



Frontiers

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MAY 2012 / Volume XI, Issue I

Wired for success

Boeing El Paso is a
strategic manufacturing
center for electronics





“We’re helping to
define the future
of flight.”

Marty Bradley
Technical Fellow
Boeing Research
& Technology

SUGAR VOLT

Stories of
innovation
at Boeing



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Ad watch

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

Inside cover:



"Sugar Volt" is one in a series of innovation stories told by Boeing employees such as Marty Bradley. Learn more at www.boeing.com/stories.

Page 6:



This ad celebrates the delivery to Emirates of the 1,000th 777 built. With this delivery Emirates now operates over 100 777s, more than any other airline.

Pages 12-13:



Created for the Boeing Global Supplier Conference, this ad congratulates recipients of the 2011 Supplier of the Year awards and reflects the conference theme of "Shaping our success. Creating a shared vision."

Back cover:



This ad highlights the unique capabilities that allow the V-22 Osprey to provide humanitarian aid and disaster relief to those in need throughout the world. The ad currently appears in military trade and political publications.

24 Wired together

Although they may not be in the spotlight that falls on Boeing's bigger facilities, employees at the El Paso site in Texas have an important mission that makes big things at Boeing possible. They produce complex electronic assemblies and subassemblies for Boeing aircraft such as the C-17 and F/A-18 Super Hornet and for other platforms, including the PAC-3 missile system.

COVER IMAGE: MANUEL MAYNES, GENERAL ELECTRONIC MECHANICAL ASSEMBLY SPECIALIST, APPLIES SILICONE COATING TO ELECTRICAL CONNECTIONS TO PROTECT THEM FROM EXPOSURE TO ENVIRONMENTAL DAMAGE AND DEGRADATION. BOB FERGUSON/BOEING

PHOTO: SOLDERING ELECTRICAL COMPONENTS ONTO A TERMINAL BOARD. BOB FERGUSON/BOEING



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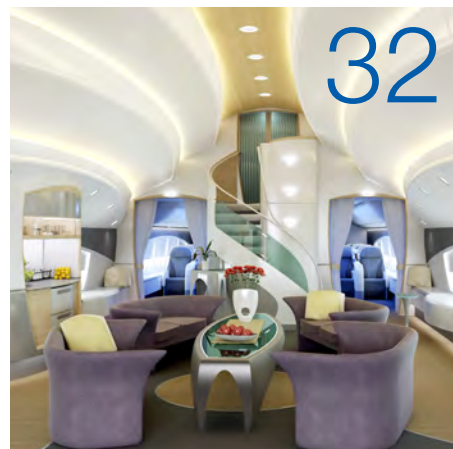
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Cleaner skies ahead

A Next-Generation 737-800 scheduled to be delivered to American Airlines later this year will first make a series of test flights as part of Boeing's ecoDemonstrator program. The flights will evaluate emerging technologies that improve environmental performance.

PHOTO: MARIAN LOCKHART/BOEING



The sky's the limit

From kitchens similar to what might be found in a home, to bedrooms with showers, when it comes to luxury interiors the possibilities are almost limitless. Boeing Business Jet operators use these long-range aircraft as a global business tool. One owner spoke with *Frontiers* about his two BBJs and why he's sold on Boeing. GRAPHIC: BOEING



Business without borders

Around the clock and around the globe, Boeing's international partnerships are integral to the company's ability to grow sales and global market share.

PHOTO: PETER ASHBY-HAYTER

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Boeing's competitive advantage is and always will be its people. To meet future business needs, Boeing recruiters are looking for qualified people from a variety of backgrounds, cultures and with different experiences—a new generation of employees who will keep Boeing competitive and a global leader in aerospace.

PHOTO: BOB FERGUSON/BOEING



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Meet Boeing's experts

They solve exceptionally difficult problems. They help Boeing define its technical strategies. They are recognized as authorities on national and international levels. Meet Boeing's five newest Senior Technical Fellows.

PHOTO: BOB FERGUSON/BOEING





FOR EMIRATES, OUR 1,000TH PRIDE AND JOY.

It's our 1,000th 777. And we're delighted to deliver it to Emirates, the world's largest 777 operator. Moreover, we're proud to salute our employees, suppliers and the Puget Sound community for making the Boeing 777 all that it is.



The right path

Working together has reduced Boeing's future health care costs—but there is more to do

In the past few years, Boeing has added new elements to its health care program to be proactive in reducing health care costs while continuing to provide employees and their dependents with comprehensive and market-leading medical coverage. We remain focused on controlling health care costs to help Boeing strengthen its competitive edge in our global markets. For the same reason and for employee well-being, it is equally important that we continue to emphasize the personal responsibility employees have for managing their health, living a healthier lifestyle and making good benefit choices.

Controlling future health care costs will remain an ongoing effort, as it is essential in sustaining Boeing's ability to invest in new products and services, price them to be successful against competitors' and, ultimately, create job opportunities for employees. As a result, our journey will continue to include a sharp focus on helping employees reduce their health risks.

A look at the numbers shows that working together has placed us on the right path. Boeing has many health care plans for different groups of employees, both union and nonunion, and with some variations by business unit. Looking at the health care plans individually, we see differences in our success in controlling their year-over-year costs. Overall, however, the \$2.3 billion that Boeing spent for health care plans in 2011 reflects a year-over-year increase of less than 2 percent, down substantially from an average annual increase of 7 to 8 percent during previous years. We also see great success from employees' actions in helping us manage future health care costs. For example, more than 58,000 employees signed up for the Boeing on the Move II physical activity challenge last year, a 46 percent increase over the 2010 participation level.

Digging a little deeper, an analysis of Boeing's health care spending reveals that about \$1 billion, roughly 40 percent of our health care costs, results from basic risk factors—such as stress, inactive lifestyles, smoking and not eating properly—that each of us can do something about every day. So, it's gratifying to see so many employees engaged in our Well Being programs,



“Controlling future health care costs ... is essential in sustaining Boeing's ability to invest in new products and services.”

— Rick Stephens

*Senior vice president
Human Resources and Administration*

PHOTO: BOB FERGUSON/BOEING

living healthier lifestyles and making thoughtful decisions about their health care and use of benefits. It shows the progress that employees and dependents are making in taking charge of their health to reduce those risk factors. These efforts and continued participation in our Well Being programs will help us with this \$1 billion challenge.

Looking ahead, the U.S. health care system is currently in a state of flux. Regardless of the outcome of legislative and other governmental changes to health care, we are moving forward with what we need to control future costs. Although our U.S. competitors are cutting health care benefits and eliminating a choice in health care plans, we want solutions that support our commitment to offer employees affordable, market-leading health care benefits. We prefer partnering with employees, encouraging them to take charge of their well-being and become informed consumers when making health care decisions.

Be sure to watch for more information and get involved. It's for your health and Boeing's future. ■

PLANE GEOMETRY

The underside of the tail section of a Boeing 717 is painted in the colorful livery of Volotea, a new European low-cost carrier that began operations last month. The all-717 airline is headquartered in Barcelona, Spain, and is leasing its fleet from Boeing Capital Corporation. BCC delivered the first airplane in January and followed with two more. PHOTO: ASSOCIATED PRESS

“The airplane has had a tremendous ability to adapt that I don’t think any aircraft, other than perhaps the DC-3, can claim.”

– Retired Brig. Gen. Peyton Cole, a former B-52 bomb wing commander, talking about the venerable bomber. The prototype made its first flight 60 years ago, in April 1952, at Boeing Field in Seattle. In Florida Today, April 16.

“Flight attendants have been requesting shifts aboard the new plane saying they prefer to work in the 787’s environment.”

– From April 3 New Zealand Herald story about the passenger experience aboard an ANA (All Nippon Airways) 787, referencing its lower cabin altitude, higher cabin humidity, roomier cabin feel and electronic window shades.

Power shift

For this employee, helping Boeing conserve energy has been a rewarding journey

By Elizabeth Davis

Although he never intended to champion energy conservation, John Norris is the resident expert on how Boeing sites can save energy and cut costs. In this *Frontiers* series that profiles employees talking about their jobs, Norris discusses why he is committed to conserving energy and encouraging others to do the same. PHOTO: MARIAN LOCKHART/BOEING

When I started my facilities engineering career, I didn't give much thought to the price of energy. As I've discovered, though, it's impossible not to be concerned about energy consumption and conservation.

About a decade ago, I participated in an Accelerated Improvement Workshop, or AIW, for the 717 program in Long Beach, Calif. These workshops aim to quickly eliminate waste and generate systemic improvements in the factory and program.

I was struck by the amount of wasted utilities, especially electricity, at our manufacturing sites. I wondered if we could take the workshop format and apply it toward finding ways to cut energy costs and consumption in Boeing buildings and factories.

In Long Beach, for example, the primary manufacturing building left all of its High Intensity Discharge lighting on even when no one was there. Each light bulb used about 1,000 watts of electricity. Most people in the factory also used fluorescent stand lights.

I suggested they turn off lights during off hours. The employees went a step further: They opened the factory doors and discovered they didn't need to use the high-intensity lights. They also reduced

their use of office lighting and turned off lights when they left for the day. The site saw a huge drop in its electricity usage.

I never imagined that this idea would develop into Energy AIWs and then into the Lean Energy Assessment Program, where our team would identify over \$20 million per year in potential energy-saving recommendations. With a focus on lighting and electrical systems, building mechanical systems and employee awareness, we developed standardized steps the sites could take—and saved enough energy to power more than 20,000 average U.S. homes for a year.

As I've traveled to various sites conducting audits, I've felt great satisfaction seeing the many changes and improvements in how we've reduced our energy consumption. I've also heard from employees that they like the new lower-cost, lower-consumption lighting systems we've installed.

I know I'm just one person, but I can see the potential effect on the environment as a result of wasting energy. It's simple, really. Saving energy equals saving money and saving the environment—and I'm passionate about all three. ■

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Frontiers

Boeing's magazine for employees celebrates 10 years of publication

Ten years ago this month, Boeing employees were welcomed to the first issue of their new monthly magazine, *Frontiers*, which replaced the biweekly Boeing newspaper. Aptly named, it was an opportunity to push into new frontiers as a high-quality, four-color magazine to best tell the global story of Boeing, its people and the amazing things they do.

That first *Frontiers* cover story in May 2002 featured the incredible transformation the company had been undertaking, building from an industry leader reliant on commercial aircraft for the lion's share of its revenue into a diverse and balanced global aerospace giant.

Today, Boeing is indeed a global company: A story on Page 35 of this issue, about the importance of Boeing's partnerships around the world, notes that the share of defense revenues derived from outside the company's traditional United States market is well on its way to meeting the company's goal of 25–30 percent by the end of 2013.

As from the first issue, *Frontiers* remains committed to helping employees better understand the company's strategic goals, such as continuous improvement, innovation, protecting the environment and international growth.

Just as Boeing has changed over the past decade, so has *Frontiers*. We are always working to improve the magazine's design, photography, content and readability. The online experience of reading *Frontiers* recently was enhanced



with user-friendly software that allows readers to easily flip through the pages and share stories by email, Facebook and Twitter. It's on the public Internet at www.boeing.com/frontiers.

One thing we will not change is our commitment to being the magazine for and about Boeing employees. In this issue, for example, a photo essay on Page 24 profiles the Boeing team that performs important electronics assembly and wiring work in El Paso, Texas.

Frontiers is distributed to employees at Boeing facilities around the world. Recently, as part of a pilot program, *The Seattle Times* began to include a complimentary issue of *Frontiers* with

"It's not often that we have the chance to make history, do something big and bold that will change the world in untold ways and endure long after we are gone."

—Jim Albaugh, president and CEO, Commercial Airplanes



the daily newspaper once a month. That means we're now sharing *Frontiers* with more than 220,000 new readers in the Puget Sound region—friends, neighbors and potential employees—who are getting to know more about Boeing and its people.

It's an exciting development. But the magazine would not be possible without the ideas and contributions of our many Boeing colleagues worldwide, including photographers, writers and designers. We thank them, and especially our readers, for these past 10 years—and for new *Frontiers* ahead. ■

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PHOTOS: (Far left) Boeing's new Chicago headquarters graced the cover of the first issue of *Frontiers*, May 2002. **(Below and right)** *Frontiers* layouts and covers from throughout the years. **BOEING**

TO BOLDLY GO

The space shuttle program has had a remarkable run that has spanned more than three decades and helped shape many Boeing careers

By Bill Seil

The space shuttle and its essential role in the assembly of the International Space Station have defined the Space Age for a full generation.

The first shuttle to orbit Earth, Columbia, was launched 30 years ago, on April 12, 1981. When Atlantis makes the first shuttle flight, tentatively scheduled for July, it will mark the end of a remarkable chapter in the history of space exploration and discovery—one that Boeing and its partner companies helped write.

While lacking a dazzling director's moment of success, such as the Apollo 11 moon landing, the space shuttle had gradually and forcefully transformed the ability of humans to live, build and respond to challenges in space. It has also set the stage for future lunar and interplanetary missions.

John Mulholland, vice president and program manager, Boeing Space Shuttle

"It's going to go down as a remarkable achievement and its legacy will be very strong. It's been inspirational to the nation, and its success has made an enormous contribution to our future in space."

—John Mulholland, vice president and program manager, Boeing Space Shuttle Program

PHOTO: Columbia lifts off from Kennedy Space Center on the first shuttle flight into space in April 1981.



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“One of my favorite publications of *Frontiers* is when the Space Shuttle program was ending and a small poster was included of the last landing. I used to work for a different company that tested the rocket boosters for the space shuttle. Now at Boeing, I see the cross-link of engineering across industries in the space program. It reaffirms the goal that many people need to come together to make an everlasting product that is both amazing in technology and significant in history!”

Melissa Yuen, structural/stress analyst
Defense, Space & Security
Ridley Township, Pa.



“*Frontiers* exemplifies the ‘One Boeing’ mindset by bringing us all together and showcasing our achievements.”

Susan McKee, Enterprise Security, Flight Test Credentialing Shared Services Group, Boeing Field, Seattle

“*Frontiers* magazine really brings into focus many facets of the company that we don’t always get to see or experience ... it draws us into another part of the Boeing world. Congratulations on your 10th anniversary.”

Alice Rafidi, Product Lifecycle Management
Defense, Space & Security, Huntington Beach, Calif.

“It is very inspiring to see articles describing our accomplishments. Knowing that the rest of the company is excited for what we are achieving really helps foster an environment filled with self-motivation and inclusion.”

Nick Noble, Manufacturing manager, 787 Internal Systems
Boeing Commercial Airplanes, Everett, Wash.

“I look forward to reading the Historical Perspective section every month. The shared history of The Boeing Company is so rich and interesting.”

Neil Phelps, Reliability engineer, 777 fleet support, Boeing Commercial Airplanes, Everett, Wash.



SHAPING OUR SUCCESS. CREATING A SHARED VISION.

Congratulations to the 2011 suppliers of the year.

Their vision and superior performance have helped us achieve a shared success.



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Frontier Electronic Systems Corp.
Harper Engineering Company
Integral Products, Inc
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Ferra Engineering
Aerospace Dynamics International, Inc
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Orion Industries
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Rensselaer Polytechnic Institute
Georgia Institute of Technology
Airgas, Inc
TEAGUE
BAE Systems
Fuji Heavy Industries, LTD

To learn more about recognition programs or for a list of the 2011 Performance Excellence Award recipients, visit boeingsuppliers.com/recognition



Clean getaway

Employees make delivering a jetliner easier on the environment—and better for Boeing

By Patrick Summers and photos by Gail Hanusa



This is another in a series of articles focusing on how Boeing employees are making a difference in the company's commitment to environmental stewardship.

Forgoing a fuel-filter change on a jetliner as big as the 777 might seem to be a small step in reducing waste and helping the environment.

But a team of environmentally engaged employees on the Everett, Wash., flight line has combined this and other changes to make flight-testing and delivering a 777 significantly cleaner, quieter and easier on the environment.

"We wanted to reduce the environmental impact of the 777 preflight and delivery process, which includes activities such as painting and engine testing," explained Carolyn Barnes, 777 Operations support.

Last fall, the team designed a package of 10 environmental initiatives that is reducing jet fuel use by 300,000 gallons (1.1 million liters) and carbon dioxide output by 5.5 million pounds (2.5 million

kilograms) annually in the 777 delivery process, along with other environmental improvements.

"These initiatives are cutting costs and improving productivity, which means we're not only reducing our environmental footprint but also improving the company's business performance," said Cindy Chan, an environmental engineer with Commercial Airplanes.

Several of the initiatives already had been implemented by Employee Involvement and process improvement teams elsewhere on the flight line or in the Everett factory.

"We started by looking at what other teams had done and what was working," said Danielle Vardaro, an advanced developmental composites engineer with Commercial Airplanes.

The next step was to produce the data that proved the initiatives would deliver the intended benefits and help Boeing reach its targets of reducing waste and boosting recycling.

These activities include:

- Using chrome-free paint primer, which cuts down on hazardous materials and enhances workplace safety for paint and maintenance crews
- Eliminating redundant engine testing; the program dropped engine-run tests already performed by engine manufacturers, helping reduce community noise and emissions
- Retaining the hydraulic and engine fuel filters used in flight test; engineers demonstrated the filters did not need to be changed before airplane delivery, reducing the amount of hazardous waste generated
- Recycling unused jet fuel from flight tests by deploying fuel bowsers, or tankers, at each fuel station
- Improving flight-test planning, which boosts efficiency and reduces flight times and fuel consumption
- Using electric instead of gas-powered vehicles on the flight line
- Reducing the amount of potable water needed in flight test
- Promoting greater flight-line and paint hangar recycling

The team chose a "pilot" 777-300ER (Extended Range) to test bundling the initiatives, and received permission from customer Air New Zealand to implement all 10 in the preflight and delivery process. Vardaro said the initiatives were well received by the customer and flight-line management. Nine now are routinely part of all 777 deliveries. The use of chrome-free primer is a customer option.

Other airplane programs also use several of the initiatives, and the team hopes more will be replicated. Team members say the project has also brought them a lot of personal satisfaction.

"It shows," Chan said, "that every employee can make a difference and help Boeing be a better company." ■

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PHOTOS: (Left) Chrome-free primer is applied to a 777-300ER (Extended Range) in Everett, Wash. The elimination of chrome in paints and primers reduces the amount of hazardous chemicals used in airplane production. **(Above left)** Cindy Chan, from left, environmental engineer, Craig Herndon, aircraft maintenance technician, and Stephanie Wong, Operations support, check a 777's GE90-115B engines. Redundant engine tests in the 777 delivery process have been eliminated, reducing fuel use, emissions and community noise. **(Above right)** Mike Day, left, aircraft maintenance technician, and Carolyn Barnes, Operations support, review flight-test schedules. Careful planning reduces flight times, fuel use and emissions.

Talent search

Boeing focuses on recruiting to meet future business challenges

By Bev Holland and Robin McBride

Commercial Airplanes design engineer Roshani Patel and Fabrication employees Brian Bettes and Uriel Lopez were all looking for different things in a company, but each found what he or she was seeking at Boeing.

"I was looking for a diverse company," said Patel, a new Structural & Payload engineer with the Next-Generation 737 program in Renton, Wash. The culture of Boeing, she added, "is like a family. It's kind of a life choice."

A recent Aerospace Engineering graduate of Iowa State University, Patel came face to face with Boeing recruiters last fall at a conference in Chicago.

After the U.S. economy's low point in 2009, hiring at Commercial Airplanes began to slowly climb as airline customers recovered. In its Current Market Outlook, Boeing forecasts demand for more than 33,000 new commercial airplanes globally in the next 20 years.

For Boeing, skilled manufacturing talent is crucial to meeting that surging demand and successfully tackling a \$308 billion backlog of jetliners.

"We continue to focus on recruiting skilled and motivated employees, including machinists, engineers and other professionals, to meet the demands of commercial airplane customers," said Rick Stephens, senior vice president of Human Resources and

Administration. "We also continue hiring for critical skills that support our pursuit of new defense opportunities internationally and in targeted adjacencies.

"With so much critical work in front of us," Stephens said, "we recognize the importance of attracting new people to the company, while making sure we continue to develop the skills and talents of our people."

Last year, Bettes, a subassembly mechanic at Boeing Fabrication in Auburn, Wash., was driving fuel tanker trucks. But the father of two young boys wanted a job with more stability and opportunities to advance and learn new skills. He knew that production at Boeing Commercial Airplanes was ramping up. Then he learned from a local news story that community colleges and technical schools in the Puget Sound area were preparing new Boeing workers.

Lopez, a hand-finisher in the extrusion area at the Auburn plant, came to Boeing in October, right out of Auburn Senior High School. Besides academic courses, he took electronics and wood shop. His shop skills transferred to the work he does today finishing metal parts.

"Since I was 8 years old," Lopez said, "I always wanted to work on planes. Right when I turned 18, I wasted no time. I went online and started applying."

During high school, Lopez worked in landscaping, busing tables

"We continue to focus on recruiting skilled and motivated employees, including machinists, engineers and other professionals, to meet the demands of commercial airplane customers."

– Rick Stephens, senior vice president of Human Resources and Administration



PHOTO: Roshani Patel, Structural & Payload design engineer for Next-Generation 737 Wing Box in Renton, Wash., joined Boeing Commercial Airplanes in January. “Working at Boeing is not so much what I’m doing,” she said, “but what I get to be a part of.”

BOB FERGUSON/BOEING

Talent search



and hosting at a restaurant, and cleaning horses and stables at a local ranch. At school, when he finished his schoolwork, he'd apply for the latest Boeing jobs online. Last May, Boeing called and he was interviewed in June.

"They asked me a couple questions, and I told them this was my dream. I told them the classes I took in school."

In August, Lopez learned he'd landed the job. "When I finish a part, I think: These people are going to be safe because I did this part to the best of my ability," he said.

While Lopez and Bettes applied to Commercial Airplanes directly, Defense, Space & Security employees also are bringing their expertise to Commercial Airplanes to support rate increases.

U.S. defense budgets are shrinking, but since 2010, more than 2,000 former Boeing defense-side employees have secured new positions in Puget Sound and other Commercial Airplanes locations. While they get to expand their skills, the company retains knowledge important to future international defense opportunities and in adjacencies such as unmanned systems, cybersecurity and C4ISR (Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance).

Boeing's two main businesses—defense and commercial—must take a long-term view, according to leaders of both.

"This means we need to continually fill the pipeline from a broad spectrum of people who can contribute their individual

insights to help us develop products that are of the highest value and quality," said Mike Delaney, Commercial Airplanes vice president of Engineering.

For Boeing Defense, Space & Security, the same is true despite the dynamics of the current U.S. defense budget, the business unit's major customer.

"While we've had reductions in particular geographic and skills areas—due largely to government spending cuts affecting defense and space programs—we recognize the need to keep attracting and developing top talent for our long-term workforce and business needs," said Rick Baily, vice president, Engineering & Mission Assurance for Defense, Space & Security. "There has been a significant volume of activity for our enterprise engineering skills teams over the past couple of years."

Boeing goes to great lengths to find talented people.

In addition to recruitment fairs at major universities and internal recruiting events to help employees find and pursue new opportunities as defense programs conclude, recruiters seek out organizations that can be considered talent pools. For example, Patel caught up with a Boeing recruiter at a Society of Women Engineers (SWE) conference in Chicago last October.

"Everyone in my Aerospace Engineering program wanted to work for a top company like Boeing," Patel said.

"During the SWE career fair, Boeing recruiters took the time



It 'fits my pace'

Software engineer finds a home with cybersecurity team

Sarah Rhoades was lucky enough to land a job right after college—as a software engineer at New Mexico State University in Las Cruces last year. While she enjoyed the work, she began to realize that to pursue the career she wanted, she would need to move.

She applied online at the Boeing Careers site (www.boeing.com/careers) and, last July, landed a position as software engineer in the Washington, D.C., area for Defense, Space & Security. Same title, very different job. Within a few months she moved to her current position

as a software engineer in cybersecurity, and she says she reached the cosmopolitan, fast-paced world she was seeking.

"It was a huge culture shift for me," she said. "But it fits my pace. Since high school, I've wanted to do website design and software engineering."

As cyberattacks within governments and businesses grow at a rapid pace, cybersecurity is an expanding area of emphasis in BDS, explained Dewey Houck, vice president and general manager, Boeing Information Solutions.

"In an era when massive amounts of

data are being collected through various means, including sensor inputs such as cameras and cyberthreat-detection software, customers are looking for an information advantage," he said. "It begins with the situational awareness and analytical support tools that Boeing and its partners provide. We are constantly looking for employees with the skills and expertise to join our software solutions team."

Rhoades said she also feels good about the defense aspect of her job. "I enjoy having an impact on protecting our country," she said.



PHOTOS: (Above) Brian Bettes, a subassembly mechanic at Boeing Fabrication in Auburn, Wash., found a mentor two weeks into his new career. He now is “shadowing” an experienced employee. **BOB FERGUSON/BOEING (Inset, left)** Enjoying the fast pace of life in Washington, D.C., software engineer Sarah Rhoades feels good about her choice of career with Boeing Defense, Space & Security. **FRED TROILO/BOEING**

Talent search



to meet with me one on one. They asked important questions that reflected Boeing's needs."

After the initial meeting, Patel was called back for a second interview.

She began work in January.

After learning that Boeing needed more mechanics, Bettes enrolled in an assembly mechanic program at Renton Technical College, affiliated with Edmonds Community College. Course work included general knowledge about Boeing and its history, online training in reading drawings and using tools, and hands-on training using equipment and tools similar to those used at Boeing. In October, he received his assembly mechanic certificate and college credit. A month later, Bettes had an interview at Boeing, and in February, a job offer.

He started March 2 at Boeing Fabrication.

With an 18,000-person increase in Boeing hiring last year,

training becomes critical. Patel said she was offered classes in a number of different areas soon after she came aboard.

"My manager also referred me to the Boeing Mentor program," she said. "From day one, if I have questions, there's always someone to help."

Bettes and others like him who are part of the latest generation of Boeing employees have similar reactions.

"I've never worked for a company that provided so much training," he said, adding: "I'll be doing blueprint reading and some hands-on training."

Still in pre-job training classes when he spoke to *Frontiers*, Bettes noted he "can't wait to get on the [factory] floor." ■

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Boeing strategy: Diverse sources of talent

Where does Boeing look for talent?

Widely. That's the one-word answer.

Joyce Tucker, Boeing vice president of Global Diversity and Employee Rights, says the company strives to "tap into the diversity of all people—their different ethnicities, cultures, backgrounds, experiences, perspectives and talents—so we can leverage these differences as strengths to create a competitive advantage for Boeing."

Boeing recruiters have a strong and coordinated engagement with diversity-oriented organizations such as the Society of Women Engineers.

Veteran recruiting brings results, too.

"Boeing has recruiters dedicated and

trained to work with the military and veterans organizations," said Glennon Cook, director of Boeing Global Staffing.

Boeing significantly exceeded its expectation of hiring 1,000 veterans last year, adding more than 1,800. (For more information, visit <http://jobs-boeing.com/transitioning-military>.)

Recruiters also scour online job boards. Accompanied by hiring managers, they visit scores of college campuses and attend and host job fairs, including those helping to redeploy current employees. Hundreds secured new positions within Boeing following the conclusion of the Space Shuttle program.

Hiring at Boeing targets critical skill

needs, such as engineering, cybersecurity and airplane production. Job seekers will find openings in nearly every skill and business, whether it's company expansion or just normal attrition as people retire or move to other job opportunities within the company.

Job seekers start at Boeing's Careers website (www.boeing.com/careers) or the companion site for employees, the Boeing Enterprise Staffing System, known as BESS. Candidates also can reach Boeing on Facebook. Posting a job-specific resume begins the application process. When selecting people to interview, managers look only at the resumes job seekers post.

PHOTO: Uriel Lopez, a hand-finisher in the extrusion area at Boeing Fabrication in Auburn, Wash., knew he wanted to work on airplanes when he was growing up. He applied for jobs at Boeing while attending high school and began work in October. **BOB FERGUSON/BOEING**

By the numbers...

- Hired **18,000** employees in 2011 (mix of replacement and new positions)
- Forecasting **11,000** new hires in 2012
- Between now and 2014, Boeing expects to replace an additional **30,000** employees who will leave the company





High performance

When it comes to the environment, the sky's the limit for Boeing's ecoDemonstrator

By Bret Jensen

Before a new Next-Generation 737-800 is delivered to American Airlines later this year, it will take to the skies loaded with testing equipment, on a mission to find and test significant advances in environmental and fuel efficiencies.

The flights, made in partnership with American Airlines, are part of Boeing's ecoDemonstrator Program. Each year for the next several years, Boeing will fly a demonstrator airplane to test emerging technologies aimed at reducing fuel consumption, reducing noise inside the airplane and in surrounding communities, and testing sustainable materials.

Behind the program is a "One Boeing" team with participation from Boeing Research & Technology, Commercial Airplanes, Boeing Test & Evaluation, Environment, Health and Safety, and many others.

The program is part of the Commercial Airplanes Product Development organization where the Environmental Performance group focuses on innovation for the benefit of the environment.

"The ecoDemonstrator Program is a strong example of how Boeing has chosen to demonstrate our commitment to the environment," said Jeanne Yu, director of Environmental Performance for Commercial Airplanes. "The program accelerates technology through innovation by testing it on aircraft."

This year's platform, the 737-800 destined for American Airlines, will be outfitted after final assembly with some of the latest developmental technology.

"Flying responsibly means being strong stewards for the environment," said David Campbell, vice president of Safety, Security and Environmental for American Airlines. "This is the right step forward to help our overall industry improve our impact on the environment."

After testing is completed, the airplane will be refurbished for delivery to American in November.

"With the use of the American Airlines 737, we have a tremendous opportunity to integrate and validate these technologies on one of the most efficient aircraft flying today," said David Akiyama, ecoDemonstrator program manager.

The first technology suite to be flown in 2012 includes a smorgasbord of

innovations. For example, the wings will be fitted with adaptive trailing edges. While not noticeable to the average passenger, these small, flaplike devices can be optimized over the course of a flight. The adaptive trailing edges tailor the airflow over the wing, reducing fuel burn at takeoff, climb and cruise and reducing community noise at takeoff.

Maturing this technology, along with a portion of the flight-test program, is made possible through funding provided by the U.S. Federal Aviation Administration's Continuous Lower Energy, Emissions and Noise program, known as CLEEN.

"The ecoDemonstrator program is important because we need to provide a platform to test these cutting-edge technologies," said Frederick "Tad" Calkins, an engineer in BR&T's Aerosciences group and principal investigator for the adaptive trailing edge technology development.

The American Airlines airplane is

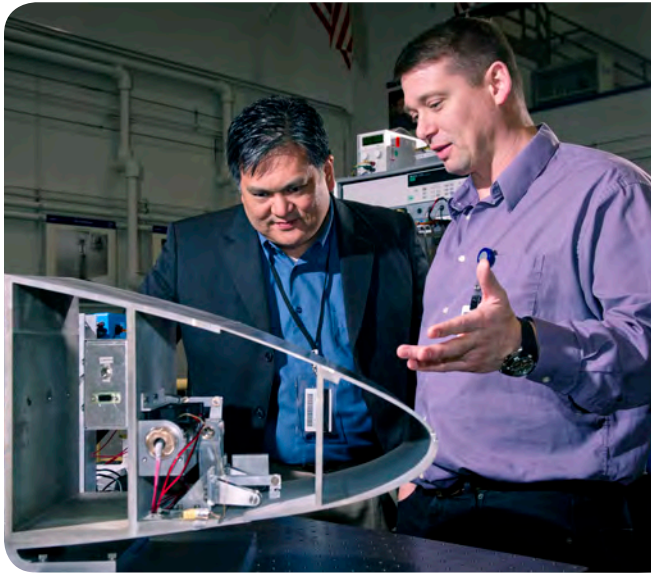
scheduled to roll out of the Renton factory in late June and then spend one month being outfitted with the technologies, before beginning a one-month flight-test program. The goal is to finish flight testing in late September.

But that won't be the end of it.

The Boeing team already is planning and auditioning innovations for the 2013 ecoDemonstrator. The test-bed airplane will be a 787.

"Each ecoDemonstrator," Akiyama said, "will feature a continuous parade of technology that we'll test for possible incorporation on our future airplane models. Technology is the best path for reducing emissions, lessening noise, and making our current and future airplanes the most environmentally responsible portion of the global air transport industry." ■

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New technology on the ecoDemonstrator

- A variable area fan nozzle where the exhaust area of the engine casing can be changed to reduce community noise and improve engine efficiency
- An active vibration control system developed with supplier Hutchinson Aerospace to reduce noise associated with engine vibration
- A regenerative hydrogen fuel cell developed by Ishikawajima-Harima Heavy Industries that provides an alternative source of power for overall airplane efficiency; the fuel cell efficiently stores and generates power, and it adapts to aircraft electrical systems' demand, potentially reducing weight, fuel burn and carbon emissions

PHOTO: David Akiyama, left, Commercial Airplanes ecoDemonstrator program manager, and Frederick "Tad" Calkins, Boeing Research & Technology Aerosciences engineer, examine a model of wing hardware. MARIAN LOCKHART/BOEING

Electrifying performance

Boeing's El Paso site may not be big, but the work employees do there makes big things possible

By Cassandra Bantly



PHOTOS: (Right) The Boeing El Paso site produces multiple electronic boxes for the new Integrated Battle Station on the B-1B Lancer, shown in flight, and is the original equipment manufacturer for the aircraft's cockpit panels and power controller assemblies. **BOEING (Insets, clockwise from left)** Robert Barraza, left, manufacturing production manager, and Edgar Quintana, general electronic/mechanical assembly specialist; the Texas state flag; Reynaldo Morales, center, manufacturing production, with general electronic/mechanical assembly specialists Sandra Perez, from left, and Martha Melendez; a relay panel in the wire routing process; Alma Acevedo, left, production integration engineering manager, and Scott Anderson, project management specialist.

BOB FERGUSON/BOEING





When Eddie Madrid joined the El Paso, Texas, site in 1985, it was just getting started. It had officially opened two years earlier as a low-cost feeder plant supporting production of the B-1B Lancer bomber for the U.S. Air Force.

Madrid helped make wiring harnesses for the Lancer, a four-engine variable-sweep-wing strategic bomber developed by Rockwell International, which would later become part of Boeing. In all, 100 of the bombers were built for the Air Force. Madrid started on harnesses that went into the third plane.

He still makes wiring harnesses, but today Madrid and some 400 other Boeing employees at the El Paso site support a variety of Boeing military programs, including the C-17 airlifter, the F-15 and F/A-18 fighters, the Apache attack helicopter and the tilt-rotor V-22 Osprey.

“It’s been rewarding,” Madrid said. “I’ve only had two jobs in my life—Boeing and the Navy. I got my education through Boeing, which I’m very thankful for. I’ve worked with a bunch of great people.”

Although they are outside the spotlight that falls on Boeing’s bigger facilities, employees at the El Paso site, a Strategic

Fabrication Center for electronics, make complex assemblies and subsystems that are critical to the company’s aircraft.

In addition, the El Paso team, part of Defense, Space & Security, produces electronic assemblies and subsystems for a wide range of other platforms, including the Patriot Advanced Capabilities (PAC-3) missile system, F/A-22 Raptor and the International Space Station. And they also assemble, test and support programs for NASA, the U.S. Air Force, Army and Navy, as well as commercial space-rated programs.

“Being a manufacturing plant, we are challenged every day to deliver a product on time and at the lowest possible cost,” said Rosaura Corral-Perez, El Paso site leader. “Throughout the years, we’ve learned how to adapt to challenges and found ways to cut time and cost to provide quality products and value to our customers.”

Corral-Perez and her team have worked hard to attract new work while keeping costs down. In 2009, the site began manufacturing electrical instrument panels for military aircraft and recently celebrated the completion of its 10,000th panel. In an effort to keep operations as efficient and productive as



possible, El Paso employees set out to improve the panel manufacturing process.

“We wanted to lower the cost of production,” said Scott Anderson, project management specialist. “A number of different product parts are being made here, and we wanted a more efficient manufacturing process.”

After researching several methods, the team adopted Demand Flow Technology. Applying this process allows more than 360 different products to be built on the same manufacturing “mixed-model” line, thus accelerating productivity, reducing build time and, ultimately, lowering cost.

Since the process was applied in early 2011, the site has seen well over \$1 million in cost savings to customers, while nearly doubling its output. This accomplishment earned the Demand Flow Technology implementation team Boeing’s prestigious John Van Gels Award for making a significant



contribution to keeping BDS competitive.

A cornerstone of the site’s success is employee participation. There is 100 percent involvement in Employee Involvement teams.

“Our workforce is engaged, smart, involved and they want to make their workplace better,” said Alfredo Ortega Jr., operations integrator manager. “They come to work with the intention of making it better every day.”

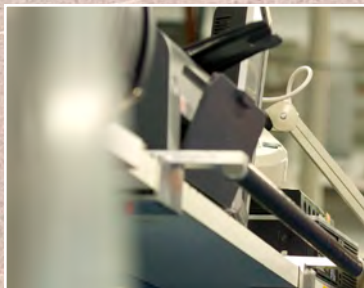
Added Anderson: “Because of the small size of our site, people know each other well and are comfortable speaking to one another about improving our workplace.”

That camaraderie among employees is what makes the El Paso site so special, explained Connie Martinez, who makes wiring panels for the F-15, F/A-18, V-22 and C-17.

One of her favorite jobs was helping make electronic components that were later sent up to the International Space Station.

“I just love it here,” she said. “It’s not very big but we have a





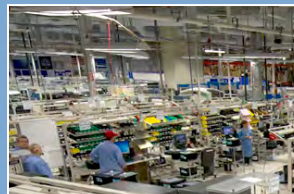
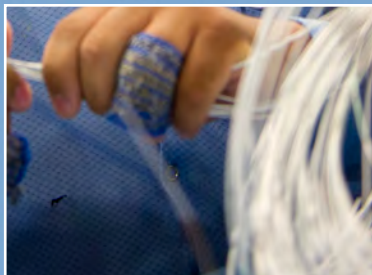
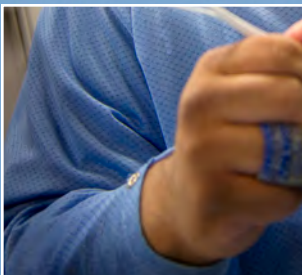
PHOTOS: (Left) An F-15 in flight. Boeing El Paso produces warfare and instrumentation electronics and electrical panels for the aircraft. **BOEING** (Clockwise from far left) Victor Alston, general electronic/mechanical assembly specialist; wire is prepared for stripping and contact insertion; Carlos Fernandez, general electronic/mechanical assembly specialist, left, and Carlos A. Fernandez, quality test specialist; Israel Valles, general electronic/mechanical assembly specialist. **BOB FERGUSON/BOEING**

In 2009...

the site began manufacturing electrical instrument panels for military aircraft and recently celebrated the completion of its 10,000th panel.



PHOTOS: (Right) Boeing El Paso produces main cockpit and power distribution panels for the V-22 Osprey. **BOEING (Insets, clockwise from top left)** Hermann Andrade, general electronic/mechanical assembly specialist; Alma Acevedo, production integration engineering manager; Alfredo Ortega Jr., operations integrator; crimp tools used to connect wire and electrical contacts, arranged in shadow boxes and sorted by contact type; the Demand Flow Technology Panel Line wire and chassis preparation area; Demetrius Torres, general electronic/mechanical assembly specialist. **BOB FERGUSON/BOEING**





great team. We all know each other by name. I hope to retire here.”

Martinez was born and raised in El Paso and went to work for Boeing there 15 years ago this month.

“A lot of people are pretty surprised to learn there is a Boeing in El Paso,” Martinez said.

El Paso, with a population of about 650,000, is in far West Texas on the Rio Grande River. It lies just across the border from Juarez, Mexico. Fort Bliss, one of the largest military complexes of the U.S. Army, is located east and northeast of the city. On weekends, it’s not unusual to find Boeing employees shopping at the colorful open-air markets of Juarez.

“We are a great big family here,” said Martha Lozano, who has been at the El Paso site since she went to work for



Boeing 14 years ago.

“Before I came to Boeing I was a housewife, so I was going into a big challenge in my life,” she recalled. “After I acquired the experience of working with Boeing, I really grew to love this place.”

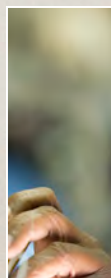
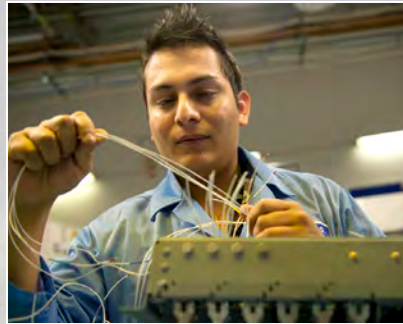
Lozano works on wiring panels for the F-15, F/A-18 and C-17. Her previous wiring jobs at the site included Boeing’s Harpoon missile.

“When we see something like a Boeing fighter or the C-17, we know we have contributed just a little bit,” she said. “We take a lot of pride in that.” ■

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PHOTOS: (Below) A C-17 Globemaster III. Boeing El Paso produces cockpit, troop light and cargo ramp control panels for the aircraft. **BOEING (Insets, clockwise from top left)** Alfonso Martinez, quality test specialist; general electronic/mechanical assembly specialists Edward Madrid; Javier Salas; David Maske; Arturo Loera, left, and manufacturing engineer Cynthia Vargas; Miguel Hernandez, facilities plant maintenance specialist; general electronic/mechanical assembly specialists Luis Ferman; Ra’Mon Patterson; Jose Chavez.

BOB FERGUSON/BOEING





All dressed up,
everywhere
to go



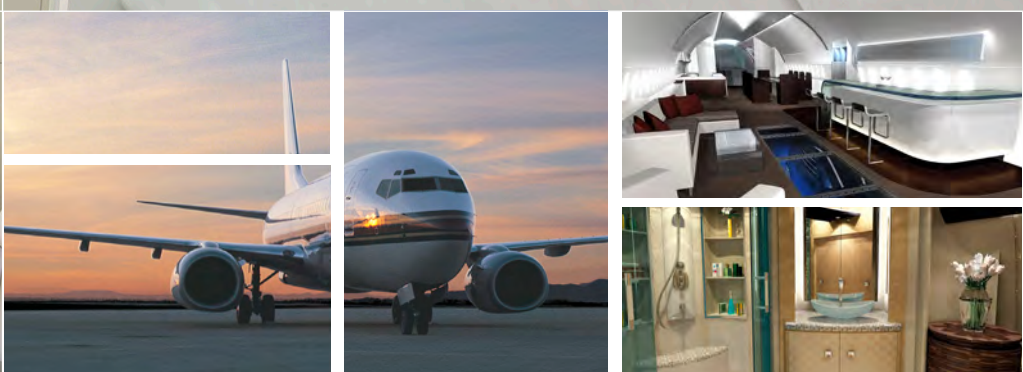


It used to be something you'd only see on "Lifestyles of the Rich and Famous." But 15 years after the launch of Boeing Business Jets, the private aircraft has become much more than a luxury item for business owners, corporations and government delegations across the world.

"I use my BBJ as a business tool to stay in touch with customers," said an owner who wished to remain anonymous. "The long-range capability allows me to cover three continents in a day, which is a significant timesaver."

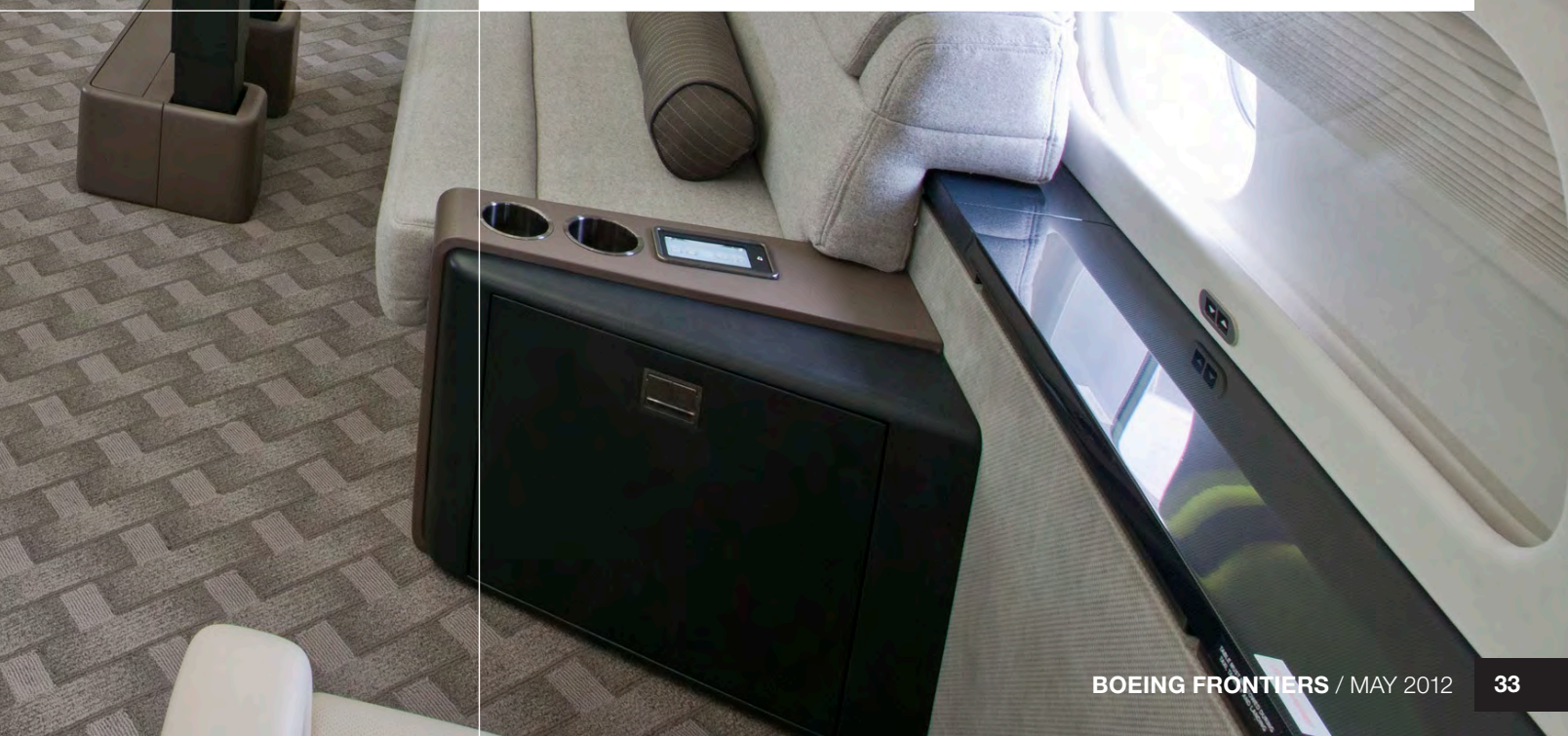
Boeing and General Electric partnered to launch Boeing Business Jets in July 1996. The first airplane in this venture, the BBJ, combines the Next-Generation 737-700's airframe with the strengthened wing and landing gear of the 737-800. The BBJ can be fitted with up to nine auxiliary fuel tanks, giving it the longest range, as far as Los Angeles to Moscow, of any business jet in this market segment.

It is the best-selling airplane in the Boeing Business Jets line, with more than 150 orders for the various versions of the 737-based airplanes. There also are BBJ



PHOTOS: (Left) The "living room" area of the newest 737-based Boeing Business Jet, or BBJ, which entered service in March. **(Inset, above left)** The very first BBJ. ED TURNER/BOEING

GRAPHICS: (Top right) An artist's concept of a BBJ interior by BMW Group. DESIGNWORKS USA
(Above right) Full-sized shower and lavatory off the master bedroom of a BBJ. GREENPOINT TECHNOLOGIES



The sky's the limit

when it comes to luxury at 41,000 feet



PHOTOS: (Top left) Steve Taylor, Boeing Business Jets president, in a newly completed BBJ. **ED TURNER/BOEING**
(Bottom right) A BBJ with an interior designed to replicate an old English library. **JET AVIATION**

GRAPHICS: (Bottom left) An artist's concept of a 787 VIP interior. **(Top right)** How a bedroom on a VIP 787 might look. **GREENPOINT TECHNOLOGIES**

The possibilities of what can be done with the interiors of a Boeing Business Jet, or the new 787 and 747-8 VIP models, are endless.

"If you can imagine it, it's either been done or is probably being engineered as you read this," said Steve Taylor, president of Boeing Business Jets.

That ranges from a putting green and exercise equipment to an elevator and special area to transport a car. "The one thing that still poses a challenge is having uncontained water on the airplane as in a hot tub or pool," said Taylor.

The BBJ team sells and supports all the models of Boeing products sold to VIP customers. This includes orders for a dozen 787 VIP and nine 747-8 VIP airplanes.

Taylor knows these airplanes inside and out. He's not just the leader of the Boeing Business Jets organization; he's a pilot, too. He was behind the controls when the first 747-8 VIP was delivered and flown off to begin the completion process in February.

Taylor was born into an aviation family and took his first solo flight at the Renton, Wash., airport in a Piper Cub on his 16th birthday. He is a former Boeing test pilot and is rated to fly all Boeing airplane models.

"When I accepted the position of BBJ president it was with the agreement they wouldn't clip my wings," Taylor said. "I get to fly, do business with fascinating people all over the world and work with a terrific team at BBJ. It's a great ride."

models of the 747, 767, 777 and 787.

Not only is it the most effective way to travel, but the comfort of a BBJ is unmatched by any other business jet, according to this owner.

"I can remember flying to New York," he said. "By the time everyone had watched a movie, eaten dinner and played some bridge, the aircraft landed and nobody wanted to get off. It is

"By the time everyone had watched a movie, eaten dinner and played some bridge, the aircraft landed and nobody wanted to get off. It is that great of an experience."

that great of an experience."

While the comfortable interior, large cabin space and quietness of the BBJ helped persuade him to buy a second BBJ, the owner said, it was the safety and security he gets with Boeing that made the decision easy.

"I never really gave another aircraft a thought," he said, adding that he has flown as a pilot and passenger in many other business jets and once found himself stranded in the Middle East due to unavailability of parts and service personnel to work on that airplane. Knowing Boeing parts and people capable of working on the BBJ are available anywhere in the world keeps him loyal to Boeing, he said.

The interior features of his BBJ are as functional as they are comfortable.

"We like to operate the BBJ without a flight attendant, so we configured it a little differently," the owner said. "Much like home, I wanted the kitchen to be a gathering place where people could socialize and just hang out."

It features a center island and appliances similar to that of a typical kitchen including convection and microwave ovens, a refrigerator, wine cooler and trash compactor. Air ducts were moved from overhead into the walls leaving a spacious 83-inch-high (2-meter) ceiling, about 6 inches (15 centimeters) higher than other BBJs. The interior of the owner's newest BBJ was completed in March at a facility in Spokane, Wash.

BBJ and Boeing VIP airplanes are delivered "green," with no interior or final exterior paint, from the factory. This allows customers to select the completion center that will create the custom interior that suits their taste and needs. There are 17 BBJ and VIP completion centers around the world. For a BBJ, it takes nine months to a year to complete the interior work, which must meet rigorous Federal Aviation Administration standards. For VIP models of the 747-8, which is just entering service, it's expected to take two or more years to complete the interior.

And the price tag for all this?

Boeing's list price for a BBJ is about \$57 million. Add another \$20 million or more for the customized interior. A buyer can spend upwards of \$500 million on a 747-8 VIP. ■

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Teaming for SUCCESS

Global partnerships play key role in growth
goal of Boeing's defense business

By Amy Horton

On any given day, workers at TATA Advanced Materials in Bangalore, India, produce honeycomb composite panels that will go into mission equipment and power-supply cabinets assembled at nearby Dynamatic Technologies.

Ultimately, it all goes into P-8I maritime reconnaissance aircraft for the Indian Navy that are assembled at the Boeing 737 factory in Renton, Wash.

As workers break for lunch in Bangalore, rotorcraft maintainers with Vector Aerospace in the United Kingdom are beginning their workday, supporting that country's fleet of Boeing CH-47 Chinook transport helicopters.

By midday in the U.K., Héroux-Devtek employees are getting started on their own Chinook-related work in Longueuil, Québec, manufacturing CH-47 landing gear. Canada is a Chinook customer. As their workday wraps up, workers at Ferra Engineering near Brisbane, Australia, are just starting their day manufacturing rudder pedal kits for



PHOTOS: (Top) A worker at Dynamatic Technologies in Bangalore, India, assembles a mission equipment cabinet for an Indian Navy P-8I maritime reconnaissance aircraft. **DYNAMATIC TECHNOLOGIES (Above)** A Royal Australian Air Force F/A-18F Super Hornet. Boeing's Office of Australian Industry Capability supports defense sales in Australia by helping local small and medium enterprises access the global aerospace and defense market.

AUSTRALIAN DEPARTMENT OF DEFENCE

Boeing F/A-18E/F Super Hornet fighters.

These companies are among nearly 22,000 with which Boeing does business worldwide. Around the clock and around the globe, these partnerships play an integral role in Boeing's growth.

"How effective we are teaming and acting as a trusted partner is a key factor in making international sales," said Mark Kronenberg, vice president of International Business Development for Boeing Defense, Space & Security.

Boeing's defense business has been pursuing an aggressive plan to grow sales internationally. By the end of 2010, international sales represented approximately 18 percent of the BDS business, up from only 7 percent seven years ago. Defense sales outside the United States now have reached 24 percent, and are on the way to meeting a goal BDS President and CEO Dennis Muilenburg has set to reach 25-30 percent by the end of 2013.

As the business edges toward that target, it's also taking a closer look at how to sustain that international market share over the long term. A key part of that plan involves partnerships.

"In some cases," Kronenberg added, "teaming will be about aligning in a local market, but it could also be about

embedding technology in our products and services to make them more capable and affordable."

Boeing certainly knows something about international partnerships. Over the past three decades, Boeing has completed on time or ahead of schedule more than \$42 billion in industrial participation programs outside the United States.

"This is exceptional because we're meeting customer objectives, benefitting local industry and creating value for Boeing," said Gwen Kopsie, BDS director of International Strategic Partnerships, the organization working across Boeing businesses to shape how and with whom the company works globally to best support the BDS growth strategy.

The company currently has 58 active programs, worth more than \$20 billion in 23 countries, contractually tied to the sales of more than a dozen Boeing products. As it pursues more and more international sales, BDS alone is looking at another \$30 billion in potential industrial participation, also known as offset, commitments within just five years.

"We aren't resting on our laurels," Kopsie said. "As the global economy shifts, as our customer set changes, and as customer and industry needs and expectations evolve, we are adapting how we address our offset commitments. We're also engaging earlier in long-term business strategy development."

Kopsie's team works closely with

engineering, operations, supplier management and business strategy experts. As the business looks to access new customer markets and target adjacent products and services, her team helps them match the best partners around the world with which to form alliances.

"We have to make sure that our interests are aligned in markets strategically important to us today and tomorrow, and that they address what matters to the customer," Kopsie added.

The company's developing partnership with Mubadala, based in Abu Dhabi, United Arab Emirates, illustrates that point.

While oil and natural gas exports dominate the UAE economy today, in recent years the government has been focused on economic diversification. It established Mubadala Development to drive economic growth in the UAE through business ventures across a wide range of industry sectors including energy, health care, information communications and technology, infrastructure and real estate, as well as aerospace.

The UAE also is a customer of both Boeing commercial and defense products, presenting an opportunity for Boeing and Mubadala Aerospace to pursue mutually beneficial initiatives in areas where there is strategic alignment between the two companies.

Boeing's research and technology development activities also present



“How effective we are teaming and acting as a trusted partner is a key factor in making international sales.”

– Mark Kronenberg, vice president of International Business Development for Boeing Defense, Space & Security

PHOTO: As part of its industrial participation programs, Boeing often conducts workshops to enhance the technical know-how of local industry, such as this high-speed machining workshop at AlmexA in Odense, Denmark.

NILS LUND PEDERSEN



PHOTO: Boeing works in partnership with Vector Aerospace in the United Kingdom to support the U.K.'s fleet of Chinooks. BOEING

abundant partnership opportunities.

Boeing Research & Technology, the company's advanced central research, technology and innovation organization, is responsible for making sure technologies that enable the development of future aerospace solutions—as well as solutions that improve the cycle time, cost, quality and performance of our current products and services—are ready when needed.

“Beyond the work done by thousands of Boeing researchers, we're increasingly engaged in collaborative research and development with our global supply chain, strategic partners, universities, and public and private R&D agencies to quickly find the most innovative and affordable solutions possible for the benefit of our customers,” said Pete Hoffman, director of Global R&D Strategy for Boeing Research & Technology.

The University of Sheffield Advanced Manufacturing Research Center with Boeing in the U.K. is but one example of this approach. The center brings together industry, government and academic institutions for the development of advanced manufacturing methods needed in key growth industries, including aerospace.

It's a model that has been replicated with centers of excellence in other parts of the U.K. and around the world—from Australia, Singapore and India to Italy, Germany, the Netherlands, Denmark and Canada.

These centers specialize in technology development ranging from the advancement of manufacturing, forming, forging and composites capabilities, to wireless networking technologies and systems health monitoring and management, to rapid prototyping and nanotechnology.

“Working collaboratively with organizations that have global reach and world-leading research allows companies to compete more effectively on a global market, while applying the latest sustainable manufacturing processes,” said Keith Ridgway, co-founder of the Advanced Manufacturing Research Center, and director of research.

“These collaborations increasingly are being recognized as the way forward for advanced manufacturing.” ■

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PHOTO: (Below) The first P-8I aircraft for India will begin flight testing this summer following mission system installation and checkout at the company's facility near Boeing Field in Seattle. Indian companies producing parts for the P-8I include Hindustan Aeronautics, Bharat Electronics, Electronics Corporation of India, Avanel, Dynamic Technologies and TATA Advanced Materials. JIM ANDERSON/BOEING



Command performance

Meet the experts—Boeing's newest Senior Technical Fellows

By Candace Heckman

Boeing employees share common DNA comprising an enterprising spirit and desire to define the future. As the backbone of the company's vast knowledge base, the Boeing Technical Fellowship ensures this expertise develops, broadens and grows—so Boeing continues to produce technologically advanced products that change the world.

This year, Boeing recognizes the advancement of five of the company's top technical leaders, individuals who exemplify a commitment to personal and professional excellence. For dedication and achievement, each has been named a Senior Technical Fellow.

These individuals are major contributors at an industry level and are recognized as authorities on national and international levels. The Fellows have proved their ability to overcome technical barriers to meet challenging customer business and mission needs. They solve exceptionally difficult problems of major importance to Boeing and define technical strategies based on innovation that drive Boeing's leadership in aerospace.

Boeing employees can contact the five new Senior Technical Fellows—Shane Arnott, Scott Black, Stephen Clark, Julio Navarro and Rick Vahlberg—on inSite. ■

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Model engineer

Ask Shane Arnott how modeling and simulation became his career field of choice and he will mention one inspiration: playing video games as a kid.

Even today, with much of the year spent on travel, visits to multiple countries and working with international customers, Arnott is still inspired by his childhood experience.

"Growing up I played a lot of video games and even composed my university thesis on the topic of virtual reality," said Arnott, who grew up in Australia. "It built my interest in this cutting-edge technology and how people could use it to be more effective."

This inspiration has carried him around the globe, tackling some of the most challenging questions and concerns facing Boeing's business and customers. His work in Strategic Development and Experimentation, a division of the Phantom Works organization in Boeing Defense, Space & Security, eventually paved the way for Arnott to become Boeing's first international Senior Technical Fellow.

"Working together with our international customers through our simulation and analysis centers has grown our understanding of customers' needs like never before," Arnott said. "In large part it's the technology that makes this relationship possible. Being able to contribute in this way has been an incredible experience and very rewarding. And it shows that if we want to, we can create technology anywhere in the world."

As for what advice he would give up-and-coming engineers, Arnott offered, "Always look for ways to differentiate yourself and add value. Don't wait to be asked."

— Terence Williams



Signal career

Julio Navarro's technical career actually started as a small businessman with a \$1,000 loan from his dad. And with his brother's help, Navarro, who was born in Argentina and moved to the United States with his family when he was 10, was able to mow enough lawns to pay back the loan in a few weeks.

At that time, Navarro had completed his freshman year at Texas A&M University and aspired to be a professional soccer player. After one year on the school's soccer team, he re-evaluated his plans.

"In retrospect, the weekend work was one of the best things that ever happened to me," Navarro explained. "It helped pay for tuition, books and most of my lodging expenses. Most important, the work kept me well-grounded, focused and out of mischief on the weekends."

Navarro turned his attention to engineering. After five co-op terms at General Dynamics, he found a calling in antennas. Now with more than 15 years at Boeing, Navarro is working on the leading edge of integrated circuits and agile antenna systems.

From his lab in Renton, Wash., Navarro has helped develop phased array antennas used in unmanned aerial vehicles, aircraft, ships, submarines, satellites and missiles. His innovations are shown in more than 25 patents—as well as several industry firsts.

"As an emigrant from a small town in South America, I am fortunate to be a contributor at Boeing today," Navarro said. "It is an exceptional place to find your passion and grow in your career."

— Candace Heckman



Structural Integrity

At any point throughout his career, old buddies could ask Scott Black what he'd been up to. "Working on the Space Shuttle program, F-15s, 737 winglets, 787. You know, the usual," Black would answer.

He knows not many jobs let someone work on such a wide variety of programs. In Black's case, his expertise in automated nondestructive inspection—that is, examining a structure without having to break it apart—is a highly valued talent.

Add to that his work in robotics, signal processing, control systems and software development, and there's always something at Boeing for Black to do.

"I've never been bored. Not once," Black said about more than three decades as an engineer.

Black, who works in Boeing Defense, Space & Security, has developed systems that he operates for Boeing programs. Products such as the Automated Ultrasonic Scanning System and Mobile Automated Scanner are recognized worldwide. He works in commercial as well as defense, supporting Boeing Research & Technology and Boeing suppliers, including Alenia Aermacchi in Italy.

With the increasing focus on composite structures, automated nondestructive inspection is a critical element in meeting challenging production rates and ensuring the structural integrity of Boeing aircraft. Just as important, Black also contributes to the structural integrity of Boeing's skill base. He founded a mentoring group for his field 10 years ago in St. Louis, has taught night-school classes at a local college, and has served as a judge for students participating in FIRST Robotics competitions.

"I grew up in this little town just north of St. Louis. And now, I get to work on all of this cool stuff, and I get to travel all over the world," Black said. "It sounds corny, but I've got a great job."

— Candace Heckman

Technical resolve

Extraordinary problem-solving abilities are only a portion of what makes a Senior Technical Fellow stand out. Rick Vahlberg works in the Boeing Defense, Space & Security unit, but he provides technical leadership and insight to multiple programs across the enterprise.

In 2011, after one of the many technical reviews Vahlberg routinely participates in, he led a multi-divisional team to resolve a critical inboard aileron oscillation issue on the 747-8 Freighter. This team identified the root cause and recommended the design changes that supported Federal Aviation Administration certification and delivery of the airplane.

During the past 10 years, Vahlberg has provided structural and mechanical dynamics leadership and consulting to 35 Technical Independent Reviews across Boeing. Recently he's been instrumental in resolving critical technical issues on programs such as Airborne Early Warning & Control aircraft, the P-8A Poseidon and the C-130 Avionics Modernization Program. Additionally, Vahlberg is an enthusiastic volunteer at science and engineering fairs and does everything he can to mentor young engineers and encourage kids to learn science, technology, engineering and math.

With a laugh, Vahlberg recalled, "I could've been a chicken farmer." He grew up in rural Idaho, and his family's business at its peak was raising 1.8 million fryer chickens annually. But his father took night math classes and moved to Seattle to work for Boeing as a machinist in 1960. Thus began Vahlberg's fascination with aviation.

"When I look around Boeing, I see thousands of talented engineers doing amazing work together," he said. "I couldn't imagine a better career choice, or company choice. It's been a blast."

— Candace Heckman



BOB FERGUSON/BOEING

Propulsionforce

Stephen Clark was one of those kids who used to build airplane models and dream about flying jet fighters at supersonic speeds.

Growing up in Olympia, Wash., he would press his face against the car window to catch a glimpse of the flight line each time the family drove past Seattle's Boeing Field.

But Clark, who has worn eyeglasses since his youth, never thought he'd have the chance to get near anything as exciting as a jet airplane. So he was excited when, near the end of high school, he received an acceptance letter to the U.S. Naval Academy.

"I couldn't fly, but I did become even more fascinated with jets—actually, with propulsion," he said.

As with any veteran who comes to Boeing, Clark believes his military experience invested him with a strong service ethos—devotion to a cause larger than himself. He's tried to consistently apply this concept throughout his Boeing career, first on defense programs and now in the propulsion technology group in Boeing Commercial Airplanes. "The magnificence of Boeing's products and the strong team-oriented nature of our work make this a natural fit," he said.

"Some people prefer deep specialty—to be really, really great at that one important thing," Clark said. "What energizes me is the opportunity to work with a variety of different groups of people with varying skills and expertise, coming together to create a complex object like an airplane.

"As a mechanical engineer," Clark added, "I can't imagine a more exciting product to work on than aircraft."

— Candace Heckman



BOB FERGUSON/BOEING

Advancing Australia

Boeing's roots in Australia's aerospace industry run deep

By Mike Lombardi

The first time a Boeing plane landed in Australia was during the 1934 MacRobertson air race, from London to Melbourne.

A de Havilland DH.88 racing plane won, but less than a day behind were a Douglas DC-2 operated by KLM airlines and, two hours later, a Boeing 247D flown by famed aviators Roscoe Turner and Clyde Pangborn.

At the time, Australia had a small but growing airplane manufacturing base that would eventually grow into three major manufacturers: de Havilland Australia (later Hawker de Havilland), Commonwealth Aircraft Corp. and Government Aircraft Factories (later AeroSpace Technologies of Australia). Today, these three companies are the foundation of Boeing Aerostructures Australia.

It began in 1927 when United Kingdom aviation pioneer Geoffrey de Havilland established de Havilland Australia as his first overseas subsidiary. The company first focused on production of Tiger Moth trainers, but the need for combat aircraft during the Second World War forced a shift to Mosquito fighter-bomber and reconnaissance airplanes. More than 200 Mosquitoes would be built



PHOTO: A Beaufighter built by Australia's Department of Aircraft Production (later Government Aircraft Factories) flies over Melbourne in 1945. BOEING AEROSTRUCTURES AUSTRALIA

at the de Havilland plant in Bankstown, a suburb of Sydney.

Australia's second major manufacturer was Commonwealth Aircraft Corp. Founded in 1936, Commonwealth Aircraft established an assembly plant at Fishermans Bend, Melbourne, where it built a modified version of the North American Aviation BC-1 trainer named the "Wirraway," an Aboriginal name meaning "challenge." Between 1938 and 1946, Commonwealth Aircraft assembled 755 Wirraways, which were used as trainers and general-purpose combat airplanes by the Royal Australian Air Force.

The Wirraway design provided the base for Commonwealth Aircraft's Boomerang, an indigenous fighter that filled a critical need until a modern fighter could be built. That need was answered with the arrival of the North American P-51 Mustang. Commonwealth Aircraft built 200 Mustangs at the Fishermans Bend facility, which had the distinction of being the only Mustang production line outside the United States.

The Second World War gave rise to Australia's third major aircraft manufacturer, established by the government as the Department of Aircraft Production. Sharing the runway with Commonwealth Aircraft at Fishermans Bend, the Department of Aircraft production built 700 Bristol Beauforts and 365 Beaufighters. After the war, the Department of Aircraft Production was reorganized and the name was changed to the more familiar Government Aircraft Factories.

Following the war, all three manufacturers quickly brought the jet age to Australia. Commonwealth Aircraft continued its partnership with North American Aviation, receiving a license to produce F-86 Sabre fighters. De Havilland Australia built Vampire fighters, and Government Aircraft Factories assembled English Electric Canberra medium bombers and, later, French-designed Mirage III fighters.

In 1961, de Havilland Australia became Hawker de Havilland and in 1986 acquired Commonwealth Aircraft. Together they supported Government Aircraft Factories in the production of Boeing F/A-18 Hornets.

Government Aircraft Factories was reorganized in 1987 as AeroSpace Technologies of Australia, portions of which were purchased by Rockwell. In December 1996, with Boeing's acquisition of Rockwell's aerospace and defense business,

PHOTO: A Commonwealth Aircraft Corp. Sabre, built under license from North American Aviation and powered by a Rolls-Royce Avon engine. BOEING ARCHIVES



PHOTO: A Royal Australian Air Force F/A-18B Hornet, built under license by Government Aircraft Factories, flies over Uluru/ Ayers Rock. BOEING ARCHIVES



PHOTO: A Commonwealth Aircraft Corp. Boomerang. MUSEUM OF FLIGHT ARCHIVES



“Acquiring Hawker de Havilland in 2000, Boeing brought together the three historic manufacturers and in 2009 they were united under one name, Boeing Aerostructures Australia.”

the former Rockwell holdings in AeroSpace technologies of Australia became a wholly owned subsidiary of Boeing.

Acquiring Hawker de Havilland in 2000, Boeing brought together the three historic manufacturers and in 2009 they were united under one name, Boeing Aerostructures Australia. This consolidated a heritage of some 85 years of aircraft manufacture in Australia.

Today, Australia is recognized as home to one of the world's leading centers for the manufacture of advanced composite structures, building critical control surfaces for the 787 Dreamliner and exploring new applications of resin infusion for future

airplane developments. Although the names, locations and even the work has changed, the legacy of aircraft manufactured by Hawker de Havilland, Commonwealth Aircraft Corp. and AeroSpace Technologies of Australia lives on as the proud foundation of Boeing Aerostructures Australia. ■

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FLIGHT OF PASSAGE

Space Shuttle *Discovery*, carried on the back of its modified Boeing 747 transporter, makes a fly-by of the Washington Monument last month on its final mission, accompanied by a chase plane. It was en route from Cape Canaveral, Fla., to its new home on permanent display in the James S. McDonnell Space Hangar at the National Air and Space Museum's Steven F. Udvar-Hazy Center outside Washington, D.C. *Discovery* was first launched in 1984 and flew 39 times in space, more than any other shuttle. Among its many achievements was delivering the Hubble Space Telescope to orbit. The space shuttles were built by Boeing and its heritage companies. The program began in 1972 and ended late last year. *Discovery's* final flight to space was in February 2011. PHOTO: FRED TROILO/BOEING





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