuselage after it comes out of the factory, P-8 modifications are built into the fuselage at Spirit AeroSystems in Wichita, Kan., before assembly on the Renton, Wash., production line.

That novel approach helped the program deliver under budget, and it has become a model acquisition program for the U.S. Department of Defense, as well as a model for future commercial derivative programs

PHOTO: A P-8A Poseidon receives its gray U.S. Navy colors in a paint hangar at Renton, Wash. **BOB FERGUSON/BOEING**


DANGER
DANGER
Danger - Keep Out

within Boeing, including the new KC-46 tanker, Detwiler said. Even so, there have been improvements since the program launched, said Bill Hull, a P-8 manufacturing representative with Commercial Airplanes in Renton.

"Tooling has greatly been improved, as has the build and sequencing process," Hull said. "The build is getting better every day. We are getting more stable, better quality and more efficient."

The same can be said for the Defense, Space & Security team that installs the airplane's sophisticated surveillance and detection systems at a Boeing Field facility in Seattle, said Tony Temeyosa, a modification mechanic at the facility. He worked on the first P-8 during his early days on the program.

"From that to what we have now, there's a big difference. It's definitely streamlining," Temeyosa said.

Stacy Vosburg, a P-8 technician in Seattle, said a small team worked from start to finish on the systems installations on the first Poseidons. Now, with a steady stream of aircraft, the installation line works more like a normal production line. Along the way, ideas from the facility's employee involvement teams and others have improved the installation process, she said.

The result of improved production efficiency isn't trivial. It has resulted in a nearly 30 percent reduction in the per-aircraft cost since the first model was assembled. More improvements to the production and installation lines are likely, as the P-8 program is "just getting up to speed," said Detwiler, who added that more customers for the aircraft are coming.

"We will ramp up from Low-Rate Initial Production to Full-Rate Production over the next couple of years. Multiple new international customers will join the worldwide fleet, with both Foreign Military Sales and additional direct sales likely," he said.

India ordered its first eight P-8s in 2009. Australia, which has been a development partner on the program since that time, has received government approval to purchase eight P-8s, with an option for four more. Other nations also are considering the P-8. Detwiler said interest has risen since the U.S. Navy's deployment of the first Poseidon squadron. The aircraft also performed in the air and was on display at this year's Farnborough International Airshow in the United Kingdom.

"We think there's a pretty significant international market for the P-8, up to 75 aircraft overall," said Rick Heerdt, vice president and program manager for the P-8 program. "The program's got a bright future. This aircraft's going to be around for 30, 40 years."

Boeing employees who put together the P-8 and its systems don't need to be told of the aircraft's performance and expected longevity. They increasingly hear about that when U.S. and Indian Navy officials visit the P-8 production and installation facilities, Temeyosa said. "They'll stop and tell us how great the plane is. It's really cool to hear their reactions," he said.

Vosburg has been to Naval Air Station Jacksonville to perform in-field modifications and other work for the first P-8 squadron. So she has heard

PHOTOS: (Clockwise from far left) In Seattle, Hermon De Leon installs release units in the P-8 weapons bay; Tonia Swenson conducts a functional test at the Boeing Defense, Space & Security mission systems installation and checkout facility; Richard Harrington, left, and Cosme Beltran perform mission console checks. **BOB FERGUSON/BOEING**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from the new aircraft's operators directly and seen how great a leap forward the P-8 is from the P-3.

"It's amazing to see what they're replacing. This plane has many more options and capabilities available as far as mission systems," Vosburg said.

Hull worked on the 737's commercial production line before transitioning to the P-8 line in Renton. He said he always felt a responsibility to build the best airplane possible for the airline customers, but building the P-8 for the military is different.

"It gives me a sense of pride to work on this program, knowing the men and women who protect freedom will be enjoying the capabilities and the comfort that the P-8A Poseidon offers," Hull said. "I feel I am working for the entire nation, knowing that this aircraft may very well someday protect our waterways." ■

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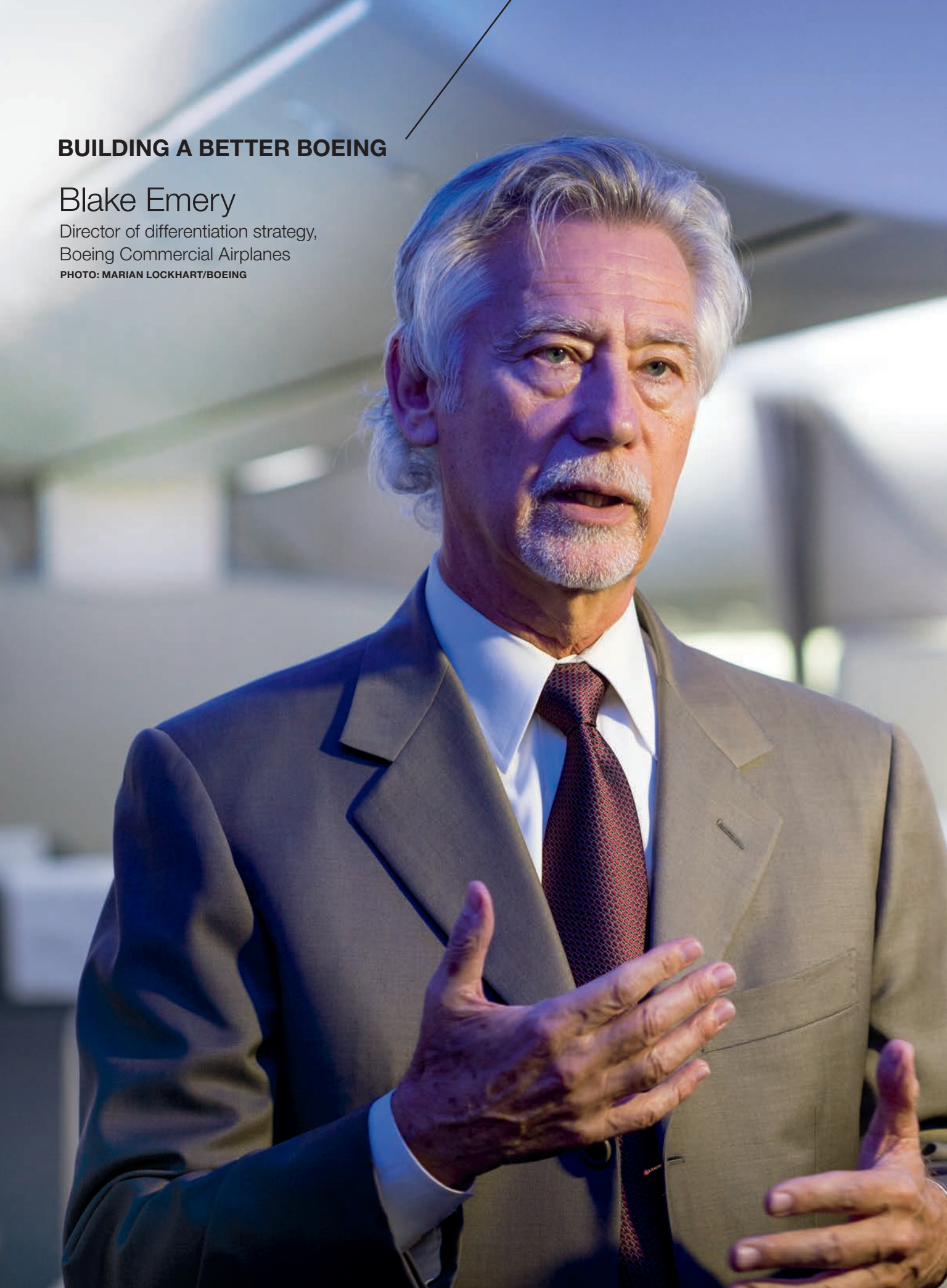
PHOTOS: (Left) A U.S. Navy P-8A Poseidon over the Washinton state coast earlier this year. **LEO DEJILLAS/BOEING** From their workstations on board a P-8A, crew members assigned to Patrol Squadron (VP) 16 assist in search operations in the India Ocean in March for missing Malaysia Airlines flight MH 370. **U.S. NAVY**

BUILDING A BETTER BOEING



Blake Emery

Director of differentiation strategy, Boeing Commercial Airplanes

PHOTO: MARIAN LOCKHART/BOEING

Welcome aboard!

For Boeing's cabin design guru, it has always been about improving the passenger experience and the joys of flight

By Dan Raley

This is an occasional feature about Boeing employees and the work they do that helps the company be more successful.

Blake Emery slides into a 787 premium seat and gets comfortable. Dressed smartly in a suit and tie, he could pass for a business traveler flying off to an important meeting or convention. Yet Emery doesn't stow any carry-on luggage, fasten a seat belt or care to look out the window. By simply sitting down, he's arrived at his destination.

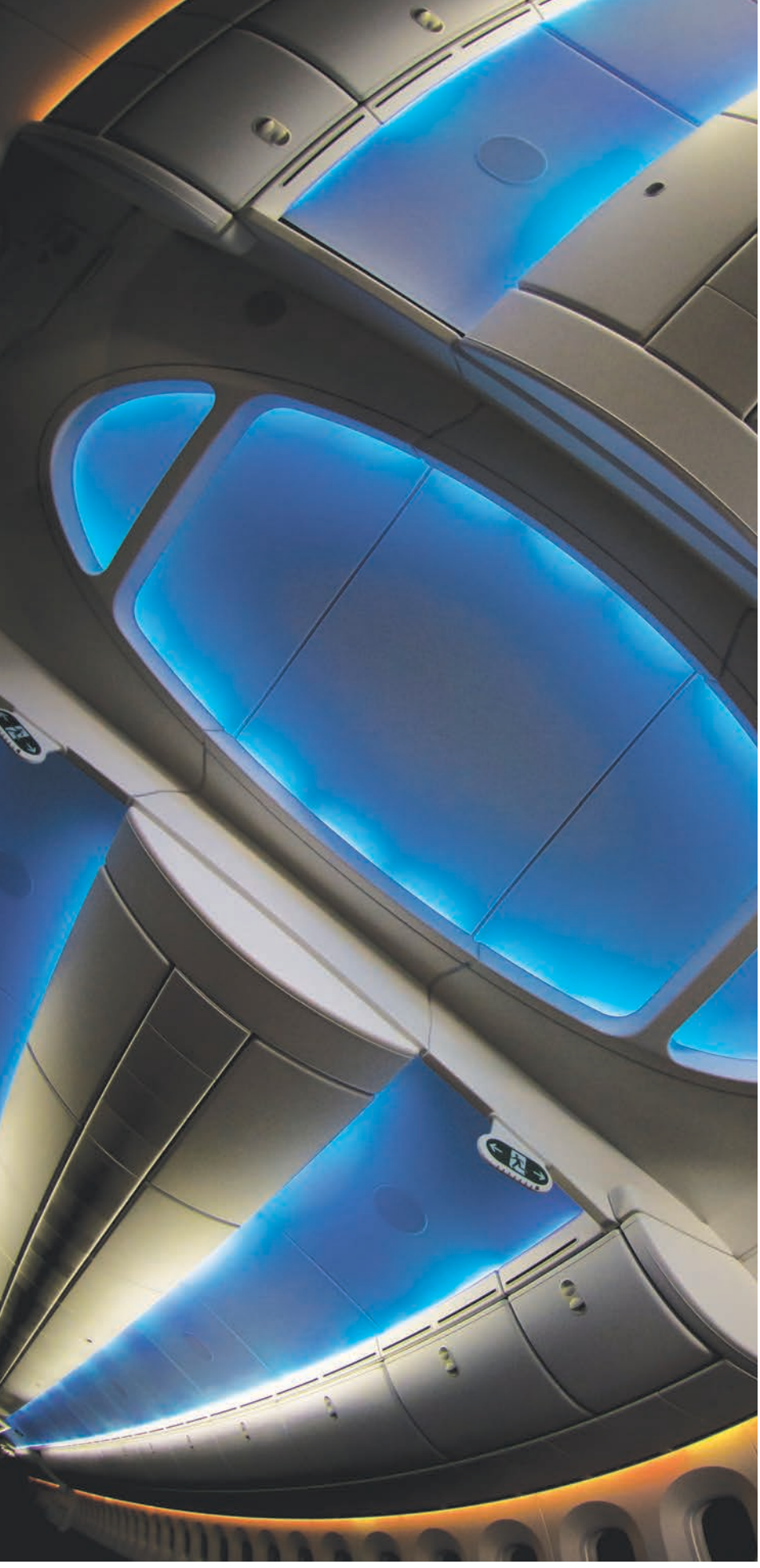
Emery is Boeing's cabin design expert. Officially recognized as the director of differentiation strategy for Boeing Commercial Airplanes, he's widely credited with bringing about radical change to the latest commercial jetliner interiors, for being a cutting-edge innovator, for taking chances. Often perched between two armrests, he studiously mulls his surroundings while coming up with countless ways to improve them.

"I think to be an innovator, you have to sort of think and see the world differently from others," said Jerry Allyne, Boeing vice president for Planning and Analysis. "Blake has a very distinctive sense of style. He appears to understand where markets may be going, and by markets, I mean things or attributes customers would value that others don't see yet. He's the over-the-horizon guy."

On this day, the trim, personable Emery holds court in a 787 Dreamliner mock-up tucked away inside the newly renovated Customer Experience Center in Renton, Wash. One minute he's seated, drawing curving lines on a writer's notepad to illustrate a point; the next, he's bounding up the aisle to offer more tangible examples, with passion and excitement in his voice.

Emery was a key member of a team responsible for bringing bigger cabin windows to the 787, for the optional spacious foyer and archway in the same airplane effectively used as a visual welcome mat for boarding passengers, and for the Boeing Sky Interior first introduced on the 737. These innovations provide a more pleasurable overall flying experience, and have been lauded by the public and industry analysts.

Yet it's a process that never

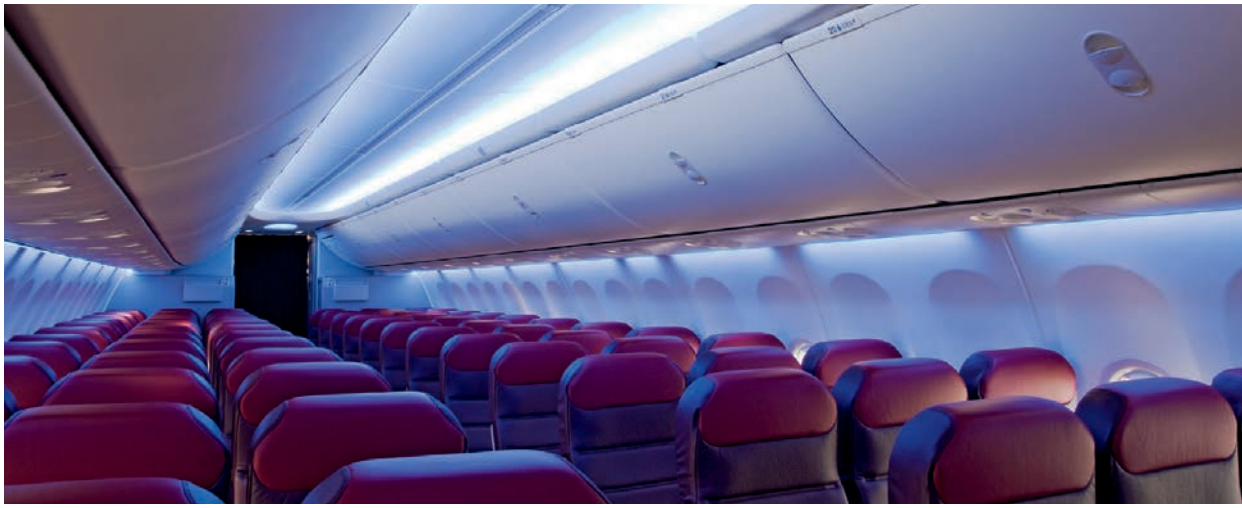


ends. With the launch of the 737 MAX and 777X, Emery now feels the need to top what the team did with its first set of unique cabin upgrades. Careful not to give away any trade secrets, he says larger passenger windows, windows in unexpected places and even more advanced cabin lighting are among the possibilities for future jets. This constant demand for innovation is not lost on him.

"I was there when the airlines said, 'Boeing, with this 787, you really raised the bar, you really made things better for the passenger experience—now do it again,'" Emery recalled. "I took it as a real compliment to Boeing. It's kind of like saying, 'You can do it; we know you can do it.' But it's a challenge."

Trying out something new has never been a daunting task for this Northwest native, the son of a boat builder who was born and raised in Renton, not far from his job, in a neighborhood filled with Boeing people. His rampant curiosity and need to experiment have been long-running traits.

Emery is a martial arts devotee, proficient in Taijiquan; he trains with a master and teaches a weekly class, and he uses the spiritual discipline to guide him in his other pursuits. He's a singer and a guitar player. A natural entertainer, he once cut a music compact disc with a fellow Boeing executive. He's a serious car enthusiast, finding a hobby that has enabled him to meet some of the world's leading auto designers and share in ideas that would work in



aviation—for example, the instrument panel look and feel in the 787 flight deck has elements from a car design. And he has a professional background in psychology, a field of interest that first brought him to Boeing as a teacher focused on work relationships and corresponding research.

"An important aspect of martial arts is opening the mind to learning," said John Barratt, CEO of Teague, the Seattle-based company that has partnered with Boeing on every one of its jetliner cabins starting with the 707. "Blake is a lifelong learner; his appetite for knowledge is part of what makes him great at what he does."

Originally hired by Boeing in the early 1980s to teach interpersonal management skills, Emery showed people how to be better listeners, business writers and public speakers. As his job morphed in different directions, and Boeing made it a priority to find ways to be markedly different in an increasingly competitive marketplace, Emery was asked in 1999 to lead a team that would travel to several countries and ask people what they wanted in an airliner, specifically cabin comfort.

From this research project, the team created a campaign called "airplanes for people," which was meant to personalize the flying experience for everyone, including crew, mechanics and passengers. Emery was fascinated by the idea of implementing notable change for Boeing. His team recommended the creation of a new position: director of differentiation strategy. Emery nominated himself.

"I was so interested in it and wanted to do it so badly, I stood up in a meeting with the leadership team and said, 'If I was the director of differentiation strategy, these are the kinds of things I'd be doing, and until someone tells me different, that's what I'm going to be doing,' " Emery said. "I stood up and basically gave myself the job."

Emery assumed his new role immediately, though it took nearly a year to become official. He began work on the interior and exterior look of the high-speed Sonic Cruiser, charged with bringing engineers and designers together in the creative process, until that project was replaced by the 787. Change remained high-priority, even with the shift in airplane direction. Without traditional training, Emery learned design concepts on the fly. He was not shy about offering suggestions, his ideas coming rapid-fire. He has been awarded 20 U.S. patents largely for seat, interior and exterior design.

"Sometimes you run into guys like him who are so far out there they have a hard time bridging back to reality, and Blake's not that guy," Allyne said. "He's able to bridge and think and bring it back."

With the success of the new interiors for the 787, 737 and 747-8, Emery has become a well-known creative face for Boeing, drawing international attention and leading to some interesting comparisons. A Peruvian newspaper likened him to the chocolate-minded Willy Wonka. The Chinese version of *Elle* magazine called him Gandalf, referencing *The Hobbit*. Even a Boeing video lightheartedly described Emery as a seat specialist, seat scientist and seat guru all in one, outfitting him first in a lab jacket and then a scarf.

With everything he does, Emery's mission has always been this: The psychologist in him wants to hear what others have to say and improve their relationships. That could involve two individuals, two groups of people, a group and a company, or even someone and an airline seat. He also wants to return people to a golden aviation age, where everything was once so new and a moment of discovery. And, if he's done his job well, there will be momentary angst along the way.

"I want people to be a little bit sad when the flight is over and they have to get off the airplane." ■

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PHOTOS: (Far left) An innovative cabin design and lighting help provide a sense of spaciousness, and the sky above, inside a Boeing Business Jet 787. **BOB FERGUSON/BOEING**. (Above, right) A 737 Boeing Sky Interior. **BOEING**

GRAPHIC: (Above, left) The futuristic Sonic Cruiser, shown in an illustration, launched interior concepts that later were used for the 787 Dreamliner and the Boeing 737 Sky Interior. **BOEING**

CUSTOMER PROFILE

Global reach

Emirates is one of the world's leading airlines, and a major Boeing customer and partner

By Bill Seil

It was a small, upstart airline with big ideas. On Oct. 25, 1985, the newly formed airline in the United Arab Emirates began passenger service from Dubai with only two airplanes, one a Boeing 737.

The airline's first commercial flight, using the other airplane, an Airbus A300, flew from Dubai to Karachi. Both jets had been "wet leased" from Pakistan International Airlines, meaning they were piloted and maintained by PIA personnel.

During its first season, the new airline flew to only four destinations: Bombay, Delhi, Karachi and Kuwait.

From those humble beginnings, Emirates has grown into the world's biggest international carrier and one of the world's most innovative long-distance airlines—and one of Boeing's most important Commercial Airplanes customers and partners.

Emirates operates more Boeing 777 jetliners than any other airline. It recently ordered 150 777X jets that Boeing is developing to succeed the 777. But Emirates is also a major Airbus customer. It has more A380s in operation, and on order, than any other airline. The double-deck A380 is the world's biggest passenger jet. Emirates has 53 in service, with 87 more on order. It also operates 34 other Airbus airplanes.

In part, the airline's rapid growth has been driven by the geographic location of Dubai. From Dubai, Emirates has the potential to reach 80 percent of the world's population, nonstop, within eight hours' flying time.

To take advantage of that hub and its growth, Emirates, owned by the government of Dubai, made the strategic decision to invest in the world's largest fleet of 777s and A380s to serve millions of passengers who pass through Dubai, with many staying for a time to enjoy a dazzling array of tourist attractions that have been developed over the years.

"It's truly a partnership between Emirates, the airport and all the adjoining infrastructure to bring success to Dubai," said Marty Bentrott, Boeing Commercial Airplanes' vice president for sales in the Middle East, Russia and Central Asia.

"It's a fairly unique approach, different

from other airline hubs around the world," Bentrott said. "There, it's all integrated—an integrated economic machine."

The airline carried 44.5 million passengers last year, a 13 percent increase from the previous period. Current growth levels project Emirates will carry about 93 million passengers in the year ending March 2020.

Bentrott said the economics and long-range capabilities of the 777 have long played an important role in the success of Emirates' business strategy.

Emirates took delivery of its first 777-200 in 1996. As the airline moved to extend its global reach, Emirates expanded its fleet with different 777 models. In 2011, Emirates announced an order for 50 777-300ERs (Extended Range) which, at that time, was Boeing's largest commercial airplane order by dollar value.

That order was surpassed in July of this year when Emirates ordered the 777X. The order became part of the largest product launch in commercial aviation history.

For several years, Emirates has played a significant role in planning the features and performance capabilities of the 777X. The airline's many years flying a large fleet of 777s has given it a wide-ranging knowledge of the airplane's performance and how it can be further improved, Bentrott noted.

"There's no question about it; Emirates has been integral in contributing to the development of the 777X," Bentrott said. "As a result, the airplane is going to deliver more value—not just to Emirates, but to the marketplace as a whole."

While Emirates' collaboration on the 777X was more extensive, it also was involved in design features of the 777-300ER.

Currently, Emirates has 142 777 jetliners in service, and 202 on order. It also operates two 747-400ER freighter jumbo jets. In addition, Bentrott sees Emirates as a potential customer for the 787 Dreamliner. Bentrott noted that Emirates has focused on widebody airplanes since the single-aisle market is served by Dubai-based flydubai, a low-cost carrier. However, Emirates does use widebody airplanes to service short-haul, high-volume routes.

Bentrott attributes a large share of Emirates' success to its president, Sir Tim Clark, a citizen of the United Kingdom, who has worked in the Middle East's airline industry for many years. He also has been a catalyst, pioneering the global use of the 777 in multiple ultra-long-haul routes.

"Sir Tim is a fabulous visionary for the industry, and certainly for

PHOTO: A Boeing 777-300ER (Extended Range) in Emirates livery takes off at Dubai International Airport earlier this year. Emirates is based in Dubai, United Arab Emirates. **SHUTTERSTOCK**

Emirates," Bentrott said. "He's constantly looking out into the future, trying to determine the efficiency gains that will be needed to continually improve the economic performance of his business. He's constantly looking at what type of passenger environment future air travelers will want to see."

Clark said Emirates' fleet strategy has focused on widebody aircraft that are fuel-efficient and capable of missions ranging from quick-turnaround regional flights in a desert climate to 17-hour routes over the North Pole.

"Emirates has been involved in the 777 program since 1996, and we've always had a constructive and consultative partnership with the Boeing team," Clark said. "For the 777X, we have been involved at every stage, from the airframe and wings to engines and cabin design. Our order for 150 of these aircraft gives a fair indication of our satisfaction with the resulting product."

Clark noted that Emirates, in addition to being the largest 777 operator in the world, is the only airline to fly all 777 variants. The 777-300ER makes up the largest part of its fleet by far.

"As an airline with a global route and network that spans six continents, we need efficiency, reliability and flexibility for our fleet," Clark said. "The 777-300ER ticks all of those boxes for us."

Scott Adamson, Commercial Airplanes director of Marketing for the Middle East, said Dubai has long had a tradition of being a crossroads of trade and transportation, even before the advent of commercial aviation. As the commercial aviation industry grew, Dubai saw it as a way to bring in business people and tourists.

"At that time, there was no Emirates and Dubai was not an aviation hub," Adamson said. "There was no major tourism. It was a fairly quiet community."

When Emirates was started, the airline was seen as an opportunity to attract commerce from India, Europe and Southeast Asia. Adamson said there was no expectation that Dubai would become the great hub it is today. It was well-positioned, but there were no commercial airplanes that could provide the ultra-long-range service needed to serve a global market in non-stop fashion. The arrival of jetliners such as the 777-200LR (Longer Range) and the 777-300ER began to change all that.

"The 777 was a game changer," Adamson said. "Soon, Emirates was able to fly from Dubai to virtually all points in the world nonstop."

Dubai's connectivity contributed to its ability to attract foreign investment and fuel infrastructure development, which included a big modern airport, first-class hotels, mammoth shopping malls and major tourist attractions. In addition to tourists, Dubai worked to attract meetings, conferences and exhibitions and made it easier for business travelers to spend extra time in the area.

Adamson said the mix of 777s and A380s works well for Emirates. While the 777 doesn't carry as many passengers as the A380, it is a very efficient airplane. Emirates often uses the A380 to serve routes with heavy traffic—thus limiting the number of individual flights that are needed and reducing airport congestion.

Bentrott said Emirates also attracts passengers by creating a positive flying experience—from first class to coach.

"They have high-quality meal and beverage services, and there's a terrific selection of on-board entertainment," Bentrott said.

And Emirates flight attendants are focused on making sure the trip is an enjoyable experience, he added. The on-board staff is made up of people from multiple cultures. That means there's a good chance most passengers can communicate with a flight attendant in their own language.

"Emirates is an amazing airline and a fabulous partner for Boeing," Bentrott said. "Given the quality of their product, there's no doubt in my mind that they're going to continue to grow and expand their network. We're looking forward to continuing this important relationship for years to come." ■

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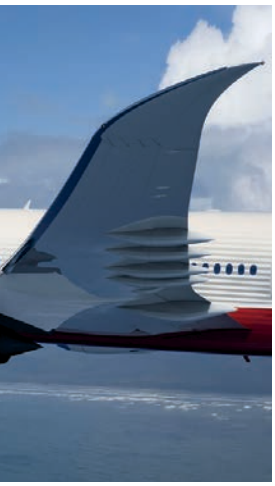

GRAPHIC: (Top left) An artist's concept depicts a Boeing 777X forward fuselage and wing. Emirates has ordered 150 777X jets. **BOEING**

PHOTOS: (Top right) A Boeing 777 in Emirates livery is parked nose to nose with an Emirates SkyCargo 777 Freighter. **GAIL HANUSA/BOEING** (Below) A view of a Boeing 777 and one of its General Electric engines, at Dubai International Airport. **SHUTTERSTOCK**

MILESTONES

Fire in the sky

A Greek Army Aviation AH-64D Apache Longbow helicopter launches decoy flares during a flight demonstration at the Athens Flying Week air show, held near the Greek capital in late September. The flares are a countermeasure to divert heat-seeking anti-aircraft missiles. Boeing employees build the Apache in Mesa, Ariz. PHOTO: GETTY IMAGES


BACK TO SPACE,
THE AMERICAN WAY.
Boeing's Commercial Crew Transportation System will provide NASA with safe, reliable crew and cargo transportation to the International Space Station. The CST-100 is an American spacecraft that will launch from American soil. Boeing is proud to partner with NASA in restoring a U.S. capability critical to a robust exploration program.
BOEING