

Frontiers

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APRIL 2011 / Volume IX, Issue XI



Light fantastic

Rapid advances in laser technology are turning science fiction into reality

KC-46A

Air Refueling Tanker



A WIN FOR THE WARFIGHTER AND THE NATION.

We're honored that the U.S. Air Force has selected the Boeing KC-46A as its next-generation aerial refueling tanker. By delivering the advanced capabilities required in a more efficient, more affordable tanker, the Boeing KC-46A provides the maximum value to the warfighter and the nation.





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Focused on the future

Lasers are used daily at Boeing, from helping mechanics align fuselage sections of commercial jetliners to displaying livery patterns on those same jets when they are in the paint shop. Lasers also are revolutionizing warfare, and in the field of directed-energy systems, Boeing and others are rapidly advancing this speed-of-light technology.

COVER IMAGE: BOEING ELECTROPHYSICS ENGINEER MARK LAINE, LEFT, AND MATT NIXON, A TECHNICAL FELLOW IN DIRECTED ENERGY SYSTEMS, TEST A LASER IN NEUTRALIZING A SIMULATED IMPROVISED EXPLOSIVE DEVICE AT BOEING'S ALBUQUERQUE, N.M., SITE. BOB FERGUSON/BOEING

PHOTO: THE AIRBORNE LASER TEST BED, A MODIFIED 747, IS READED FOR ANOTHER TEST FLIGHT. BOB FERGUSON/BOEING

Ad watch

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

Inside cover:



This ad was developed to recognize the U.S. Air Force's selection of the Boeing KC-46A as its next-generation aerial refueling tanker. The ad ran in *The Washington Post* and key regional, defense and trade publications.

Page 6:



In December 2010, Qatar was named host country for the 2022 FIFA World Cup, the international soccer tournament held every four years. In celebration, Boeing developed an ad congratulating Qatar on the honor. The ad

ran in *Al Sharq* and *Arrayah*, which are local publications.

Back cover:



In January, Hainan Airlines was awarded the prestigious 5-star rating by SkyTrax, the world's largest airline and airport review website. It is only the seventh airline in the world, and the first Chinese airline, to

achieve this status. Boeing developed this congratulatory ad, featured in *China Business News*, *21st Century Business Herald* and *CAAC Journal*. The campaign also featured an online component.



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Historical Perspective

From crude sketches on a notepad, North American Aviation's NA-16 was born, launching one of Boeing's heritage companies into the military trainer business. The NA-16 flew for the first time 76 years ago this month. Over time, improved versions were developed including the AT-6 Texan, one of the most recognized and famous of all military aviation trainers.

PHOTO: ERIK SIMONSEN/BOEING



High points

Being recognized for good work can make a big difference in how employees feel about their jobs at Boeing. Recognition can take many forms, from a simple "great job" email from a co-worker or boss to Pride@Boeing points that can be used at the Boeing Store to a cash award, all through the Boeing Recognition Program. A cross-company team including the Boeing Stores has been working to make recognition more meaningful for employees.

PHOTO: BOB FERGUSON/BOEING



No. 1 on the runway

Boeing Commercial Airplanes President and CEO Jim Albaugh and his team are focused on regaining market leadership. To accomplish this, Commercial Airplanes employees are following a game plan that involves seven strategies for getting back to the top—and staying there.

PHOTO: JIM ANDERSON/BOEING

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44 Dream line

These are heady times for the 787 program, with momentum building in anticipation of first deliveries to airline customers. On the final assembly line at the Boeing plant in Everett, Wash., employees are hard at work assembling the Dreamliners that will usher in a new chapter in aviation history. They are “Working on a Dream,” as captured in this photo essay.

PHOTO: BOB FERGUSON/BOEING

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Environmental performance is one of the measures by which Boeing’s success is judged, says Mary Armstrong, vice president of Environment, Health and Safety. And employees throughout Boeing are finding ways, big and small, to help the company run a healthy business and make continuous environmental improvements.

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Taking flight

Boeing’s F-15E Mission Training Centers program, which has ground-based training simulators at three locations around the world, has been scoring impressive business results. Yet this was a program that had problems early on. What turned things around? Building stronger relationships with employees and the customer.

PHOTO: RICHARD RAU/BOEING

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رايتكم الغالية في السما عالية

نرفع أسمى آيات التهاني والتبريكات

إلى مقام حضرة صاحب السمو الشيخ
حمد بن خليفة آل ثاني
أمير دولة قطر

وإلى سمو الشيخ
تميم بن حمد بن خليفة آل ثاني
ولي العهد

وإلى سمو الشيخ
محمد بن حمد بن خليفة آل ثاني
رئيس لجنة ملف قطر ٢٠٢٢

وإلى الشعب القطري الكريم

مناسبة الفوز التاريخي لدولة قطر بشرف استضافة
تنظيم بطولة كأس العالم لكرة القدم ٢٠٢٢

Running a healthy business

Environmental performance is a key indicator of business results

Every day, in crew meetings and conference rooms around Boeing, we track the health of our business. Each of us plays a pivotal role in our continued success by:

- Improving quality and productivity
- Streamlining processes and reducing waste
- Enhancing workplace safety
- Engaging employees to generate innovative ideas to help Boeing stay ahead of the competition and shape the market for aerospace products

In short, we measure continuous improvement as a sign of running a healthy business.

To the metrics listed above, I suggest we include one additional measure, and that involves improving our environmental performance.

Boeing set aggressive environmental improvement targets for our facilities and, since 2002, cut energy use and carbon emissions by nearly one-third and water consumption and hazardous-waste generation by more than 40 percent.

By eliminating environmental waste and conserving resources, we have saved millions of dollars in cost, making our products more competitive in the market.

In the past few months, Boeing sites in Charleston, S.C., Huntsville, Ala., and Philadelphia have joined Salt Lake City in eliminating solid waste sent to landfills. This indicates that these manufacturing sites are improving processes and operating efficiently. This month, The Boeing Company is set to receive an ENERGY STAR Partner of the Year award from the U.S. Environmental Protection Agency for our ongoing commitment to protecting the environment through energy efficiency in our internal operations.

Environmental improvements have played a major role in our recent business successes. Sales of the 787 Dreamliner and 747-8 are the result of responding to customer demands for cleaner, more fuel-efficient airplanes. A key component of our P-8A Poseidon and KC-46A tanker wins involved responding to Defense Department requests for airplanes that can be operated and maintained using fewer toxic chemicals.

This month, thousands of Boeing employees will participate in Earth Day projects around the world, many aimed at protecting natural resources and improving performance at our operations—



“It’s exciting how Boeing leverages our environmental performance to create a market advantage for our products.”

— Mary Armstrong

Vice president, Boeing Environment, Health and Safety

PHOTO: BOEING

just a snapshot of the many environmental achievements we see throughout the year from Lean+ events, supplier collaboration, Green Team efforts, volunteerism and more. (Read about a Boeing Green Team, at the Wichita, Kan., site, on Page 43.)

It’s exciting how Boeing leverages our environmental performance to create a market advantage for our products. None of this would be possible without the energy, enthusiasm and expertise of people throughout the company in finding ways—both big and small—to generate continuous environmental improvements.

Earth Day is now in its fourth decade of inspiring awareness and encouraging participation in the appreciation and protection of our planet. I participated in the first Earth Day by walking to school instead of riding the bus. Little did I know how much that early experience would come to be so meaningful to me personally and professionally.

Every day, people throughout Boeing make both small and large contributions to improve our environmental performance. Like other indicators of a healthy business, continuous environmental improvements ensure our place as the global leader in aerospace technology. ■



FASTEN YOUR SEAT BELTS

The 787 Dreamliner and the exotic McLaren MP4-12C sports car have more in common than a sleek, aerodynamic look. Both make extensive use of lightweight carbon fiber composite technology. *Road & Track* magazine recently featured an interview on advanced composites and the Dreamliner with Boeing's Mike Sinnett, vice president and chief project engineer for the 787. As the two vehicles share "similar structural DNA," the auto magazine brought the McLaren to Boeing Field for a photo shoot with one of the 787 flight-test aircraft. The interview can be found at www.roadandtrack.com/special-report/5-questions-with-mike-sinnett.

PHOTO: ED TURNER/BOEING

Quotables

"To earn the confidence our Air Force customer has placed in us, we must deliver this program on time and within budget."

– Part of an email sent to all Boeing employees from Defense, Space & Security President and CEO Dennis Muilenburg and Commercial Airplanes President and CEO Jim Albaugh after the Pentagon selected Boeing to provide its 767-based tanker to the U.S. Air Force.

"ScanEagle type UAS is just great to have out there. It's exactly what you need."

– Recently retired Rear Adm. Terence McKnight, who commanded Task Force 151 operating against Somali pirates, discussing the value of unmanned airborne systems, or UAS, such as Boeing's ScanEagle, in surveillance operations. His comments appeared in *DoD Buzz*, an online defense journal.

Success story

Creating an environment of diversity and inclusion benefits employees and the company

By Donna Douglas

Donna Douglas is the cultural diversity and inclusion manager for Boeing sites in Kansas and Oklahoma, where she works with site leaders, diversity councils and affinity groups to help enhance employees' professional development, advance understanding and respect for diverse cultural perspectives, and enable an inclusive work environment. In this *Frontiers* series that profiles employees talking about their jobs, Douglas, who is based in Wichita, Kan., discusses how diversity and inclusion can lead to long-term success for individual employees—and for Boeing. PHOTO: BEVERLY NOWAK/BOEING



Diversity is my passion. As a cultural diversity manager, I help the company cultivate an environment of inclusion—one that leverages employees' different perspectives, experiences and capabilities. I believe diversity and inclusion is not only our social responsibility but also a strategy to ensure the success of the company.

Let me provide an illustration of inclusion in action. We had an engineer in Wichita, Colyn Moss, who was vice president of our local chapter of BBEA, the Boeing Black Employees Association affinity group. Even though Colyn had a lot of ability, he received a layoff-warning notice.

From years of working with leaders of affinity groups and diversity councils, I knew Colyn had the same skills as any leader of a

business organization or function—leadership skills that could benefit the company. So I inquired within my network whether anyone could use someone with Colyn's engineering and leadership talents.

I heard back from Keith Chappell, a senior engineering manager in Oklahoma City, that his site might have a place for him. I coached Colyn through the job application and structured interview process and gave him a few tips on how to market himself. Long story short: He went through the process, was offered the job and accepted the transfer.

A year later I ran into Keith. He told me that not only had Colyn done well but that he was up for a promotion—which, I found out later, he got! And Colyn even helped get the site's new

BBEA chapter off the ground!

My job is to find out how we can leverage all of the skills of all of our people, because when an individual grows, the business unit grows. And when the business unit grows, the company grows. That's what leveraging diversity and inclusion as a competitive advantage is all about. It feels great to know I helped someone succeed—and each person who succeeds helps the company succeed. ■

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For more information about cultural diversity and inclusion at Boeing, visit the Global Diversity & Employee Rights site at <http://hr.web.boeing.com/index.aspx?com=12&id=1> on the Boeing intranet.

The 'Texan'

What started as North American's NA-16 became the most popular military trainer ever

By Erik Simonsen



PHOTO ILLUSTRATION: (Above) A pair of restored SNJ-5s in U.S. Marine Corps markings fly with solo pilots. ERIK SIMONSEN/BOEING

PHOTO: (Inset) The first NA-16 trainer (X2080), photographed at North American Aviation's Dundalk, Md., plant. BOEING ARCHIVES

Seventy-six years ago, on April 1, 1935, test pilot Eddie Allen took off from a hard-packed dirt runway in Dundalk, Md., in a newly designed monoplane that would launch North American Aviation as a manufacturer of military training aircraft.

The NA-16 that flew for the first time that day would later be produced in many variants, including the AT-6/SNJ “Texan,” arguably the greatest of all military trainers.

Foreseeing the need for a low-cost and rugged training aircraft for the military, James “Dutch” Kindelberger, president and founder of North American Aviation, chief engineer John Leland Atwood, and fellow engineer Harold Raynor had sketched their ideas about a new trainer on a notepad on Dec. 10, 1934. A U.S. Army Air Corps competition was slated for the following year at Wright Field near Dayton, Ohio, and North American Aviation wanted to compete.

The company’s engineers and assembly personnel completed a prototype by March 1935. Designated the NA-16, the aircraft’s steel tube frame fuselage was partially covered with fabric. But the fully cantilevered wing was all metal. The NA-16 featured an open tandem cockpit for an instructor and student pilot with fixed, non-retractable landing gear.

During the flyoff at Wright Field, the NA-16 competed against aircraft from Curtiss-Wright as well as Seversky, whose

Aviation factory was completed by January 1936 and some 75 employees began work on the new basic trainer, designated the BT-9.

Gradually the BT-9 was improved with all-metal construction and retractable landing gear. In early 1937, North American received its first U.S. Navy order for 40 variants, later designated SNJ. In 1939, the airframe was standardized into the Advanced Trainer-6, or AT-6, for the Army Air Corps, and SNJ-3/6 for the U.S. Navy. Both variants were produced in large numbers that eventually totaled 21,070 aircraft, including foreign sales.

The AT-6 got its nickname after North American, to accommodate demand, decided to take some of the production pressure off its California factory and build a sprawling plant in Dallas. Production of the trainers there began in December 1940.

With a top speed of 205 mph (330 kilometers per hour), the Texan was an agile trainer capable of snap rolls, loops and spins. The Army Air Corps and Navy versions trained more U.S. and Allied pilots than any other aircraft just before and during World War II.

When war broke out on the Korean Peninsula in June 1950, the Texan was once again called into service. More than 90 Air Force T-6s had been converted to the LT-6G configuration and were designated Forward Air Control aircraft. Dubbed



Basic training: **The NA-16**

Crew: Two (instructor and student pilot)

Wingspan: 42 feet (12.8 meters)

Length: 27 feet 7 inches (8.4 meters)

Height: 8 feet 10 inches (2.7 meters)

Weight empty: 3,078 pounds
(1,400 kilograms)

Weight maximum: 4,098 pounds
(1,858 kilograms)

Speed maximum: 170 mph
(274 kilometers per hour)

Service ceiling: 17,100 feet
(5,210 meters)

Range: 700 miles (1,130 kilometers)

The Texan was an agile trainer capable of snap rolls, loops and spins.

basic trainer was favored. The NA-16 got the nod from the Army Air Corps, however, and by the end of October North American Aviation had received orders for 82 aircraft worth a record \$1,027,000.

It was at that time that Kindelberger made a historic decision to leave Maryland and the company’s Dundalk factory and move operations to Southern California. Kindelberger had previously visited the area and had arranged to lease property at Mines Field, at what today is Los Angeles International Airport.

Construction on the new North American

the “Mosquitoes,” these planes formed the 6147th Tactical Control Group, which flew its first mission on July 9, 1950. The Mosquitoes directed Army artillery fire and marked enemy positions with smoke rockets for the P-51D Mustang, F-80 Shooting Star, F-84 Thunderjet and F-86 Sabre Jet.

During the Korean War, the Mosquitoes flew 40,354 missions.

When Kindelberger retired in 1960, Atwood became president and chief executive officer of North American. In a conversation with the author in 1997, Atwood reminisced about the days

when airplanes often started out as a simple hand-drawn sketch, and recalled using only a T-square and drawing board to specify the wing layout for the NA-16 in 1934.

Today, more than 75 years after Atwood, Kindelberger and Raynor sketched out a crude design of what became the NA-16, nearly 350 Texans are still flying. ■

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Forecast

Knowing what's happening with the world's weather is critical to Boeing flight-test programs By Kate Zaranek

Many people probably check the local news for weather reports to determine how to dress for the day.

Mike Patnoe and Matt Grzych check weather conditions around the world—but not to find out what to wear.

They are atmospheric scientists with Boeing Test & Evaluation. The company's flight-test planners depend on them in picking the most appropriate locations for testing airplanes such as the 787 Dreamliner and 747-8 Freighter.

Today, flight testing of new aircraft can occur anywhere in the world, wherever weather conditions exist that will allow the airplane to be tested to its performance limits, including extreme conditions from subzero temperatures to hot and humid environments.

The two meteorologists monitor and track flight conditions and predict with a great deal of accuracy where proper conditions will be present.

"We can help determine the forecast for the next five days to predict crosswinds, icing and other specific conditions that are needed, depending on the flight test being performed," Grzych said.

For certification purposes, some flights require extreme conditions to determine that the aircraft and systems can withstand the various environments that Boeing products operate in, he said.

In addition to finding the weather required for certain flight tests, both scientists work with planners to ensure test teams avoid bad weather, or conditions that could impact or slow test flights. They also assist with long-range projects by providing climatological data for product development programs.

Because they are a team of two located states apart—Patnoe in Washington and Grzych in Colorado—they divide work based on tasks and often collaborate by Instant Messenger.

Each has his area of expertise.

Patnoe, recently named an Associate Technical Fellow, specializes in icing issues and is part of an International Civil Aviation Organization committee that is developing procedures for communicating with government agencies, airplane operators and other entities that need to be notified in the event of volcanic eruptions.

Grzych, an occasional storm chaser in his personal time, specializes in convective storms.



cast for success



Tools provided by the National Weather Service and the National Oceanic and Atmospheric Administration help Patnoe and Grzych build their midrange forecasts up to five days in advance. After that, accuracy decreases.

“The biggest surprise in my career has been that one accurate forecast carries far more weight than four inaccurate ones,” Patnoe said. “I’ve had dead-on forecasts that make people really happy and then they forget the ones that were wrong.”

They also use a tool developed by the University of Wisconsin–Madison called McIDAS, or Man computer Interactive Data Access System, a data service that provides imagery and radar and also archives climatological data that can be used during accident investigations—if investigators suspect weather is a factor.

Why would two atmospheric scientists choose to work at Boeing instead of a news outlet or the National Weather Service?

“Because there is a wide variety of work,” Grzych explained, “with the opportunity to do lots of different things.” ■

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PHOTO: Atmospheric scientist Mike Patnoe checks conditions at Boeing Field in Seattle. JIM ANDERSON/BOEING



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 This certificate is presented to
BEZZETTE L. TRAVIS
 in appreciation of
30 YEARS
 of valued service with The Boeing Company
 April 30, 2010
 W. James McNamara, Sr.
 Chairman, President and Chief Executive Officer

To view your personal account and redemption options, visit Boeing TotalAccess and click My Pay & Incentives, then click Incentives & Employee Recognition. Links to Service Awards and Pride@Boeing can be found there.

PHOTO: Bezzette Travis of Information Technology was recognized for her three decades of service. **BOB FERGUSON/BOEING**

Make their day

Creating a 'recognition culture' means showing employees their contributions matter *By Carrie Howard*

For Bezzette Travis, receiving a service award from her manager in the company of her peers was a high point in her Boeing career.

"As I read the words on my 30-year certificate, my heart filled with the same pride I felt upon receiving my very first service award," said Travis, a security design and integration specialist in Information Technology.

"People deserve to be recognized for their contributions," said Doug Kight, vice president of Human Resources Strategy, Compensation and Benefits. "It's important to thank people for the good work they do and to let them know their contributions are critical to the success of the company. A few good words can make a tremendous difference in how someone feels about his or her job."

The Boeing Recognition Program recently made several changes to help make recognition more meaningful for employees and less complicated for managers.

The basic elements of the program remain the same, including Pride@Boeing nomination-based awards; informal Instant Appreciation awards; cash awards, which are given at a manager's discretion; and Service Awards, bestowed at five-year intervals.

Jim Dingus, Recognition Programs specialist, said the company wants to create a "recognition culture" in which employees feel appreciated and understand how their efforts contribute to the success of their program, business unit and company on a daily basis.

"A recognition culture creates an environment where employees' accomplishments and service are recognized—which helps them stay motivated to contribute and achieve more," Dingus said.

Travis understands the impact that recognition can have on employee morale. "From my first day on the job, I felt as though the company recognized my hard work and dedication and encouraged me to continue down the path of employee excellence," she said.

Appreciation might take the form of praising an employee's efforts, sending an Ecard or handwritten thank-you note, sharing positive customer comments or nominating the employee for a Pride award.

"These may be little things, but little things can mean a lot," said Lisa Moggio, director of Compensation.

Beginning this year, all elements of recognition are administered under the Boeing Recognition Program, and new Web banners and links make it easier to find information on recognition, submit nominations and redeem awards on the Boeing intranet.

In addition, the Boeing Stores team has been asked to make the program more efficient and to improve the award selections. Boeing Store buyers have studied past recognition award orders to refine award selections, eliminate redundancy and ensure that awards are tailored to the Boeing population's preferences.

"We share the pride in Boeing's heritage and in the accomplishments of our fellow employees across the enterprise," said Jim Newcomb, who oversees the Boeing Stores and is the director of Global Brand Management & Advertising. "We want to celebrate that pride with an even better selection of items that connect the awards more closely to employees' work achievements and service."

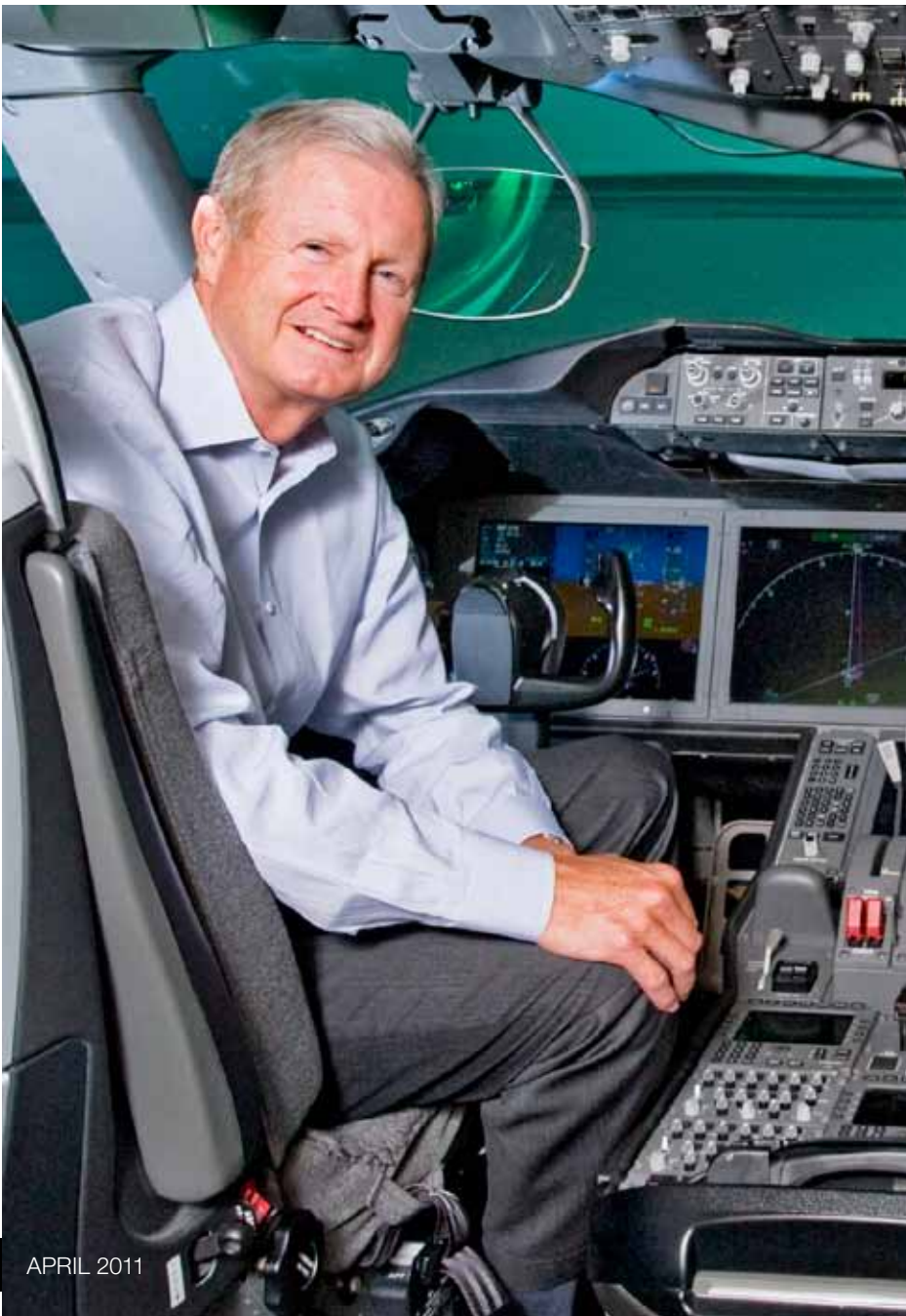
Employees can use their award points at the Boeing Store, and the award programs offer a wide selection of gift cards, so that employees can shop in person or online at a number of retail partners and find the best values.

Travis redeemed her Service Award through the online catalog and recently used some Pride@Boeing award points at the Boeing Store.

"I made all my selections with a sense of pride," she said. "I got a camcorder to capture happy memories to share with my grandchildren over the coming years, and the Boeing T-shirts and airplane models remind me that I play a part in the development of Boeing aerospace products. Those things mean a lot to me." ■

Questions? Contact Nancy Kaiser at nancy.e.kaiser@boeing.com

Game plan



Commercial Airplanes leader Jim Albaugh charts the path back to the top

By Christina Kelly and Dawsalee Griffin

When Jim Albaugh addressed senior leaders of Commercial Airplanes earlier this year he was uncompromising on one point.

“Our intent is to be the best in the world, to be No. 1 by all measures,” the Commercial Airplanes president and CEO (shown left) told 850 Boeing executives. “I’m talking about selling the most airplanes, having the highest revenues, having the most profitable business and—the most important thing—being the airplane manufacturer of choice for customers in every market we serve.”

Laying out seven strategies “that all employees can see themselves in,” Albaugh said Commercial Airplanes can regain that market leadership. And he set a deadline to get there—before the company’s 100th birthday in 2016.

The people of Commercial Airplanes are stepping up to the challenges Albaugh set out.

These are their stories.



PROGRAMS: THE 767 TEAM EFFORT

The 767 team is working to streamline production, improve quality and create more value for customers. The team's work exemplifies the first of the seven strategies: Extend existing programs.

Even as the 767 team worked with Boeing Defense, Space & Security on the successful bid to build an aerial refueling tanker for the U.S. Air Force, members of the Everett team transformed the program's production system. By moving production from one side of the Everett, Wash., site to the other, the team reduced the factory footprint by 40 percent, found ways to cut labor hours by a third and increased the production rate. (See story on Page 40.)

The 767, like the 777 and 737, is profitable and producing airplanes that customers like, Albaugh said, adding: "We want to extend those programs as long as we can."

Phil Weatherholt (above), a 767 final body join manager, shares that vision.

"My dream is to extend this program for another 15 to 20 years and see it built as a tanker," Weatherholt said. "We've developed a revolutionary way to build airplanes. I'm very proud of that."



PROVIDE GREATER VALUE: GOLDCARE

GoldCare offers 787 customers complete solutions for maintaining airplanes, including monitoring airplane performance and ordering replacement parts; that's part of Commercial Airplanes' second strategy—to provide greater value to customers in all markets.

"When you talk to customers about GoldCare, it's amazing the value that the Boeing brand brings to that service," said Bob Avery (above), vice president of Fleet Management at Boeing's Commercial Aviation Services. "They really like the fact that the people who designed and manufactured this airplane are going to be the same people who take care of them."

That aligns with the strategy perfectly.

"Boeing doesn't build the cheapest airplanes, but we build airplanes with better fuel burn, lower maintenance and operating costs, and greater range and payload," Albaugh said. "GoldCare gives our customers more value for their money."



TECHNOLOGY AND INNOVATION: THE 787

Innovation sets Boeing Commercial Airplanes apart from the rest of the industry. The third strategy—to accelerate leadership in technology and innovation—is a call to action.

"It's easy to talk about innovation, but you need to know where you are going to go with it," said Dan Smith, director for 787 major projects and technology.

In using a more electric architecture on the 787, the program knew where it needed to go. The new design taps electricity generated from the spinning engines themselves and avoids using ultra-hot "bleed air" energy from the engines' compressor stages. Because the electric system requires fewer parts, maintenance costs are reduced and reliability improved.

Another result is a lighter, more efficient airplane. Like many other Boeing innovations, the new electrical system is considered intellectual property to be closely guarded. It won't be the only breakthrough to be zealously protected.

"We have asked the engineering organization to define core technologies that we need to invest in and that we need to hold very close to The Boeing Company," Albaugh said. "We need to build very high walls around them and make sure we don't give anything away."



MANAGE THE VALUE STREAM: BOEING SKY INTERIOR

To manage the value stream for competitive advantage—the fourth strategy—the Boeing Sky Interior for the Next-Generation 737 required close collaboration among suppliers, customers, Fabrication’s Interiors Responsibility Center and 737 program staff to streamline work, improve quality and increase efficiency.

“It’s a new look, a new feel and a new experience for the customer,” said Troy Terry, design engineer on the project.

Going forward, Albaugh said, Boeing must have the knowledge and capability to manufacture and assemble all key systems of the airplane. “That doesn’t mean we’re going to build everything, but we need to build some of everything so if our partners get in trouble, we can help them or bring the work inside.”



CONTINUOUSLY IMPROVE: PROJECT \$747

As the cost of doing business continues to rise, Boeing works to improve quality, productivity and affordability. Project \$747 was created to look for ideas that cut costs, save time and simplify processes. The goal is to save \$747 million in the next two years.

By engaging key members of the value chain at the beginning of a project to discuss changes and costs, the Project \$747 team resolves issues early, said Christi King (above), director of Supplier Management.

More than a year into the four-year program, the team has exceeded six quarterly targets and is poised to achieve its goal early.

Albaugh sees such efforts as key: “Every day, our customers face the need to reduce their cost of doing business. And our competitors have a very different cost structure. So we have to make sure we are doing our part to improve quality and make our airplanes more affordable.”



CULTIVATE CUSTOMER KNOWLEDGE: SOUTHWEST AIRLINES

Last year, when Southwest Airlines had technical issues with some of its 737s, employees from across Commercial Airplanes met with the airline to find a solution. It took disciplines from across Boeing—engineering to finance, customer support to design, maintenance to quality assurance—to identify the problem and solve it.

“I can think of no other situation where there is greater risk or opportunity of building trust and respect than when challenged with a major technical issue such as this,” said Paul Richter, chief engineer, Out-of-Production Airplanes, Single Aisle.

“I don’t think you can have that kind of soul-searching if you don’t have a strong partnership and a strong relationship,” agreed Mike Van de Ven, executive vice president and chief operating officer for Southwest Airlines.

That’s the sixth strategy: Cultivate intimate customer knowledge and relationships.

“We need to be with our customers, understand their needs, understand their routes and understand the political issues in their countries,” said Albaugh, defining customers as those both inside of Boeing and outside the company. “Then we must translate that knowledge into products and solutions they will prefer.”



ATTRACTING, DEVELOPING, RETAINING PEOPLE: THE 777 PROGRAM

The 777 program came up with a better way to help new managers succeed from the start of their careers.

“Historically we would hand them their crew list on their first day and say ‘good luck,’” Patti Taksa (above), 777 Human Resources specialist, said about the seventh strategy—to attract and retain the best employees. “Now, we have great information that really gives them a foundation to be successful.”

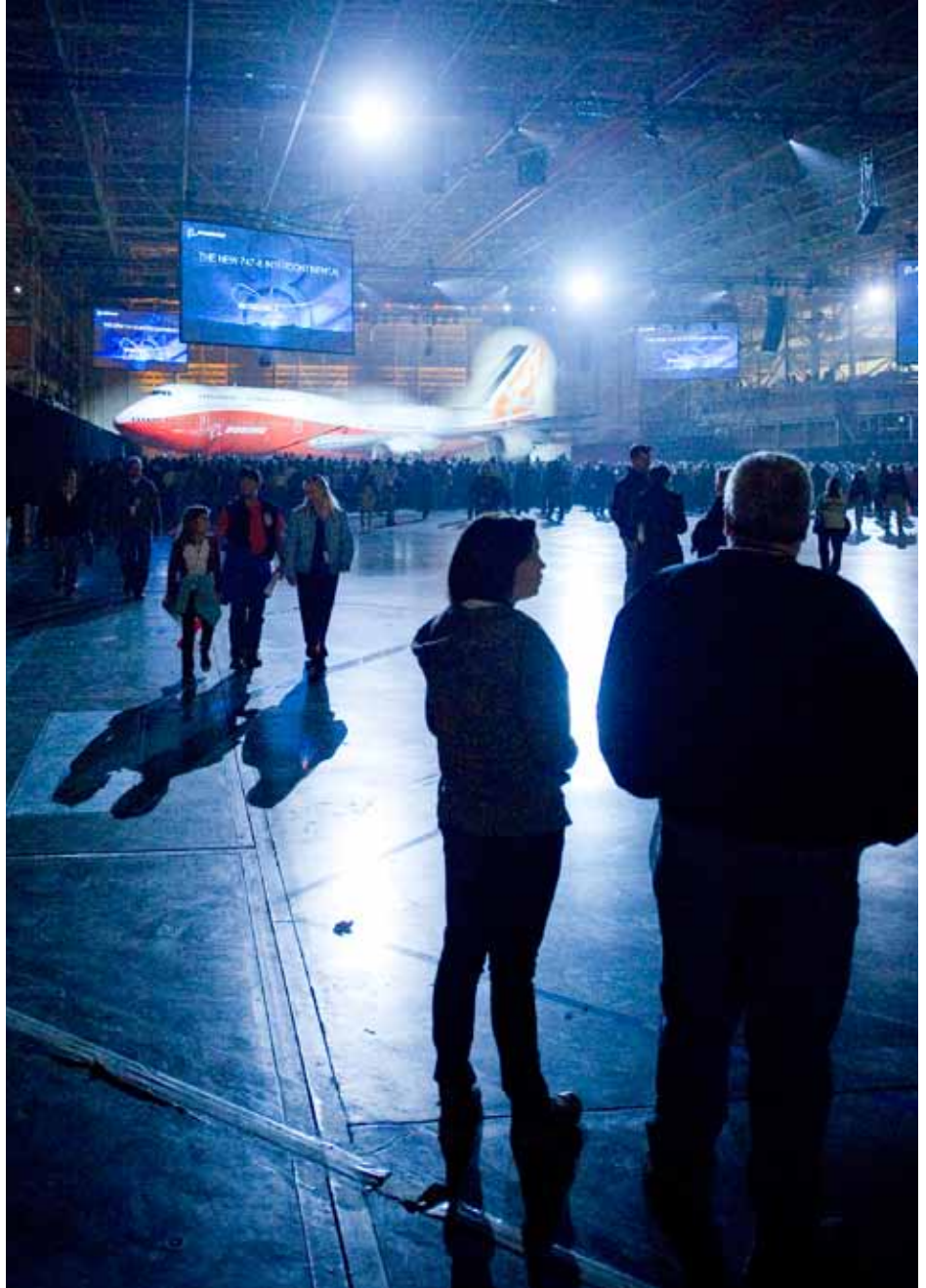
New managers also have the opportunity to come in early to experience the pace of production and tailor their knowledge about the area where they will work.

Developing people is the single most important job of leaders, Albaugh said. “It isn’t about just hiring talent, it’s about providing meaningful experience and opportunities—about inspiring the team and making sure people get up every morning wanting to come to work for the best aerospace company in the world.”

Being No. 1 again, Albaugh often says, means returning to what made Commercial Airplanes great in the first place: engineering excellence, innovation, providing customers with products they want—and building tomorrow’s airplane while competitors are still building today’s.

Seven teams already have pointed the way. ■

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“Our intent is to be the best in the world, to be No. 1 by all measures.... selling the most airplanes, having the highest revenues, having the most profitable business and—the most important thing—being the airplane manufacturer of choice for customers in every market we serve.”

— Jim Albaugh, president and CEO of Boeing Commercial Airplanes

PHOTOS ON PAGES 16–19 BY BOB FERGUSON/BOEING, GAIL HANUSA/BOEING, MARIAN LOCKHART/BOEING AND ED TURNER/BOEING



PHOTOS: (Above) The nose turret of the modified 747 known as the Airborne Laser Test Bed contains a large telescope that is used to focus and direct the high-energy laser beam to its target. **(Insets, from top)** Boeing aircraft maintenance, launch and recovery flight technicians David Porr, left, and Dave Delazari conduct pre-flight checks for an Airborne Laser Test Bed mission; George Rodriguez, standing, Boeing Operations manager, works with Northrop Grumman Airborne Laser Test Bed teammates Bob Birkitt, left, and John Rendler, who monitor laser fluids loading for a mission; Lockheed Martin teammates Lisa Saguibo, left, and Chris Cirves verify laser functions prior to a flight. **BOB FERGUSON/BOEING**



Field of beams

The use of laser weapons has reached a tipping point and Boeing is rapidly advancing this speed-of-light technology *By Eric Fetters-Walp*



A century's worth of imaginings about using focused beams of light as weapons has moved from science fiction to reality.

Laser-guided and directed-energy weapons—the next evolution from successful precision-guided munitions introduced in the 1970s—are revolutionizing warfare. And The Boeing Company, through its Strategic Missile & Defense Systems, is among those making significant advancements in the power, range and precision of laser technology.

Boeing's customers, meanwhile, are defining how to incorporate this new capability into current and future missions.

Even with recent revisions in the U.S. Defense Department's spending priorities, laser weapons continue to capture the Pentagon's attention. The U.S. Air Force's chief scientist, Werner J.A. Dahm, told the *Los Angeles Times* he considers lasers to be "potentially game-changing" to the warfighter.

"Watching the Airborne Laser Test Bed shoot down a missile in midflight or the Advanced Tactical Laser cause a vehicle to burst into flames for no apparent reason because an infrared laser did its job—it's science fiction brought to life," said Mike Rinn, vice president and program director for Boeing Directed Energy Systems, a unit of Strategic Missile & Defense Systems.

Prototypes being developed, in some cases solely with company funding, help Boeing make the case that it is the right choice for effective and safe laser systems, Rinn added.

"We are working on rapid prototypes, which are meant to shape the market and demonstrate the capability of these systems for the warfighter. They also give us data to prove and improve how these systems work," Rinn said.

A historic first was achieved in laser capability last year when the Airborne Laser Test Bed destroyed an in-flight ballistic missile with a directed-energy weapon.

Consisting of a huge chemical-powered laser mounted on a modified 747-400 Freighter, the Airborne Laser is being co-developed by Boeing, Lockheed Martin and Northrop Grumman for the U.S. Missile Defense Agency. Originally contracted by the U.S. military in 1996, it is designed to shoot at tactical-range missiles while they are in the boost phase—between the missile's launch and when it leaves the atmosphere. By heating and weakening the missile's skin, the megawatt-class Chemical Oxygen Iodine Laser causes the missile to break up in flight.

Although lasers have been tested for decades, the challenge has been to combine the powerful beam with the right cutting-edge optics, beam control and targeting technology, according to Rinn.

"Nobody in the world is flying with this large a laser and this precise a pointing system,"

he said of the Airborne Laser Test Bed. “That’s what makes this program so unique.”

Last year’s experiment was the first of its kind. Despite some technical issues, the Airborne Laser has successfully engaged a total of nine missiles to date. With each experiment, the team continues to make breakthroughs in the application of laser technologies—such as advanced optics, beam control and pointing, Rinn said, noting these breakthroughs are critically important to the future capabilities of U.S. warfighters and their allies.

But the challenges are not just technical.

In 2009, the Pentagon shifted the Airborne Laser from a potential weapons system program to a research and development program, meaning leaner budgets in the future. Even so, the program’s partners hope to continue proving the system’s worth. Rinn said the program has accomplished much, and he believes it still could produce a future viable weapons system.

The Airborne Laser may be the most high-profile directed-energy weapons program under development by Boeing, but it is hardly the only one. The U.S. Defense Department has multiple contracts with the company to research lasers for a number of military missions, from destroying improvised explosive devices to defending naval ships.

Larry Pinkel, program management specialist for Boeing Laser Technical Services, said the technology is gaining trust among warfighters, who are used to lasers as sights, pointers, designators and dazzlers on the battlefield.

“There’s no doubt that we’re approaching the tipping point, or we may already be there, when it comes to the use of directed energy in a battlefield,” Pinkel said. “We’ve demonstrated that these weapons systems can do things that no other weapon can do, and that they can save lives.”

An example of that is the Boeing Acquisition Tracking and Pointing System, a laser weapon system that can be integrated on a number of military platforms. To keep the Boeing Avenger air defense weapon system up to date against the latest potential threats, Boeing has funded its own initiative to fully integrate this laser tracking weapon into the Avenger vehicle. The prototype, called Laser Avenger, has been demonstrating its capabilities over the past three years.

“It allows the warfighter to flip a switch and shoot a Stinger missile, flip a switch and fire a gun, or toggle another switch and fire the laser,” said Phil Hillman, Avenger Program manager for Boeing Defense, Space & Security. “You don’t see the laser. All you see are the results.”

With advanced targeting systems, the laser has demonstrated its ability to destroy the type of improvised explosive devices that pose a growing threat to warfighters, said Dave DeYoung. He’s a Directed Energy Systems program manager responsible for many of Boeing’s independent research and development laser efforts. These systems have shown

“We’ve demonstrated that these weapons systems can do things that no other weapon can do, and that they can save lives.”

– Larry Pinkel, program management specialist for Boeing Laser Technical Services

PHOTO: Drew Riedle, left, a Systems Engineering manager in Albuquerque, N.M., and engineer Barry Crow ready a beam control system for disassembly from its Avenger platform. BOB FERGUSON/BOEING





GENUINE
Dickies
BY WORKFORCE
MANUFACTURING

they can destroy unexploded ordnance and unmanned aerial vehicles. Work continues with the U.S. Army and Navy to apply the technology to several different platforms.

The Army is working with Boeing on the High Energy Laser Technology Demonstrator program, which will defend tactical vehicles and troops against incoming rocket, artillery and mortar projectiles. After the prototype system is installed on an Oshkosh Heavy Expanded Mobility Tactical Truck, initial firing tests will take place at the White Sands Missile Range in New Mexico.

Boeing also is advancing a Free Electron Laser weapon and Tactical Relay Mirror System. The latter is designed to extend a laser beam's range. The Free Electron Laser is being developed for the U.S. Navy and will pass a beam of high-energy electrons through a series of powerful magnetic fields to create an intense laser. This electric-powered laser, just out of the preliminary design phase, could defend naval ships against cruise missiles and other potential threats. The Office of Naval Research recently awarded Boeing a contract to complete the critical design of the electric-powered Free Electron Laser.

Boeing also has invested in development and testing of a surveillance detection system that incorporates laser technology and is capable of near-real-time, 360-degree detection of optical threats. (See story on Page 52). The system is designed to identify when friendly forces are being monitored or targeted through the use of cameras, binoculars, sniper scopes or other optical means.

All of the weapons applications under development by Directed Energy Systems are well-suited to maximize the advantages of lasers, including precision targeting to avoid collateral damage or casualties. Challenges still exist, however, including dissipating the heat generated by laser units and managing the size of laser units that can generate powerful beams. The Airborne Laser Test Bed's weapon, for example, fills much of a 747. Pinkel said Boeing is working with the military to make lasers more rugged and suitable for battlefield conditions.

Greg Hyslop, vice president and general manager for Strategic Missile & Defense Systems, said Boeing and its partners will continue to refine laser capabilities to fulfill the missions proposed by the Pentagon.

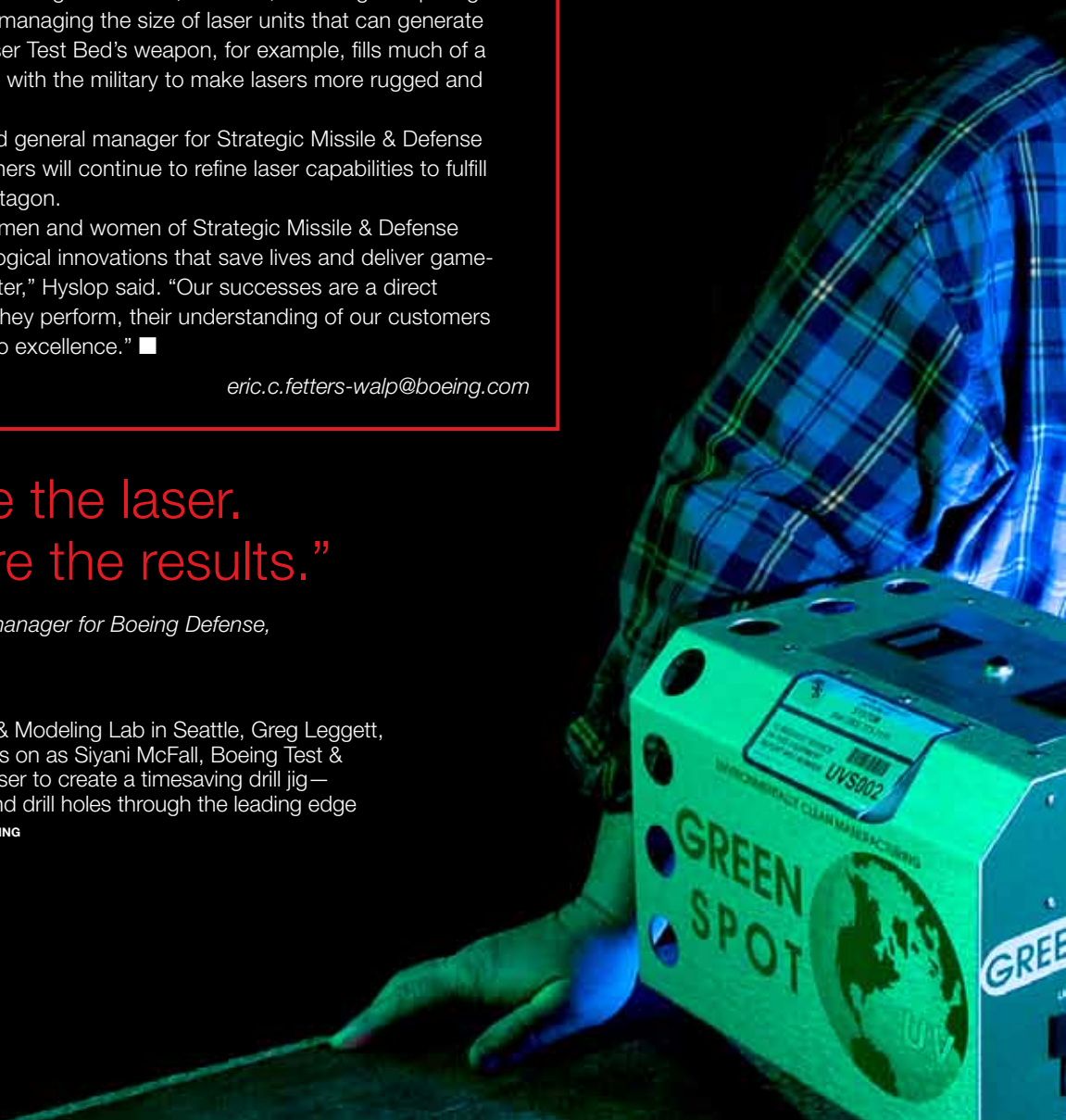
"I'm constantly amazed by the men and women of Strategic Missile & Defense Systems who help design technological innovations that save lives and deliver game-changing weaponry to the warfighter," Hyslop said. "Our successes are a direct reflection of the challenging work they perform, their understanding of our customers and their continued commitment to excellence." ■

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**"You don't see the laser.
All you see are the results."**

*— Phil Hillman, Avenger Program manager for Boeing Defense,
Space & Security*

PHOTO: In the Rapid Prototyping & Modeling Lab in Seattle, Greg Leggett, left, manager of Test Services, looks on as Siyani McFall, Boeing Test & Evaluation lab technician, uses a laser to create a timesaving drill jig—a key component used to locate and drill holes through the leading edge of an airplane's wing. **JIM ANDERSON/BOEING**



Bright ideas

Laser technology has far-reaching applications at Boeing, from jetliner production to making wind-tunnel models

Directed-energy weapons are still emerging as a practical technology, but lasers are used every day by Boeing employees for airplane production, tooling and research tasks.

On the 777 production line in Everett, Wash., lasers help align sections during final body join. Similarly, they assist in aligning wings on the Next-Generation 737 final assembly line.

After jetliners leave the Everett factory for the paint shop, the Laser Exterior Marking System uses lasers to display livery patterns on an airplane's exterior for better accuracy during painting.

One of the more innovative uses of lasers takes place in the Rapid Prototyping & Modeling Lab in Seattle. This Boeing Test & Evaluation facility often is called upon to make airplane conceptual and wind-tunnel models, prototype parts and unique tools. Components of both the 787 Dreamliner and the 747-8 have been produced by the lab's lasers.

Greg Leggett, manager of Test Services, said the laser tools his lab uses perform "additive manufacturing," also called

fused deposition, using resins, powdered nylon and even metal powders to build 3-D parts and tools from scratch.

To do this, a high-powered laser melts the powder together to form a solid layer. Each layer is then built upon the next to form the desired shape. In stereolithography, an infrared laser bonds layers of photopolymer liquid resin to produce detailed models and tools to tolerances within 1/5,000th of an inch.

Boeing also has pioneered the use of a process called selective laser sintering to manufacture certified, flight-worthy aircraft parts. This process similarly uses a laser to produce parts from powdered nylon. It creates parts and tools with less fine detail than stereolithography, but with more durability.

Because the laser tools can create models and parts directly from computer-drawn plans, there is no need for molds to be created, Leggett said.

"I've had an aircraft in flight test call us at 3 p.m. for a part," he said, "and by 7 a.m. the next morning, we have it ready and delivered there." ■

— Eric Fetters-Walp



Beam me up

At age 50, the laser has boldly gone where no technology has gone before—except in science fiction

By Christina Kelly

In 1953, many moviegoers were treated to their first glimpse of a “laser” in the science fiction thriller *The War of the Worlds*, where Martians fired beams of red lights to vaporize humankind.

Seven years later, in May 1960, the world’s first functional laser was developed up the road from Hollywood in Malibu, Calif., at HRL Laboratories, formerly known as Hughes Research Laboratory.

A number of laboratories were attempting to demonstrate the laser concept, but it was Theodore Maiman, a young physicist at HRL, owned by Boeing and General Motors, who won the technological race.

Laser is an acronym for light amplification by stimulated emission of radiation—an optical device that produces an intense monochromatic beam of coherent light. Now 50 years old, it has led to significant advances in science, communications, manufacturing, medicine, defense and countless other fields. It has been singled out by the National Academy of Engineering as one of the 10 greatest developments in a century chock-full of notable inventions.

“The idea was postulated nearly 100 years ago, by Albert Einstein, and then proved at HRL in 1960,” said David Whelan, chief scientist for Boeing Defense, Space & Security and an admitted fan of old science fiction movies.

“Boeing and its legacy companies were a part of laser innovation then, and continue today pursuing advanced technologies to improve laser weaponry, better pointing and tracking systems, and laser communications for satellites,” Whelan said. “It is one of the world’s most prolific technologies, and it plays a big part in our everyday life, from supermarket scanners to medical instruments.”

Laser applications continue to grow. Surgeons use lasers to perform cataract surgery; groceries are scanned at check-out via lasers; printers churn out crisp copy thanks to lasers; laser gyroscopes guide commercial airliners to their destinations and control their landing approaches; lasers are revolutionizing biomedicine and chemistry; and lasers ensure precise alignment of parts in the assembly of the newest Boeing jetliners.

Whelan noted that the U.S. Energy Department is experimenting in Livermore, Calif., with the world’s biggest laser in hopes of producing laser-driven nuclear fusion.

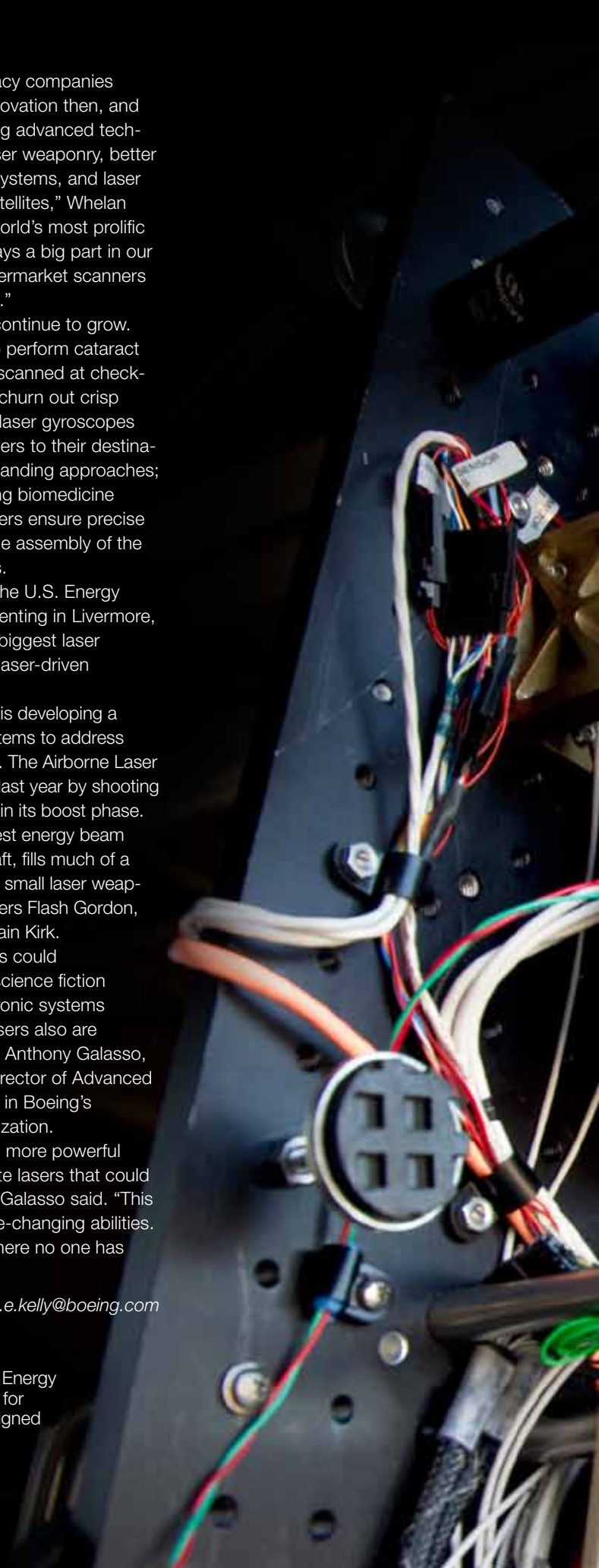
Boeing, meanwhile, is developing a wide range of laser systems to address multiple defense needs. The Airborne Laser Test Bed made history last year by shooting down a ballistic missile in its boost phase. But that laser, the highest energy beam ever fired from an aircraft, fills much of a 747—a far cry from the small laser weapons fired by TV characters Flash Gordon, Buck Rogers and Captain Kirk.

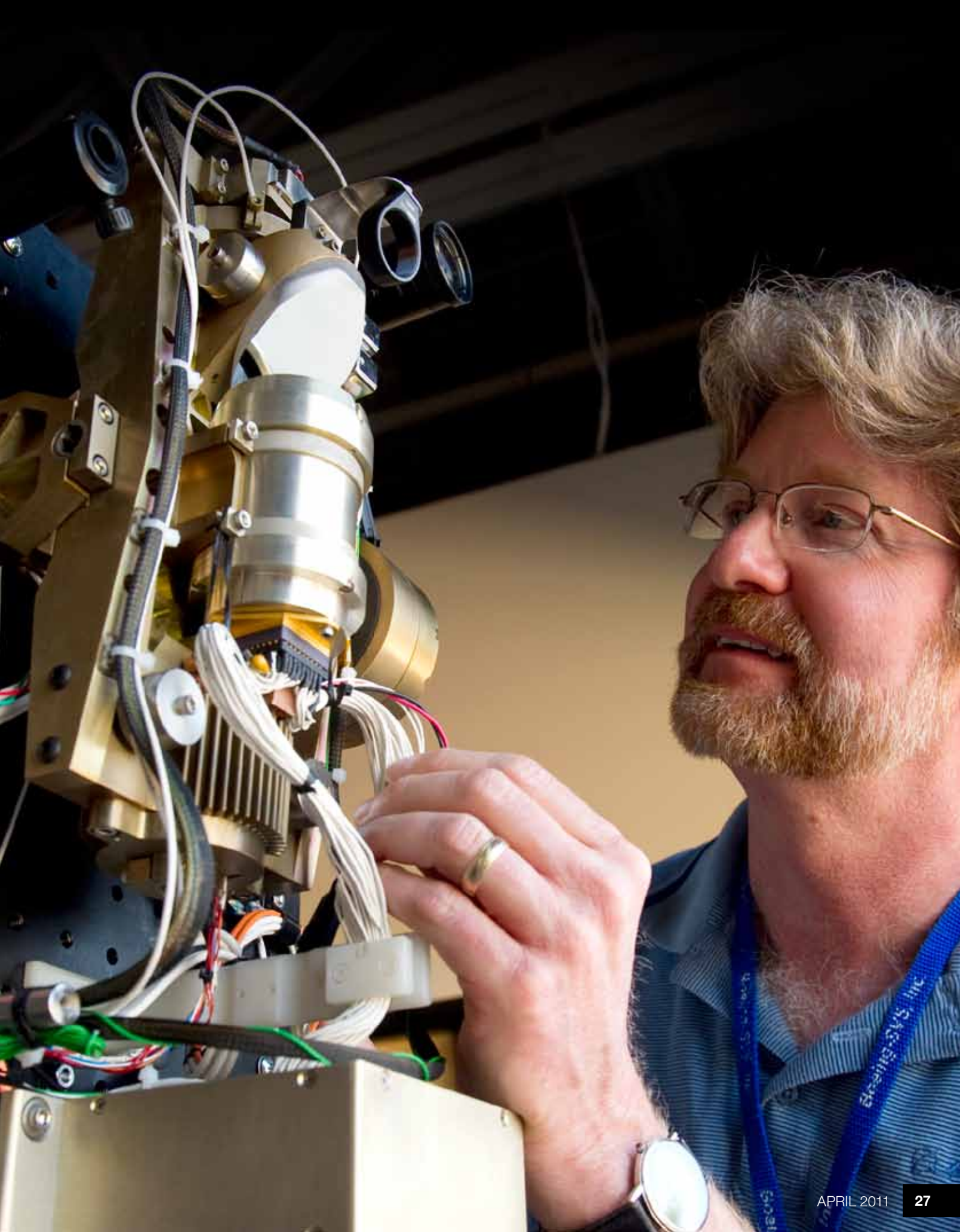
But hand-held lasers could eventually move from science fiction to reality. Just as electronic systems have gotten smaller, lasers also are shrinking, according to Anthony Galasso, a laser physicist and director of Advanced Integration Capabilities in Boeing’s Phantom Works organization.

“We could see even more powerful and compact solid-state lasers that could fit on combat aircraft,” Galasso said. “This technology offers game-changing abilities. We are boldly going where no one has gone before.” ■

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PHOTO: Bryan Morris, an electro-optical physicist working in Directed Energy Systems in Albuquerque, N.M., examines a 3-D camera he developed for military and commercial applications. The laser-assisted system is designed to map the ground in three dimensions. **BOB FERGUSON/BOEING**







Engineering at the speed of light

Directed Energy Systems, part of Boeing Strategic Missile & Defense Systems, is researching and developing laser weapon systems to meet a number of customer requirements. The major programs:

AIRBORNE LASER TEST BED

The Airborne Laser Test Bed is designed to destroy ballistic missiles in their early stages of flight using a high-energy chemical laser, along with battle management equipment and a beam control system, integrated on a modified 747-400 Freighter. Along with Boeing,

Northrop Grumman and Lockheed Martin are part of the program for the U.S. Missile Defense Agency.

FREE ELECTRON LASER

Boeing has a contract with the Office of Naval Research to complete critical design of the electric-powered Free Electron Laser, which provides an ultra-precise, speed-of-light capability to defend ships against emerging threats. The megawatt-class laser will counter hyper-velocity cruise missiles, ballistic missiles or low-cost, low-tech threats.

HIGH ENERGY LASER TECHNOLOGY DEMONSTRATOR

Under this \$23 million U.S. Army contract, Boeing is developing a truck-mounted solid-state beam control system that can destroy incoming rocket, artillery and mortar projectiles. Field testing is scheduled to begin this year.

BOEING ACQUISITION TRACKING AND POINTING SYSTEM

Developed by Boeing, this system destroyed 50 improvised explosive devices during a test in September 2009. The



solid-state laser, mounted on a combat vehicle called Laser Avenger, also has destroyed small unmanned aerial vehicles in tests. The laser system is designed to be integrated into other platforms as well.

TACTICAL RELAY MIRROR SYSTEM

Working with the U.S. Air Force under a \$40 million contract, Boeing is helping develop a relay mirror system that can be carried on unmanned aerial vehicles or other airborne vehicles. The system would relay ground or airborne laser

beams to allow them to provide intelligence, surveillance and reconnaissance, or “shoot over the hill,” without having direct line of sight. ■

PHOTO: Control systems engineer Tony Lazzaro, left, and optomechanical engineers Matt Edwards, center, and Bryan Crespin work on the telescope of the Tactical Relay Mirror System in Albuquerque, N.M. **BOB FERGUSON/BOEING**

Remembering *'The Bowl'*

Making history come alive at Santa Susana,
the former federal rocket engine test site

By Kamara Sams

Bill Vietinghoff played an important but unseen role in America's space program: testing rocket engines that propelled Mercury, Gemini, Apollo and shuttle astronauts into orbit.

Nearly 60 years later and now in retirement, Vietinghoff is helping make the unique history of the Santa Susana Field Laboratory come alive for visitors to the Southern California site, which is undergoing cleanup by Boeing and others for soil and groundwater contamination.

"When the countdown started, an incredible tension would float in the air. The engine would roar, the ground would erupt and my body would shake from the pressure," Vietinghoff recalled of his job with North American Aviation at Vertical Test Stand-1, the first test stand erected at Santa Susana.

He started working at the historic test stand in 1953, monitoring pressure gauges in rocket engine combustion chambers.

"When something was wrong, an engine would scream. It was my job to study the pressure fluctuations to find out why," noted Vietinghoff, who was trained as a chemical engineer and supported numerous rocket engine programs before retiring in 1998.

"No amount of education prepared us for those jobs," he said. "There were no textbooks to guide us. We were creating the technology and writing our own textbooks."

A federal rocket engine and energy research site, Santa Susana started operations in 1950 as post-World War II America began its national space program. Rocket engine testing at Santa Susana supported nearly every major U.S. space program, from the earliest unmanned



“I have very fond memories of my time working at that test stand. I was amazed by its size, its complexity and how it buzzed with activity.” – Bill Vietinghoff

satellites through the space shuttle. Similar to other Cold War-era government laboratories, rocket engine testing and nuclear energy research resulted in environmental contamination of soil and groundwater at Santa Susana.

Perched on a picturesque mountaintop, Santa Susana’s 2,850 acres (1,150 hectares) is home to riparian woodlands, pre-historic Native American pictographs, and rare plant and animal species. Wildlife thrives at the former government laboratory where Boeing, NASA and the U.S. Energy Department are cleaning up the site.

Since Boeing acquired its land at Santa Susana in 1996, the company, along with NASA and the Energy Department, has made significant cleanup progress, including the removal of more than 69,000 cubic yards (52,800 cubic meters) of contaminated soil and the installation of more than 400 wells—some going down to a depth of 1,400 feet (430 meters)—to monitor groundwater quality.

That first test stand where Vietinghoff worked at Santa Susana was built with support from German rocket engine scientists and was modeled after a similar structure built at the German Lehesten rock quarries during World War II. Soon after, two more vertical test stands were constructed, creating what was called “The Bowl,” one of the first test complexes of its kind in the country.

Until the mid-1960s, “The Bowl” supported rocket engine testing for the government’s programs. The second and third test stands were demolished in 1996, and Vertical Test Stand-1 was partially dismantled. The remainder of the stand was taken down in late 2010 as part of the environmental cleanup.

Remnants of Vertical Test Stand-1 were not eligible for listing in the National Register of Historic Places or in the California Register of Historic Resources. But Boeing is preparing a Historic American Engineering Record to ensure that the engineering efforts that produced the test stand are preserved. In addition, parts of the test stand are on display in the Smithsonian Aerospace Museum.

Boeing, NASA and the U.S. Energy Department offer regular tours for persons interested in following the cleanup progress. Vietinghoff, who has been retired for 12 years, is one of the tour guides.

“I have very fond memories of my time working at that test stand,” Vietinghoff said. “I was amazed by its size, its complexity and how it buzzed with activity.”

The Bowl is quiet now. But Vietinghoff can make the site come alive when he shares his memories during the tours. ■

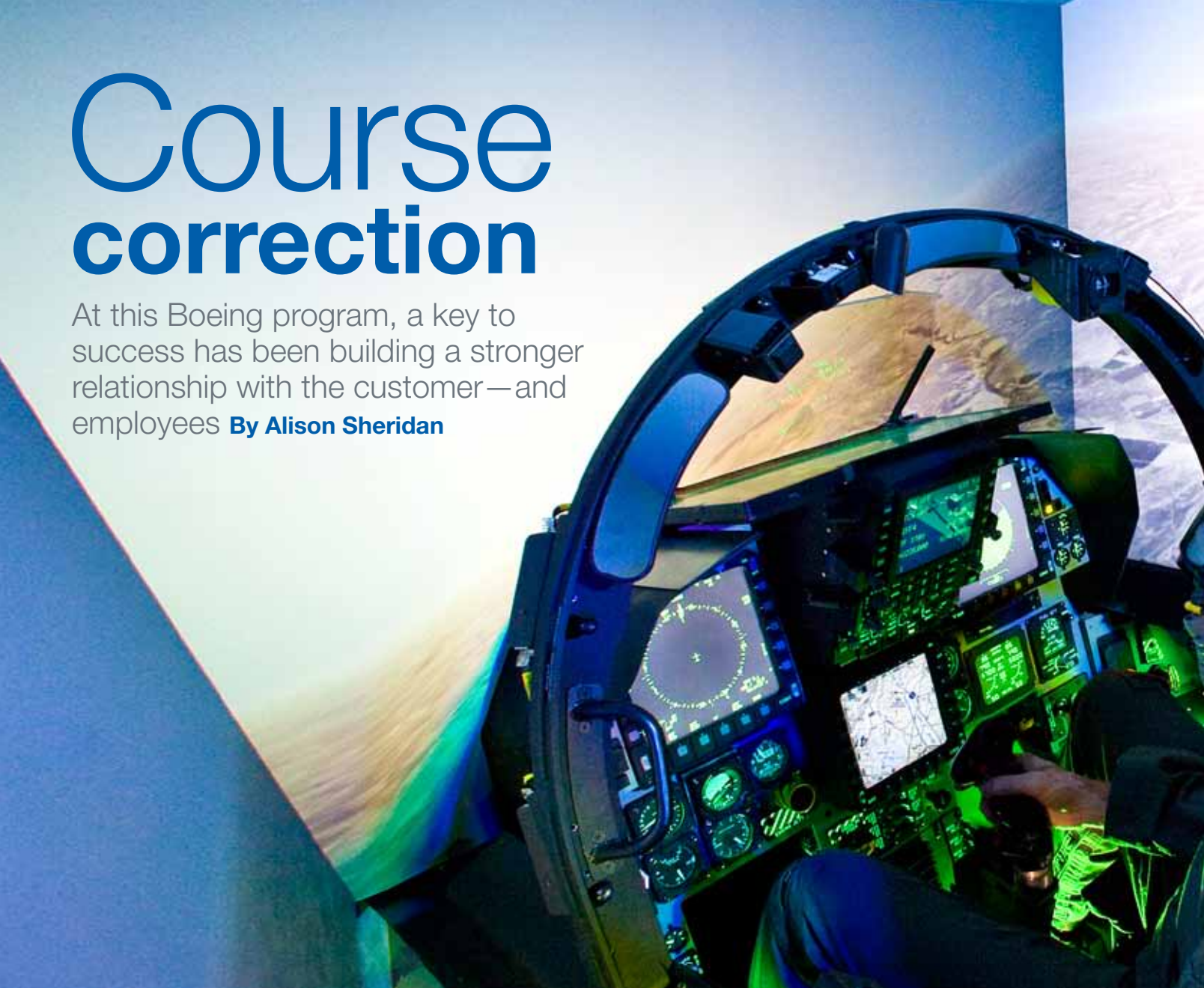
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PHOTO: Retiree Bill Vietinghoff visits the Alfa test stand, situated on federal property at Santa Susana. He worked on the Alfa test stand in 1955, gathering performance data for the Atlas rocket engine. PAUL PINNER/BOEING



Course correction

At this Boeing program, a key to success has been building a stronger relationship with the customer—and employees **By Alison Sheridan**



For aircrews flying Boeing's F-15 Eagle, a twin-engine, all-weather tactical fighter designed to gain and maintain air superiority in combat, what happens out of the sky is also critical.

From the novice pilot and weapons system officer to the U.S. Air Force's equivalent of "Top Gun" aircrews, Mission Training Centers provide the most realistic training available—without aircrews ever having to leave the ground. The centers are located at Seymour Johnson Air Force Base, North Carolina; Mountain Home AFB, Idaho; and at the Royal Air Force Base Lakenheath in the United Kingdom.

Three years ago, Boeing's F-15E Mission Training Centers program was receiving positive feedback from the aircrews who use the trainers for mission

rehearsal—but the program had problems.

"Everyone was working on individual issues, but we were scrambling, not doing what the customer needed, and it just wasn't working," recalled Darla Yoakum, with the program's configuration management.

The situation, along with low employee morale, was something that couldn't be ignored and had to be fixed—fast.

Kay Grabanski, no stranger to turning around troubled programs, took over the F-15E Mission Training Centers—and took on the challenge.

To boost performance and employee morale, Grabanski started with small, realistic goals.

"We chose three things to focus on and celebrated every success along the

way," she said. "We used cash awards, Pride@Boeing points and formal recognition from upper management to show in concrete ways that we appreciated the team's commitment."

That recognition was important, according to Yoakum.

"When you get recognized by leadership, you feel like you're not just another pencil in the cup; it feels good to know they appreciate that we went the extra mile," Yoakum said.

Grabanski also made it her highest priority to improve the program's relationship with the U.S. Air Force customer.

The results?

- The Mission Training Centers have recently passed the 12,000 successful



“I wanted to see the shine return to their eyes, the excitement of coming to work each day and knowing they make a difference.”

– Kay Grabanski, program manager for the F-15E Mission Training Centers

PHOTO: RICHARD RAU/BOEING

PHOTO: A pilot trains in an F-15E simulator. The Training Systems & Services F-15E Mission Training Centers team took on a struggling program and effected positive change. **RON BOOKOUT/BOEING**

missions mark, totaling more than 18,000 hours of ground-based training time that offsets the millions of dollars, aircraft wear and tear, and fuel costs associated with flight training.

- The Air Force requires 95 percent availability, but the team boasts greater than 100 percent availability for aircrews, by being available not only for all scheduled training but also for unscheduled training missions.
- The team has delivered 10 trainers to three locations, including five in five months, a significant task considering the four cockpits, instructor stations, hundreds of computers and other equipment that have to be assembled, tested, packed and shipped for each site.

- The customer has awarded Boeing \$17.8 million in new work since Grabanski came on board, with additional funding and more work planned for 2011.

“We have definitely tightened our focus,” said Martin Hassett, manned combat station integrated product team lead. “Before, our objective seemed open-ended, but now we’re more precise.”

When asked what she is most proud of, Grabanski doesn’t cite the growing list of accomplishments. Instead, she talks about the team.

“I am most proud of my team! Period!” she said. “The morale of the team was pretty low, and I wanted to see the shine return to their eyes, the excitement of coming to work each day and knowing

they make a difference. The shine—and the excitement—are back! They trust one another; they trust leadership, and I believe they feel engaged.”

Lana Deinhart, configuration management engineer and a former U.S. Marine lieutenant, said she takes pride in being part of a team that makes the best trainers in the world.

“We’re not bogged down or spinning our wheels anymore,” she said. “We certainly got things turned around.”

Yoakum added she felt like she was on her own before Grabanski came on the program. “She established teams, brought in people of purpose and met with us individually,” she said. “She kept us on track and said, ‘We can do this!’” ■

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Your *flight* path

Boeing employees pursue many paths for career advancement and success **By JoAnn Houlihan**

Dashan Craft's career path at Boeing has been about balance—a combination of experience and knowledge and being a father.

A systems engineer with Defense, Space & Security, Craft started his Boeing career as a structural mechanic and used the Learning Together Program, Boeing's tuition assistance program, to gain degrees in both information systems and systems engineering. This education, combined with knowledge gained through a leadership development program and work with a mentor, opened the door to his current position. "I talked with a few people who were mentoring me and they gave me some great advice—sometimes you have to take a step back to go forward," Craft said.

"The systems engineer position did not allow me to earn overtime. But it had more long-term potential for where I want my career to go."

Craft's four children also played a big role in his career path. "I kept asking myself, what kind of example am I going to set for my kids?" Craft said. "The best way for me to do

"Before you move into another area, you really have to find a balance between experience and education. I'm doing that right now."

– Dashan Craft, systems engineer, C-17 Program, Boeing Defense, Space & Security

PHOTO: SALLY ARISTEI/BOEING



that was to take the time and complete school, and then get the experience I need to be competitive.”

Boeing offers employees such as Craft numerous opportunities for growth—including making a lateral career move, attending education and training programs, volunteering in the community, participating in mentoring, or taking a temporary assignment.

Norma Clayton, who began her career at Boeing as an engineer, has made a number of lateral moves across business units and locations before landing in her current role as vice president, Learning, Training and Development.

“The most important tool for career advancement is having a learning map, which defines some end state that you as an individual are trying to achieve and then building a career path to get you there,” Clayton said. “That career path has to include a balance of both your experience and your knowledge.”

Natasha Kuleshova’s career at Boeing has taken her from Russia, where she began working for Boeing as a receptionist, to the Middle East, where today she is a Human Resources leader.

The secret to her success can be found in a Russian proverb that says, “You cannot pull a fish out of a pond without labor.” And achieving career success requires hard work.

As a receptionist in the company’s Moscow office, Kuleshova began to pursue her Ph.D. in economics from the renowned Peoples’ Friendship University of Russia, which earned her the respect of her peers and opened doors to new opportunities, including her move into Human Resources.

“Earning my Ph.D. taught me to think logically. It changed the way I do my work,” Kuleshova said. “In addition, I studied international labor migration. How ironic that I now find myself in the middle of it!”

Three years ago, she left her native Moscow for a lateral move to a position in Dubai in the United Arab Emirates. “I was so interested to learn a new culture and live in a new environment,” Kuleshova said. “While it may be viewed on paper as a lateral move, I see it as a completely new experience.”

A company the size of Boeing can offer employees

“Earning my Ph.D. taught me to think logically. It changed the way I do my work.”

– *Natasha Kuleshova, Human Resources leader, Middle East and Africa*

PHOTO: ASSOCIATED PRESS



multiple career paths and ways to develop and grow. Just as Kuleshova did, some employees have gone back to school, some have taken on new roles, and some have been guided by mentors.

In one of her mentoring relationships, Kuleshova was able to spend a week in the United States shadowing her mentor. She listened to her mentor talk to her team about the organization and watched the leadership skills she was working to cultivate on display.

"I could ask my mentor anything," Kuleshova said.

Steve Watkins has also moved laterally in his career path with Boeing Commercial Airplanes—several times.

He has moved across production lines at the Everett, Wash., plant, going from the 767 to the 747 to the 777; he then went outside Boeing for a while and is now back on the 777 line as a team leader in Wing Body Join. These moves have also taken him through three job codes—electrician, plumber and mechanic.

Along the way, he has been careful to align his career

goals with his obligations as a father of three young children.

"I made career choices that have allowed me to be home with my family in the evening," Watkins said. "I am even holding off on a move to management because I would have to work a rotating shift—something that is not a good fit for my life right now, but it might be down the road."

Watkins was laid off after five years at Boeing and used the time as an opportunity to go back to school to get a degree in welding technology.

"I really wanted a skill that I could fall back on," Watkins said.

After a stint putting his welding skills to use building catamarans, he returned to the 777 line working on systems installation. He also plays a number of other roles, including peer coordinator, where he works with the Skills Process Center to integrate new employees to a line by providing job assignments, ensuring certifications are attained and creating job shadowing opportunities.

"When I see these people doing their jobs right," he said, "I know I had something to do with that."



"I made career choices that have allowed me to be home with my family in the evening."

— Steve Watkins, team leader in Wing Body Join, Boeing Commercial Airplanes

PHOTO: GAIL HANUSA/BOEING

Another way to gain experience is through community volunteering.

Rashara Givhan has cultivated her leadership skills through the work she does as an Amateur Athletic Union basketball coach for school-age girls in the St. Louis area.

"A lot of discipline and hard work has to be done in those years to get academic and athletic scholarships," Givhan said. "Helping them get to the next level motivates me to do what I need to do to get to the next level."

Givhan has also used education—balanced with experience—throughout her career as a catalyst to new opportunities. She started her career at NASA as an aeronautical engineer and left after three years to pursue a master's degree in electrical engineering.

"My goal was to open more doors, and I did," Givhan said.

Today, working as a deputy program manager in Defense, Space & Security, Givhan is using the Learning Together Program to pursue a Ph.D. in engineering management and wants to use her knowledge to improve Boeing's competitive edge.

Givhan's experience, and that of Craft, Kuleshova, Watkins and many other Boeing employees, shows there's more than one way to catch a fish.

"You really have to find a balance between experience and education," Craft said. "I'm doing that right now." ■

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"Helping them get to the next level motivates me to do what I need to do to get to the next level."

– Rashara Givhan, deputy program manager and systems integrator, Integrated Product Data Management, Boeing Defense, Space & Security

PHOTO: RON BOOKOUT/BOEING



Where do I want to be tomorrow?

A lifetime of learning prepares employees and the company for the future

Norma Clayton, vice president for Learning, Training and Development, and Dianna Peterson, director of Strategic Workforce Planning, discuss work force readiness and lifelong learning.

Why is work force planning important?

Peterson: Like many technology-based companies, Boeing faces an impending skills shortage due to fewer workers being prepared to replace seasoned and skilled workers nearing retirement. By understanding business requirements and forecasting the associated near- and long-term skill needs, we can ensure employees develop in the right areas and also maintain our focus on hiring and retaining talent that matches our innovation and growth strategies.

What are some of today's strategic skill needs?

Peterson: Strategic skills vary by business unit and even by function. At Commercial Airplanes, strategic skill needs include several in the engineering discipline, such as structural analysis, payloads design and industrial engineering, among others. For Defense, Space & Security they include network communications, systems and software engineering. Across the company, we will continue to have strong needs for business developers and market strategists. Cybersecurity also is an area with significant opportunity as Boeing continues to grow its cybersecurity solutions business.

How are you growing strategic skills among employees?

Clayton: We analyze skill areas and identify what's needed to achieve a high level of proficiency in them. Once we have that intelligence, we review what formal curriculum exists in our portfolio to support development, and if one doesn't exist, we create new training to support it.

What role do employees play in keeping their skills current?

Peterson: It's up to each employee to set goals and manage his or her career. We provide the tools to do it—Performance Management, Learning Together Program, certification training, and opportunities for mentoring and special assignments, among others.

Clayton: There are also certain things that are done to execute a job that are not necessarily captured in any formal learning program or process. I'm talking about the knowledge in the index card in somebody's pocket that tells you how a machine runs. That's knowledge that can be tapped into by expanding your network and building relationships.



Career development tools

Boeing employees have many ways to advance their careers. Here are some helpful ideas:

- My Learning: Accessed through Boeing TotalAccess, My Learning is Boeing's single learning management system.
- Learning Together Program: Information about Boeing's tuition assistance program can be found by visiting <http://learningtogether.web.boeing.com> in the U.S. and <http://ltp-intl.web.boeing.com> for employees outside the U.S.
- Lateral moves: Talk to your manager about opportunities that might fit into your career path. You can also visit the Boeing Enterprise Staffing System for a list of current positions available. <https://bess.web.boeing.com>
- Leading projects: Volunteer to take a lead role on projects.
- Mentoring: Be an informal mentor to someone in your group and share your unique skills. To learn more, visit <http://hr.web.boeing.com/index.aspx?com=12&id=96>.
- Volunteering: Expand your horizons and benefit the community at the same time. Visit Boeing's Employee Volunteer Program website at <http://community.web.boeing.com/volunteerevents.cfm?gcc=volunteer&news=volunteerevents>.
- Development planning: The Continuing Education Advising Toolkit was developed to help managers and employees identify learning opportunities to enhance career development. To learn more, visit http://ltd.web.boeing.com/cea/cea_index.htm.

What is being done internally to increase strategic skills knowledge?

Clayton: What we're finding is that traditional skills like network systems and electrical engineering provide foundational knowledge needed for emerging skill areas. So there are certainly opportunities for employees to adapt to new technologies and skill sets by going back to school and learning new areas that have a foundation in their primary skill area. We also invest \$131 million annually in learning programs internally and \$75 million in tuition assistance. There's also an investment of 1.3 million hours in on-the-job training, ranging from industrial skills to engineering to quality to supplier management.

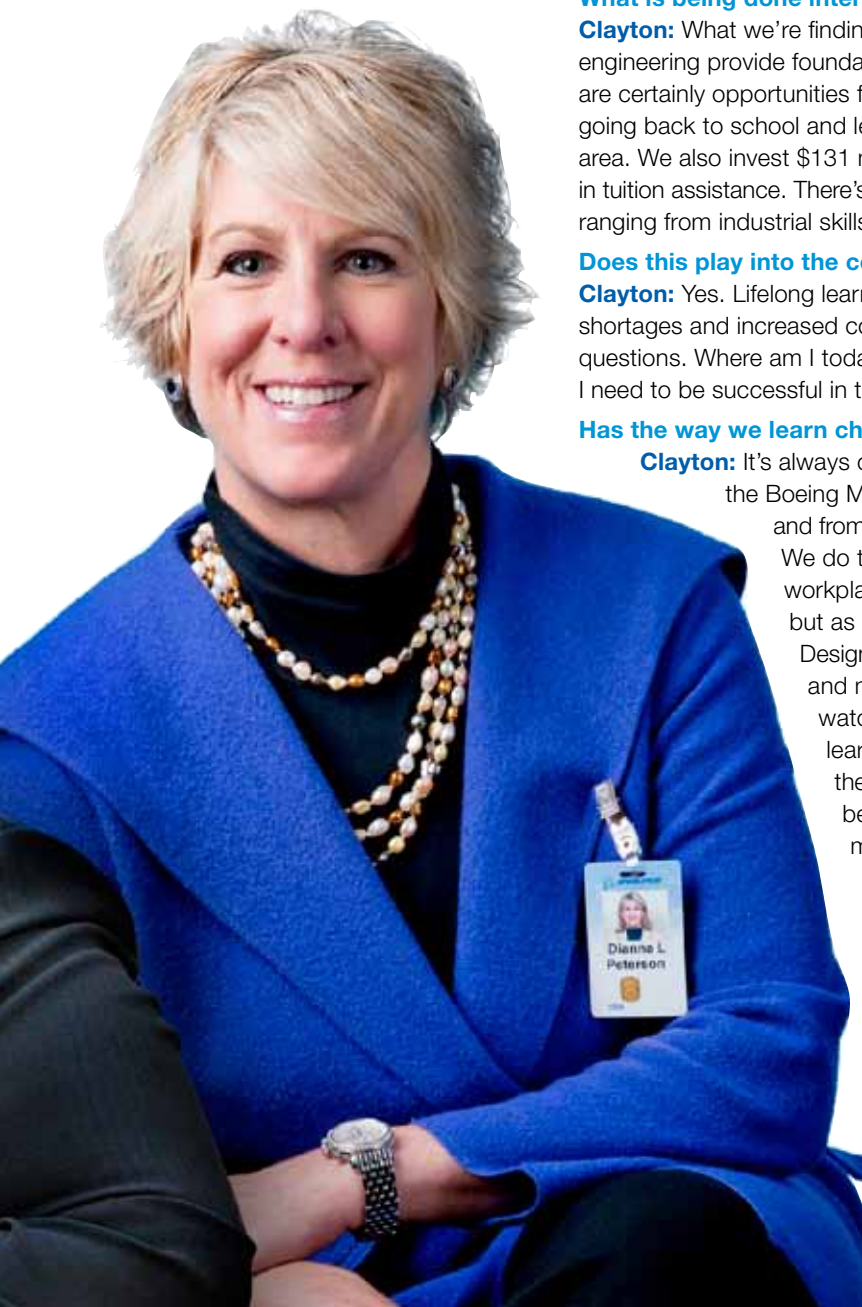
Does this play into the concept of lifelong learning?

Clayton: Yes. Lifelong learning is absolutely critical because we are facing critical skill shortages and increased competition. Each of us needs to ask ourselves a few tough questions. Where am I today? Where do I want to be tomorrow? And what skills do I need to be successful in the future at Boeing?

Has the way we learn changed?

Clayton: It's always changing. That's why learning is a foundational component of the Boeing Management Model: Maximize learning across the enterprise and from outside, and adapt and apply it in clearly defined businesses. We do this a number of ways, including leaders teaching leaders and workplace coaching, where leaders are serving not only as leaders but as coaches for employees. We also have teams like the Moscow Design Center using interactive tools and portals—like virtual lectures and mentoring—to learn from engineers who are in Seattle, literally watching them as they design products. Fostering a lifelong learning mindset means we must continually define the tools, the methods and the social sciences that facilitate learning. It's become part of our culture, and it's ingrained in the way we manage our business. ■

PHOTOS: (From left) Norma Clayton, vice president for Learning, Training and Development. RON BOOKOUT/BOEING
Dianna Peterson, director of Strategic Workforce Planning. MARIAN LOCKHART/BOEING



Door to the future

The 767 program's new final assembly home is more efficient than ever **By Leslie Hazzard**

When one door closes, another one opens.

In the case of the 767 airplane program in Everett, Wash., a new and rather large door—80 feet (24.4 meters) tall by 240 feet (73.2 meters) wide—opened recently on the most efficient 767 production facility ever.

At the end of February the program officially completed a move into its new final assembly bay in the Everett factory, the largest building in the world by volume. The program closed the door on assembly in the 40-24 bay, where it began production in 1978, to accommodate a temporary second line for the 787 Dreamliner.

The relocation is ripe with opportunity for the future of 767 production.

"We made significant progress using Lean+ not only to help us prepare for the move but also to help us focus on building the most competitive 767s possible, including the new KC-46A tanker for the U.S. Air Force," said Kim Pastega, 767 Program vice president and general manager.

The Department of the Air Force announced in late February that Boeing had won the competition to supply the Air Force with




PHOTO: This 767 was the first airplane to roll out the north side of the Everett, Wash., factory in January 2011—some 30 years after the first completed 767 left its position on the opposite side of the factory.

GAIL HANUSA/BOEING

179 tankers to replace the aging fleet of KC-135s. Boeing will deliver the first 18 767-based tankers to the Air Force by 2017.

“Our hard work in the direction of a more efficient building positively affected our ability to win that contract,” Pastega said.

What was originally a 20-month project to prepare for the 767 move was completed in only 13 months.

“We capitalized on the experience, capability and ‘can do’ attitude of everyone on the program to write this new chapter for the 767,” Pastega said.

Preparing for the future of the twin-aisle 767 was just one of several major goals the team needed to accomplish during the past year. Along with completing the move, the program made significant progress implementing the Boeing Production System, built its 1,000th airplane and increased production to 1.5 airplanes per month from the prior rate of one per month.

Pastega noted that the 767 team includes employees who worked on the first 767 more than 30 years ago, as well as employees with only a year or two on the job.

“The move presented us with a huge opportunity to pull from that wealth of experience while also benefiting from lots of new

ideas,” she said. “We succeeded largely because we used that base of diversity to our best advantage.”

After 30 years in the same location, the program needed to do some serious housecleaning and planning before boxing up the first piece of tooling. Relocation project leader Jerry Deinas headed up the overall effort, leaning on his experience helping the 777 program implement Lean+ and a U-shaped moving assembly line.

“The best thing we had going for us was a highly capable and motivated team that is invested in the future of the 767 program,” Deinas said. “The team wanted to make the most of this chance to improve how we’ve always done things, and to make us more competitive in the twin-aisle market.”

Enormous tooling fixtures weighing 130 tons (118 metric tons) to 200 tons (180 metric tons) had to be unbolted from the floor in one portion of the bay and reattached in another area of the bay. Boeing hired an outside company to complete the task, which took less than eight hours per piece of tooling versus several weeks using older methods.

Some tooling that wasn’t scrapped or moved needed to be





PHOTO: Both commercial airplanes and military tankers will be built in the new 767 bay, which sports an epoxy floor coating for improved lighting and better detection of foreign object debris.

TIM STAKE/BOEING

resized drastically. The wing panel team was only one of several that applied Lean+ practices to prepare for the move. Erik Pham led that team, which needed to reduce the size of the major wing panel tool by half.

“After brainstorming ideas to resolve a critical technical issue, we thought we had a solid plan,” Pham said. “And then the newest guy on the team, who’d been here about six months at the time, looked at the proposal and said, ‘there’s no way that’s going to work.’ He was right, so we found another idea that actually did work.”

Other pre-move tasks included tearing up concrete on the new assembly bay floor to lay new utilities in underground trenches. Fresh concrete had to be poured and then coated with a light-gray epoxy that makes the new home of 767 final assembly appear bigger and brighter.

Because the remodeled bay is about 60 percent of the size of the original 767 final assembly building, finding innovative ways to give employees the sense of a larger space was important, explained Darrel Larson, 767 Manufacturing director.

“The light-colored floor also makes it easier to spot foreign

object debris, or FOD, which can damage new airplanes during production,” Larson said. “The floor coating is part of our plan to enable a FOD-free production environment.”

Plenty of construction took place outside as well. The Everett Site Services team worked with contractors for months to strengthen and regrade the pavement outside the new bay. More than 8,000 cubic yards (6,120 cubic meters) of concrete were poured and graded to create a tow path for completed 767s exiting the north side of the factory.

The team also sliced off the corner of a building along the new tow path, reducing its footprint by 10,000 square feet (930 square meters). The building needed to be modified to allow sufficient wing clearance for new 767s to make their way to the Everett Flight line. Another major Site Services project was installing the first-ever hangar doors on the north side of the factory.

“In the end,” Pastega said, “it was clear we had matched the people with the right skills and the people with the right leadership experience to take us where we needed to go.” ■

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Towering achievement

Wichita renovation project saves energy and improves operational performance

By Bill Seil and
photos by Beverly Nowak



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

When the legendary B-47 bomber completed its flight-test program at Boeing's Wichita, Kan., site more than 60 years ago, today's techniques for improving the energy efficiency of buildings weren't even on the radar.

The flight tower used in testing the bomber was mounted atop one corner of a large hangar and had single-pane glass windows and a modest environmental control system. Over time, the tower's flight-test technology was upgraded, but the environmental control system remained essentially the same.

With the support of Boeing Site Services and a group of environmentally engaged Boeing employees at Wichita, the tower has been given a full environmental upgrade, complete with a new heating, ventilating and air-conditioning (HVAC) system and energy-efficient windows. During its first full year in operation the renovated tower has saved thousands of dollars in energy costs. Personnel are more comfortable, and testing conditions have been greatly improved.

The project won a Boeing Site Services 2010 Conservation Award for operational excellence.

"When the tower was built ... all of the electronic equipment used vacuum tubes, which generated a lot of heat. That was fine during the winter, but it was extremely uncomfortable during the summer," said Ken Peoples, who handles energy-related issues at the Wichita site for Boeing Site Services.

"We were having a lot of problems functioning up there with all the temperature swings," said Peoples, a member of the Wichita Green Team.

He worked with Site Services colleagues to complete the project. They included Kevin Davis, who coordinated the window replacement, and Ralph Stout, who coordinated the replacement of HVAC equipment with a digitally controlled system.

Today, the hangar (the 4-056G building) is used to support Wichita's heavy modification programs. It contains three bays, each large enough to accommodate a 747.

The Wichita Green Team, led by Pam Reiz of Environment, Health and Safety, became involved in the project as a result of its regular interaction with project administrators and the site's EHS team, Peoples said.

In addition to the tower renovation, the Wichita Green Team has been involved in many other environmental projects. ■

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For more information on how to support environmental activities at Boeing, visit the Environment Information Center at: <http://environment.web.boeing.com>



PHOTOS: (From left) The control tower at Boeing's facility in Wichita, Kan., features renovations that have improved operations and reduced energy costs; controller Frank Woodson monitors flight patterns through the tower's energy-efficient windows; and Ken Peoples of Boeing Site Services inspects a new air duct.

Working on a chore



PHOTO: Installing the advanced 787 flight deck are team members Kellen Miller, left, and Scott Hinrichs.

Team



By Emma Hodsdon and photos by Bob Ferguson

The 787 program is making steady progress toward certification and delivery.

Employees are working to help the program reach its goals and feeling excited about the first delivery scheduled for later this year.

"It's an absolute joy to see this plane come together," said Kathleen Hughbanks, structures mechanic. "It is a great plane and I can't wait to get it out to the world."

Although the program has faced challenges, employees now have plenty to cheer about. Recent 787 program milestones include logging 1,000 test flights, more than 3,000 hours of flying and traveling 1,000,000 flight miles.

First delivery to launch-customer ANA is scheduled for the third quarter of 2011.

"Every time I go to the factory and see the planes being assembled I am amazed," said Cory Goulet, lead staff analyst, 787 Propulsion Systems. "It's been a lot of hard work, but I'm really looking forward to us reaching certification."

Dave Cernich, team lead, Section 41/43 A Deck, began working on the 787 program two and half years ago.

"Starting on the 787 was a whole new career path for me and every day it is exciting to come to work," he said. "It's been great to watch us overcome the challenges on the program as a team and as a company. The first delivery to our customer and seeing the plane in service is what I'm looking forward to."

Don Neisinger, 787 mechanic, echoed that.

"I enjoy the sense of accomplishment I get from my job and building a quality product for the customer," Neisinger said. "I'm looking forward to the airplane being delivered and to see the customer happy ... It really is a wonderful airplane."

On the following pages are photos of the 787 team at work building Dreamliners, as captured by Boeing photographer Bob Ferguson, during a recent visit to the Everett, Wash., plant. ■

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PHOTOS: (Below) The sweeping curve of a 787 wing graces the final assembly line. **(Insets, from left)** Tan Truong; a mechanic works on the wing; Les Smith; and forklift operator William Work.



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PHOTOS: (Below) Focused on a final assembly task on the 787 wing are Ricardo Barreda, left, and Ralph Gonzalez. **(Insets, from left)** 787 team members Charlie Alexander; Mishelle Prochaska; Derek Pickering, left, and Ken Mattson; and Eric Reighard.



■ rience



inspiration



PHOTOS: (Below) Crane operator Bob Soltesz has a front-row view of the 787 assembly line. **(Insets, from left)** 787 team members Alma Carter; Vannak Peou; Jennifer McGlothlen; and James Palmer.



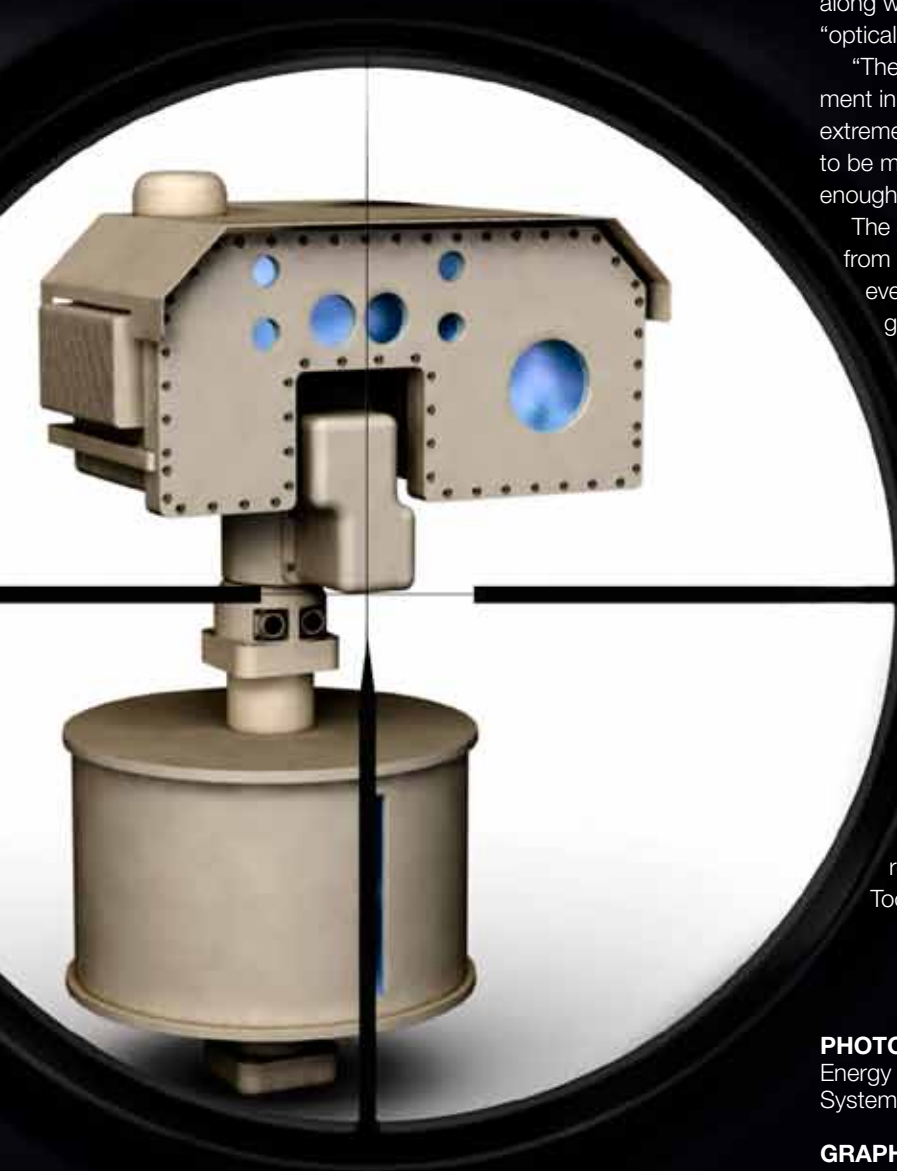
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Watching you watching me



New Boeing system detects optical monitoring devices such as binoculars—or a sniper scope

By Elizabeth Merida



Federal agents are assigned to keep an eye on an area surrounding the open-air platform where a candidate for high office is about to give a speech. A block away, someone else is watching the scene through some sort of optical device. It might just be a supporter. It might be something more sinister.

Agents are instantly alerted to the existence of the optical device and the exact location. Fortunately, it's just someone with binoculars.

How did they detect the optical device in this fictional scenario?

Through Boeing's Surveillance Detection System.

Developed by Boeing's Directed Energy Systems division, the system is capable of detecting optical monitoring devices such as binoculars, cameras or sniper scopes. It can also provide detailed information about and images of the onlookers it "sees," delivering near-real-time range and GPS data to help identify potential threats.

Boeing's team of Directed Energy Systems engineers has extensive experience with the development and application of pointing and tracking algorithms for beam control systems. Optical physicist Nora Tocci said that the team applied this knowledge, along with new detection schemes, to the principle known as "optical augmentation" to develop the new system.

"The combination of good optical design and major advancement in real-time image processing is what allows our system to be extremely flexible and accurate," Tocci said. The device is designed to be mounted on a telescoping pole or tripod, but it is portable enough for hand-held use.

The Surveillance Detection System is capable of scanning terrain from every angle. A spinning line scanner rotates 360 degrees every few seconds, allowing comprehensive surveillance of a given landscape.

Once the scanner skims an area, it captures the imagery in a linear array of pixels. This pixilated information is then transferred to the system's high-resolution interrogation sensor, which uses technology similar to that of a digital video camera to translate the pixels into a detailed, 360-degree image of the landscape. Then, using GPS technology, the system pinpoints both the range and precise position of objects of interest.

Boeing has extensively and successfully tested the system in the field, and it has proved to be reliable, day or night, in a number of tactically relevant scenarios.

The company announced availability of the system last November. It is primarily intended for soldiers in the field.

"Our hope is that it can help soldiers identify and react to potential threats in real time with high confidence," Tocci said. ■

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PHOTO: Boeing optical physicist Nora Tocci is part of the Directed Energy Systems team that developed the Surveillance Detection System. BOB FERGUSON/BOEING

GRAPHIC: The Surveillance Detection System can help soldiers pinpoint when they are being observed by optical devices such as binoculars or a sniper scope. BOEING



Capital investment

For Ethiopian Airlines, Boeing's 777-200LR links two key cities with nonstop service

By Adam Morgan

The world has gotten a little smaller for passengers flying nonstop between Washington, D.C., and Ethiopia's capital city, Addis Ababa.

When Ethiopian Airlines took delivery of its first 777-200LR (Longer Range) from Boeing in November, it became the first airline in Africa to operate the longest-range commercial jet flying today.

The 777-200LR makes it possible for the airline to fly nonstop on one of its most popular routes—Washington, D.C., to Addis Ababa. Before receiving its new airplane, the airline flew that route but had to make a stop in Rome. The old flight took approximately 18 hours or more, including transfer and layover times. Nonstop takes only about 12 hours.

"We've been building our fleet with Boeing airplanes for 65 years, but I think this airplane is extra special for us," said Ato Tewolde Gebremariam, newly appointed CEO for Ethiopian Airlines. "The 777-200LR is able to do what no other twin-engine airplane can do—fly

from the capital of the United States to the capital of Ethiopia. This is a very popular route for us, and the 777-200LR does it more economically for our airline and more comfortably for our passengers."

Washington, D.C., has one of the highest populations of Ethiopians outside Ethiopia. In addition, Addis Ababa is considered the political capital of Africa. The headquarters of the African Union and the United Nations Economic Commission for Africa are both in Addis Ababa, and it is home to the fourth-largest number of diplomatic missions in the world. That combination means business for the airline.

And there are other opportunities for Ethiopian Airlines and the 777-200LR.

"With this new long-haul capability, we can look at other direct routes previously unavailable to us, like Addis to Asia, that we can now fly nonstop because of the impressive range of this airplane," Ato Tewolde said.

Ethiopian Airlines is configuring its 777-200LRs to carry 321 passengers—

34 in business class and 287 in economy. Ethiopian Airlines has three 777-200LRs in service and will take delivery of its fourth this month, the month of the airline's 65th anniversary.

Owned by the Ethiopian government since its founding in 1945, the airline operates an all-Boeing fleet, including the 737, 757, 767, MD-11 Freighter and one 747 Freighter. The airline's order for 10 787 Dreamliners was the first in Africa.

"The 787 is worth the wait because of all the great new technology and benefits to our airline and passengers," Ato Tewolde said. "We continue our strong relationship with Boeing not because of our past but because we share a vision for the future. Boeing employees really are building the products of tomorrow, today." ■

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PHOTOS: (Above) Ethiopian Airlines CEO Ato Tewolde Gebremariam. **JOHN CROZIER/BOEING**
(Below) The airline took delivery of its first 777-200LR last year. **TIM STAKE/BOEING**





PICTURE PERFECT

Boeing's new 747-8 Intercontinental, the largest commercial airplane the company has ever developed, soars above Puget Sound in Washington state during its first flight March 20. Chief pilot Mark Feuerstein called the nearly 4.5-hour flight "perfect." At 250 feet (76 meters) long, the 747-8 Intercontinental is about 18 feet (5.6 meters) longer than its predecessor, the 747-400. "This is a great day for the 747-8 team and for all of Boeing," said Elizabeth Lund, vice president and general manager of the 747-8 program. "What an honor it is to see such a beautiful airplane fly."

PHOTO: ED TURNER/BOEING





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