

# Frontiers

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APRIL 2012 / Volume X, Issue XI

## Load star

Boeing's C-17 airlifter is a global workhorse





“We took the 747, the world’s best-performing large airframe, and added the advanced technology developed for the 787 Dreamliner.”

**David Loffing**

Designer of the 747-8 Wings

# 747-8 WING

Stories of  
**innovation**  
at Boeing



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# 24 Clutch cargo

Whether it's serving as a flexible military transport, performing humanitarian missions to airdrop food and water for thousands, or flying an aeromedical mission to save one soldier, Boeing's C-17 Globemaster III is a global workhorse for the U.S. Air Force and a growing number of international customers. In this *Frontiers* photo essay, meet some of the Boeing men and women who have assembled nearly 250 of these highly capable aircraft in Long Beach, Calif.

COVER: U.S. AIR FORCE PERSONNEL BOARD A C-17 DURING AN OPERATIONAL READINESS EVALUATION IN GULFPORT, MISS., IN OCTOBER. U.S. AIR FORCE

PHOTO: CLOCKWISE FROM TOP LEFT, WING MECHANICS LEOTIS RUSSELL III, RUBE SMITH AND JESUS ROMERO JOIN SIDES OF A C-17 WING AT THE LONG BEACH FACTORY. THE C-17 HAS A WINGSPAN OF 170 FEET (52 METERS). BOB FERGUSON/BOEING



## Ad watch

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

Inside cover:



"747-8 Wing" is one in a series of innovation stories told by Boeing employees such as David Loffing. Learn more at [www.boeing.com/stories](http://www.boeing.com/stories).

Page 6:



This *Flight International* ad is a call for entries for the Boeing-sponsored Engineering Student of the Year Award. Part of the Flightglobal Achievement Awards, the award recognizes an outstanding student working on aeronautical

or space technology and will be presented at the Farnborough International Airshow in July.

Back cover:



This ad was developed to announce the launch of the 787 "Dream Tour" in China and to highlight some of the airplane's innovations, such as improved fuel efficiency and lower carbon emissions. The ad ran in

the in-flight magazines of China Southern and Hainan Airlines, as well as on local websites.

# Frontiers

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## Historical Perspective

Boeing Commercial Aviation Services has a global force of men and women stationed in more than 60 countries to provide immediate support, expertise and services to Boeing customers. It's a legacy that began with Boeing field service representatives who followed B-17 bombers to the front lines during World War II. The pioneer field rep was Herbert "Nemo" Ponceti. PHOTO: BOEING ARCHIVES



## Security at the speed of light

The danger from attacks on national and business computing systems and infrastructure continues to grow and will eventually surpass the threat of terrorism, according to the director of the FBI. As the demand for "cybersecurity" grows, Boeing is making key investments in this market. One of those is Boeing's new Cyber Engagement Center in Annapolis Junction, Md. PHOTO: FRED TROILO/BOEING



## Clean machines

Boeing engineers set their sights high when it comes to the environment—the new 787 Dreamliner and 747-8 jetliners raised the bar for fuel efficiency and environmental performance. Boeing innovation is not stopping there, however. Ongoing efforts to improve energy efficiency will make a major difference on commercial and military aircraft in the future. PHOTO: ALAN MARTS/BOEING

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They are known as the Bluestreak team. When a customer needs an out-of-production part to keep a Boeing jetliner in service, this rapid-response team of skilled machinists in Long Beach, Calif., is ready 24 hours a day to manufacture it—and quickly get the airplane back in the air. PHOTO: BOB FERGUSON/BOEING



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The Commercial Aviation Services team is taking important steps to capture the fast-growing services and support market by sharpening its brand identity as the Boeing Edge, writes Ray Conner, senior vice president of Sales and Customer Support, Boeing Commercial Airplanes.

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## Long-haul leader

Even as Boeing studies the next big advance for its best-selling 777, manufacturing improvements are helping to speed production and meet demand for the twin-aisle jetliner. One such innovation is a high-tech drilling machine that provides a significant improvement over drilling fastener holes by hand, reducing costs while making it safer and easier for mechanics. PHOTO: BOB FERGUSON/BOEING



# Engineering the future

## ENGINEERING STUDENTS. YOU COULD BE THIS YEAR'S BOEING ENGINEERING STUDENT OF THE YEAR

The Boeing Engineering Student of the Year Award recognizes the outstanding talent of tomorrow – both at graduate and undergraduate level.

Presented at the Flightglobal Achievement Awards at the Farnborough Air Show in July and now in its seventh year, the Boeing Engineering Student of the Year Award is the world's leading competition to recognize students whose work shows the greatest promise, aptitude and dedication in the field of aeronautical or space technology.

For the first time, as well as the overall award, a special prize will be given to the best undergraduate submission, giving global recognition to those working on their first degree.

The competition is open to any engineering student currently enrolled in a programme leading to a recognized academic degree. The submission deadline is May 21, 2012. Don't miss your chance to engineer the future.

For more information or to enter now go to:  
[www.flightglobal.com/student](http://www.flightglobal.com/student)



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# Boeing's new 'Edge'

New initiative brings Commercial Airplanes' sales and services closer together—increasing competitiveness

There's a lot of focus on the amazing technology and airplanes we produce today, but Boeing offers other capabilities that bring equally compelling value to our customers.

A case in point is the service and support that Commercial Aviation Services delivers throughout the life cycle of customer fleets. Boeing offers services with a breadth and depth that is unmatched by our competitors, starting with airplane acquisition and entry into service, through decades of daily operations, maintenance and upgrades, and followed by the transition to retirement. The ways we integrate this range of services to meet customers' needs is our value proposition: We lower their costs and optimize their performance.

Boeing established the forerunner of Commercial Aviation Services more than 70 years ago. (See pages 10–11.) It has set the standard for delivering the fundamentals of aviation support with spares, training, maintenance documents and technical advice. And in recent years, under the leadership of Lou Mancini, senior vice president, Boeing Commercial Aviation Services, advances in technology have increased our ability to quickly and efficiently provide services around the world.

Today, Commercial Aviation Services mirrors the way our airline customers do business through four distinct business units: Fleet Services, Flight Services, Information Services and Material Services.

Together these business units represent an essential growth area for the company. Last year alone, services accounted for 15 percent of Boeing Commercial Airplanes' business—and the opportunity for further growth cannot be overstated.

The worldwide aviation services and support market is estimated to be worth \$2.3 trillion through 2030. That's slightly more than half of what Boeing estimates as the value of the global market for airplane sales in the same period.

Big business, indeed.

The Commercial Aviation Services team is taking important steps to position CAS to capture that growth by sharpening its brand identity as the Boeing Edge.

The Boeing Edge is a new way to talk about who we are, what we do and how we can give our customers a competitive advantage. It's a way to position Boeing in the marketplace as a world leader in aviation services. And it's an important initiative to bring Commercial Airplanes' sales and services closer together so



“The Boeing Edge is a new way to talk about who we are, what we do and how we can give our customers a competitive advantage.”

— Ray Conner

Senior vice president, Sales and Customer Support  
Boeing Commercial Airplanes

PHOTO: JOHN CROZIER/BOEING

we can provide the best products and support to our customers, increasing Boeing competitiveness and job opportunities.

In this issue of *Frontiers* (pages 36–37), Lou and his team show how the Boeing Edge brings value to our customers every day—value generated by offering a tightly integrated and focused array of innovative services and support technologies as part of every aircraft sale, by leveraging our investments in personnel and infrastructure, and by building on our strong foundation of spares, training, maintenance and technical services.

Everyone knows that Boeing builds great airplanes. Now it's time for us to talk with pride and clarity about how Boeing provides our customers with a service and support advantage they simply cannot find anywhere else. ■

*Ray Conner was appointed to his current position in August. He has responsibility for leading Sales, Marketing and Commercial Aviation Services. A former machinist, Conner was one of several key participants in reaching the recent groundbreaking labor agreement with the International Association of Machinists and Aerospace Workers in the Puget Sound region.*



**ONE IN A THOUSAND:** An estimated 5,000 Boeing employees, along with representatives of customers and suppliers, surround the 1,000th 777 built during a ceremony last month in the Everett, Wash., factory. The 777-300ER (Extended Range) will be flown by Emirates, the world's largest operator of 777s, with more than 100 in its fleet. No other twin-aisle jetliner has reached the 1,000 milestone faster. PHOTO: GAIL HANUSA/BOEING

## Quotables

“This is a human problem, and real people are on the other end of these attacks.”

– Dewey Houck, vice president and general manager of Boeing's Information Solutions at the company's new Cyber Engagement Center in Annapolis Junction, Md., talking about the growing threat of cyberattacks. (See story, Page 20.)

“This plane is in a class all of its own.”

– United Airlines sales agent Stephanie Macleod, after she and other United employees got a close-up look at a 787 at Newark Liberty International Airport in New Jersey, a stop on the Dream Tour. United will be the first North American airline to take delivery of a 787. Boeing News Now, March 7.



# Art of the sale

For this employee, long-term partnerships are key to providing great customer support

By Marcy Woodhull

Lisa Dantzler helps support Boeing's jetliner customers with products and services throughout the life of their fleets. In this *Frontiers* series that profiles employees talking about their jobs, Dantzler describes the mutual rewards of establishing enduring partnerships.

PHOTO: JESSICA OYANAGI/BOEING



**M**any people think once Commercial Airplanes has sold an airplane to a customer, that's the end of the campaign. But at Boeing, we establish partnerships with our customers that last for the entire life cycle of their airplanes.

I am a member of the Commercial Aviation Services, or CAS, Sales team, supporting our customers in Europe. We sell products and services to maximize the life of our customers' fleets and improve the efficiency of their operations, giving our airline customers a real advantage in a highly competitive marketplace.

Say an airline has a fleet of aircraft that varies in age and it wants commonality in interior configurations. Our Fleet Services unit will develop an interior modification package, while our Material Services group will ensure all the parts needed are available to our customer.

Aligning a customer's need and schedule to Boeing resources and capacity can be challenging, but when it results in providing the right solution for the customer and contributing to Boeing's bottom line, seeing that I've made a difference is very rewarding.

Building good relationships is an important part of my job: Having strong relationships within Boeing helps me be effective

as my customer's advocate. And strong relationships with my customers helps me understand their operational requirements and build trust. Traveling to and visiting with the customer is essential to the process, and a part I really enjoy. Interacting with people from different cultures and backgrounds ensures no two days are the same—and it has made me a more well-rounded person.

I've been with Boeing for 24 years. I joined Sales Operations in 2001 and moved to the Sales team more than five years ago. I've been supporting the Europe region for the past three years. Currently, I'm working with a startup airline that will begin passenger service later this year. Helping this new customer get off the ground and become successful provides a great deal of professional—as well as personal—satisfaction.

I feel fortunate to be a member of a highly motivated and professional sales team that has the privilege of working directly with Boeing's customers. My colleagues and I within CAS Sales are dedicated to supporting all of our customers worldwide well—and well into the future. ■

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# 'Keep 'em flying'



The legacy of Boeing field reps began in China with the P-26 'Peashooter'

*By Mike Lombardi*

The name may not be familiar to many at Boeing, but Herbert "Nemo" Ponceti belongs in that pantheon of men and women who helped define what Boeing is today.

He was the pioneer of Boeing field service representatives.

In those days, the job of taking care of Boeing customers rested squarely on the shoulders of a single dedicated individual who did not have a hotline to call for technical information and no distribution center that could ship spare parts in a matter of hours. What this person did have was an expert knowledge of every single stringer, wing rib, spark plug and control cable in a Boeing airplane.

Ponceti's story is tied to one of Boeing's first international customers: China.

In the 1930s, Chinese Americans raised funds to help China purchase military airplanes for its defense, including 11 speedy Boeing P-26 "Peashooter" fighters. When the P-26s were shipped to China in 1935 they were accompanied by Ponceti, who was tasked with teaching the Chinese pilots and ground crews all they needed to know about their new Boeing fighters.

Ponceti was a Boeing troubleshooter,

engineer, mechanic and customer training expert—all rolled into one.

But he faced troubles that would become familiar to future field service reps and Boeing Airplane on Ground, or AOG, teams.

When a pilot ground-looped his Peashooter, Ponceti's challenge was to build an entire new wing with materials that he could find locally. In the end, Ponceti succeeded. When he finally returned to Boeing from China, he had a sincere respect for the Chinese pilots and mechanics.

Following Ponceti's example, Boeing officially established its customer service organization in 1936, known as the Field Service Unit. It began with 24 employees who supported Boeing P-26s, B-17 Flying Fortresses and, later, 307 Stratoliners and 314 Clippers.

With the outbreak of World War II, those first Boeing field reps followed the B-17s to the front lines, where they lived like the troops, sleeping in tents and staying on alert for enemy snipers. Their task was to help U.S. Army ground crews keep the Boeing planes flying and also feed performance data back to the company to support





continuous improvement of the bombers.

Ponceti also went with the B-17s, and for 13 months he supported the 15th Air Force in North Africa and into Italy.

When Ponceti returned to Boeing, the first leg of his journey home from Italy was aboard a B-17 that he had a hand in saving from the scrap yard. This particular Flying Fortress was a showpiece for the B-17's reputation for ruggedness (it appeared in a Boeing advertisement). The badly damaged bomber returned its crew safely to their base after colliding with a German fighter that nearly sheared the B-17 in half. Ponceti supervised the repair of the plane, which required replacing the destroyed half of the Fortress with the tail section from another B-17.

It was just one of many examples of how Army Air Force mechanics and Boeing field reps followed the wartime motto of "Keep 'em Flying!"

From that first group of two dozen Boeing field service representatives, today's Boeing Commercial Aviation Services, or CAS, has grown to a global force stationed in more than 60 countries, and supported with the latest technology that allows for the immediate response to any need that a Boeing customer may have.

But the foundation behind the CAS organization is still that elite cadre of customer service representatives and engineers who—in the tradition of Nemo Ponceti—know every fastener, computer chip and composite structure of today's Boeing airplanes. ■

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**PHOTOS: (Below and top right)** Boeing Model 281s (P-26 "Peashooters") in Chinese service. **(Insets, from far left)** Nemo Ponceti in 1944; Boeing service representative Ken Hammer supporting the 15th Air Force B-17s in Italy; after this B-17 bomber collided with a German Me 109 fighter, Ponceti supervised the repair. **BOEING ARCHIVES**



# Stepping up

## Employees and Boeing work together to lower health care costs

By Ken Groh

Once again, Boeing and employees are working together to overcome a challenge.

This time it's to push back the rising cost of health care to help the company reduce overall costs and strengthen its competitive position in the global market. Combined with other enterprisewide productivity efforts, the initiative to control rising health care costs will help preserve Boeing's ability to invest in new products and services, price them to be successful against the competition and

create opportunities for employees, according to Rick Stephens, senior vice president of Human Resources and Administration.

Putting the brakes on the annual increase in the cost of health care coverage has been a multiyear effort led by the Benefits Policy & Strategy team, with strong support from Benefit Operations and Government Operations.

"This year we expect a cost avoidance of more than \$400 million in health care," Stephens said. The savings include renegotiating contracts with suppliers, taking advantage of changes resulting from Health Care Reform, expanding Well Being programs and other initiatives.

"We're continuing to aggressively mitigate costs and improve quality while maintaining comprehensive benefits, Stephens said.

In addition, employees are continuing to step up to help create a healthier workforce—which helps both employees to live healthier and the company to avoid many high-cost health claims in the future. More than 94 percent of nonunion employees completed the online Health Assessment

last year. Many, including 58,000 employees who joined Boeing on the Move, embraced fitness, improved eating habits and worked with health coaches to help manage a health condition.

"The record level of participation in these programs is really encouraging, a sure sign that, together, we're gaining momentum in improving the health of our employees and their families," Stephens said. "It also allows us to join together in facing the challenge of rising health care coverage costs for employees and the company."

Stephanie Vo, of Long Beach, Calif., a 28-year employee with Defense, Space & Security, is among those employees taking advantage of the company's Well Being programs. She works on the C-17 program.

She has participated in Boeing on the Move for the past two years, gets her flu shot on-site and completed both the on-site screening and online Health Assessment.

"Boeing on the Move gave me the courage to stay active," Vo said.

More managers also are teaming up with employees to use Boeing on the





Move and other Well Being programs to make a difference.

“Managers need to buy into the benefits of well-being and understand that employees are more productive when they’re healthy,” said Hank Conard, a manager for Boeing Test & Evaluation in St. Louis, who understands firsthand what can be achieved when a team works together toward a common goal. He was able to motivate high participation among his team members with Boeing on the Move last year because he genuinely believes in the benefits of the challenge.

Working together yields results—but there is room for improvement, Stephens noted. For example, more than 40 percent of Boeing’s health care costs result from basic risk factors employees can do something about, including inactivity, stress, smoking and nutrition.

Boeing will continue the Well Being programs and add more resources that help employees and families with their health care, Stephens said. This year, the company will:

- Make it easier to complete the online Health Assessment.

- Roll out enhanced online resources for researching personal health costs and quality of care.
- Increase efforts to help employees and dependents with chronic health conditions.
- Offer employees and their families facilities that provide best-in-class treatment for certain major health conditions.

Employees and their families are encouraged to take advantage of these resources to achieve better health, Stephens said. The Boeing Benefits Team will continue identifying ways to improve how the company manages and reduces health care costs, while maintaining access to quality health care for employees and their families.

Together, according to Stephens, employees and Boeing are creating a culture in which employees make better health care decisions, improve their quality of life and help control rising health care costs. ■

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**PHOTO:** Boeing employees participate in an aerobics class at the Huntsville, Ala., site. ERIC SHINDELBOWER/BOEING

# Out of the blue

When out-of-production airplanes need a part, Boeing's Bluestreak team delivers—fast

By Stephanie Miller and Nancy Standifer and photos by Bob Ferguson



**PHOTOS: (Below)** Bluestreak-made brackets are shown. A protective “case” of material captures manufacturing marks and scratches and is removed in the paint process.

**(Insets, from left)** Bluestreak mechanic Brian Maida; hand layout of a part radius; mechanic Larry Truong reviews material prior to building.



One day last November, all the expectations riding on an MD-10 cargo jet were going nowhere—just like the plane.

It was grounded at Los Angeles International Airport (LAX) for want of a single part—a hydraulic tube.

This meant it could not be used to haul cargo ranging from business to the personal: perhaps a care package from a mom to a son or daughter far away, or a tool for a small business, or perishable food, or medical supplies for a rural clinic, or important papers that needed to be somewhere, signed, the next day.

Although the MD-10 is a trusty airplane, it—like its parts—hasn't been built in years. That hydraulic tube couldn't be found in any warehouse inventory. This time on the ground threatened to cut into carrier profitability and consumer trust. Hours were acceptable; weeks or months were not.

However, a rapid-response team of skilled machinists is at the ready, around-the-clock, when calls for help arrive at the Boeing Emergent Build Center in Long Beach, Calif.

Their name—Bluestreak—is appropriate for well-drilled first-responders who spring smoothly into action at the first sign of trouble.

"If our customers are stuck on the ground, they're not profitable," said Mike Meraz, leader of the 11-member Bluestreak team.

"Our Bluestreak team saves the customer a lot of time and keeps planes flying," added Brian Maida, a mechanic. "We love what we do and are committed to meeting customer expectations."

Bluestreak's name was coined at Boeing Commercial Airplanes years ago to describe employees who fabricate or create parts quickly, sometimes using alternative methods—creating something from almost nothing.

There are plenty of customer support reasons for the team's existence. Of the 13,600 commercial airplanes in service, some 7,800 are no longer in production.

"Our customers are looking for immediate solutions," said Jim Michel, the center's director, explaining that 84 percent of the center's orders are needed within 30 days, usually tied to an aircraft returning to revenue service or to meet a

heavy maintenance check schedule.

Members of Meraz's team make out-of-production parts themselves. They've spent more than 10 years using Lean principles to develop quick-turn solutions for sheet metal and tube requirements. The mechanics are cross-trained so anyone can step in and handle a job at any time.

"The Bluestreak crew has been fabricating parts for these airplanes for decades, with tools and machines they've relocated from other Boeing sites," said Mark Pierce, Emergent Build Center manager.

Sometimes, as with the MD-10 hydraulic tube, there are no parts to be found, and it's up to Bluestreak to create a new one.

Recently, a customer called on a Monday with an airplane on the ground at LAX and the team was able to make a new part by Wednesday—two days before the customer expected to put the plane back into service.

So why is it difficult to find parts for old, out-of-production models? Economics.

Airlines often look to qualified fabricators to replace parts on their old airplanes. That can take months while the part is made and shipped. If a sheet metal shop is producing hundreds of parts daily for the 787, stopping a smooth-running production line to change out tools to make one part for a 717 is not financially viable.

Bluestreak started supporting the 717 program—a jetliner produced in Long Beach—in 1999 to make those hard-to-find parts. When the program shut down in 2004, the team convinced Commercial Aviation Services it could provide invaluable support to the "aftermarket" customer.

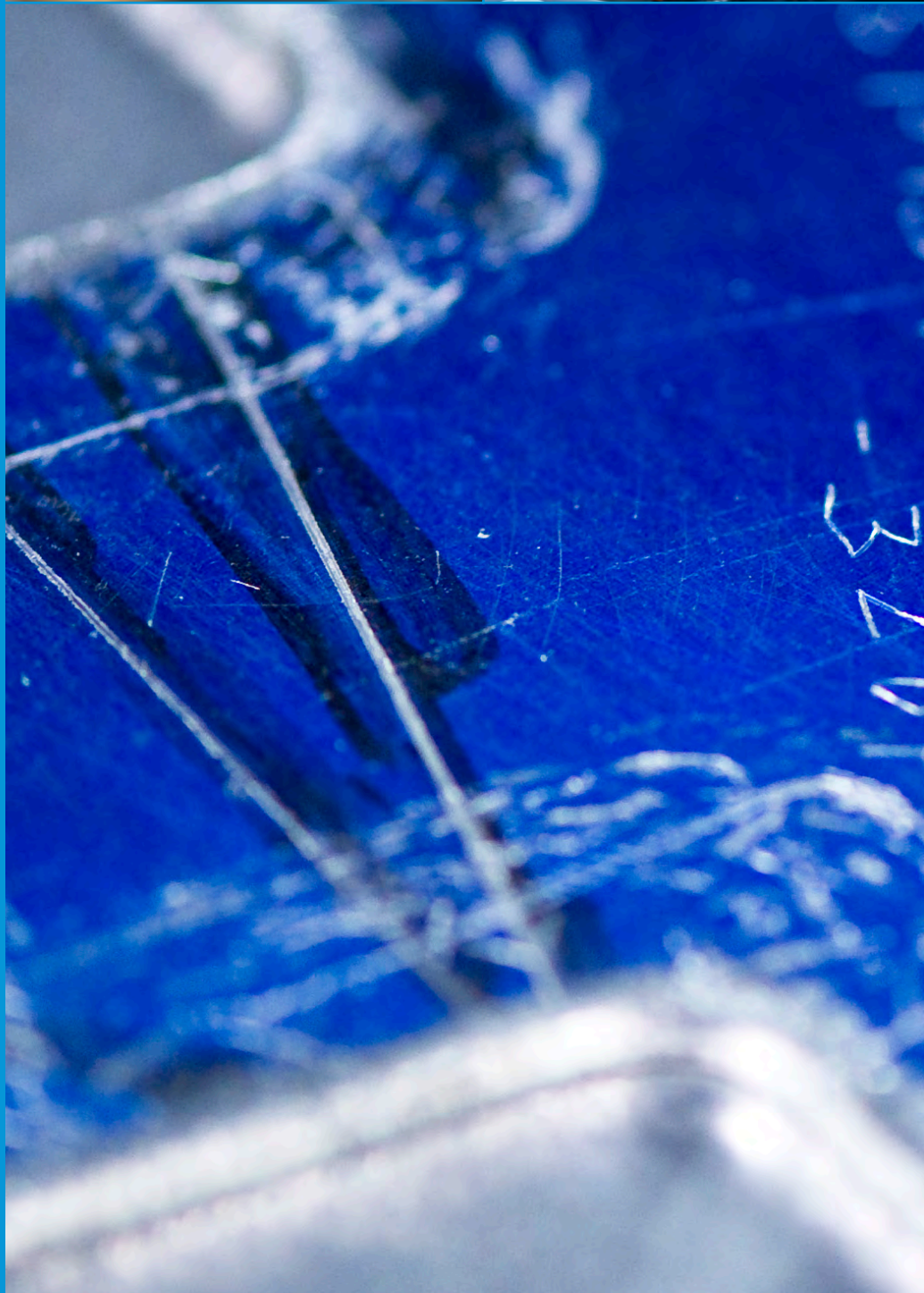
This year, the Bluestreak team will increase revenue by 15 percent from last year, up 44 percent from two years ago—mainly due to a sharp focus on continuous improvement and quick response rate to customer requests.

When customers order from the Material Services' Bluestreak shop, they can get their parts in days, not months.

In the case of the MD-10 hydraulic tube, it was fabricated and shipped within 24 hours of the request.

"We're in business for our customers," said Joe Lancaster, Bluestreak manager. "We're here to help them succeed—it's why Commercial Aviation Services exists." ■

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**PHOTOS: (Below)** A replacement part in process.  
**(Insets, from left)** Cutting material on a band saw; Tony Aguirre, mechanic, uses a vector probe; Mike Meraz, Bluestreak team lead, sets weld parameters for a pipe; Harold Green, mechanic, welds pipe; hand-filing a template.



**“The Bluestreak crew has been fabricating parts for these airplanes for decades, with tools and machines they’ve relocated from other Boeing sites.”**

*– Mark Pierce, Emergent Build Center manager*



**PHOTOS: (Below)** A Bluestreak tube bin. **(Insets, from left)** Red protective end caps for tubes; Dale Sabrowsky, mechanic, cuts a part to run on a mill; a flared and protected MD-80 pipe end; Mike Meraz, Bluestreak team lead; “S” coils in a 717 wing hydraulic pipe.

**“Speed is important—our churn time is supposed to be five days or less, but often we can come through in a couple of hours.”**

– Loren Neighbors, supervisor at the Auburn, Wash., center



# Cut above the rest

While the Emergent Build Center in Long Beach, Calif., does its vital work for Boeing airplane customers, another team performs a similar job before airplanes leave the factory.

Members of the Boeing Fabrication, Emergent Operations Bluestreak team in Auburn, Wash., are the go-to group when a part or piece is required during assembly or when an airline customer has an airplane on the ground and needs parts quickly.

“We have been chartered with protecting the production system by providing emergent support,” said Loren Neighbors, supervisor at the Auburn, Wash., center.

During airplane assembly, if a part is damaged or placed improperly, the Auburn center can make the replacement quickly to keep the assembly process moving.

If a part gets dinged in transport or during production, the center is called in to replace it and make sure the airplane is ready to go.

“Speed is important—our churn time is supposed to be five days or less, but often we can come through in a couple of hours,” Neighbors said.

One of the team’s strengths is its extensive experience in creating what are often one-off parts when a replacement is required. Team members refer to themselves as the “Swiss Army knife” of the manufacturing process, ready to make anything required to keep airplane production on schedule.

“If there’s a hole in the airplane,” said Neighbors, “it’s our job to make it whole.”

— Robin McBride



# The Unseen enemy

## Boeing's growing expertise in cybersecurity on display at new Cyber Engagement Center

By Eric Fetters-Walp and photos by Fred Troilo

One of Boeing's newest and fastest-growing businesses involves technology that moves at the speed of light.

It's also of vital interest to government agencies and businesses around the world.

What is it? Cybersecurity and information technology. And it holds promise as a rapidly growing market that dovetails with Boeing's existing interests.

Earlier this year, FBI Director Robert Mueller told a U.S. Senate intelligence panel that cyberattacks are increasing each year, and he expects the danger from cyberthreats eventually will surpass the threat of terrorism. With that reality, demand for cybersecurity services is rising, according to Boeing's Bryan Palma, vice president, Secure Infrastructure Group, Information Solutions division.

"The current market is fast-growing—one of the fastest-growing markets Boeing's engaged in," Palma said, adding that the sector's main markets are all predicted to grow by at least 7 to 10 percent annually in the coming years. "We see it as a great place for Boeing to continue to invest."

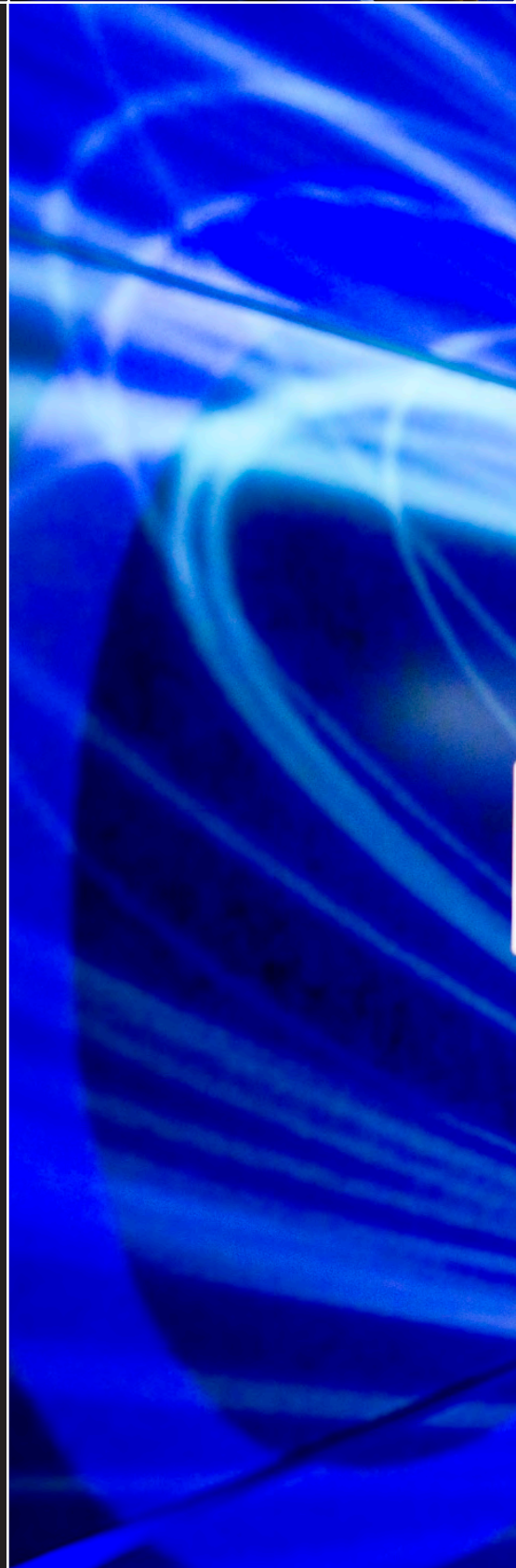
The company's latest investments in Information Solutions can be seen in Annapolis Junction, Md., where the Cyber Engagement Center showcases Boeing's capabilities to existing and potential customers. Filled with walls of screens that can support multiple product and capabilities demonstrations, along with plenty of computing horsepower, the main control room looks like it's been transplanted from a *Mission: Impossible* movie.

"The space was built to really engage and immerse folks in what cybersecurity is so they understand," said Bill Hubbard, the Information Solutions systems architect who helped lead the center's design process, which included input from several organizations in both Boeing Defense, Space & Security and Engineering, Operations & Technology.

That said, the Cyber Engagement Center is much more than a place to impress customers, explained Dewey Houck, vice president and general manager of Boeing's Information Solutions. The center houses experts from across Boeing, including the Information Technology Security team, the Network & Space Systems Information Solutions division and Phantom Works, all of whom can tackle network security attacks and similar disruptive emergencies.

Boeing's growing expertise in cybersecurity developed first out of necessity. The company's own computer network is believed to be the world's sixth-largest private enterprise network, with more than 176,000 employee logins and 40 million authentications or authorizations a day. And as a government contractor and an innovator in airplane design, keeping that network safe and operating smoothly is paramount, especially in the face of increasing attacks by hackers and the proliferation of computer viruses.

U.S. federal agencies saw a 650 percent increase in cybersecurity incidents during the past five years, the Government Accountability Office reported in 2011. Hackers





**PHOTOS: (Below)** A view of the Cyber Engagement Center's Cyber Cube, a four-sided video wall used to enhance information awareness. **(Insets, from left)** Data are displayed on the Cyber Cube inside Boeing's Cyber Engagement Center in Annapolis Junction, Md.; the center's lobby includes interactive touch-enabled displays designed to showcase Boeing capabilities to customers; information display towers; a mosaic picture wall in the Cyber Engagement Center underscores that both people and technology are needed to solve cybersecurity challenges.

probed or attacked executive and congressional computer systems an estimated 1.8 billion times a month in 2010, according to a 2011 cybercrime report from Symantec, an online security firm.

"This is a human problem, and real people are on the other end of these attacks," Houck said.

This is why Boeing's existing Intelligence Community, commercial and military customers could benefit from the company's emerging cybersecurity business.

Some of Boeing's cybersecurity business has grown organically, but it also has made several strategic acquisitions to rapidly advance the enterprise, bringing in new customers and opportunities. During the past four years, Boeing has acquired eight businesses, five of which are now part of Information Solutions. RavenWing, Kestrel Enterprises, exMeritus, Narus and Solutions Made Simple (SMSi) all bring capabilities related to cybersecurity and command, control, communications, computers, intelligence, surveillance and reconnaissance (commonly referred to as C4ISR). In the realm of logistics command and control, Boeing acquired Tapestry Solutions, Federated Software Group and CDM Technologies.

In January 2011, to bring all these businesses together as a coordinated enterprise, Boeing formed Information Solutions, a division of Boeing Defense, Space & Security's Network & Space Systems unit.

"It's a hugely diverse business, with customers in intelligence, law enforcement, IT/telecommunications and commercial business scattered all around the world," Houck said. "I think our advantage is in our [Intellectual Property] and in the capabilities we have in the companies we've acquired over the past 36 months. We picked best-in-class companies for the evolving markets we saw."

And those markets are changing as fast as the computer technology used by Boeing and its customers. For example, Houck said, with people in business and government increasingly using cellphones and tablets instead of laptops, there's an urgent need to improve cybersecurity for mobile computing devices.

"The secure mobility part is where I see the explosive growth," Houck said. "By 2015, there will be six times as many people connecting to the Internet on small-screen devices as on a computer. It will be you and me worried about our cellphones being hacked and demanding secure connections."

Houck added that he believes Boeing has a lead in addressing that market.

Palma said the ability to stay on the cutting edge is vital for growing Information Solutions and requires innovative thinking and a proactive approach. "The nature of our business and our offerings require us to be quite nimble," he said. "It's a different kind of business for Boeing, and we need to be even quicker and more flexible to respond to our customers."

Boeing may acquire more businesses when it makes sense, according to Palma, and holds the potential to further expand Information Solutions' cybersecurity capabilities. But the division also still has plenty of room to grow from within, especially internationally.

"Our services and products are very well suited to international customers, and we are leading the way in those markets," Palma said. "Obviously, when people first think of Boeing, they think of airplanes. But we've had a very good reception internationally. The Boeing brand is well-recognized and regarded and does nothing but afford us opportunities."

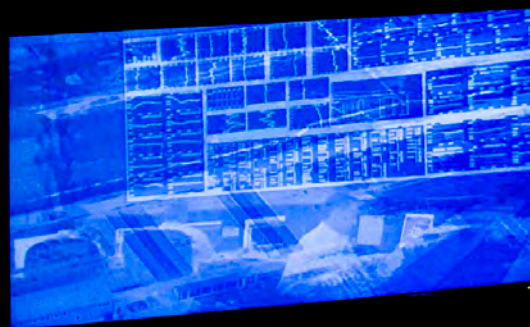
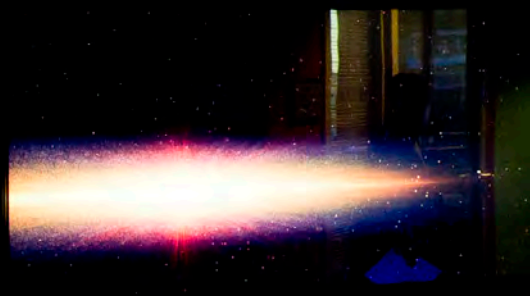
Marrying the best technology available with the best and most expert people at Boeing will allow the business to take advantage of those growing opportunities, Houck added.

"When people look at Information Solutions, I want them to see a technology-driven business that reflects the best of Boeing," he said. "That's what we're really striving to do." ■

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# Information Solutions: A global business

Information Solutions, the chief operator of the Cyber Engagement Center in Annapolis Junction, Md., combines Boeing's expertise across a broad range of technology areas to develop advanced solutions for government



and commercial customers that will protect their applications, infrastructure and mobile environments. The division, which includes nearly 3,000 employees spread around the globe, comprises five different businesses:

**Secure Infrastructure Group** delivers integrated solutions to improve situational awareness, analysis and decision support for physical and virtual infrastructures. Within the SIG business unit are Information Security Solutions, Critical Infrastructure Protection Solutions and Narus. It also operates the Cyber Engagement Center.

**Mission Operations** integrates, deploys, transitions, operates and sustains satellite ground systems supporting Intelligence Community, U.S. Department of Defense, and civil and commercial customers for mission success.

**Intelligence Systems Group** develops and integrates systems that provide advanced capabilities to Intelligence Community customers, with specific expertise in collection planning, data

management, analysis, exploitation and dissemination for moving the information advantage to the point of consumption.

**Advanced Information Solutions** is a diverse, entrepreneurial team responsible for identifying, developing and capturing significant growth opportunities in the secure mobile sector—including smartphones, mobile system architectures and applications—and advanced decision aids.

**Advanced Technology Programs** delivers innovative mission solutions for the U.S. Intelligence Community. Key programs include the Echo Ranger commercial unmanned undersea surveying vehicle and the acoustic subsystem for the U.S. Navy's P-8A Poseidon aircraft.

**PHOTO:** A The four-sided Cyber Cube, located in the Cyber Engagement Center's "public square," is used to monitor cybersecurity-related information, news and imagery simultaneously.





**PHOTOS: (Below)** Members of the U.S. Air Force Air Demonstration Squadron "Thunderbirds" board a C-17 at Nellis Air Force Base, Nev., to depart for the Portsmouth, N.H., air show in August 2011. U.S. AIR FORCE **(Employee insets, clockwise from top left)** Wing tank mechanic Steve Roberson; wing mechanics Joseph Lorenzen, Bo Harris and Arthur Williams. BOB FERGUSON/BOEING





# Heavy lifting

For Boeing's globe-trotting C-17 transport, the journey begins in Long Beach

By Diane Stratman

**C**orey Chow was there from the start, when production began 24 years ago in Long Beach, Calif., for a new heavy-lift aircraft for the U.S. Air Force. The aircraft—the Boeing C-17 Globemaster III—would usher in a new era of military and humanitarian airlift capabilities.

"I'm very attached to this aircraft, since I was one of the first ones there at the start of production in 1988," said Chow, who works on the C-17 Long Beach flight ramp in Liaison Engineering. He and his teammates help ensure that every airlifter leaving Boeing's final assembly facility is ready for delivery to the customer—and ready for any number of global missions.

The C-17 is a main workhorse of the U.S. Air Force with flexibility to transport all types of cargo and heavy loads across vast ranges, land on short runways anywhere in the world, and operate in extremely hot and cold climates.

With a maximum payload capacity of 164,900 pounds (74,800 kilograms), the C-17 can carry cargo as large as an M1 Abrams tank in its 88-foot-long (27-meter) cargo compartment. It was designed to operate from runways as short as 3,500 feet (1,070 meters) and it can fly 2,400 nautical miles (2,760 miles, or 4,450 kilometers) without refueling.

The C-17 was used extensively in Iraq and continues to







**PHOTOS: (Left)** Pallets are airdropped from a C-17 over Afghanistan in September 2011. U.S. AIR FORCE **(Insets, clockwise from top left)** Mechanics Jesus Romero, Harold Elliard, Jobie Turner and Dexter Levingston. BOB FERGUSON/BOEING

transport tens of millions of pounds of cargo, water and rations to troops in Afghanistan where the terrain is steep and roads are often dangerous.

It can also transform into a flying hospital, providing wounded soldiers—on their way to ground-based hospitals—the same state-of-the-art medical care and technology seen in modern intensive care units.

“It’s always great to see the C-17 coming in when you’re on a tour of duty,” said Dave Ruiz, C-17 systems engineer in Long Beach and a major in the U.S. Air Force Reserves. “When I was in Afghanistan, I’d see a C-17 flying in and immediately associate it with home. There was so much comfort in seeing that plane arrive. I knew that if my troops were injured, I could put them on a C-17 which would transport them to the combat support hospital in Germany; once they were on that plane, I knew they’d be OK.”

When disaster strikes—whether the event is an earthquake, tsunami, hurricane or the city of Shanghai in 2008 battling the worst winter in 50 years—the C-17 is uniquely suited to deliver massive quantities of supplies within a few hours’ notice because of its ability to land on austere runways after traveling long distances.

“Twenty years ago, when I was working in flight test for this new airlift program, I could not anticipate just how critical the C-17 would become for the U.S. Air Force and its allies and in support of



**PHOTOS: (Right)** A C-17 delivers bundles of fuel to Forward Operating Base Waza K'wah in Afghanistan. The fuel was part of an air delivery to help sustain members of the 101st Airborne Division, who had no other means of being resupplied. **U.S. AIR FORCE**  
**(Employee insets, bottom row from left)** Joseph Young, fuselage mechanic; John Moore, left, and Joe Sabio, wing mechanics; Rube Smith, wing mechanic. **BOB FERGUSON/BOEING**





humanitarian missions,” said Bob Ciesla, vice president and C-17 program manager. “The C-17 transports supplies, cargo and troops closer to the point of need than ever before, and delivers hope to those hit by even the most devastating disasters.”

When a powerful earthquake devastated Haiti in 2010, the runway at Port-au-Prince international airport was rendered inoperable. A C-17, however, was able to maneuver on the damaged runway and deploy an elite search-and-rescue team that located and rescued survivors who might not otherwise have been found.

Just over a year ago, C-17s from the U.S. Air Force and Royal Australian Air Force flew to northern Japan to support search-and-rescue efforts following an earthquake and tsunami that killed more than 10,000 people and left tens of thousands of residents homeless.

The airlifter has even been used to ferry Keiko—the 5-ton (4.5-metric-ton) whale and inspiration for the movie *Free Willy*—to his native waters in Iceland.

“The C-17 is the best airlifter ever built,” Chow said, echoing the shared pride of those who build the aircraft in Long Beach or who work for the program in various capacities. “There’s nothing else out there capable of doing what it does.”

It’s been nearly 21 years since the C-17 flew for the first time. That occurred Sept. 15, 1991, when the first took off from Long Beach on a two-hour flight that ended at Edwards Air Force Base in the high desert of California. There, the C-17 began flight tests and would go on to set 33 records for aviation yardsticks such as “payload to altitude” and “time to climb.”

Last year, on the 20th anniversary of that first flight, U.S. Air Force Col. Andrew Ingram, C-17 systems program manager at Wright-Patterson Air Force Base in Ohio, summed up the many accomplishments of the airlifter when he told *Air Force Today*, “It allows us to deliver hope, fuel the fight and save lives.”

Parry Havelaar, a C-17 manufacturing analyst in Long Beach, has worked on the

program for more than 22 years and was there for the first flight, as was Chow. The same plane that flew the first flight also flew over the Long Beach plant last year on the 20th anniversary.

"Seeing the same aircraft last year that I saw on its first flight 20 years ago sent a chill up my spine, as that represented one of the proudest moments of my career," Havelaar said.

With most U.S. Air Force planes having been delivered, Boeing has reduced production at the Long Beach plant to 10 C-17s a year.

In cutting the production rate, we bought time," said Ciesla, the C-17 program manager.

"In other words, there are potential customers out there who want the C-17 for their military and humanitarian transport needs, but they're not quite ready. Keeping the line open has bought or is currently buying time for these important customers to formalize their airlift requirements."

The C-17 has already found a home with a growing number of international customers including the United Kingdom's Royal Air Force, Royal Australian Air Force, Royal Canadian Air Force, Qatar Emiri Air Force, the United Emirates Air Force and Air Defense, and the 12-member Strategic Airlift Capability initiative of NATO and Partnership for Peace nations. Last June, the Indian Air Force ordered 10 C-17 airlifters for delivery in 2013 and 2014, establishing India as C-17's largest international customer.

"The C-17 family just keeps on growing as our international customers realize what a true asset this aircraft is to their military and humanitarian missions," Havelaar said. "If I had a son or daughter serving in the military, I would feel good knowing this aircraft would keep them safe and bring them home."

Tracy Gray, a C-17 loadmaster for Boeing, is one such parent.

"Dependability is what best describes this jet," Gray said. "My son, an Army vet, spent a year in Baghdad while I was flying in and out of that region. He saw a lot over there, but he—and I—never doubted I'd be safe flying on the C-17."

The aircraft's role in saving lives is a big part of what motivates Betty Cavanagh, who's been with Boeing nearly 61 years and with the C-17 program for 20 years.

"As a fuel tank inspector, I get teased by teammates for being so particular," she said. "But they still come to me because they know I will get the job done right. Getting it right is what ultimately saves lives."

And getting it right—down to the smallest detail—is what makes the C-17 what it is. ■

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**PHOTOS: (Below)** Members of the U.S. Air Force's 621st Contingency Response Wing perform a nighttime, engine-running offload of a C-17 using an articulated forklift at Joint Base McGuire-Dix-Lakehurst, N.J. **U.S. AIR FORCE (Insets, from left)** Reginald Hill, structure mechanic; John Williams, fuselage mechanic; James "Bill" Harris, wing mechanic; Elinor Otto, wing mechanic and a "Rosie the Riveter"—one of the many women who worked in factories and shipyards during World War II. **BOB FERGUSON/BOEING**







# Innovation for a cleaner tomorrow

By Patrick Summers and Cindy Naucler Glickert

It all starts at an engineer's desk.

The 787 Dreamliner and 747-8 have established new standards among jetliners for efficiency, environmental performance and noise reduction, and Boeing engineers continue to set their sights just as high when it comes to the environment.

The ongoing drive to improve energy efficiency has the potential to make a major difference on board both commercial and military aircraft.

"One of the technologies we're looking at is fuels cells that would generate onboard electricity closer to where it's needed," explained George Roe, leader of the energy management team in Boeing Research & Technology.

Fuel cells cleanly convert the chemical energy in fuels such as hydrogen into electricity. A simple application would be to power a commercial airplane galley, which would help reduce the amount of electrical wiring on the airplane.

"This is one of the technologies we can use to help the environment," Roe said. "Smaller, lighter and more efficient systems mean aircraft burn less fuel and emit less carbon dioxide."

Harnessing energy from clean sources is one of the many ways Boeing applies innovative engineering and advanced technology to improve the efficiency and environmental performance of its products, services and facilities—and create a cleaner future for the aerospace industry.

"Our commitment to Boeing employees, customers and the communities we serve is to continually improve the company's environmental performance across our product lines and operations," said Kim Smith, vice president of Environment, Health and Safety.

Currently, more than 75 percent of Boeing's commercial airplane research and development efforts contribute to advancing environmentally progressive innovations, Smith said.

**PHOTO:** Advanced jet engines are more fuel-efficient, produce fewer greenhouse gas emissions and play an important role in reducing the environmental footprint of Boeing products. BOB FERGUSON/BOEING

It's all part of the company's legacy of innovation that has helped make air travel 90 percent quieter and 70 percent cleaner since the 1960s.

Boeing's biggest environmental impact comes from improving products already in use. Air transportation contributes 2 percent of global human-produced carbon dioxide (CO<sub>2</sub>) emissions, according to a United Nations panel on climate change.

"As the world demand for airplanes continues to grow, our biggest environmental challenge is to reduce the carbon footprint of our products in service," said Jeanne Yu, director of environmental performance and product development for Commercial Airplanes. "Meeting that challenge has also been one of our greatest achievements."

The technology that shapes the environmental performance of the 787 Dreamliner and 747-8 includes advanced materials, such as carbon-fiber composites, more fuel-efficient engines, new wing designs and improved aerodynamics. The Dreamliner boosts fuel efficiency by 20 percent over airplanes of comparable size, according to Boeing. The 747-8 improves fuel economy and cuts carbon emissions by 16 percent over the older 747-400, while reducing its noise footprint by 30 percent.

Advanced engines also are a key feature of the new 737 MAX, launched last year and slated to enter commercial service in 2017. It will have a 10 to 12 percent smaller carbon footprint than its predecessor and be noticeably quieter, according to Boeing engineers.

An area with significant potential for reducing airplane CO<sub>2</sub> emissions is using alternatives to fossil fuels. Boeing has taken an industry leadership role in accelerating the research, testing and commercialization of sustainable aviation biofuels made from algae or jatropha and camelina plants. "Sustainable" means the biofuels are processed from feedstocks that do not compete with food, water or land-use resources (see Page 16 of the March 2012 *Frontiers*).

The interest in sustainable biofuels and other clean technologies increasingly extends beyond commercial aviation.

"Our military customers are making the connection between



improved environmental performance and safer, more efficient operations and lower life-cycle costs,” said Tim Vinopal, director of environmental engineering for Boeing Defense, Space & Security.

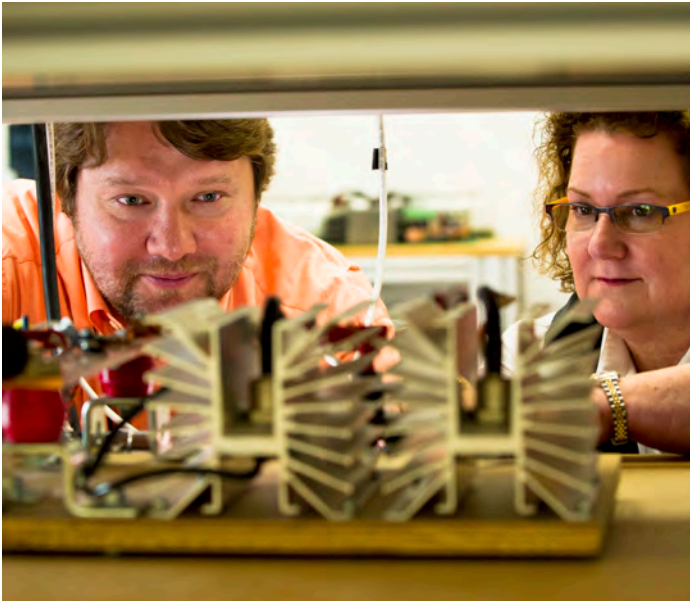
Many of the technologies that boost the efficiency of Boeing’s commercial products can have the same benefits on military aircraft.

“Our commercial engineers work closely with one another and with their counterparts on military programs to ensure that we replicate successful commercial technology across business units and customers,” said Vanessa Gemmill, leader of the Environment Technology Domain. Boeing’s eight Technology Domains allow the company to take an integrated, more effective approach to technology development—and help get the greatest return on its technology investment.

Another key part of Boeing’s strategy to continually improve its environmental performance is the Design for Environment program, which provides engineers with tools to help them make design decisions that reduce a product’s environmental footprint.

Other examples of clean technology can be found across Boeing products and operations, including:

- Chrome-free primers and paints – Eliminating chrome reduces the use of hazardous materials and creates a safer work environment for employees and the people who repair and maintain Boeing products.
- Required Navigation Performance procedures – Required Navigation Performance, a GPS-based navigation technology that enables aircraft to fly precise, predefined paths, allows pilots to fly more efficient airport approaches that reduce fuel consumption and noise.
- Laminar flow advances – Designing an aircraft that minimizes the disruption of air (thus creating more laminar flow, or the “smoother” flow, of air over an airplane’s surfaces) improves aerodynamics and fuel efficiency.
- Renewable energy – Ten acres (4 hectares) of solar panels on the roof of the final assembly building are part of the company’s commitment to use 100 percent renewable energy to power Boeing’s North Charleston, S.C., site.
- Product life-cycle planning – Once an aircraft completes its service life there can still be environmental impacts. Boeing’s



life-cycle approach to environmental performance has led to strides in recycling end-of-service aircraft in safe and environmentally responsible ways. Boeing is a founder of the global Aircraft Fleet Recycling Association, whose members dismantle and recycle airplanes and aerospace components.

This year Boeing will launch the ecoDemonstrator program to accelerate the development of new technologies that will further reduce aircraft fuel consumption, greenhouse gas emissions and noise.

The first ecoDemonstrator flight will be a partnership with American Airlines and the U.S. Federal Aviation Administration on a Next-Generation 737. It will flight-test technologies such as fuel cells, adaptable wing trailing edges, variable area engine fan nozzles to reduce noise, and flight trajectory optimization software, which enables airlines to select and fly more fuel-efficient routes.

“The ecoDemonstrator is a way for us to gain experience with the technology and how it integrates with the airplane,” said Kelly Kronberg, a member of the fuel cell team in Commercial Airplanes product development. “It’s an important step in proving the technology’s potential economic and environmental benefits.”

For Roe, improving the environmental performance of Boeing products also brings a lot of personal satisfaction.

“I think more and more about our direct and indirect ‘footprints’ and the systems I’m helping create,” he said. “I believe what Boeing is doing with the environment and energy is truly important—and among the top priorities that capture the imagination and hearts of our employees and customers.” ■

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**PHOTOS: (Clockwise from far left)** In Everett, Wash., mechanic Steve Kory inspects General Electric’s GE-115B noise-reducing engine on a 777 Freighter. *GAIL HANUSA/BOEING* Clean-burning hydrogen fuel means the only emissions will be water from Phantom Eye, a high-altitude, unmanned airborne system. *NASA* Chrome-free paints and primers are reducing the amount of hazardous material used in airplane coatings. *JIM ANDERSON/BOEING* American Airlines is Boeing’s first partner on the ecoDemonstrator program to improve aircraft environmental performance. *BOEING* System integration engineer Vyacheslay Khozikov, left, and product development specialist Kelly Kronberg test equipment used in fuel cells. *ED TURNER/BOEING*

# Keeping the edge

Commercial Aviation Services redefines the Boeing services advantage

By Rick Sanford and Gary L. Sanders

**W**hat do you think of when you hear the name “Boeing”? If you were to ask Boeing’s customers around the world, it’s likely the most common answer would be “great airplanes.” Most Boeing employees would probably agree.

Lou Mancini and his team do. But they’d add more.

Mancini is senior vice president of Commercial Aviation Services, or CAS as it’s often called within Boeing. At the Singapore Airshow in February, he rolled out a new initiative called the Boeing Edge—a framework for a better way of thinking about

Boeing and the service advantages it offers customers.

Mancini and his 13,000 employee-strong global organization want the world to know Boeing for its great airplanes and for the unmatched array of services, technologies and expertise that Boeing makes available to customers.

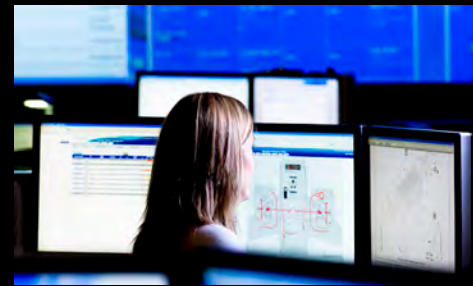
The reason is simple: The payoff for success is potentially enormous.

The worldwide aviation services and support market is estimated to be worth \$2.3 trillion through 2030. That’s slightly more than half of what Boeing estimates as the value of the global market for airplane sales in the same period.

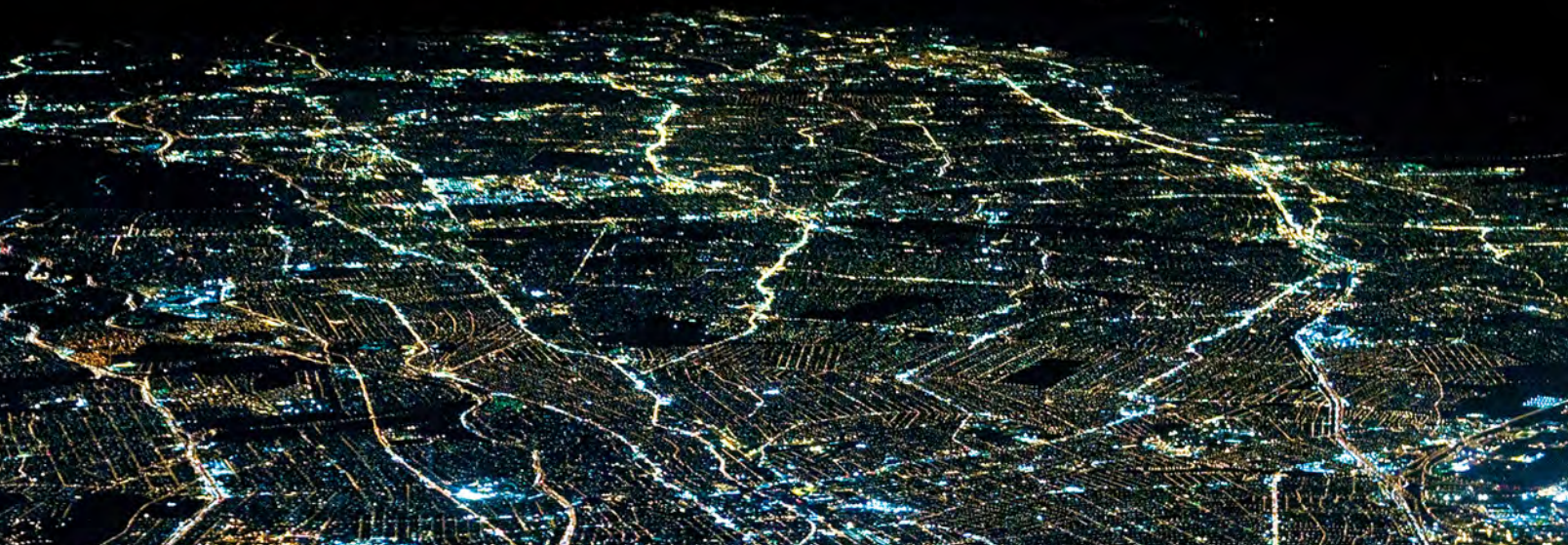
It’s a space with plenty of competition, though. Boeing already is the third-largest aviation service provider. But its market share in services still is in single digits. So growing the company’s reputation and market share in this highly competitive space is the challenge that Mancini and CAS have undertaken.

The first step, made in 2010, was to organize CAS into four groups, aligned with the way airlines organize their operations: Material Services, Fleet Services, Flight Services and Information Services.

Next was to give employees and customers worldwide a common vocabulary to talk about what Boeing provides—all



**PHOTOS: (Below)** This image was used in Boeing promotional materials to highlight the Boeing Edge, an initiative that provides a framework for a better way of thinking about Boeing and the services advantages it offers customers. **(Insets)** Boeing employees work behind the scenes to help keep customers’ operations running smoothly, whether it’s providing training, maintenance or parts management. **BOEING**



under a common set of messages that emphasizes the advantage of buying services from the company that builds the airplanes.

That's the Boeing Edge. And it's defined by the people of CAS themselves.

For Alex Fecteau, the Boeing Edge for his group, Flight Services, is the knowledge only an original equipment manufacturer gives to customers.

"We at Boeing have the latest, most advanced capability that we can bring to our customers," said Fecteau, a project engineer for Required Navigation Performance. "When a customer comes to Boeing, they know with certainty that we offer them the latest information, the most advanced methods of using their equipment and the absolute authority on what they can and can't do with their airplane."

For Ray Rodriguez, the Boeing Edge in Material Services is the speed and convenience that result from integration with the customer.

"We work with the customers to bring them a tailored solution so that we can get their airplanes flying as quickly as possible," said Rodriguez, who works in Services Development. "We manage from the customer's perspective; we integrate at the customer's site."

Dennis Floyd, who leads Fleet Services, said the Boeing Edge is the company's ability to deliver upgrades, modifications and enhancements to keep airplanes up to date and operating efficiently. Boeing's use of advanced digital tools to speed troubleshooting and manage the entire maintenance process is just one example.

The Boeing Edge—advanced technology that links airplanes in the air to services and supplies on the ground—is readily apparent in Information Services.

By applying technology leadership, original-equipment-manufacturer knowledge and fleet data available exclusively from Boeing, Information Services is helping create the "Digital Airline," said Per Norén, vice president of CAS Information Services.

How will it be perceived by customers?

"Customers value doing business with Boeing—the collaboration, innovation and global resources coupled with an amazing team of people who are efficient and, above all, trusted," Mancini said.

"Ultimately, our people are the Boeing Edge." ■

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# Defining the future

Improvements continue on 777 line as studies focus on what's next

By Kathrine Beck

Ryan Hoover, a mechanic on the 777 production line, remembers when all the holes for fasteners had to be drilled by hand. It was physically demanding work that could be hard on shoulders, backs, knees and wrists.

Today, Hoover is still responsible for making sure holes for fasteners are drilled properly and in exactly the right place on the fuselage. But now he operates Flex Track drilling equipment, one of the many manufacturing refinements being added at the Everett, Wash., factory as programs push to increase production rates.

It's part of Boeing's effort to make cost-saving improvements in the production of the popular 777 twin-aisle jet—as well as ongoing improvements to the airplane—while company leaders study what might come next.

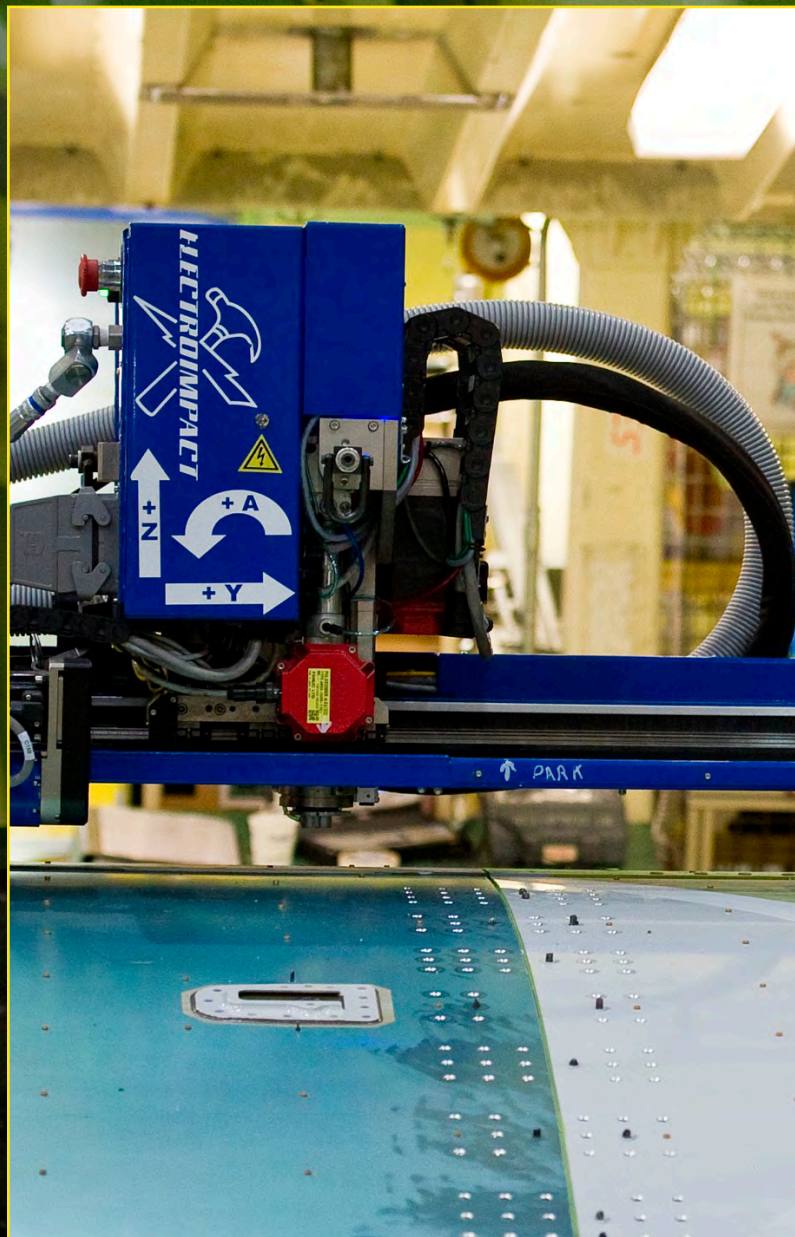
The automatic drilling machines have proved their value on the 777, so much that they are now being used as a best practice by the 767 program.

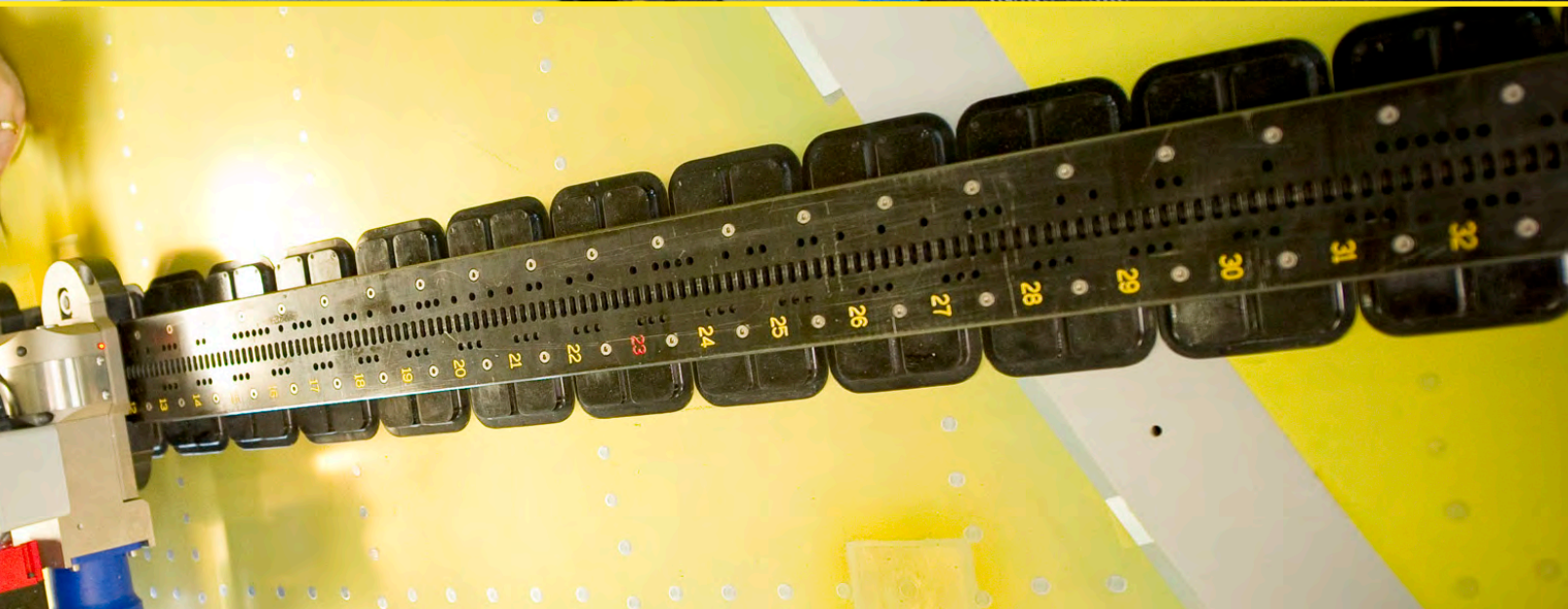
Hoover gets the numerically controlled drill machine started at a “K hole”—a locating hole that is used to find the correct position for all the other holes. Then, a camera takes a picture of the drilled hole and shows it to Hoover on his laptop. He checks it to make sure the hole was centered properly so the

“This is more accurate, the quality is better, there are fewer chips, and it's a lot better for the body.”

— Ryan Hoover, a mechanic on the 777 production line

**PHOTOS: (Top right)** 777 assembly mechanic Ryan Hoover monitors drilling progress on his laptop. **(Right)** Assembly mechanic Michael Guldenmann checks countersink depths. The Flex Track, shown, is used to guide the drill. **BOB FERGUSON/BOEING**





subsequent holes will be accurately positioned.

After that, the machine is programmed to know where to drill the next hole.

The bright blue drill climbs up the fuselage, moving on a track to the next position. During the drilling of the hole, chips are vacuumed up and carried away by a hose, keeping the 777 clean and free of foreign object debris. Hoover monitors the progress of the machine, changes drill bits, and ensures quality standards are met. He also sets up the job by attaching the track to the airplane, using neoprene suction cups.

Hoover has high praise for the system.

"This is more accurate, the quality is better, there are fewer chips, and it's a lot better for the body," he said.

Alan Draper, 777 Body Structures production reduction manager, agreed, noting the system reduces risk of injury from overhead drilling and chips falling in eyes. "All great safety improvements," Draper said.

The new system originated as part of a 777 customer initiative to reduce tool marks such as scratches, nicks or blemishes.

"The customer expects us to do high-quality work, and this was one of our quality initiatives to figure out ways to reduce tool marks," Draper said.

It works.

"We reduced skin defects by 97 percent," Draper said, in the process making significant safety improvements. ■

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**PHOTO:** A 777 in final assembly at the Everett, Wash., factory.  
JOHN CROZIER/BOEING





# Future perfect

The 777 program delivered 1,000 airplanes faster than any twin-aisle in history, an achievement celebrated just last month when Emirates took delivery of a 777-300ER (Extended Range).

So it's perhaps logical to ask what's next for the 777 airplane family.

Not so fast, urge company leaders.

"Time is on our side," said Jim McNerney, Boeing chairman, president and chief executive officer, speaking at the Cowen and Company 33rd Annual Aerospace/Defense Conference in February, when asked about future 777 derivatives or replacements.

"The 777 is the gold standard and is viable for decades to come," McNerney said.

What's more, 2011 was the best year on record for 777 sales. The final tally of 200 beat the previous record of 154 set in 2005. Production is at an all-time high for the program and a 20 percent rate increase already has begun, increasing from seven to 8.3 airplanes a month (100 airplanes per year) in 2013.

Still, that leaves a backlog of more than 350 airplanes that will keep the 777 production line humming well into the next decade.

"The 777 is the leader in the long-haul market," said Nicole Piasecki, vice president of Business Development and Strategic Integration at Commercial Airplanes. "That gives us the time to make the right product decisions, timed with the right technology and resources. We are committed to improvements in both the 787 and 777 families. In line with our product strategy, we are committed to having the most competitive airplane in every market segment."

In the twin-aisle market, according to Piasecki, Commercial Airplanes is focused on a full array of products with seat count capacity in 15–20 percent increments from the 787-8 all the way through the 747-8.

"This gives the customer maximum flexibility to adjust capacity when the marketplace moves up or down," Piasecki said. "We want to offer full flexibility across platforms to maximize our advantage."

Currently, Boeing teams are working with customers and studying several options for improving on the 777. These range from improvements to the wing design along with new engines to more aggressive programs with major improvements including composite wings and new engines. Studies also are under way to bring to market the 787-10, the largest version of the new composite airplane, Piasecki said. The program is studying larger versions of the 787 with proposed range capabilities of 6,800–7,000 nautical miles (7,830–8,060 miles, or 12,590–12,960 kilometers) and 315–330 seats. Timing for entering the market on either would be late this decade or early next.

"These are difficult decisions, Piasecki said. "The key to launching both programs is to prove that we can develop these products affordably, and that we have a market-winning definition of the airplanes."

— Karen Crabtree



# The silky way

The rich history and culture of Azerbaijan is reflected in its dynamic national airline

By Kathrine Beck

**A**t the crossroads of Europe and Asia, Azerbaijan has long been a place where people from many lands met and traded. As they did, Azerbaijan developed a legendary tradition of hospitality to the guest and the traveler.

Azerbaijan, located south of the Russian Federation on the Caspian Sea, was the center of many ancient cultures and a key part of the Silk Road, where for centuries caravans carried silks and spices from Asia to Europe.

The first airplane to take to the air there did so over the capital city of Baku at the dawn of flight in 1910. Commercial aviation followed quickly.

Azerbaijani commercial aviation will celebrate its 75th anniversary in 2013. Today, the country's national carrier, Azerbaijan Airlines, takes its place as one of the world's most dynamic airlines.

"Azerbaijan is becoming a busy hub in a centralized geographic location," said Azerbaijan Airlines Director General Jahangir Askerov, a former pilot. "We are capitalizing on this development by expanding our long-haul passenger fleet and growing our cargo business."

Boeing is providing the right airplanes for the job. The airline has four 757-200s and two 767-300ERs (Extended Range) in its fleet. It will take delivery of another 767-300ER and two 767-300 Freighters this year, and has two 787-8s on order.

Azerbaijan Airlines flies to Europe, the Middle East, Russia and the surrounding region and plans to add routes to the United States and China. Reflecting the country's hospitable culture, the airline's commercial flights are designed for an enjoyable passenger experience, according to Serdar Gurz, director of Sales, Boeing Commercial Airplanes.

"The way they're configuring their 787s, you know comfort and customer satisfaction take priority," he said.

Martin Bentrott, vice president, International Sales for the Middle East, Russia and Central Asia, noted that Azerbaijan Airlines also has one of the fastest-growing cargo operations in the world. The future offers even more growth.

Azerbaijan Airlines has invested in airport infrastructure in six international airports across the country, and it is building a new terminal at Haydar Aliyev Airport in Baku. And, in partnership with Boeing Flight Training Systems, it has established a state-of-the-art simulator center.

"They keep taking it to the next level," said Bentrott, who travels frequently to Azerbaijan. "They've gone out of their way to teach me about their business and where they're going from an aviation standpoint."

Askerov shared Bentrott's enthusiasm about the airline's relationship with Boeing.

"We see it as a full partnership," he said. "Like any partnership, there can be a bump in the road once in a while, but this road has become extraordinarily smooth." ■

*kathrine.k.beck@boeing.com*



**GRAPHICS: (Below)** A close-up of the Azerbaijan flag. **SHUTTERSTOCK (Insets, from top)** Boeing 767-300ERs (Extended Range) in the Azerbaijan Airlines livery. **BOEING** Shown in this artist's concept is the new Baku Heydar Aliyev International Airport, scheduled for completion in 2013. **AZERBAIJAN AIRLINES**

# Stories of service

Meet three Boeing employees who put their skills to good use—through volunteering

**W**hen Juan “Tony” Castilleja Jr., was growing up, he dreamed of someday working in the space program. Now he is living the dream as a program engineer for Boeing Defense, Space & Security in Houston, where he supports the Crew Space Transportation program.

Exciting as his work is, one of his proudest accomplishments has been as co-founder of a program that matches disadvantaged and minority students in the Houston area with Rice University engineering undergraduates who mentor them.

Two other Boeing employees, Melinda Keeling and Carl Vorst, understand that type of accomplishment, one that comes from volunteering.

Keeling, a finance manager with Boeing Test & Evaluation in Palmdale, Calif., is proof that you don’t have to be skilled with a hammer and nails to help a community service program grow. Sometimes a head for business, a heart for helping and an Excel spreadsheet are the right tools for the job.

Vorst, a Technical Fellow for Boeing Defense, Space & Security in St. Louis, repairs generators and vehicles, fixes water and electrical systems and does anything else that needs to be done—on trips to help out in Haiti.

They were all recognized by the Boeing Exceptional Volunteer Service Award program, an annual award that goes to three outstanding volunteers who use their professional skills to address needs in the community.

Castilleja was the recipient of the 2011 service award, for his work mentoring disadvantaged high school students interested in science, technology, engineering and math, or STEM, careers. The two finalists were Keeling, honored for her work with The Catalyst Foundation, a medical and support center for disenfranchised members of the community; and Vorst, who was recognized for his commitment to helping children and the homeless in Haiti.

“Each year I’m awed by and appreciative of the work all our employees do for communities around the globe,” said Patrice Mingo, director for Global Corporate Citizenship’s enterprise employee engagement program. “Beyond being ambassadors for this great company, their selflessness and generosity are truly inspiring.”

## Launching dreams

Castilleja, a Rice University graduate, joined Boeing as a full-time employee in 2009 after completing a three-summer



**PHOTO:** Juan “Tony” Castilleja Jr. holds the William Allen Chairman’s Cup, which is awarded annually to the recipient of the Boeing Exceptional Volunteer Service Award, the company’s highest volunteer honor.

ELIZABETH MORRELL/  
BOEING

**PHOTO:** Melinda Keeling, left, reviews paperwork for The Catalyst Foundation's Bartz-Altadonna Community Health Center with Pamela Griffin, a board member and vice president at AV Bank. **DANA REIMER/BOEING**



internship at the company. Five years ago, wanting to repay the support he received as a student and an intern, he co-founded Rice University's Designing with Rice Engineers, Achievement through Mentorship—or DREAM—program.

"Many of these students don't realize the opportunities that engineering and college present," Castilleja said. "When university students tell them that with engineering degrees they can launch space shuttles, build satellites or build next-generation spacecraft, they get excited. Their next question is: 'How can I get into college?'"

The students participate in a design project led by their mentors and get help preparing for college. The program has grown from eight student participants and 10 mentors in 2007 to 150 students and 60 mentors today.

"To be able to connect with those students and see a part of me in them, and at the same time have them see themselves in me—that's very gratifying," Castilleja said.

#### **Helping the community thrive**

Keeling, meanwhile, has used her financial planning and management skills to help The Catalyst Foundation's Bartz-Altadonna Community Health Center expand its facilities and services over the past decade. The center, located in Lancaster, Calif., provides primary medical care, mental health care, and support services to some 4,000 low-income, uninsured and homeless people each year.

Her professional capabilities have been critical in helping the clinic to not only survive but grow during challenging financial times. With her assistance, the organization obtained grants that kept it from closing after the loss of several funding sources.

"I have had the opportunity to know and interact with so many wonderful and inspiring people through these organizations," she said. "It allows me to grow as a person and to give back to those in the community who are less fortunate."

#### **Lending a hand**

For Vorst, there is no substitute for the personal touch. He makes at least five trips to Haiti each year to support the work of the Amer-Haitian Bon Zami organization, providing much-needed services to the poor and homeless.

"My work has been personally rewarding, knowing that I was making a difference for the long term," Vorst said.

Amer-Haitian Bon Zami (the name means "American Haitian Good Friends") operates

an orphanage and school, pays tuition for poor children, is building a medical clinic, and provides food and hygiene supplies to people living in tent cities since the 2010 earthquake. As the executive director, Vorst provides assistance with financial management, fund raising, and planning and design of construction projects.

Vorst and his wife, Carole, who is the president of the organization, have volunteered in Haiti for more than 20 years.

"I really encourage everyone to reach out to others," he said. "It doesn't have to be in a foreign country. Look around you. Volunteer where you can, be a friend to someone that others might ignore, help shovel snow for the elderly. There are many needs that you can help satisfy." ■

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## A legacy of community service

The Boeing Exceptional Volunteer Service Award honors the community service legacy of William M. Allen, president of Boeing from 1945 to 1968, by recognizing employee volunteers' dedication to their communities.

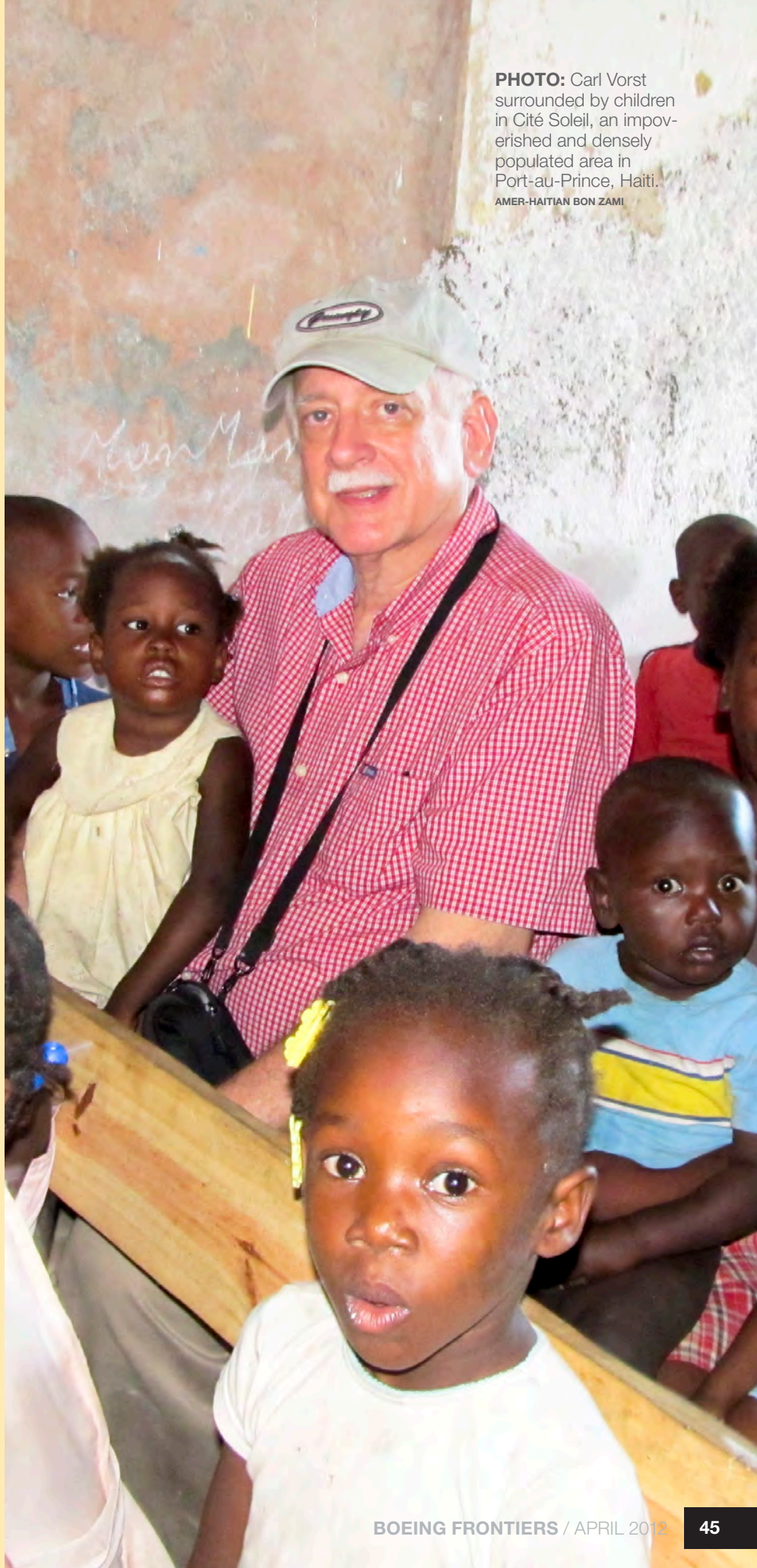
The top award winner's name is engraved on the William Allen Chairman's Cup, and the company makes a \$10,000 donation to the nonprofit organization the winner supports. Each of the two finalists receives a plaque and a \$2,500 donation to their causes.

Nominations are accepted between August and September from Boeing employees, friends and family members, as well as representatives from community organizations. Nominations are reviewed by screening and selection committees, and the winners are honored at awards ceremonies later in the year.

For more information, see [www.boeing.com/companyoffices/aboutus/community/volunteerism/vol\\_wacc\\_overview.html](http://www.boeing.com/companyoffices/aboutus/community/volunteerism/vol_wacc_overview.html)

**PHOTO:** Carl Vorst surrounded by children in Cité Soleil, an impoverished and densely populated area in Port-au-Prince, Haiti.

AMER-HAITIAN BON ZAMI



## SERVICE AWARDS: Boeing recognizes the following employees in April for their years of service.

### 55 years

Raymond Libby

### 50 years

Richard Campbell  
Ronald Hoppe  
Jerry Merkel

### 45 years

Douglas Albee  
Alfred Davis  
Rocky Fuji  
Niles Halla  
James Logan  
Ronald Martinez  
Barbara McJamid  
Robert Steiner  
Terry Teague

### 40 years

Bruce Ammerman  
Frank Bernier  
Gloria Beveney  
Charles Hill  
James Hollenback  
Robert Hoover  
Paul Hurd  
Christopher Jacobson  
Odis Johnson  
James Jones  
Marla Jones  
Phyllis Mulliken  
Oneta Murphy  
Kathleen Nunez  
Albert Olesberg  
Jeffrey Polak  
Paul Parsons  
Terry Shelhorn  
Jeanette Spradley  
Donald Thom  
Gordon Walters  
David Weston

### 35 years

Ewood Achuff  
Marilyn Akutsu  
Steven Alston  
Laurence Anderson  
Robert Austin  
Bandy Baird  
James Baker  
Mary Bandini  
James Bacal  
Jeffrey Barnes  
Karen Barnett  
Mark Battles  
John Berryman  
Scott Bohm  
Michael Bowes  
Donna Brennan  
Michael Brown  
Randal Brown  
Bary Bunt  
David Burnett

Mark Calkins  
Linda Calloway  
Uinda Coing  
Jerry Casper  
Jeanne Catron-  
L. Genzaker  
Eugene Cauchon  
Lori Coates  
Claude Colson  
Spruce Cox  
Renato Cruz  
George Cudjamat  
Rolf Dahmen  
Karen Debrecht  
Leslie Demney  
Don Dese  
Phillip Dewdney  
Arin Ditus  
Diana Dikneau  
Bryan Dorwin  
James Drake  
Richard Dresel  
David Eberkamp  
Dale Effort  
Ronald Eyerkuss  
Mark Fenske  
Genald Galland  
Alicia Gaslin  
Jan Gilson  
Donald Gray  
Douglas Green  
Philip Griesbach  
Susan Hammer  
Eric Hanks  
David Hansen  
Emma Harter  
Barbara Hernandez  
Denise Herzog  
Russell Hill  
Larry Holmes  
John Hopkins  
Steven Huggay  
Steven Ickla  
Bly Johnson  
Byron Johnson  
Jill Johnson  
Thomas Johnson  
Allen Jones  
David Jones  
Dion Kinde  
Thomas King  
John Knott  
Kathleen Landino  
Roxanne Langer  
Barbara Langvat  
Robin Lawson  
Mark Lindgren  
Keith Mack  
Susan Maher  
Pete Marikidi  
Mark McGills  
Daniel McCowan  
Daniel Meddaugh  
James Meyer  
Richard Miller  
Robert Miller

Greg Mladineo  
Joseph Murphy  
Louis Murray  
Brian Nichols  
Florante Padela  
Jerry Paulson  
Robert Peacock  
Gurts Panamon  
Peter Peterson  
David Pierce  
David Pontello  
John Pursee  
Deborah Ravenberg  
William Rangstorf  
Robert Richardson  
Patricia Rohlinger  
Adolfo Ruiz  
Charles Saakman  
Robert Samuelson  
Philip Sauterby  
Bryan Schneider  
David Schobbe  
Reginald Sheagoy  
Sherinda Glas  
Raymond Smith  
Robert Stahl  
Robert Starowak  
Robert Stevens  
Allen Sunde  
Jerry Strong  
Roy Stroup  
Edward Tait  
Jean Tapp  
Michael Thompson  
Dean Tsuchida  
Joseph Voyles  
John Walker  
Joel Ware  
Carlton Wear  
Harold Wehman  
Patricia White  
Richard Williams  
Douglas Wilson  
Gregory Wood  
Bernard Wright

### 30 years

Milagros Arcaid  
Jean Adams  
Tony Adams  
Steven Adamson  
Kathleen Aland  
Richard Alexander  
Sharon Allen  
David Anderson  
Gloria Anderson  
John Anderson  
Timothy Angst  
Victor Autero  
Clark Baker  
Catherine Barton  
Edwin Batangan  
Theresa Bauerlein  
Linda Book  
Joann Boffi

Erik Belmont  
Naty Bernstein  
Steven Bishop  
Ollie Bivins  
Lisa Bland  
Karl Bloomberg  
Michael Brockerman  
Frank Bond  
Kimberly Boone  
Matthew Borland  
Janis Brooks  
David Brown  
Lawrence Bruggs  
Fred Bruner  
Paul Burton  
Brian Bygland  
Brian Caldwell  
Brad Campfield  
Ross Cardillo  
William Carner  
Margaret Carter  
Michael Chambers  
Wayne Chambers  
Anthony Churcher  
Louis Coccolone  
Michael Cimicata  
Daniel Cohen  
Billy Collins  
Geoff Collins  
Jerome Collins  
Victor Colon  
Michael Connor  
Margaret Cooper  
Richard Cross  
Mark Crowe  
Druella Curry  
Catherine Curtis  
Margaret Davis  
Russell Davis  
Shauna Dean  
Marc Del Rio  
Carlene Dix  
Tom Dobbs  
Timothy Dosselt  
Bruce Drumon  
Beverly Edwards  
James Embry  
John Emerson  
William Evans  
Brian Ford  
Jack Fowler  
Neil Gallon  
Julian Galloway  
Ode Games  
Henry Garcia  
Victoria Garcia  
James Gills  
Ernest Gilmer  
Gerard Ginn  
Richard Gomez  
Virgil Goodwin  
Shane Granger  
Randy Gray  
Michael Green  
Kenneth Grossman  
Michael Hanley

Thomas Harmon  
Tina Harshfield  
Mitchell Haber  
Thomas Heintzinger  
Shame Hanson  
Thomas Harmann  
Richard Houett  
Roger Hille  
William Ho  
Sally Howard  
Marg Howat  
Bertelynn Hughes  
James Hughes  
Linda Humphray  
William Hunter  
Robert Jacques  
Sherman Johnson  
David Jones  
Eugene Jost  
Joy Junghanel  
Fredrick Kaczmarek  
Sharon Kaku  
Joseph Karshuta  
Charles Keane  
Billy Kearney  
Robert Kelly  
Robert Knipler  
Richard Koenigstein  
William Korb  
Michael Lackey  
Dennis Lang  
Mark Larson  
Yvette Lathan  
Teresa Lee  
Steven Letter  
Frederick Lewis  
Roger Lewis  
Michael Lieske  
Shi-Chao Lin  
Charlene Lindsey  
Michael Lowery  
Garald Lui-Kwan  
Ellen Lutbow  
Jimmy Lyons  
Bary Maddox  
Michael Maestri  
William Major  
Randall Makemus  
Sheryl Manjaraz  
Kelly Manny  
Kenneth Markham  
Robert Merkin  
Jose Mart  
George Mason  
Larry Maizey  
Dale Mansberg  
Lorenzo Matthews  
Kerby Mayer  
Robert McKay  
Gary Meix  
Javier Mercado  
Scott Michel  
Randa Milberg  
Robert Mohrman  
Timothy Montgomery  
David Moore

Melvin Morgan  
Janetta Mooky  
Jan Murphy  
Steven Natziger  
Phealox Nail  
Michael Nastase  
Bibi Nguyen  
Milton Noel  
Alan Oakes  
Kenneth O'Connell  
Garald O'Connor  
Ronald Ockers  
Patrick Ouellette  
Denzil Owen  
James Parker  
Janet Parker  
Gery Parsons  
William Peterson  
Vicki Pettigraw  
Joe Phelps  
Michael Plearkiewicz  
Clintie Porter  
Steven Ransville  
Henry Raynor  
Gregory Reedy  
Gloria Reynolds  
Gloria Richardson  
Donald Richardson  
Brian Riker  
Patricia Roberts  
Donna Romani  
David Romine  
James Russell  
Shirley Sartin  
Michael Sawyer  
Joseph Scarso  
Timothy Schaeffer  
Patricia Segura  
Joseph Sape  
James Shannon  
Nicholas Silling  
Eduo Silva  
Michael Slater  
Mark Setto  
Anthony Smith  
Roger Smith  
Steven Snyder  
Charles Spanski  
Michael Spears  
Stephen Sucknall  
Gary Stone  
Robert Taktler  
Stephen Tanaka  
Bart Teoza  
Mark Teff  
Glarence Thompson  
Denise Thomson  
Keith Timmins  
Dale Torres  
Filipe Torres  
Erich Tretzger  
Thomas Trieschmann  
Yolanda Valdez  
Michael Votaw  
Robert Wagner  
Cynthia Wistrom

## SERVICE AWARDS:

Boeing recognizes the following employees in April for their years of service.

Robert Wilrow  
Renard Wolf  
Joanne Wolff-Howell  
Jonathan Woodall  
Donald Young  
Frank Young  
John Young  
Richard Young  
Thomas Zakrzewski

### 25 years

Susan Abbott  
Annie-Marie Abongiar  
Lori Abscior  
Arl Alamin  
Jeffrey Albert  
Mark Alon  
David Alseth  
Michael Alsos  
Anita Anderson  
David Anderson  
Ronald Anderson  
Steven Anderson  
Eszal Andrawes  
Ronald Andrawig  
Gilbert Arellano  
Patricia Arriola  
Judith Arsenoan  
Thomas Atkins  
Michel Bachawed  
Kenneth Baker  
Robert Baldwin  
Samuel Bailentyna  
Linda Barker  
Eric Barnes  
Ronald Barnum  
Louis Barron  
Stephen Barton  
Robert Bartus  
Craig Baes  
John Batchelor  
David Beal  
Lina Beck  
Steven Behruncik  
Mark Behrmann  
Howard Bonner  
Shawn Bony  
John Digger  
Terry Burke  
David Blount  
Brian Bolin  
George Bonham  
Anthony Bradley  
Nadine Bradley  
Randolph Bradley  
Mark Braun  
Elaine Brazinski  
Jeffrey Brandy  
Craig Bower  
Philip Brown  
Robert Brunfield  
Marie Brumm  
Jason Brunner  
Stanley Buchnaller  
Duc Bui

Hiep Bui  
Hoang Bui  
Matthew Burchell  
John Burke  
Dana Burns  
Richard Burns  
Stephen Bush  
Samuel Caldwell  
Pete Carlton  
Joseph Cardinale  
Michael Carlson  
Daniel Casari  
Frederick Casebeer  
Billy Celli  
Steven Gernat  
Mary Chackluck  
James Cheng  
Ming Cheng  
Myrono Chang  
Heather Cheeks  
Gennie Cheng  
Meli Chung  
Andrew Clark  
Christopher Clark  
Thomas Clark  
Gary Cleland  
Michael Clement  
Deborah Colburn  
Paul Comer  
James Connor  
Mark Connors  
Richard Conrad  
Howard Cordell  
Guillermo Corpus  
Arthur Cote  
Lloyd Crite  
Uma Cuchon  
Suzanne Dahl  
Bernard Dalen  
Craig Dalton  
Mai Dang  
Nghien Dang  
Susan Davidson  
Scott Davis  
Valerie Davis  
Roger Day  
Terry De los Santos  
Issagani Dejesus  
Nick Delcore  
Paulette Delgado  
Douglas Den  
Steven Despain  
Marc Deveraux  
Craig Dickerson  
Eric Dickinson  
Ricky Dicks  
Dale DiGiovanni  
John Doll  
Yenancio Domingo  
Jedde Dougherty  
Andrew Downing  
Robert Downing  
Douglas Dove  
Joseph Drake  
Thomas Dubois  
Janis Duckett

Stephen Edger  
Daniel Eise  
John Elliott  
Charles Emery  
Mam English  
Scott Erickson  
Timothy Etting  
Gary Evarhart  
Mel Felton  
Ronald Ferguson  
Frank Fernandez  
Daryl Fish  
Sterling Flake  
Bruce Fithian  
Susan Flath  
Bandy Folmar  
Carl Forcannon  
Steven Forsyth  
Charles Fountain  
Mark Fournier  
James Franklin  
Richard French  
Ron Freund  
Charles Fromong  
Kenneth Fuegmann  
Michael Funk  
Ginny Garcia  
Gloriene Gard  
Joseph Gack  
Jerry Gerstmann  
Lance Gibson  
Tony Gibson  
Paul Gilbert  
Timothy Gilman  
Dale Glechill  
Patrick Goggin  
Steven Graess  
Ronald Grayson  
Christopher Greenman  
Steven Gustafson  
Earl Guyton  
Kathleen Haase  
Joseph Habersetter  
Augustine Halder  
James Harlin  
Donald Handy  
James Hanna  
Weekey Hansen  
Eileen Hardesty  
Lon Harper  
Timothy Harrell  
Beverly Hart  
Martin Harvey  
Connie Hauck  
Richard Hauser  
Mark Hayden  
Keith Haynes  
Charles Hoffeman  
Nancy Hensz  
Jerome Heller  
Brian Hansen  
Gregory Herzberg  
Donald Hill  
Richard Hoffer  
Jodi Hoffi  
Christina Holbrook

Bobby Hollingsworth  
Louise Holmes  
Thanh Hong  
Wilard Honglyn  
Gregory Hopp  
Douglas Horn  
Ellen Hoy  
Mark Hudson  
Tern-Anna Hunting  
Cham Huynh  
Mark Jams  
Peter Idzikowski  
Ana Ilegan  
Shon Inabnit  
Francisuk Intason  
William Inch  
Thomas Jablonski  
Paul Jackson  
Rick Jackson  
Steven Jackson  
Ebrahim Jalei  
Lawrence Janik  
Joseph Janosov  
Buck Jay  
Terra Jenkins  
Warren Jenkins  
George Johnson  
Lary Johnson  
Lloyd Johnson  
Kim Jones  
Mark Jordan  
Michael Karapetian  
John Kelly  
Drew Kemp  
Eric Kendall  
Lewis Kibler  
George Kimball  
Sharon King  
Leslie Kitamura  
William Knutson  
Russell Kolds  
Ky Komadino  
Dawn Kootmann  
Martha Koshiyama  
Angelina Kriinke  
Mary Kubo  
Kelly Lane  
Harold Lansdowns  
Allan Larr  
Hanson Lee  
Martin Lee  
Beverly Lead  
John Legg  
Scott Lenicks  
Richard Leonard  
Arthur Leong  
Bee-Pu Lin  
John Liston  
Loren Litke  
Gordon Little  
Nancy Loachel  
Thomas Loewen  
David Lotquist  
Anthony Long  
David Lowe  
Bryan Lowrey

Nancy Lundeen  
Edward Lynk  
Ebrahim Maadani  
Hung Mach  
Mark Madsen  
Matthew Malin  
Robert Male  
Tari Mallow  
Narciso Marcelino  
Joseph Marcy  
Doris Marcyes  
Darcy Marshall  
Leonard Martinez  
Randolph Masada  
Don Mason  
Richard Masutaka  
Ronald Mathes  
John May  
Deanna Mays  
James McAfee  
Famela McCallister  
Joan McClelland  
Michael McGary  
Eileen McGowan  
Cecelia McGraw  
William McKerzie  
Michael McLaughlin  
John McShay  
Mary McVey  
John Malnick  
Gawna Mendossa  
Mark Mero  
Edward Meyer  
Paul Moxie  
Daniel Mihalik  
Debra Miller  
Robert Miller  
Robin Miller  
Robin Miller  
Ronald Miller  
Vincent Miller  
Michael Mills  
Donald Miko  
Edward Milton  
Michael Monelli  
David Monteith  
Raymond Montebaur  
Daniel Moore  
Jeffrey Moore  
Mary Morrow  
Kirsti Morton  
Paul Mowrey  
Leland Mullins  
Barbara Murdoch  
Michael Murphy  
Donald Myers  
Michael Myers  
Donald Nagel  
Christine Nagers  
Cheryl Nearing  
Ricky Nedrow  
Craig Nelson  
Daniel Nelson  
Doai Nguyen  
Dung Nguyen  
Owen Nguyen

Khoa Nguyen  
Long Nguyen  
Robert Nguyen  
Tam Nguyen  
Gregory Nichols  
Steven Nishikawa  
Alan Nisler  
Kimberlee Nofts  
Jaren Norris  
Thomas Novak  
Jame Nucora  
Bryan Nunnally  
Christopher Olafson  
Javier Olmos  
Joseph Ondik  
Daniel Onill  
Karen Ostliff  
John Oswald  
Johnny Ouding  
Judy Palomino  
Dana Parke  
Antonio Patton  
Daniel Paulson  
Richard Peerman  
Thomas Parkoski  
James Perry  
Robert Petterson  
Martin Petis  
Clanh Pham  
Lan Pham  
Trang Pham  
Eric Phillips  
Don Pierce  
Jeffrey Polite  
Stephen Pondrom  
John Popovich  
Greg Pierek  
Jokary Prince  
Susan Pursell  
Theresa Reish  
Jeffrey Rand  
David Ratliff  
Mahesh Reddy  
Richard Reeder  
Phillip Reid  
Ani Rhamulla  
Lucine Richardson  
Kristine Riles  
David Riggs  
Harold Ring  
Ronald Robbins  
Calvin Robinson  
Terry Robinson  
Donald Robinson  
Bart Rogers  
Noel Rogers  
James Rowell  
Rodney Russell  
Steven Rutledge  
Gregory Rubioka  
Mark Ryan  
Spencer Sager  
Krisna Sahasou  
Ronald Saldin  
Robert Saling  
Olivia Sanchez

## NEW DAWN

Against the backdrop of a spectacular sunrise, a Boeing 787 Dreamliner and C-17 Globemaster III military airlifter meet nose to nose in Long Beach, Calif. The 787 visited California last month as part of the ongoing Dream Tour, which has allowed employees, suppliers, media, airline representatives and others around the world an opportunity to see the new jetliner up close. Boeing employees in Long Beach build the C-17 and provide engineering support for the 787. (For more on the C-17 program, see Page 24. To download this image as a wallpaper for your computer screen, visit [www.boeing.com](http://www.boeing.com).) PHOTO: GREG THON/BOEING









## THE DREAM TOUR BEGINS IN CHINA.

It's time to reach greater heights on a more relaxing, more sustainable kind of flight. By improving fuel efficiency and reducing carbon emissions, both by 20%, the Boeing 787 Dreamliner is revolutionizing what air travel can be. It's no longer a Dream. It's an entirely new kind of airplane. The Boeing 787 Global Tour begins in China.  
[newairplane.com.cn](http://newairplane.com.cn).

 **BOEING**  
波音