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Frontiers

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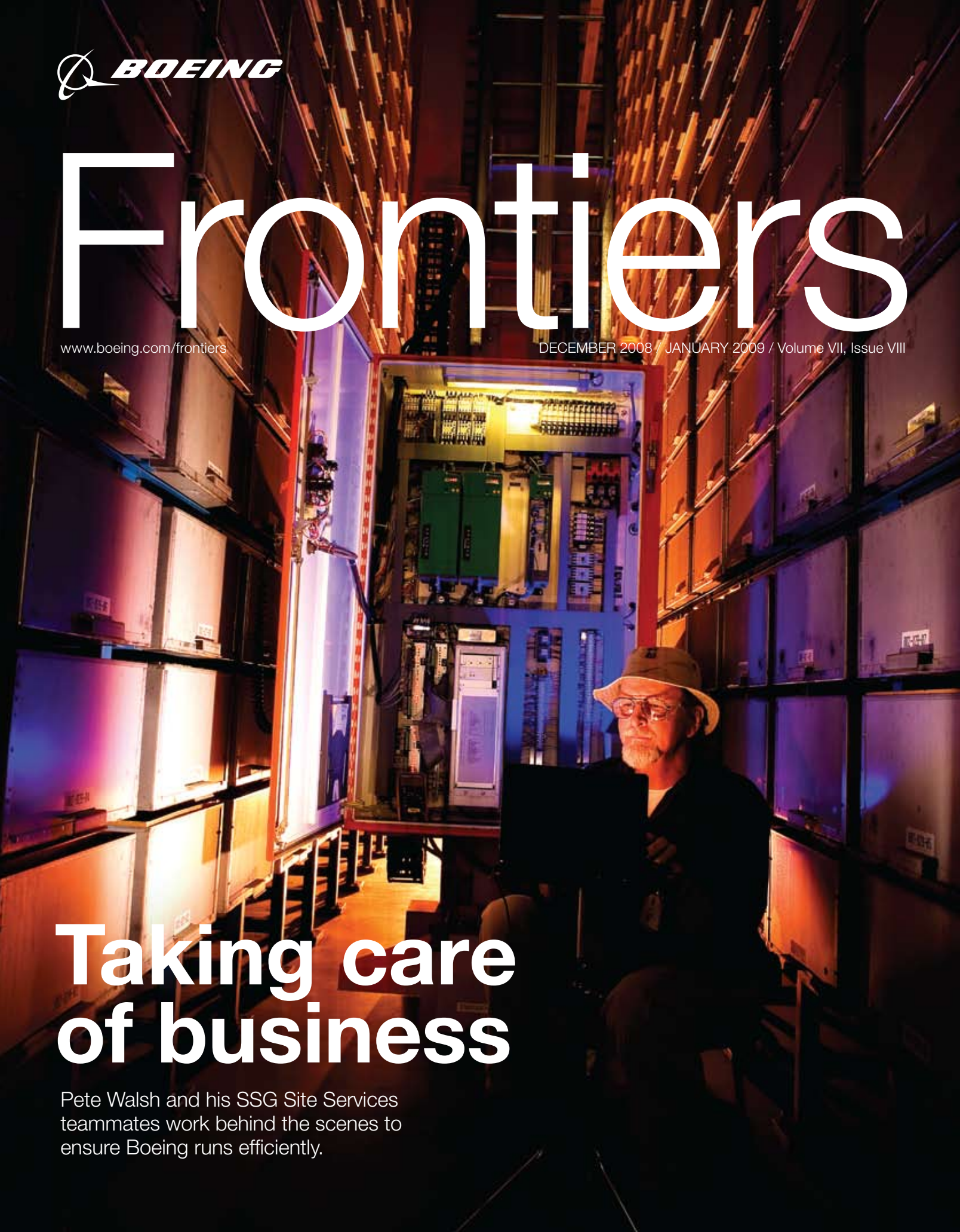

Taking care of business

Pete Walsh and his SSG Site Services teammates work behind the scenes to ensure Boeing runs efficiently.

BOEING

THE WORLD'S MOST POWERFUL communication satellites are built by Boeing. Your contributions will continue to advance the essential space-based solutions that today's commercial and defense programs demand. That's why we're here. The job categories below reflect skills we are seeking for various positions in Alabama, Arizona, California, Colorado, Kansas, Maryland, Missouri, Pennsylvania, Texas, Virginia and Washington. To view the available jobs at each location and to apply, visit: boeing.com/careers

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- COMMUNICATION SYSTEMS – MILSATCOM/ NETWORK/SATELLITE/WIRELESS
- ELECTRICAL ENGINEERING – COMPONENTS
- ELECTRONIC WARFARE
- FINANCE/ACCOUNTING/PLANNING/ SCHEDULING/ESTIMATING/PRICING/ EVMS/TAX
- GIS/IMAGERY
- GROUND MISSILE DEFENSE/ GROUND-BASED MISSILES
- INFORMATION TECHNOLOGY
- MECHANICAL ENGINEERING – EM/ STRUCTURAL DYNAMIC/THERMAL/STRESS
- MODELING & SIMULATION
- NETWORK ARCHITECT/ NETWORK SECURITY
- NETWORKING/EMBEDDED/ WEB/ARCHITECTURE
- PAYLOAD SYSTEMS – SPACECRAFT/ SATELLITE/AIRCRAFT
- PRODUCT REVIEW ENGINEERING (LIAISON/MRB ENGINEERING)
- QUALITY ENGINEERING
- RADAR DESIGN/ANALYSIS
- SIGNAL PROCESSING – SONAR/RADAR/ DSP/SIGINT SYSTEMS
- SOFTWARE ENGINEERING – REAL-TIME
- SYSTEMS ENGINEERING

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To view a comprehensive listing of all available positions, please visit: boeing.com/employment. Security clearance requirements are indicated in the position listings. U.S. citizenship is necessary for all positions requiring a security clearance. Boeing is an equal opportunity employer supporting diversity in the workplace.

This image, from the "Epic" recruitment advertising campaign, is part of Boeing's efforts to attract a talented, diverse group of college and experienced professionals, and encourage them to explore a career with Boeing. The skill sets listed demonstrate the breadth and depth of Boeing opportunities. The ad directs candidates to view detailed job descriptions and apply online at: boeing.com/careers.

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ALWAYS ON THE GO

The Site Services organization of Shared Services Group helps keep Boeing moving. The team handles myriad tasks from delivering interoffice mail to maintaining building systems to sprucing up facilities—including Long Beach, Calif., where contractors are shown here working on the historic "Fly DC Jets" sign. Here's a pictorial look at Site Services in action. MICHAEL GAIL/BOEING

ON THE COVER

Pete Walsh is a Production Equipment Maintenance mechanic in Mesa, Ariz.
Photo by Bob Ferguson/Boeing

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THE 'FUTURE' TAKES SHAPE

Thanks to the Future Factory project, the work space at the Everett, Wash., factory is being transformed in an environment that enhances collaboration, improves employee satisfaction and supports production system efficiencies. Here's a peek at how the revamped facility looks, more than midway through this multiyear project.

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Steve Schmidt's duties include being a show pilot, which allows him to demonstrate the capabilities of Boeing's jet fighters to current and potential customers—as well as the general public. KEVIN FLYNN/BOEING

INSIDE

SNAPSHOT /

I'LL BE RIGHT THERE

U.S. Army soldiers with the 101st Division Special Troops Battalion, 101st Airborne Division, watch as two Boeing Chinook helicopters arrive to return them to Bagram Airfield in Afghanistan. The soldiers searched a small village in the valley below for materials and facilities that could be used for making improvised explosive devices.

SPC. MARY L. GONZALEZ/U.S. ARMY

QUOTABLES /

"We've turned missile defense—the idea of hitting a bullet with a bullet—into a reality."

—Greg Hyslop, vice president and Ground-based Midcourse Defense program director, at the opening of the program's training center in Huntsville, Ala., in the Oct. 30 *Huntsville Times*

"This is ... another step from one perfect flight to making all flights perfect in terms of operational efficiency."

—Kevin Brown, vice president of Boeing Air Traffic Management, in a Nov. 14 *Seattle Post-Intelligencer* report on the flight of a United Airlines 747 that demonstrated how improved air traffic control techniques can save fuel and reduce emissions

"With Super Hornets likely to remain in the fleet for 25 years, any upgrades that bolster reliability or maintainability will pay for themselves."

—Loren Thompson, chief operating officer of the Lexington Institute, in a Nov. 18 issue brief advocating that the U.S. Navy needs more F/A-18E/F Super Hornets

IAM PROMOTIONS

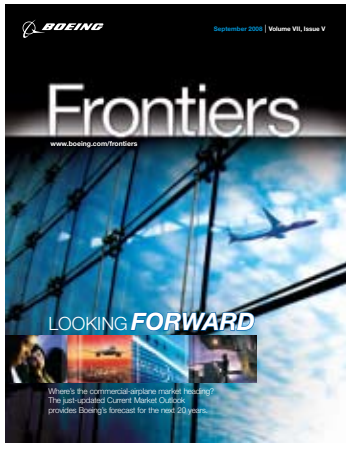
No promotions listed for periods ending Oct. 31 and Nov. 7, 14, 21 and 28.

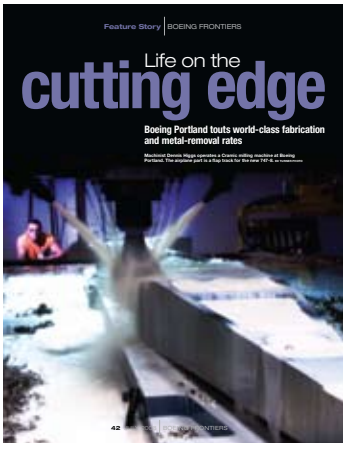
ETHICS QUESTIONS?

You can reach the Office of Ethics & Business Conduct at 1-888-970-7171; Mail Code: 14-14; Fax: 1-888-970-5330; e-mail: ethicsline.ethics@boeing.com; Web site: http://ethics.whq.boeing.com

Publisher's Note:

A thank you to the employees





As *Frontiers* turns the page from 2008 to 2009 with this double issue, the staff and I would like to thank the more than 160,000 Boeing employees whose amazing work, commitment and dedication to our company, its customers and communities make this feature magazine possible. The *Frontiers* team is honored to present a sampling of your inspiring stories through words and images each month.

Since having launched this magazine for employees in May 2002, our team of writers, editors and other communicators from across the company has strived to provide in-depth coverage and context—the "why" and "how" behind Boeing-related news—and tell the "story beneath the story" of one of the most exciting and dynamic companies in the world. Whether that story is about our customers, our products and services, our supplier-partners, our technologies or our support of communities near to home or far away, we aim to tell it through the eyes of the men and women who do their best to make Boeing successful—day in and day out, in good times and bad.

During the course of 2008, *Frontiers* has taken its readers to meet customers, supplier-partners and employees from Australia to Japan, from Norway to Saudi Arabia and from space to the deck of an aircraft carrier. We've glimpsed potential new comforts of air travel as envisioned by our own Boeing futurists. We've shared process improvements by teams from Boeing Fabrication in Auburn, Wash., and Portland, Ore., to the Composite Center of Excellence in Philadelphia. We've met engineers who apply their

who bring *Frontiers* to life

talents both at work and in their communities, mechanics who make speedy repairs of Special Operations Forces equipment and all sorts of employees who have earned degrees through the company's Learning Together Program. We've learned how people from Commercial Airplanes and Integrated Defense Systems work together to produce military derivatives of commercial airplanes, share best practices and lessons learned and even fight foreign-object debris. We've also explored ways in which employees are protecting the environment, improving their ergonomics and helping our customers operate their fleets more efficiently.

While the current global economic climate and other business challenges are likely to remain with us well into 2009, *Frontiers* will continue its mission to tell the story of employees' efforts to better serve our commercial and military customers; to remain lean, productive and competitive in global markets; to strengthen Boeing for the long term; and to connect and protect people all around the world.

With hopes to you for a happy holiday season and a peaceful new year from the *Frontiers* team,

Tom Downey
Senior Vice President, Communications

Looking straight up

The Rockwell XFV-12A pursued both vertical lift, supersonic conventional flight

By Erik Simonsen

During the early 1970s, the notion of having a supersonic, highly maneuverable fighter that could take off and land vertically from a carrier deck was a naval planner's dream. Hoping to make that a reality, in November 1971 the U.S. Navy initiated the Vertical Fighter Attack-X program and invited contractors to submit proposals. Rockwell International, a Boeing predecessor company, submitted an entry featuring a Thrust Augmenter Wing (TAW) concept and was awarded a $47 million contract in May 1972 for two demonstrators.

As Rockwell received its TAW concept contract, the Navy, under the leadership of Adm. Elmo Zumwalt, Chief of Naval Operations, planned to build a new, smaller class of 12,500-ton Sea-Control ships to base the new lightweight vertical or short takeoff and landing (V/STOL) fighters on.

For its V/STOL fighter (designated XFV-12A), Rockwell utilized the forward fuselage/cockpit and the nose/main landing gear from a McDonnell Douglas A-4 Skyhawk fighter, and the inlets, wing box/main fuel tank from a McDonnell Douglas F-4 Phantom fighter to expedite assembly and reduce cost. In all, 35 percent of the XFV-12's structure would originate from existing aircraft.

The TAW system was designed to flow ducted air into a full-span ejector flap system in the wings and in the canards. With the rear exhaust nozzle closed, engine thrust was augmented by drawing air in from the top of the fuselage and into flaps (movable panels) that carried exhaust gases to augmenter exit nozzles. This would also result in a cooler exhaust footprint on the carrier deck. Once flight was achieved, the nozzles would be rotated to transition the aircraft to conventional flight mode. Additionally, the mixing of primary and ambient air above the wings would provide increased vertical lift, thus easing the transition. The aerodynamic effect would be similar to the blown-flap technique of the North American RA-5C Vigilante (see Page 8 of the September 2008 *Boeing Frontiers*). The afterburner would only be used for conventional supersonic flight.

At the aircraft's Aug. 26, 1977, rollout at Rockwell's Columbus, Ohio, Division, the public saw an aircraft with a sleek futuristic design. After substantial ground testing it was determined that powered tethered tests were needed to validate the TAW system. In November 1977 the XFV-12A was transported via the Aero Spacelines Super Guppy aircraft to the NASA Impact Dynamics Research Facility, formerly known as the Lunar Landing Research Facility, at Langley, Va. Flying the XFV-12A to Langley was considered but rejected—a decision later regretted. Certainly, testing and demonstrating the aircraft in conventional flight mode at Columbus and flying it to Langley would have been a substantial step toward building confidence in the design.

Tethered beneath the huge gantry where Apollo astronauts once trained for simulated lunar gravity, the XFV-12A underwent six months of powered V/STOL testing. Although the aircraft exhibited excellent handling characteristics with the ducting system, sufficient thrust was not developed for vertical lift. The TAW system achieved a thrust-to-weight ratio of 1.35; however, 1.45 was required using 21,800 pounds of engine thrust.

"Unfortunately, computational fluid dynamics was not available at the time. That may have predicted the corner flow for the ejectors and isolated the vertical thrust anomalies," Bob Gulcher, divi-

Shortly after its rollout on Aug. 26, 1977, the futuristic XFV-12A is shown near the runway at Rockwell's Columbus Division. BOEING ARCHIVES PHOTO

sion chief engineer for the XFV-12A, recently said. "Had we shifted away from vertical lift, I believe the aircraft would have made an excellent short take-off and vertical land (STOVL) fighter."

Unfortunately for the XFV-12A, naval strategy had begun to shift by the mid-1970s toward re-emphasis on larger Nimitz-class aircraft carriers basing larger, multirole fighter/attack aircraft. What's more, funding inconsistencies plagued the program—in fact, the second demonstrator was eliminated—and in 1981 the XFV-12A program was terminated.

LET'S GET CONVENTIONAL

Although original plans called for a conventional first flight, the XFV-12A program remained firmly focused on solving the V/STOL problems. Flying conventionally and demonstrating extreme maneuverability utilizing direct lift, direct side force control thrust and a large speed brake—coupled with supersonic dash speeds—might have struck the right chord with the Navy.

Indeed, the British-designed V/STOL Harrier made its first flight in conventional mode on Dec. 28, 1967; V/STOL testing followed later. Today, Harriers of the Royal Air Force and Royal Navy—and the Boeing AV-8B Harrier II flown by the U.S. Marine Corps—achieve maximum efficiency in short takeoff mode. This lesson learned, today's strategy favors short takeoff for multimission, flexible-base fighters.

Rockwell's work on the XFV-12A led to the creation of a demonstrator aircraft that incorporated envelope-pushing technologies. Although the Navy ultimately scrapped this program in part because of strategic shifts, Rockwell's achievements helped pave the way for other advanced-flight achievements. ■

erik.simonsen@boeing.com

Tale of the tape: **XFV-12A**

CREW: 1

LENGTH: 43 feet 11 inches (13.4 meters)

WINGSPAN: 28 feet 6 inches (8.72 meters)

HEIGHT: 9 feet 5 inches (2.9 meters)

EMPTY WEIGHT: 13,800 pounds (5,897 kilograms)

VTOL GROSS WEIGHT: 19,500 pounds (8,618 kilograms)

STOL GROSS WEIGHT: 24,250 pounds (10,866 kilograms)

POWERPLANT: One Pratt & Whitney F401-PW-400 afterburning turbofan

THRUST WITH AFTERBURNER: 30,000 pounds

LIFT THRUST: 21,800 pounds (plus augmentation)

SPEED: 1,534+ mph (2,470+ km/h)

RANGE: Operational radius 575 miles (925.37 kilometers)

SERVICE CEILING: 40,000 feet (12,192 meters)

ARMAMENT: One 20 mm M61 Vulcan cannon; two AIM-7 Sparrow (fuselage hardpoints) and two AIM-9L missiles, or four AIM-9 Sidewinder (outboard wing) missiles

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LETTERS /

"The Minuteman program accomplished some major milestones during the time of their testing at these facilities."

—Victor E. Jarc, Surprise, Ariz.

ACES WILD

I enjoyed the article "Ace in the hole" about the Minuteman program in your November 2008 edition. However, I noticed you left out a significant contributor to the Minuteman program.

At the time I was employed in the Range Safety Office at Vandenberg Air Force Base, Calif. The Boeing team on site at Vandenberg played a major role in the testing of the Minuteman missile system and subsequent deployment of the program.

I don't recall any other sites that executed silo based launches as extensively as were conducted at Vandenberg. The support teams were not only on site at Vandenberg but throughout the Western Test Range. This system, along with the Titan, Atlas, and Thor Delta, were major programs being developed and tested at that time.

The Minuteman program accomplished some major milestones during the time of their testing at these facilities. Perhaps in the future you could do an article on this phase of both the Minuteman and Delta programs led by Boeing and McDonnell Douglas respectively.

Keep up the good work with *Frontiers!*

—Victor E. Jarc
Surprise, Ariz.

CALENDAR /

2009 /

Jan. 21–22: MRO Middle East 2009 Conference & Exhibition. Dubai, United Arab Emirates. See www.aviationweek.com/conferences/mmemain.htm

Feb. 11–12: Asian Business Aviation Conference & Exhibition. Hong Kong. See www.abace.aero

Feb. 11–15: Aero India. Bangalore, India. www.aeroindia.in

Feb. 22–26: IDEX 2009. This biennial Middle East defense conference and exhibition is taking place for the ninth time. Abu Dhabi, United Arab Emirates. See www.idex2009.com

March 10–15: Australian International Airshow and Aerospace & Defence Exposition. Geelong, Australia. See www.airshow.net.au

March 11–12: Defense Technology & Requirements. Washington, D.C. See www.aviationweek.com/conferences/dtarmain.htm

March 15–17: ISTAT (International Society of Transport Aircraft Trading) 26th Annual Conference. Scottsdale, Ariz. See www.istat.org

March 31–April 2: Aircraft Interiors Expo. Hamburg, Germany. See www.aircraftinteriors-expo.com

April 7–9: Air Cargo Management Group's 5th Annual Air Cargo, Express & Freighter Aircraft Workshop. Seattle. See www.cargofacts.com

May 6–7: Airline Purchasing Expo 2009. London. See www.aviationindustrygroup.com

June 15–21: Paris Air Show. Paris. See www.paris-air-show.com

LETTER GUIDELINES

Boeing Frontiers provides its letters page for readers to state their opinions. The page is intended to encourage an exchange of ideas and information that stimulates dialogue on issues or events in the company or the aerospace industry. The opinions may not necessarily reflect those of The Boeing Company. Letters must include name, organization and a telephone number for verification purposes. Letters may be edited for grammar, syntax and size.

Going places

'Road warriors' share tips on how to cut costs

By Stephen Davis

Boeing, a favored supplier to the global travel industry, also buys a lot of what the travel industry sells: Seats on airplanes. On any day, 1,000 of your fellow employees are hoisting carry-ons into overhead bins, hunting for the light switch in a dark hotel room or studying a dubious "chef's special" on a café menu.

Several Boeing travelers shared with *Boeing Frontiers* their tips for complying with company policy while lowering costs to Boeing—as well as a few of their road memories.

Larry West, Shared Services Group
Trips in the past six months: 2
Reason for travel: Audit Virtual Office Hoteling Centers.
Travel advice: "Try WebEx meetings to book trips with several travelers. It ensures we arrive the same time—saving a car rental—and stay near each other."
Travel memory: "When setting up the St. Louis centers, the hotel's breakfast cook quickly remembered my preferences. It really made me feel welcome."

Allen Loveless, Commercial Airplanes
Trips in the past six months: 9
Reason for travel: Collaborate with partners, subsidiaries.
Travel advice: "When organizing a meeting, make commitments quickly so others can plan and book early. Choose the location that incurs the fewest travelers."
Travel memory: "We were leaving Chicago during the winter and the weather was deteriorating. Then Midway Airport closed. Worried about finding a hotel, we called the Boeing Travel after-hours desk. They found a room within minutes. And by the time we got to the hotel, they had found us another flight out."

Jennifer Yost, Integrated Defense Systems
Trips in the past six months: 2
Reason for travel: Program Management Reviews and negotiations with prime customers, U.S. Air Force and Northrop Grumman.
Travel advice: "Find cost-effective nonstop flights. The time loss and potential for problems when changing planes can prove costly."
Travel memory: "Learning to drive on the left in Australia because it was safer and less stressful than riding with some co-workers!"

Duff Graham, Boeing Capital Corporation
Trips in the past six months: 7
Reason for travel: Collaborate with airlines, financiers to develop airplane financing solutions; represent BCC at industry events.
Travel advice: "Make the most of your time at the destination. Prepare for the meeting before traveling."
Travel memory: "On a Morocco trip, we were invited to have dinner with a local family and watch a soccer match on TV, which was powered with a car battery. As soon as they tuned in, all the neighbors crammed into the very small room. It reminded me that our business helps connect the world."

If you have traveled recently and have advice to share, e-mail your tips to SharedServicesGroup@boeing.com. Feel free to send tips about all parts of the travel process: travel, how to meet the 12-day expense-reporting requirement and how to keep your company-provided charge card in balance. ■

stephen.m.davis@boeing.com

Jennifer Yost prepares to head out from the Developmental Center in Seattle. Among her travel strategies: Taking cost-effective nonstop flights to bypass flight connections.
JIM ANDERSON/BOEING

PLAN EARLY, BOOK EARLY

Once you and your manager have decided travel is essential, plan carefully and act quickly to minimize overall costs.

"Our goal is to assist employees in making smarter travel choices that save Boeing money," said Yvette Winn, director, SSG Travel & Expense Services. "If you ask my team how to do that, we sum it simply as 'Plan early. Book early.' Company policy asks that of all employees. But knowing a few ways how to do it helps us all."

Tips for planning early:

- Confirm venues and agendas well before the meeting date. This gives presenters and participants time to book early and purchase airfare at lower rates.
- Not everyone may need to travel. Consider using video and Web technologies to tie in some presenters.
- Use Travel's meeting services if your group will include more than 10. They often can negotiate better deals.

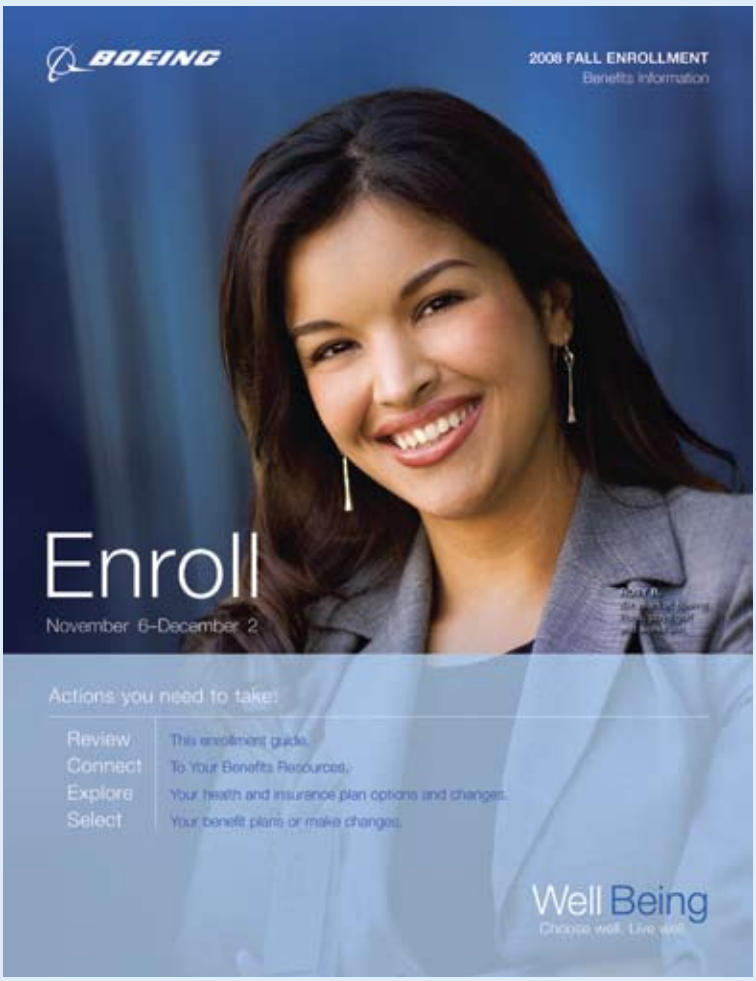
Tips for booking travel early:

- Make reservations as soon as the travel requirement is known. Low-cost options fade with time: Airfare booked 13 days or more in advance costs, on average, 20 percent less than if booked seven days or less in advance.
- Be flexible to take advantage of alternative airlines and flight times. And choose mid-market Boeing preferred hotels.

—Stephen Davis

Well Being at Boeing

New initiative aims to help employees reach physical and financial wellness



This fall, Boeing employees received benefits enrollment information (above) that depicted the Well Being identity. The identity is part of an initiative that aims to help employees achieve a sense of physical and emotional well-being.

By Susan Birkholtz

When you and your family feel your best in every way, both physically and emotionally, chances are your productivity and satisfaction in both work and life are at their peak. Also key to a satisfying, low-stress, high-functioning life is feeling financially secure and having the confidence that you'll be able to live comfortably in the years after work.

At Boeing, there are programs, services and tools to help employees achieve just that sense of "well-being" described above, through a comprehensive initiative by the same name. "Well Being" bundles both health and work/life benefits such as the Employee Assistance Program and wellness, retirement savings and planning—basically everything the company offers employees to help them achieve physical and emotional health as well as financial security in their retirement years. New Well Being tools and resources will be added to existing offerings over the next few years as part of this initiative.

Boeing will be incorporating the Well Being identity and the accompanying phrase, "Choose Well. Live Well.," in materials related to health, work/life benefits and savings planning in the coming weeks and months.

"Benefits enrollment information that employees received in October includes the Well Being identity and includes a new look that features real-life Boeing employees," said Pam French, Boeing Benefits director. "This reflects the company's commitment to focus on the people behind our products—the 'who we are' as well as 'what we do'—in how we communicate about the company."

Rick Stephens, senior vice president, Human Resources and Administration, agreed.

"It's all about people. When employees have reliable information to make sound, proactive decisions about their health and finances they enjoy life more, are better able to contribute their time and talents back to their communities, and are generally more productive at work and at home. Lives are transformed in positive ways," he said. "And it's all about the long term—the more money you have in the piggy bank and the healthier you are as you age, the greater your ability to take advantage of future opportunities."

It's about the long term for the company as well, as Boeing continues to address rising health-care costs, which are increasing an average of 6 to 8 percent a year. Each percentage-point increase equals about $20 million in increased cost to the company.

Stephens noted that at any given time a couple thousand employees may be out sick or on disability leave, which is obviously not good for those employees or for Boeing.

"The cost of having this number of employees out of the workplace translates to millions of dollars of lost time, not including the resulting health-care cost and lost productivity," Stephens said. "If we could cut this number in half and slow the rate of heath-care cost increases, we can invest that money in more productive ways. Integrating health and financial well-being through this Well Being initiative—both as a business issue and in employees' lives—is one way that we can accomplish these goals."

AVAILABLE RESOURCES

There's a world of well-being materials employees can access on the Boeing intranet, with many just a click or two away.

- **www.BoeingWellness.com:** A wealth of tools and resources to help you feel your best, with content provided by the Mayo Clinic.

- **BoeingWellness Health Letter:** This letter, created by the Mayo Clinic and customized for Boeing, is mailed monthly to employees' homes.
- **Health Assessment:** The Mayo Clinic Health Assessment is an interactive tool offered on BoeingWellness.com each year where an employee can get a personalized report on the state of his or her health and receive lifestyle coaching.
- **Family Care Resources:** This service provides free, confidential referral services for Boeing employees, retirees and family members, helping them find a variety of services including day care and elder care.
- **Stress Management Web site:** Visit www.boeing.com/stressmanagement for "one-stop shopping" for all the stress-related resources Boeing offers employees and their family members.
- **Weight management tools:** Free and discounted weight management tools are available to Boeing employees and their family members through www.BoeingWellness.com.
- **Employee Assistance Program:** This confidential service links Boeing employees and their families to experienced counseling professionals for help with personal issues.
- **Flu prevention:** Boeing's free flu shot program is available to employees each fall at company sites in North America.
- **Exercise opportunities:** Many Boeing facilities have health, fitness and activity centers on site. Also, Boeing families in some parts of the United States qualify for savings of up to 65 percent when they join a fitness club through GlobalFit, which is partnered with Boeing to offer discounts at commercial health clubs.
- **Free & Clear Quit for Life Program:** This award-winning program provides participants a coach to offer advice through a 12-month quit-tobacco plan. The program includes free nicotine replacement therapy products.
- **Preventive care:** Employees and dependents covered by a Boeing medical plan likely are eligible to receive preventive-care exams—often at low or no cost.
- **Care management:** Most of Boeing's health plans offer care-management programs, which provide personalized education and support for people with chronic conditions.
- **Pay and Benefits Profile:** This provides a personalized snapshot of your total pay and benefits package and other sources of income available during retirement—as well as tools to help you estimate your retirement income needs.
- **Retirement income calculator:** The Boeing Savings Plans Online Web site, accessible through TotalAccess, offers savings and retirement planning calculators that provide estimates tailored to the individual employee. ■

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Republic of Singapore acquires first F-15

The Republic of Singapore Air Force (RSAF) last month joined the list of F-15 "owners" when the first Singapore F-15 was rolled out in a ceremony at Boeing facilities in St. Louis.

Singapore awarded Boeing a contract to build 12 F-15SG aircraft in December 2005 with an option for an additional eight aircraft. In October 2007, Singapore awarded Boeing a second contract for four aircraft and exercised the option for eight aircraft from the 2005 contract, bringing the total aircraft under contract to 24.

During the ceremony, Maj. Gen. Ng Chee Khern, RSAF Chief of Air Force, praised both the aircraft and the team that made the rollout possible.

"We are proud to be on this distinguished list of air forces to operate this platform, which boasts an impressive combat record of 104 victories and zero defeats," he told a crowd of more than 500.

The aircraft will undergo a one-year flight test program to confirm aircraft performance. Flight testing will take place at Boeing facilities in St. Louis and in Palmdale, Calif. F-15SG production deliveries will begin in the second quarter of 2009. The final aircraft in this procurement will be delivered to the RSAF in 2012.

The first F-15 took to the skies in 1972. Since then, more than 1,500 Eagle variants have been produced for the U.S. Air Force and several foreign countries. In addition to the Republic of Singapore and the Air Force, F-15 aircraft have been delivered and are in service with the Republic of Korea Air Force, Israeli Air Force, Japan Air Self Defense Force and Royal Saudi Air Force.

U.S. Air Force Lt. Gen. Loyd Utterback (right), points out features in the cockpit of the first Singapore F-15 to Maj. Gen. Ng Chee Khern, chief of the Singapore Air Force. RON BOOKOUT/BOEING

—Kathy Cook


World On Time
Envelope
FedEx
Express
Small Pak

Service that never *sleeps*

SSG Site Services keeps Boeing going 24/7

Every Boeing employee encounters a service provided by SSG Site Services every day. Indeed, probably more than one. From the buildings we work in and the grounds that surround them, to the interoffice mail we read and the food we eat, Site Services is there. When deliveries of parts and other materials arrive like clockwork, systems are maintained and passenger vans arrive on time to shuttle folks from one point to another, it's Site Services that's keeping Boeing's business moving.

Site Services is the largest organization within Boeing's Shared Services Group—5,600 employees strong—and its annual operating plan of $1.8 billion provides nearly 40 unique services. "Site Services has a phenomenal opportunity to help the business units leverage the power of 'one Boeing,' as our work touches all business units at all sites," said Site Services Vice President Larry Edwards.

Site Services leaders work in tandem with business partners to arrive at decisions that are best for the company as a whole. By leveraging economies of scale in the services it provides, Site Services can establish delivery models for those services that result in the most efficient and economical solutions for its business partners.

From changing a light bulb to arranging for a building's demolition, no job is too big or too small for Site Services teammates. Here's a pictorial look at some of the services SSG Site Services provides, manages and facilitates around the clock for Boeing.

—Debby Arkell, Glen Golightly and Kathy Spicer

PHOTO: Mail service delivery, part of SSG Site Services, is a vital part of what it takes to keep Boeing offices and operations ticking. Boeing Chicago Mail Services employees Jennifer Wadley (left) and Robert Delelio, and Aramark employee Natalie Thurmond (right) help manage costs and services associated with incoming and outgoing mail, interoffice mail and assistance for misaddressed mail. BOB FERGUSON/BOEING

TOP LEFT AND RIGHT: Corporate Real Estate manages all aspects of property acquisition and sale for Boeing in partnership with the Real Property Planning group. CRE is working with contractors in Long Beach, Calif., to spruce up the former 717 assembly facility prior to disposition. At top left, Southwest Regional CRE leader Mark Villagomez (left) consults with contractor Jerry Ankeney on the work that will be performed on the iconic "Fly DC Jets" sign atop Building 80, including repainting, and removal and reinstallation of neon tubing. At right, contractor Jordan Harvey removes neon tubing from the "Fly DC Jets" sign. MICHAEL GAIL/BOEING

MIDDLE LEFT: Site Services' Utilities Management & Conservation organization supports Boeing business units by improving energy efficiency and awareness. Lean Energy Assessments are one way this is done. John Norris (right), Site Services Utilities Management & Conservation, counts light fixtures while LEA partner Ed Stefanski of Philips measures foot-candles emitted in the 40-03 building in Everett, Wash. This data will support recommendations on actions Everett site leaders can take to reduce energy consumption. ALAN MARTS/BOEING

LOWER LEFT: The SSG Site Services Construction team recently worked with their Commercial Airplanes business partners at the Frederickson, Wash., site to redesign and reroof the "clean room," a climate- and pressure-controlled area where composite materials are laid up for the 777 empennage and 787 vertical fin. Shown are (from left) Jim Walton, Steve Beier, Gordon Mueller, Greg Cox, Shannon Hoveland, Troy Gamba and Dennis Kinne. (Also with the team but not pictured: Guy Brewer, Billy Owens.) JIM COLEY/BOEING

By the numbers: SSG Site Services

175
Equivalent number of homes' energy consumption saved each day through conservation efforts

2,675
Calls received during an average work week for maintenance needs throughout the Puget Sound area and Portland, Ore.

16,500
Number of parts ordered each day in support of maintenance and construction activities

24,000
Miles driven daily (38,600 kilometers) by Licensed Transportation drivers

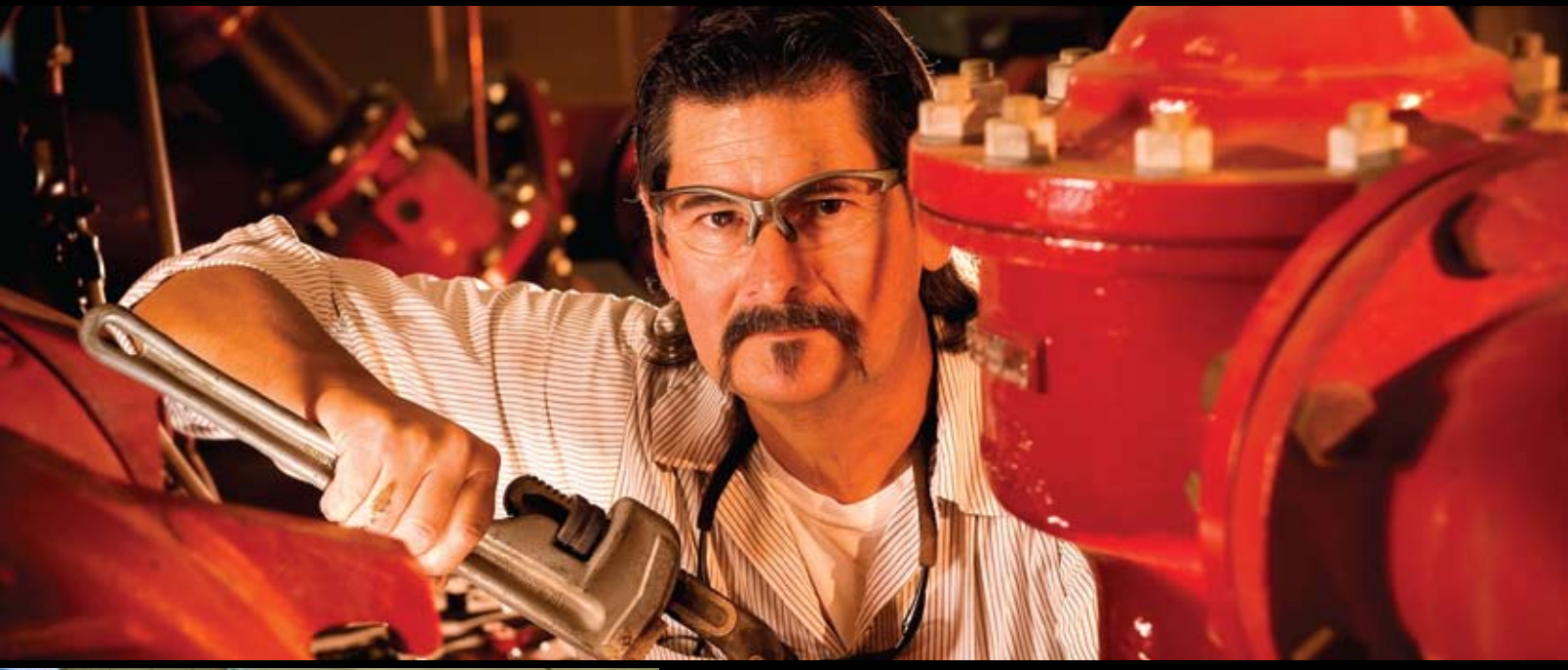
50,000
Number of two-way radio calls placed daily using systems installed and maintained by Site Services' Radio Services organization

90,000
Pieces of mail delivered each day within Boeing

250,000
Number of meals served to Boeing employees each week

1 million
Average U.S. dollar value of real estate transactions negotiated each day by Site Services' Real Property organization

2.4 million
Gallons of water (9.1 million liters) saved each day through Site Services-led conservation efforts



ABOVE: Maintenance employees—including Plumber Danny Phipps at the Mesa, Ariz., site—work to continually improve their maintenance service delivery, minimizing operating costs while delivering desired performance.
BOB FERGUSON/BOEING

LEFT: Food Services operations manager Laurel Lutz in St. Louis helps Boeing employees eat healthier by offering well-balanced food menus. The cafeteria also implemented a multi-use mug program to reduce waste: Employees who buy the mugs shown at the left in this photo or use one from home—and forgo using a disposable cup—receive a discount on beverages.
PETER GEORGE/BOEING

Production Equipment Maintenance mechanics are the experts business partners rely upon to keep tools and other machinery calibrated and fully functional. Pictured here is Pete Walsh of Mesa, Ariz. BOB FERGUSON/BOEING

Nearly everything used at Boeing is powered by electricity. SSG Site Services electrician Louis Macias (above) is one of many craftspeople at the Mesa, Ariz., site providing electrical system maintenance and helping keep machinery and computers running, lights shining and phones ringing. BOB FERGUSON/BOEING

Common, effective and affordable services

Shared Services Group plays a vital role in helping Boeing achieve growth and productivity goals. Led by President Tim Copes, SSG is a multibillion-dollar functional unit that provides common internal services across Boeing's global enterprise.

Its service groups, including Site Services, +are designed to boost Boeing competitiveness by providing effective services at an affordable cost. To read more about SSG and its key focus areas, see Page 34 of the September 2008 Boeing Frontiers. Or view the article online at *www.boeing.com/news/frontiers/archive/2008/september/i_ssg.pdf.*

ABOVE: SSG Site Services employees Audrey Allison (right), Frequency Management Services (FMS) director, and Alan Rinker, international director for the Russian region, are part of the FMS team based in Washington, D.C. The team works to balance the global requirements of radio-frequency spectrum regulations, laws and standards for regulatory bodies such as the Federal Communications Commission and the International Telecommunication Union's Radio Regulations, with the need to make spectrum available to Boeing business partners and their customers (see Page 42 of the October 2008 *Boeing Frontiers*). THOM GOERTEL/BOEING

LEFT: SSG Sites Services Supply Chain Logistics coordinates with freight carriers to move parts, materials and assemblies inbound from Boeing suppliers to manufacturing areas, and transports finished products outbound to assembly areas and customers around the world. Here, large-scale assemblies for the C-17 (background) have been transported onto a rail car in Building 101 in St. Louis for a journey to the final assembly factory in Long Beach, Calif. Logistics analysts Mike Aden (left) and Diane Moore (middle), along with C-17 Production Control manager Ken Schwegel, discuss logistical requirements for the upcoming transfer. PETER GEORGE/BOEING

Let the sun shine in

Huntington Beach turns to a bright idea, thanks to SSG Site Services

By Eric Fetters-Walp

New skylights at Boeing's maintenance office in Huntington Beach, Calif., do more than shed a little sunshine on employees.

By replicating an installation at a maintenance facility in Mesa, Ariz., Huntington Beach is realizing energy savings, better lighting and increased productivity.

Mesa last year installed nine solar-tracking skylights, a pilot project that won an Energy Conservation Award from Shared Services Group, which has identified the increased use of natural daylight as one of its top renewable energy projects. Carl Luther, facilities analyst and site energy focal at Mesa, said the skylights have been a success.

"The skylights definitely brighten the shop area, and there has been very positive acceptance of the installation," Luther said.

Steve Evans, utilities focal for Boeing's Site Services, thought the skylights would work well for a similar building at the California site where he works. The 20,000-square-foot (1,858 square meters) maintenance office was a good candidate, as the artificial lighting provided by sodium lamps is less than ideal, Evans said.

The skylights' manufacturer, with assistance from Site Services personnel, installed 28 of them on the roof of the Huntington Beach facility. The dome-shaped devices contain an array of mirrors that track the sun through the sky during the day. Powered by light-sensitive photovoltaic cells, the moving mirrors are able to direct the most available daylight into the building from sunrise to sunset.

"These offer a little more consistent lighting from morning until late afternoon," said Evans, noting that during the middle of the day, artificial lighting in the building often isn't needed.

That could reduce the building's carbon footprint by an estimated 50,916 pounds (23,095 kilograms) of carbon dioxide a year. The accompanying savings on energy bills mean the skylights are expected to pay for themselves within three years. They also contribute to Boeing's companywide goal to improve its energy efficiency by 25 percent by 2012.

There also are less tangible benefits. "Increased daylighting and exposure to the natural environment has a positive benefit for employees," explained Jeff Nunn, an SSG Conservation Program manager.

Numerous studies have suggested use of natural lighting, referred to as daylighting, is associated with improved morale, lower fatigue rates and reduced eyestrain. The California Energy Commission found that office workers exposed to daylight in their workspaces showed better concentration and short-term memory recall than workers using just artificial lighting.

Steve Evans (left), utilities focal for Boeing's Site Services, consults with Lavey Roofing's Shannon Booth on the installation of solar-tracking skylights atop a 20,000-square-foot (1,858 square meters) office building in Huntington Beach, Calif. Solar-tracking skylights help reduce energy bills and Boeing's overall carbon footprint.
MICHAEL GAIL/BOEING

While solar-tracking skylights demonstrate use of innovative technology, Boeing also has recognized the wider use of traditional skylights and windows can improve lighting and employees' productivity. As examples, Nunn points to large windows installed in the Renton, Wash., 737 assembly building during the Move to the Lake project and conventional skylights at the Everett, Wash., plant, part of the Future Factory renovations (see story on Page 42).

Site Services is looking at the business case for installing the specialized skylights at other sites, especially in the southwest United States. Evans said they are being considered for additional buildings in Huntington Beach, and Boeing's facility in nearby El Segundo, Calif., is studying them. He thinks there are plenty of other places they might make sense as well.

"When you think of how many square miles of roofing Boeing has, there's certainly an opportunity there," Evans said. ■

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Let's get moving!

Everett team's changes make it safer, more efficient to get into, around facility

By Patrick Summers

It's rush hour on Main Street—aisle 11 inside the Everett, Wash., factory—and traffic is humming. At its busiest, more than 500 pedestrians, 150 bicycles and 50 vehicles an hour pass through a single intersection on aisle 11, the main transportation hub for all Everett production programs.

Outside the factory, the picture is the same: Material-handling and general traffic lanes encircle the building and fan out across the site. A network of pedestrian walkways guides thousands of employees, suppliers and visitors each day to and from the factory, parking lots and other buildings around the Everett site.

This complex movement of people, material, parts and vehicles in, out and around the factory and site must be choreographed carefully. That's the job of the Everett Site Logistics & Material Handling team, which since 2006 has implemented dozens of safety and efficiency improvements that have changed the way people walk, drive, park and travel around the site and inside the factory.

PREPARING FOR THE FUTURE

In 2006, Everett site and program leaders began to prepare for the growth they knew was coming. Although the factory was designed for a single program, the 747, "over the years we expanded and grew," said John Larson, Site Services project manager for the Logistics & Material Handling project. By 2006, the site had four airplane programs and increasing production rates but "we couldn't physically expand our facilities. That required a new mindset about how we could make everything work together, inside and outside the factory."

New programs also required new thinking. "With the 787 Dreamliner program coming online, we expected more people but also different manufacturing processes," said John Akiyama, Logistics & Material Handling program manager and a senior manager in Commercial Airplanes. "We knew this would require different ways of moving parts and material into and around the factory. We needed to accommodate new ways of building airplanes and a growing site population to ensure the Boeing Production System operated at peak efficiency."

To help plan and design a safer and more efficient site operation, Boeing hired the Transpo Group, a transportation planning and engineering firm that completed a similar safety improvement initiative at the Renton, Wash., factory. The first step was to hear the priorities and concerns of key stakeholders during a three-day workshop in December 2006 that included Manufacturing, Materials Management, Site Services and Field Operations and Delivery.

"A key feature of this project is that it's enabling closer collaboration among different groups on key logistics issues," noted team member Ron McEnulty, Manufacturing Operations focal. "This is helping all of us fulfill the mission of the Boeing Production System."

The next step was to get a clear picture of the site's transportation situation by collecting data on how, where and why people and vehicles move around the site the way they do. A

PHOTOS: Left: Wider walkways, channeling fencing and reconfigured traffic lanes are among the improvements that are helping create a safer environment on the Everett factory's busy south apron. Center: An orange stripe along the length of the Everett factory's south apron marks the airplane tow line, the boundary of the section of pavement that must be kept clear from 7 p.m. to 5 a.m. for the overnight movement of airplanes. Right: Site and program representatives conduct regular "aisle walks" inside the Everett factory to identify potential safety improvements. GAIL HANUSA/BOEING

three-month assessment during the first quarter of 2007 involved measuring sight distance—the distance required between a person, either pedestrian or driver, and an object or situation for safe operations—and light levels at different times of day; physically counting the number of people and vehicles and observing their maneuvers and direction of travel; and reviewing reports of accidents and near misses.

It wasn't always easy, given the activity and complexity at the Everett site. "One day you may have a sight problem because material may be staged in a certain place, but the next day it's not there. Assessing and adapting to a continuously changing environment can be challenging," noted Kerensa Swanson, Transpo Group project manager and associate principal.

The assessment found areas where improvements could be made to lane striping, signage, lighting and lines of sight that would help pedestrians safely spot oncoming traffic or other potential hazards. Larger outdoor areas, such as the factory's south apron, needed a clear separation of pedestrians, material handling and vehicle traffic.

The team began implementing major transportation improvements in mid-2007, which continued through 2008 (see sidebar at right). Additional changes are planned outside and inside the factory through mid-2009, with a focus on the east side of the Everett site and the flight line.

What do Everett employees think of the improvements? "I like how the parking lots have been redesigned and how the shuttle stops look like community transit. I feel much safer with the new look," said Tanya Parker, industrial engineer, 747 program. Added Joan Fridell, Material Management supply chain management analyst, "You know where you're supposed to be; things are clearly marked. I do feel safer." ■

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Paving the way

The Everett Site Logistics & Material Handling team made many improvements to enhance pedestrian and transportation safety around the facility. Here's a list of some of these changes.

South apron:

- New pedestrian walkways connect the factory with reconfigured parking stalls that run along the south edge of the apron. A new east-west walkway, which runs the length of the apron, is separated from traffic lanes by new channeling fencing.
- Parking stalls and local receiving areas were reconfigured to improve traffic flow in front of the factory. Parking stalls also were reconfigured south of the general traffic lane.
- To improve traffic flow on the apron, general-purpose and material-handling traffic lanes were reconfigured, and the three-way stop at the bridge over Highway 526 was converted to a four-way stop.

West side:

- Gate E-72 was closed to vehicle traffic to relieve congestion and eliminate potential conflicts between pedestrians and vehicles; a new bus plaza and new turnstiles help improve pedestrian flow.
- New fencing and walkways along the west side of the general traffic lanes help protect pedestrians, and additional turnstiles and a crosswalk improve pedestrian access.
- Access to parking lot W2 was improved.

North side:

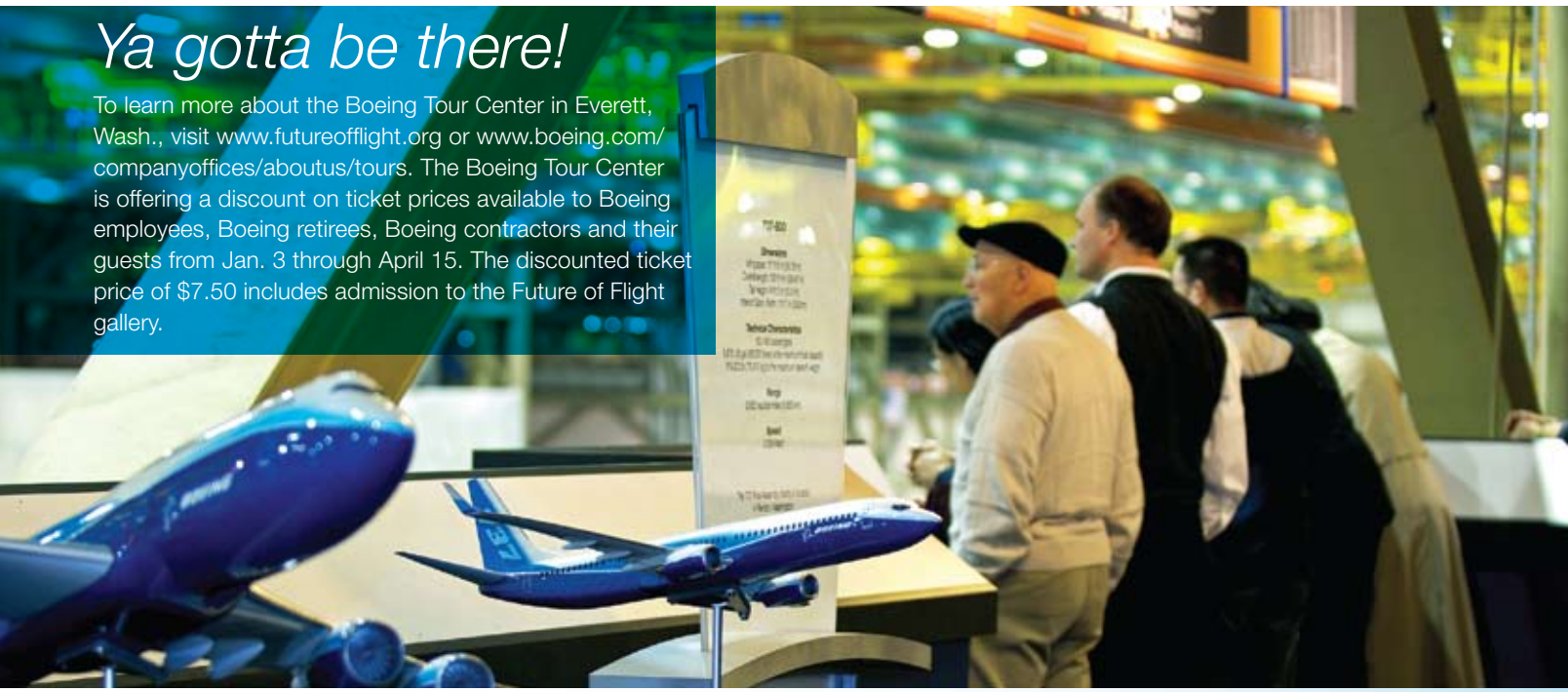
- At Gate E-81, access was improved to accommodate increased traffic; lighting was improved; pedestrian walkways and crossings were defined and marked clearly; and other markings and signs were improved.
- Sidewalk access and parking were upgraded in accordance with the Americans with Disabilities Act.

Inside the factory:

- On Main Street (aisle 11), fire lanes were striped and walkways and traffic lanes reconfigured; similar improvements are under way on most north-south transportation aisles.
- Southbound vehicle traffic on aisle B was converted to one-way between columns 1–5.

Ya gotta be there!

To learn more about the Boeing Tour Center in Everett, Wash., visit www.futureofflight.org or www.boeing.com/companyoffices/aboutus/tours. The Boeing Tour Center is offering a discount on ticket prices available to Boeing employees, Boeing retirees, Boeing contractors and their guests from Jan. 3 through April 15. The discounted ticket price of $7.50 includes admission to the Future of Flight gallery.



Worth a look

Everett factory tour expands, gets enhancements

By Eric Fetters-Walp

The face of Boeing for scores of people in the general public on any given day isn't a company executive. Instead it's Sharon Stevens and her fellow tour guides in Everett, Wash.

For the past 40 years, the Boeing Tour Center has shown millions of visitors Everett's airplane factory and introduced them to Boeing. People come from all corners of the globe, including Antarctica on one occasion, to see jetliners being built in the world's largest building by volume.

"This is the first impression many people get of The Boeing Company, so it's a real responsibility to make sure that the experience is a real positive one for them," Stevens said.

As the tour enters its fifth decade, it's keeping up with the factory's move into the future. An updated introductory movie made its debut a year ago. The tour was expanded from 60 to 90 minutes, allowing time for visitors to see the 747, 777 and 787 Dreamliner lines from two different balconies, according to Roy Henslee, manager of the Boeing Tour Center. Previously, visitors got the chance to see just one of the production line areas. Balcony viewpoints will be outfitted in the coming months with new see-through barriers, making it more convenient and safer for everyone to see the activity below them.

These changes are aimed at providing a "safe, secure and satisfactory" tour for visitors, said David Reese, senior manager of Boeing Everett Visitor Relations. He added that the new barriers will allow the tour to waive its current height requirement, allowing visits by children and more students, the people who will be flying the next generation of Boeing airplanes.

Additionally, updated video presentations on the balconies soon will introduce visitors to the employees assembling the airplanes. "We want to tell the story of the people who work there, because it's amazing what they do," Henslee said.

Co-located with the Future of Flight Aviation Center since 2005, the Tour Center gives visitors a brief history of the way Boeing changed aviation and international travel with the introduction of the Everett-built 747 and how it's leading the way forward with the 787 Dreamliner. Interest in that new airplane in particular is drawing greater numbers of people to the tour.

Public curiosity about the Everett factory began as soon as the building was completed. In 1967, more than 13,000 people took "unofficial" tours of the factory, spurring Boeing to develop a formal tour. The tour recorded its 3 millionth all-time visitor in 2007, a year in which it attracted more than 175,000 people. That was up more than 30 percent from the prior year.

Handling that many people around a busy workplace takes military-like precision from tour guides and the bus drivers. That's especially true in the summer, when bigger crowds mean the number of tour guides swells from less than a dozen to twice that number, Henslee said.

Stevens said it's hard to tire of the Everett plant, even when she sees it several times a day. "The factory is never routine," she said. "It's a constantly changing environment. It's always interesting." ■

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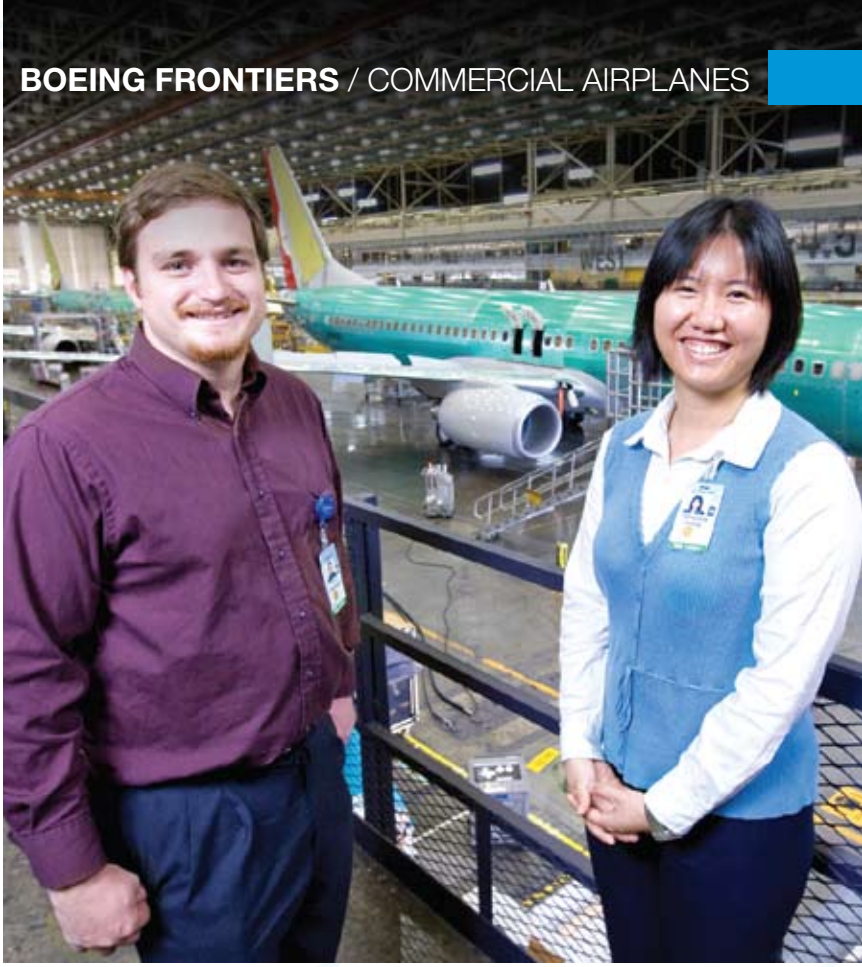
PHOTO: The tour of the Boeing factory in Everett, Wash., now gives visitors a chance to see production lines for the 747, 777 and 787 Dreamliner airplanes. More upgrades to the overlook balconies are planned in the coming months. GAIL HANUSA/BOEING

The ol' college try

How two interns calculated the amount of carbon dioxide created in manufacturing a 737

By Eric Fetters-Walp



Eric Greenwald and Chunjiang "Stella" Huang faced a daunting challenge during their internship at Boeing this past summer: Devise a way to calculate the amount of carbon dioxide created by the manufacture of a Next-Generation 737-800 jetliner. It was something no one else had tackled, much less in a span of 12 weeks.

Christer Hellstrand, Capabilities and Processes director for Environment, Health and Safety in Renton, Wash., got the idea to study the issue when EHS Vice President Mary Armstrong mentioned that a British supermarket chain had added carbon footprint information to product labels for consumer awareness. "Understanding our carbon footprint is part of our effort to aggressively reduce greenhouse gas emissions from our operations," Hellstrand said.

Greenwald and Huang discovered during their busy months of research that the majority of carbon emissions generated from an airplane's production comes from producing and shipping raw materials. They also calculated that, although significant, the carbon footprint of building an airplane is much smaller than that of operating the airliner over its lifetime.

The interns' methodology can be used to determine the carbon footprint of other jets in production, and Greenwald said he hopes their results spur further work toward reducing carbon emissions.

"As we design our next airplanes, we now have a baseline to look at the improvements in manufacturing's carbon footprint compared to older models," Hellstrand added.

Greenwald, 21, and Huang, 24, started their work in May, after EHS began focusing specifically on the carbon footprint question. Greenwald is studying chemical engineering and applied mathematics at the University of Colorado at Boulder. Huang is a University of California, Berkeley, senior working toward a degree in chemical engineering.

The students said the opportunity to gain experience at a company of Boeing's size and scope attracted them.

"Boeing is a big company and an international company, and my career plans include doing some international projects in the future," Huang said.

Boeing's most important environmental focus is to reduce the impact of its products and services in operation, so the carbon footprint of airplanes in flight already is well studied. Documenting carbon dioxide emissions from manufacturing an airplane meant tracing back to the extraction or production of raw materials—aluminum, steel, plastics and more. The pair then worked forward up to the plane's delivery to a customer, accounting for the electricity, natural gas and fuel used at each step.

To establish a methodology that covers something so complex, the interns consulted with a University of Washington professor and then gathered data from 18 different groups within Boeing. That was the most difficult part, Greenwald and Huang agreed. However, it also gave the duo an unusual glimpse of the spectrum of departments within the company, Huang said.

Once Greenwald and Huang finished their methodology and findings, they presented their results to the EHS leadership and the Airplane Programs leadership team in Seattle. "People were amazed at how much they got accomplished," Hellstrand said.

For Greenwald and Huang, collaborating with each other and Boeing employees provided a valuable experience, they said. Additionally, they appreciated being trusted with such an important assignment.

"The whole development of something that hadn't been done before was interesting to me," Greenwald said.

Hellstrand said the challenge also gave them a taste of what problems the company's engineers contend with all the time. Huang clearly enjoyed it, as she plans to return to Boeing after she graduates this winter. ■

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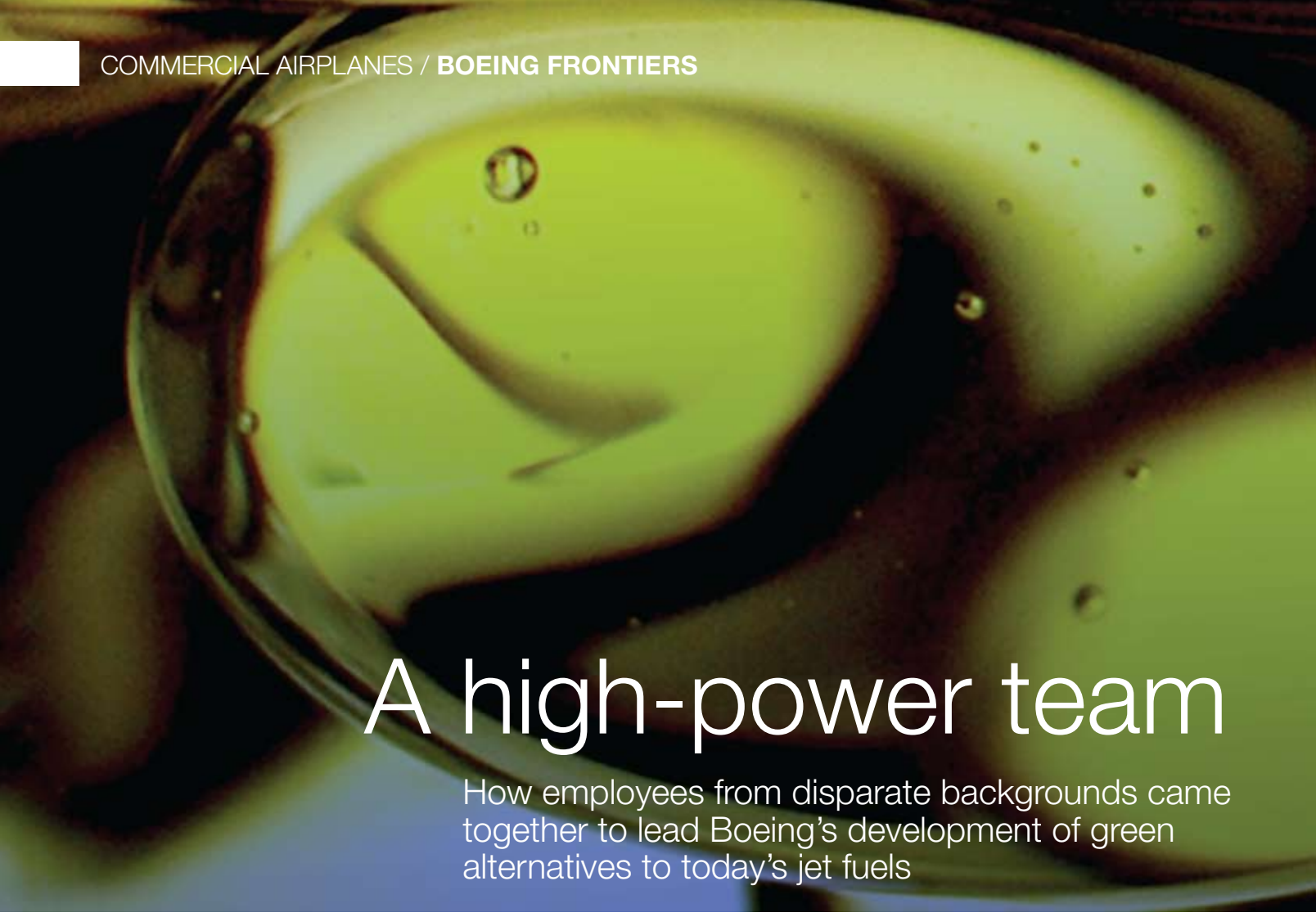
PHOTO: Eric Greenwald and Stella Huang, college students who interned at Boeing this past summer, calculated how much carbon dioxide is created in manufacturing a Next-Generation 737-800 airplane. WILL WANTZ/BOEING



A high-power team

How employees from disparate backgrounds came together to lead Boeing's development of green alternatives to today's jet fuels

By Lauren Penning

Back in 2005, Boeing played only a passive role in jet-fuel development. Now, thanks to the vision of a team of scientists, engineers and strategists across the company, Boeing is on the leading edge and has changed the way the aviation industry looks at alternative fuels.

Boeing's environmental strategy has long been focused on designing fuel-efficient airplanes. Better airplane fuel efficiency means reduced airplane emissions of carbon dioxide, the primary gas linked to climate change concerns. However, fuel efficiency is only half the story. Boeing realized that fuels derived from ecologically sustainable materials, or biofuels, could address not only carbon emissions but also the growing concern of fuel availability and sourcing. According to Billy Glover, managing director of Environmental Strategy for Commercial Airplanes, it's a two-pronged approach: "We continue to focus on improving fuel efficiency, and now we have added a focus on changing the fuel itself."

CONVERTED TO THE CAUSE

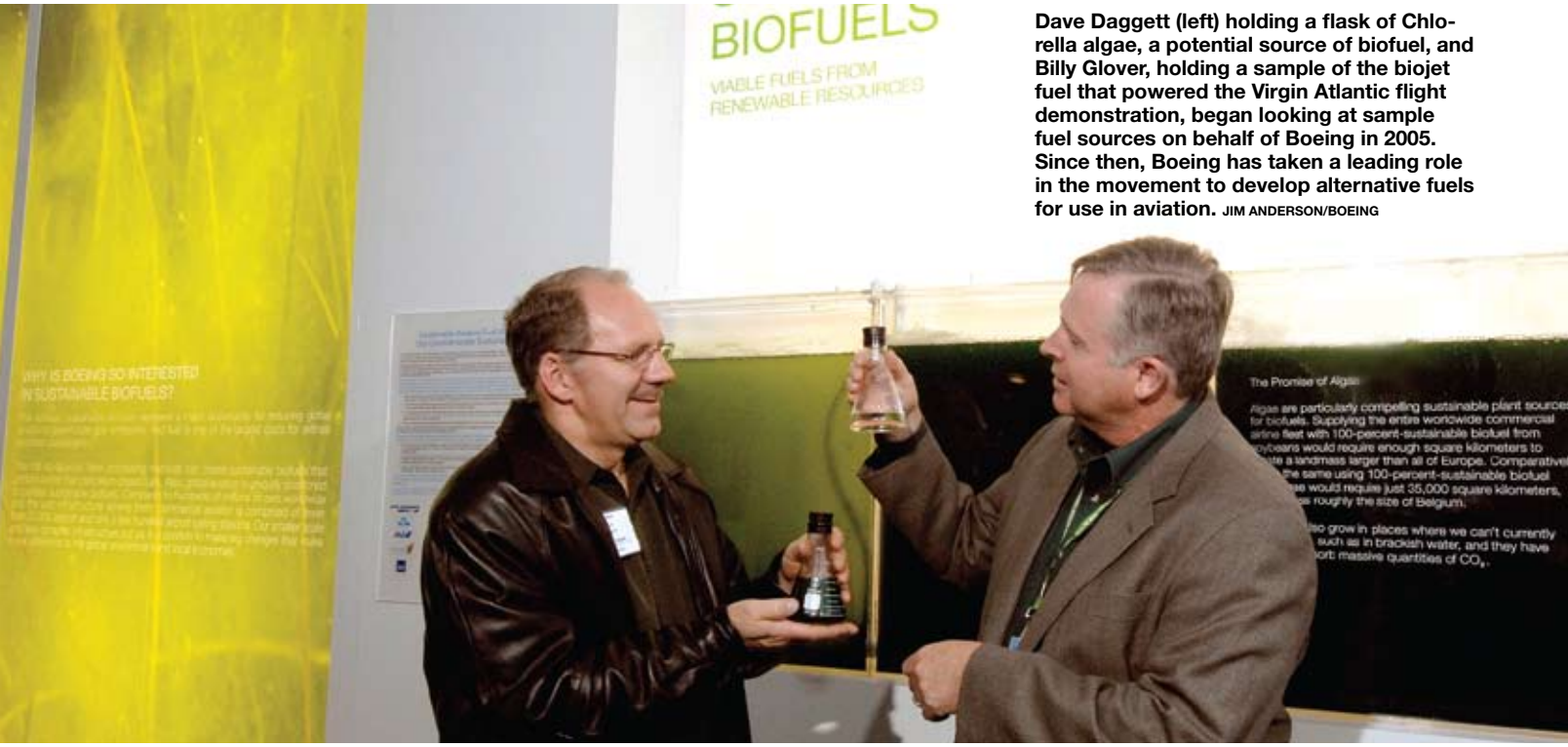
How could jet fuel be changed to reduce carbon emissions? Although biofuels seemed like a natural candidate, initially the biggest hurdle "was our own skepticism," according to Dave Daggett, Technical Fellow for Commercial Airplanes and principal investigator for the biofuels team. Glover and Daggett began looking at sample fuel sources from different vendors back in 2005, and some looked promising. "Once we started seriously looking at the possibility of biofuels, we became converts," said Daggett. "Now we had to convert the rest of the industry."

What started out as a group of two grew rapidly in the next few months. "From the beginning, we realized that if only we knew about the potential of biofuels, it would be hard" to move the cause forward, explained Glover. So Glover and Daggett organized a public meeting and started an industry dialogue. "We got calls from people [who were] not originally invited who wanted to attend our first meeting. At the end of the day, we had popular support for doing this," he recalled.

From that first meeting grew the Commercial Aviation Alternative Fuels Initiative, a group that brings industry partners, airlines and regulators together to research and discuss alternative fuels. At an early meeting in October 2006, the industry group drew up a road map that set a biofuel test flight goal of three to five years in the future. "We thought we might be able to do better if we formed a small task team," said Glover, challenging the Boeing team to a test flight on partial biofuel within one year.

SETTING THE STAGE

Traditionally "the aviation industry has looked at fuel as a given. The fuel industry screens out problems and we were [going to be asking] them to look at bringing something [new] in," Glover explained. For the industry to accept a different type of fuel, Boeing would need to provide the industry with data that



Dave Daggett (left) holding a flask of Chlorella algae, a potential source of biofuel, and Billy Glover, holding a sample of the biojet fuel that powered the Virgin Atlantic flight demonstration, began looking at sample fuel sources on behalf of Boeing in 2005. Since then, Boeing has taken a leading role in the movement to develop alternative fuels for use in aviation. JIM ANDERSON/BOEING

proved biofuels were viable.

In January 2007, Glover was named to a new position in Commercial Airplanes—managing director of Environmental Strategy—and brought together a variety of players to form a virtual working group concentrated on sustainable biofuels. Boeing identified fuel experts within the company and hired experts in plant physiology, renewable energy and public policy to help develop an environmental strategy for Commercial Airplanes that included biofuels.

Early on, many offered ideas on what sources Boeing should pursue for biofuel. Weeding out the unfeasible ones was—and remains—a sizable challenge.

"I looked into what [alternative sources] are available and the pros and cons of what can be made available," Daggett explained. Some were so far out that at one point he referred to himself as the technical fellow of "wacky ideas."

Algae is one promising candidate that caught Daggett's attention. "I grew my own algae at home for a while, and it gave me a good understanding of the challenges," Daggett recalled, such as how best to extract the algae from the water. "Once you get the algae out of the water, then you need to figure out how to extract the oil."

> "We continue to focus on improving fuel efficiency, and now we have added a focus on changing the fuel itself."
>
> *– Billy Glover, managing director, Environmental Strategy, Commercial Airplanes*

Aside from his personal tinkering with potential biofuels, Daggett manages related studies that Boeing commissions with other research organizations. "Once in a while, out of the dozen ideas, I might find one gem [and] take it to the next step," he said. "Now I'm called the technical fellow of innovative solutions."

The challenges don't end with identifying potential biofuel sources. For a new fuel to work, there must be viable suppliers, competent vendors, distribution agreements and, of course, customers for the fuel.

DRAWING FROM THE EXPERTS

The biofuels group worked closely with Phantom Works to identify possible suppliers and vendors. "We needed to learn from the mistakes of the first generation of alternative fuel in the auto industry—ethanol, or food plant-based fuel," said Glover. Boeing is committed to finding alternatives to fossil fuels that have a smaller carbon footprint and do not compete with food sources (unlike ethanol). This means finding suppliers that support this model and harvest energy sources that use minimal land, water and energy.

One such vendor is UOP Honeywell, which has been "maturing its process to create a bioderived jet fuel, and we were fortunate to apply that process to several sustainable plant sources in a large enough scale to supply fuel for airline flights and engine tests," said Tim Rahmes, emissions engineer for Commercial Airplanes and manager of the biofuel flights.

UOP Honeywell is producing fuel for the next biofuel test flight, scheduled for early 2009 with Air New Zealand. That flight follows a February 2008 test with Virgin Atlantic and GE Aviation, which

marked the first time a commercial jet flew on a sustainable plant-based fuel mixture. In that case, the fuel was 20 percent plant oils, including indigenous Brazilian plants and coconuts from the Philippines, and 80 percent traditional jet fuel.

The Virgin Atlantic flight not only provided solid data on flying on biofuels, but it also helped overcome industry skepticism. "With these flights we captured the imagination of the industry and the public," said Glover.

airport uses a million gallons of fuel per day [including some biofuel], it can't juggle blends. This has to be seamless," said Jean Ray, Associate Technical Fellow in Fuels and Lubrication Technology for Commercial Airplanes.

To that end, the Material and Process Technology fuel testing group puts new biofuels through the same rigorous testing as for traditional fuel ("Jet A"). Boeing

Jean Ray, an Associate Technical Fellow in Fuels and Lubrication Technology for Commercial Airplanes, examines test specimens after exposure to a candidate biofuel. Ray noted that biofuels must be chemically compatible with today's aviation infrastructure. JIM ANDERSON/BOEING

> "Now that these fuels look promising, newly discovered alternative fuel will allow our customers to diversify their fuel portfolios."
>
> *– Darrin Morgan, director, Business Analysis and Biofuel Strategy for Commercial Airplanes*

With each additional biofuels test flight, Boeing and its industry collaborators take a step closer to making commercial flight on biofuels a reality. The Air New Zealand flight will increase the biofuel mixture to 50 percent.

"The aviation industry is cautious—as it should be," noted Jim Kinder, a senior engineer in Commercial Airplanes and a chemist on the biofuels team. "We are taking these test flights as a step approach, but we are very confident in the biofuels we have identified for our next three test flights—the fuel is as good as or better than traditional jet fuel."

TESTING, TESTING

Before flight, the fuel testing team rigorously researches the chemistry of each fuel candidate. "Thematically, these are new sources of fuel, but chemically they contain the same types of molecules that are in traditional petroleum jet fuel," explained Darrin Morgan, director of Business Analysis and Biofuel Strategy for Commercial Airplanes.

Chemical compatibility is essential because a new fuel won't be commercially viable if it can't be dropped into the existing aviation infrastructure. "When a large

Flight Test engineer focal Mike Henry works closely with each airline to collect appropriate data and return the airplanes and engines to revenue service after a test flight. Candidate biofuels for the next test flights have all performed as well as or better than traditional fuels in Boeing and engine manufacturers testing and are not expected to have an adverse effect on the airframes, engines or systems.

The next step is testing to ensure that there are no negative effects over the life of an airplane and its servicing. "Filling hoses, storage tanks, pipelines that supply some airports, the airplane fuel tanks—they all need to be looked at," said Ray. The team will continue that testing over the next three to five years.

TO MARKET

Although the group's progress has been remarkable, the strategic driver hasn't been surprising, according to Morgan: "Before, aviation didn't have other options. Now that these fuels look promising, newly discovered alternative fuel will allow our customers to diversify their fuel portfolios."

It's not just airlines that are looking to diversify. Tim Vinopal, chief engineer for Environment, Health and Safety for Integrated Defense Systems and the person responsible for developing IDS' environmental strategy, engages Boeing's military customers about biofuels. "Historically, our [IDS] customers haven't been concerned with carbon footprint, but that's starting to change," Vinopal explained. Recently, Boeing Phantom Works received a contract from the U.S. Air Force to evaluate greenhouse gas life-cycle models for military fuels and explore how the military aircraft Boeing produces could also work with the biofuels Boeing is identifying for commercial airplanes.

The Boeing biofuels group continues to be aggressive. "I would rather have very aggressive goals and fail to meet those goals occasionally, rather than step through at a slow pace," explained Glover. "If we are not failing occasionally, we are not trying." ■

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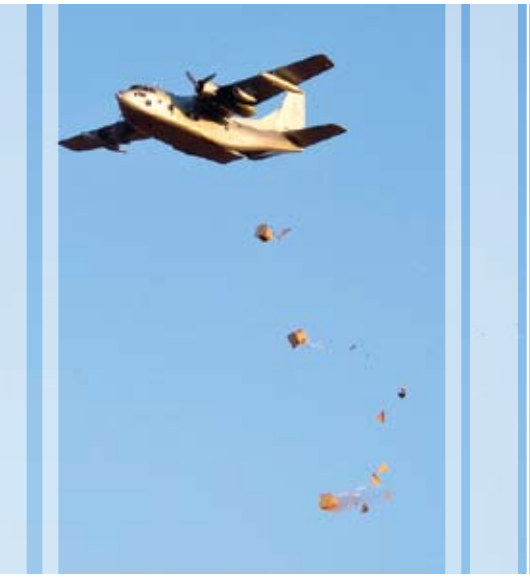
For more information on Commercial Airplanes and the environment, visit www.boeing.com/commercial/environment. To see Boeing's environment Web site, visit www.boeing.com/aboutus/environment.



Bull's eye!

Could 250-gallon 'water balloons' guided by GPS help fight forest fires?

By Marc Sklar

On a single day in 2000, dry thunderstorms generated 75,000 lightning strikes that sparked more than 400 forest fires across the western United States. Granted, every day is not as intense for firefighters, but they do face a monumental task each summer in dry areas of the United States. Their challenge is to quickly contain blazes that can rapidly turn into monster fires that threaten lives, homes and businesses, as well as destroy forests and wipe out lumber resources.

Boeing and its partners in this project, International Paper and Flexible Alternatives, are developing a tool called the Precision Container Aerial Delivery System (PCADS) that could allow firefighters to snuff out blazes faster. The system—developed by the Advanced Systems organization of Integrated Defense Systems—is based on Boeing's extensive experience with air-drop technology. "We're taking what we know about placing a payload exactly on target and using that knowledge to get fire retardant precisely where it's needed," said William Cleary, PCADS project manager.

The system works with any aircraft with a rear cargo ramp. No special outfitting is needed, which vastly expands the fleet of aircraft available to fight fires. The system consists of a triple-walled, corrugated box made by International Paper with existing, off-the-shelf components. Inside the box is a 250-gallon (946-liter) plastic bladder made by Flexible Alternatives. Straps attach the bladder to the lid of the box. As the unit exits the aircraft with GPS-guided precision, the lid lifts off, slowing its descent and then opening the retardant-filled bladder as it nears the ground. The retardant is dispersed much closer to the ground, making its coverage more targeted and intense.

"The design challenge for the bladder was getting the right balance of strength," explained Ty Bonnar, vice president of Flexible Alternatives. "It was sort of like designing a bulletproof egg. We had to design a one-ton package, make it strong enough to meet cargo delivery standards, and then have it open correctly 100 percent of the time."

In September the program got a significant boost when $2.3 million in federal funding was authorized for testing PCADS next year. The PCADS team currently is working with the U.S. Air National Guard to plan those tests that could involve both Air National Guard C-130 and C-17 aircraft. Success with the 2009 tests could lead to certification of the system for fighting fires throughout the United States and, ultimately, other countries.

So, where did the idea for PCADS originate? "A prank," said Cleary. "I was on vacation with my family and walking through a hotel garden when my son dropped a water balloon on me from the third-story balcony. The fact that I was moving, and it was a direct hit, got me thinking."

But the potential benefits of the firefighting system are no joke. "It's user-friendly and can be precisely targeted," said Mike Rauton, a captain with the Verde Valley Fire District in central Arizona, who saw a PCADS demonstration last year. "If this product can squelch fires more quickly, that's definitely the way to go." ■

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PHOTOS: Left: Precision Container Aerial Delivery System units are dropped from a C-123 cargo aircraft during a demonstration of the system. Center: Ty Bonnar of Boeing partner Flexible Alternatives fills the bladder of a PCADS unit with water for a demonstration. Red dye is added to the mix of water and retardant powder to better track dispersal patterns. Right: William Cleary, who developed PCADS, helps secure the lid of a PCADS unit for a test of the firefighting system. BOB FERGUSON/BOEING

No experience **required**

As the first class to take on F-22 pilot training without prior fighter experience, the four students who recently completed the Boeing-designed "B" (basic) course had to complete 88 hours of simulated flight—as opposed to 24 hours for students who transition from operational F-15 or F-16 squadrons. U.S. AIR FORCE

F-22 team finds a way to train Raptor pilots from the ground up

By Doug Cantwell

"There were the doubters," said Lt. Col. Derek France, commander of the U.S. Air Force's 43rd Fighter Squadron, "who said we'd never succeed at making F-22 pilots out of inexperienced students. But these first four guys have shattered those doubts."

This quartet graduated at Tyndall Air Force Base, Fla., in November from a grueling eight-month B (basic) course that used trainers and courseware designed, developed and integrated by the Seattle-based F-22 Training Systems team. The Boeing team made it look easy, but what they came up with behind the scenes—an eleventh-hour solution to end-user needs—borders on heroic customer focus.

Brig. Gen. Darryl Roberson, commander of the 325th Fighter Wing, recognized the Boeing team at the ceremony as a "key contributor to the students' preparedness." The training marked the first time in recent history that tactical fighter pilots proceeded directly to solo flight from simulator training without "backseat" supervision from an "IP", or instructor-pilot.

"Our customer wanted all the I's dotted and T's crossed, especially for the malfunctions. We were happy when they reviewed the new software and told us it exceeded their expectations."

–Dean Proffitt, manager of Pilot Training Systems

NO BACKSEAT DRIVER

When they originally set out to meet the training simulation requirements during the EMD (engineering, manufacturing and development) phase of the program, team members based their planning on the assumption that there would be a two-seat trainer variant of the Raptor. An IP in the back seat greatly eases the student's transition from simulated to actual flight. It also reduces the scope of performance and degree of fidelity required for the simulation phase of training.

When budget constraints forced cancellation of the two-seat F-22, the training curriculum needed dramatic changes. As a consequence, the team had to work more iterations of software to meet requirements. "On top of that," said Barry Cossel, F-22 Training Systems manager, "some surprises came up along the way that called for operational fixes in midstream."

These now-urgent requirements focused on handling the air vehicle and troubleshooting malfunctions. "We needed to ensure that takeoffs and landings for the B-coursers were so similar to actual flight that the crossover from simulator to airplane would feel transparent," Dean Proffitt, manager of Pilot Training Systems, explained.

In addition, the customer asked for a more realistic simulation of electrical and avionics malfunctions. They were particularly interested in "cascading," which happens when one system's glitch causes another system to malfunction, which in turn affects another. "The inexperienced student typically has a rough time pinpointing where the cascade originated," said Cossel, "which can make for some anxious moments."

Another challenge stemmed from the aircraft's unprecedented user-friendliness. "Trying to simulate emergency procedures for the Raptor is challenging," Proffitt explained, "because the airplane flies itself to such a degree that it's tough to coax it out of control—and even tougher to keep it out of control long enough for the student to practice recovery steps."

The Air Force was able to reprioritize work at the last minute, which for the Boeing team meant adding an unscheduled software delivery just two weeks before the first students were scheduled to start class. "Our customer wanted all the I's dotted and T's crossed, especially for the malfunctions," said Proffitt. "We were happy when they reviewed the new software and told us it exceeded their expectations."

TIME FOR THE HOT WASH

The success of this first class was aided partly by stringent criteria for selecting pilots. However, the Air Education and Training Command's longer-term objective is to integrate the Raptor into the overall fighter training pipeline. So the F-22 training team's goal now is to review what it's learned from these first students and create a second edition of the B-course that's scaled to the mainstream of pilot trainees.

To that end, Boeing teammates will spend the next four months conducting a "hot wash" of the course and revising it before Tyndall takes on a second class of students. They will compile feedback from 15 debrief sessions held with the first students to assess which facets of the course they need to augment, which need less emphasis and which, if any, they can eliminate.

After logging 88 hours in the simulators in their first few months at Tyndall, did the B-coursers encounter any surprises during that much-anticipated first flight in a high-performance Raptor? "It was actually very similar to flying the FMT (full mission trainer)," said First Lt. Ryan Shelhorse, "except for the sensation of wind rushing past the canopy, of moving through a sea of air that has mass and density."

Back in Seattle, the team is not resting on its laurels. "The sim fidelity we achieved for this first class has served the purpose," said Profitt, "but you never want your simulators to be a training limitation. Maturing that fidelity is a continual, never-ending process." ■

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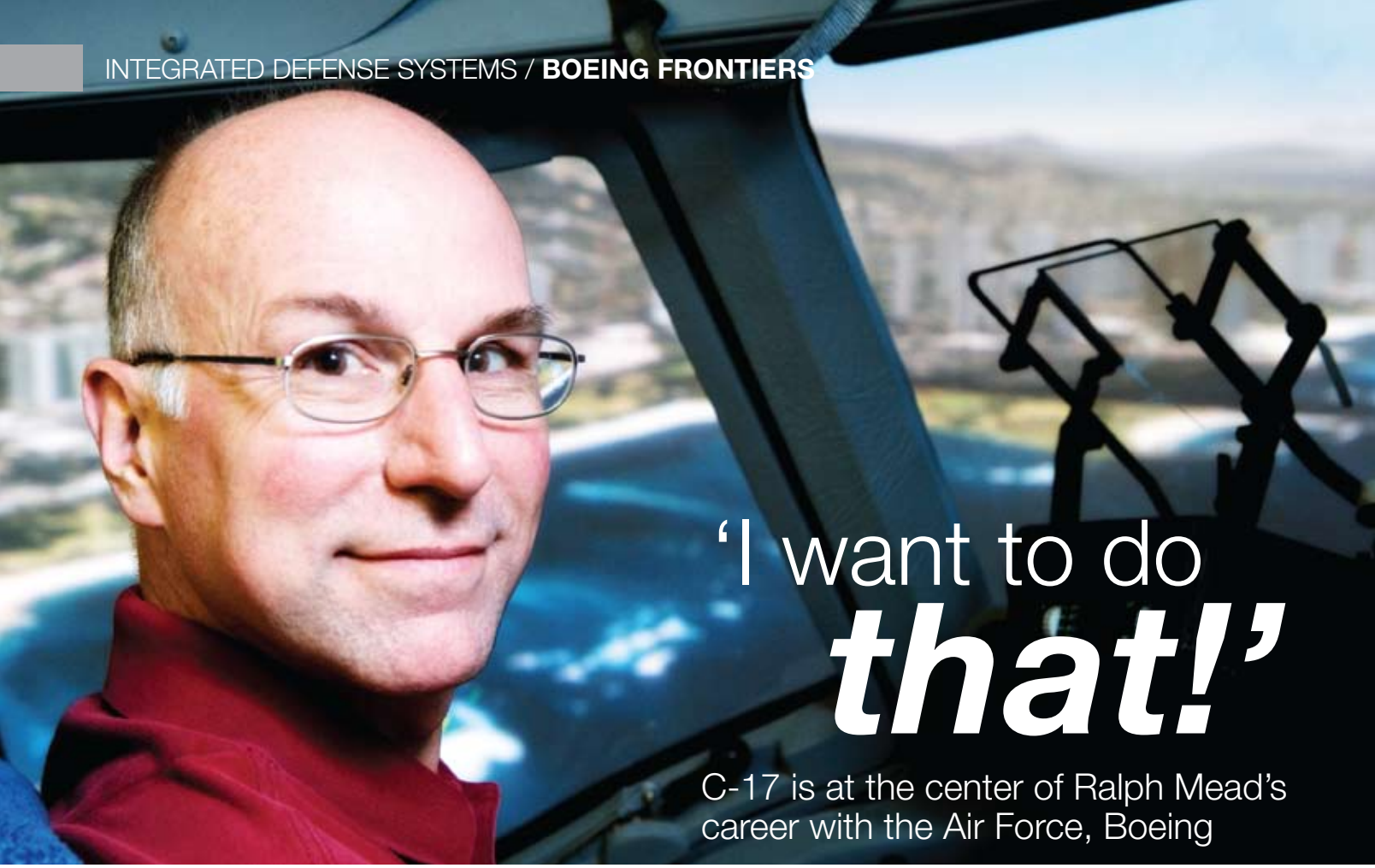

‘I want to do *that!’*

C-17 is at the center of Ralph Mead’s career with the Air Force, Boeing

By Stacey Holloway

Driving with his wife one day nearly 15 years ago, Ralph Mead spotted two enormous objects in the sky. “Flying in formation about 300 feet above ground, two C-17 Globemaster IIIs went into a left-hand bank and crossed the highway right in front of my car,” Mead recalled. “I said to my wife: ‘That is cool. I want to do that!’”

And that he did. A year later, he received his C-17 assignment from the U.S. Air Force to Charleston Air Force Base, S.C., and the Boeing-built C-17 became the heart of his career. Mead’s Air Force career included eight years as a C-17 pilot and six years as a C-17 instructor. After retiring from the service, he joined Boeing as a C-17 instructor. Today, he is program manager of the company’s C-17 Aircrew Training System in St. Louis.

This successful system provides student instruction to more than 1,000 new pilot, loadmaster and maintenance engine-run students each year while maintaining continuation training for more than 5,000 active, Reserve and Air National Guard aircrew and maintenance personnel (see box on Page 33).

Boeing conducts C-17 training not only for crew and maintenance technicians for the U.S. Air Force but also for the Royal Air Force of the United Kingdom, as well as the Royal Australian and Canadian air forces. As program manager, Mead has oversight of the entire Aircrew Training System program.

Mead said the training initially includes a lot of courseware and self-paced training. Once students learn about the aircraft and its procedures and graduate to simulated exercises, there’s more interface with instructors. “Unlike a lot of other platforms where there are 15-20 students in a class, C-17 training is one-on-one or at most two students per instructor,” he said.

A major element of the training is the C-17 Weapons Systems Trainer. This two-story, full-motion simulator allows students to train and build confidence for what they may experience in an actual aircraft such as wind, storms, turbulence, emergency situations and missile attacks. “The only thing the simulator doesn’t emulate is the smell of jet exhaust,” Mead laughed.

“What makes the simulator so realistic is the motion you feel as it rocks back and forth and tilts,” he said. “It’s feeling your stomach drop when it lifts toward the sky during a simulated takeoff. It’s the visuals you get flying over forest-covered mountains or towering city buildings. It’s the sound of the engines spooling up as you push the throttle forward, and the feel you get in the foot pedals and controls as you’re trying to land the aircraft on a small strip of runaway.”

Mead said proof of the trainer’s effectiveness is that students typically only have to fly an actual C-17 aircraft once in preparation for their evaluation mission flights, compared to up to five times on other platforms.

“The simulator’s detail and fidelity are amazing,” said Maj. Kenneth Kaupp, Air Force Command and C-17A evaluator pilot. “It allows us to do most of our training in the simulator instead of the aircraft. This saves us time and money, especially in fuel cost, and that saves taxpayer money. Boeing instructors do a great job of creating scenarios in the simulator that provide real-world training for aircrews.”

As much as he’s loved flying C-17 missions himself, Mead says his real passion over the years has been teaching student pilots. As an instructor, his No. 1 goal has been to teach pilots

how to safely operate the aircraft in a real-world environment. And that is exactly what he expects of the instruction team he now manages.

"I'm proud of the C-17's great safety record, especially considering some of the threat-filled environments it flies in," he said. "And, it's always been my goal in training to make sure that I never read the name of one of my students in a mishap report of any kind."

Indeed, Mead said that during training, he gives students a list of malfunctions that could potentially occur if a missile actually hit an engine—things like structural damage or loss of engine thrust, hydraulics or electrical power. "Then I'd let the students prioritize and determine what required immediate action and how to safely recover or land the aircraft," he said.

Mead recalls closing his eyes during his students' simulated exercises, thinking: "'Oh no, this is going to hurt!' You are immersed in a virtual environment that is so real you instinctively react to mishaps as if they're real," he said.

Mead's many years of experience—both as a C-17 pilot and as an instructor—have given him a depth of credibility with customers, which he says is invaluable in his current position.

"When I was in the Air Force, the thing I liked about Boeing was its flexibility and willingness to quickly adapt its training to the operational environment," he said. "I think one of Boeing's strengths—besides the reputation of the C-17 aircraft itself—is its willingness and ability to change the way it does training almost on a day-to-day basis in order to meet customer requirements and the needs of aircrew members. That is very important to customers, and it's my responsibility as program manager to ensure that we maintain that flexibility." ■

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PHOTOS: Left: The C-17 Globemaster III played a major role in Ralph Mead's career in the U.S. Air Force. Today, he's the program manager of Boeing's C-17 Aircrew Training System. PETER GEORGE/BOEING

Right: Larry Allison (left), Lead Instructor Loadmaster for the C-17 ATS at Altus Air Force Base, Okla., works with Staff Sgt. Keith Bryer of the U.S. Air Force. BOB FERGUSON/BOEING

Just like the real thing

Boeing's C-17 Aircrew Training System is a proven, total training solution for C-17 Globemaster III aircrews worldwide. Here's a look at some of the components of ATS.

Weapons Systems Trainer: A high-fidelity, full-motion simulator exactly replicating the C-17 flight deck. The simulator has a high-resolution day/night visual system with a 225 degree field of view from flight deck windows; aircraft attitude and movement is simulated using a 6-degrees-of-motion system. The simulator's flight deck is night vision goggle compatible.

Loadmaster Station: This trains crewmembers in preflight procedures and on aircraft systems and emergency procedures. Cargo compartment video animation is projected on a 31-inch (79-centimeter) monitor. The system can operate stand-alone or be linked to the Weapons Systems Trainer.

Cargo Load Model: This 1/10 scale replica of the aircraft fuselage, complete with scaled cargo, is used in load planning exercises and when practicing loading checklists in a classroom environment.

Computer-based training: Computer-aided courseware provides efficient and effective instruction for pilots, loadmasters and maintenance engine-run technicians.

Cargo Compartment Trainer: This trainer replicates a full-scale C-17 cargo bay, utilizing real property assets (vehicles, cargo, etc.) to provide highly realistic load preparation and planning exercises. The device offloads training performed on operational aircraft, minimizing impact to the fleet.

Crew Systems Simulator: This trainer is used for pilot tasks not requiring motion or visual cues. Its flight deck is physically identical to the aircraft.

The C-17 Aircrew Training System is in St. Louis and these U.S. Air Force bases:
Alaska: Elmendorf AFB
California: March AFB and Travis AFB
Delaware: Dover AFB
Hawaii: Hickam AFB
Michigan: Jackson AFB
New Jersey: McGuire AFB
Oklahoma: Altus AFB
South Carolina: Charleston AFB
Washington: McChord AFB

This Integrated Defense Systems print ad communicates Boeing's leadership in bringing network-enabled operations to the warfighter. This ad is one of eight versions that depict a full range of soldier diversity and U.S. military services. The ads will appear in key military trade and congressional publications.

NO WARFIGHTER STANDS ALONE.

A fully networked military connects all warfighters, so each is stronger and safer. By seamlessly integrating joint assets in real time, all forces have the right information at the right time for faster, more decisive action. Boeing's leadership in network-enabled operations and logistics for combat systems, aircraft, satellite and communication systems is helping bring the benefits of this transformation to our forces today. To ensure no warfighter ever stands alone.

BOEING

Let me **show** you

Steve Schmidt loves demonstrating capabilities of Boeing fighter aircraft

By Kathy Cook

Of the many pilots worldwide, there are aviators—those who fly for pleasure or as a profession; test pilots—aviators who fly new or modified aircraft in specific maneuvers for the purpose of evaluation; and show pilots—those who fly in air shows to display the capabilities of an aircraft and, in the process, their own flying abilities.

Steve Schmidt—a 24-year veteran pilot—has done it all, and is currently a test pilot and an air show pilot for Boeing.

Schmidt dates his fascination with flying to childhood when his Korean War-veteran father told him stories about life on an aircraft carrier. "I knew early on I was not only going to fly, I was going to take off from a carrier," Schmidt said.

He began his flying career in the U.S. Navy, flying F-14 Tomcats out of Oceana, Va. "As much as I loved the Tomcat, there were some things about the airplane I thought could be better. I figured the best way to influence the needed changes would be as a test pilot, so I applied for and was accepted into the Navy's test pilot school," he said.

As a test pilot, he played a role in the improvement of the Tomcat. His work also included tasks on several Boeing products: development of the Navy's F/A-18E/F Super Hornet and testing of another Boeing product, the Joint Helmet Mounted Cueing System.

When Schmidt retired from the Navy in 2004 he joined the Boeing flight test team. As a test pilot, his duties range from flying the first flight of an aircraft fresh off the assembly line or evaluating new systems on existing aircraft. As a Boeing test pilot, he's flown the T-45 jet trainer and F/A-18 and F-15 fighters.

"Besides checking out aircraft function and components, a test pilot's primary job is putting the aircraft through maneuvers it hasn't flown before and determining the safe edge of the envelope," Schmidt said. The envelope, in flying, refers to the limits in which aircraft can safely be flown in terms of maximum altitude, angle of attack (how sharp an angle the airplane can be flown in relation to the wind), and maximum and minimum airspeed.

Test pilots also test the number of g's an airplane can withstand, a measure of the force of gravity on an aircraft as it maneuvers. One g equals the normal force of gravity at ground level; the greater the number of g's an aircraft can pull, the more maneuverable it can be in combat situations.

While Schmidt continues to test Boeing aircraft, his additional

"Everything we do is to demonstrate a key maneuver that a customer would want the airplane to perform in a combat situation."

–Steve Schmidt, pilot

role as a show pilot allows him to demonstrate the company's jet fighters to current and potential customers as well as the general public, showing them, as he puts it, all the really cool things the airplane can do.

"We perform these maneuvers in an entertaining way, but entertainment is not the ultimate objective," Schmidt said. "Everything we do is to demonstrate a key maneuver that a customer would want the airplane to perform in a combat situation."

Unlike synchronized flight demonstrations by the Navy's Blue Angels or the U.S. Air Force Thunderbirds where the mission is recruitment, Boeing air show displays focus strictly on demonstrating an aircraft's combat capabilities. For example, one maneuver, which looks like the aircraft is painting a vertical square in the sky, demonstrates the F/A-18 can turn on a dime, anytime.

"This shows the plane's maneuverability, which is very important in a dogfight," Schmidt said. "Being able to turn that quickly at such a high pitch rate means the pilot can achieve a missile shot at an opponent or avoid an oncoming missile shot."

Schmidt is quick to point out that an air show is a lot more than a plane and a pilot. "To spectators, the show might look seamless, and of course the pilot is out front. But behind the scenes there are countless support personnel who help make a show successful. As a team, we do a lot of planning and workups before a show," he said.

Most of the work that goes into an air show begins four or five months beforehand. The planning team includes business development, aircraft maintenance, contracts, flight test, flight safety and customer relations representatives from across Boeing.

Schmidt said safety is the top concern at air shows, and pilots test maneuvers multiple times in simulators before ever taking to the skies. For instance, before this past summer's Farnborough International Airshow, Schmidt flew 20 simulator sessions training for the show format. The simulations cover every possible scenario, including emergencies such as engine or hydraulic failures at critical points in the show's flight routine.

Once a show routine is designed and the pilot has run sufficient simulations, workups begin. For Farnborough, the team spent five weeks at Cecil Field, Fla., testing and refining planned maneuvers. "Even then, we start out slow," Schmidt said. "We don't go on our first flight flying Mach 2 and pulling 7 g's. Just as in flight tests, we nibble at the corners, and when something doesn't work, we stop and evaluate."

Although most show displays are performed at exceptionally low altitudes, the workups begin much higher. According to Schmidt, the routines are first practiced at 5,000 feet (1,520 meters) and gradually brought down to the show altitude of 500 feet (152 meters), where spectators can see the routines. In comparison, the Gateway Arch in St. Louis is 630 feet tall, and the Sears Tower in Chicago is 1,450 feet tall (192 and 442 meters, respectively). "The obvious risk of flying at lower altitudes is less recovery time if something goes wrong," he said.

Schmidt is well aware of the risks, but he's confident the team does everything possible to minimize them and ensure the plane is in tip-top condition. He says he absolutely loves the thrill of precisely flying low maneuvers. "How could you not love this job?" he said. ■

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PHOTOS: After retiring from the U.S. Navy in 2004, Steve Schmidt (left) joined the Boeing flight test team. He's expanded his portfolio of duties to include making demonstration flights, such as the flights he made in an F/A-18F Super Hornet at this past summer's Farnborough International Airshow in the United Kingdom (right).

(LEFT) PETER GEORGE/BOEING, (RIGHT) KEVIN FLYNN/BOEING

Unsung *guardians*

Information Security, an organization few people know, ensures that Boeing's data is safeguarded. And that helps keep the company working smoothly.

By Jay Spenser

Boeing's most precious asset is the unique expertise of its employees, and the information they generate is its lifeblood as an aerospace company. Maintaining competitive leadership demands that Boeing properly safeguard this information.

Fortunately, Boeing Information Security is on the job. Responsible for protecting the company's data and computing assets, this small but vital organization also ensures that company employees and their external business partners can collaborate as needed with timely, secure data flows.

With Internet-based technologies advancing rapidly, meeting this mandate is never easy for any company. In Boeing's case, the challenge is far greater because of the variety of its global operations, the scale of its data flows, and the differing computing needs and habits of its highly diverse and distributed workforce.

"Boeing Information Security is fortunate to have some of the most talented and resourceful IT professionals in the world," said Vice President of Information Security Linda Meeks, the company's chief information security officer. "As a result, our industry peers, as well as our commercial and military customers, often turn to us for advice on security issues."

CAT VS. MOUSE

Information protection is a cat-and-mouse, measures-versus-countermeasures world where things quite literally change daily. Boeing has a team in place to carefully monitor all of the company's computing systems.

Majed Barbar is manager of End User Devices, Technical Controls, a part of Information Security informally called Desktop Security. A 28-year Boeing employee with a background in computer science, Barbar leads the team of experts who are the company's first line of defense against Internet-based external
attack.

"You have to have a passion for this line of work or you risk getting burned out," Barbar observed. "Every virus is differ-

ent so you also need to be nimble and knowledgeable, and a lifelong learner. Ours is a competency model because we have to deal real-time with whatever shows up. In this sense, we're more like doctors at a hospital shock-trauma center than your average aerospace worker."

Ben Norton, director of technical controls, Information Security, likens this defense to a behind-the-scenes war being waged in cyberspace.

"Majed and his team keep Boeing one step ahead of people seeking illegal access to our information or trying to disrupt our operations," Norton said. "We're constantly adjusting our desktop and network components to counter these emerging threat patterns, leaving Boeing employees free to concentrate on their work."

SYSTEM AND DATA PROTECTION

Information Security provides protection to Boeing on two fronts. The first is system protection, which seeks to ensure all employees' computers and the Boeing Intranet itself remain unaffected by external Internet-based threats. The second is data protection, which addresses the privacy and integrity of the information within this distributed computing infrastructure.

Firewalls, anti-virus protection, anti-spyware, credentialing, remote access and rights management protections are among the tools Information Security uses. The team also ensures that all attachments entering the company via the Boeing e-mail system are automatically screened.

This comprehensive suite of protections operates quietly in the background and is all but invisible to Boeing computer users. Information Security is committed to preventing hindrances and disruptions that might compromise productivity. And like the company's information technology community as a whole, the professionals of Information Security believe that even one infected Boeing laptop is too many.

In the past year, new measures implemented by Information Security further enhance this protection. For example, Digital Rights Management allows employees to send encrypted e-mails that recipients cannot copy, print or forward. DRM can also be invoked in Microsoft Office applications including Word, Excel and PowerPoint to impose similar restrictions to those applications' documents.

Another recent example: thumb-drive encryption. Complementing the whole-disk encryption that is today standard for Boeing computers, thumb-drive encryption allows users to protect the data on removable thumb drives and other external USB storage devices. Then there's the companywide screen saver that was recently deployed to protect computer users against data exposure and loss.

COLLECTIVE RESPONSIBILITY

Boeing prides itself on fostering an open and collaborative environment that values, respects and protects information. Although Information Security's practices, processes, applications and infrastructure facilitate data protection and security, proper protection still requires the active and knowledgeable participation of every person at Boeing.

A focus on enhanced awareness is under way, educating and enabling employees to better recognize when they possess sensitive information, understand which protections are required for it, and to protect it accordingly.

Plain old common sense is just as important. Never opening a suspicious e-mail, exercising good judgment when checking your personal Web-based e-mail account from a Boeing computer, and never letting your laptop out of your sight in public settings are all examples of practices that will help keep Boeing information safe. Employees also can rely on Information Technology support to answer questions.

"Information Security is vital to the continued success of Boeing. I am pleased with the progress we've made in this important area," said Boeing Chief Information Officer John Hinshaw. "We will remain vigilant in our efforts to protect Boeing computer systems and information." ■

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PHOTO: Carolyn Loew (from left), Tim Boisvin, Liz Crowley and Sonja Floyd of End User Devices, Technical Controls, are part of the Information Security team that protects Boeing from "malware," or malicious software threats.

BOB FERGUSON/BOEING

I can see C

How a culture of collaboration, learning and replication helps Boeing use know-how of many

By Paul Proctor

For Boeing to become the strongest, best and the best-integrated aerospace company, employees must have the means to collaborate easily and quickly with others enterprisewide, learn from them and replicate best practices. John Pricco, vice president and leader of the Development Process Excellence initiative, has been tasked by senior Boeing management to lead a companywide team to further advance and embed across Boeing a culture of collaboration, learning and replication—known as CLR. This includes adapting for business use emerging Web 2.0 "social networking" tools such as wikis, blogs, enhanced directories and flash forums.

Boeing Frontiers recently sat down with Pricco and discussed this challenge, which will require significant cultural change but offers leaps in efficiency, product innovation, customer satisfaction and company financial performance.

Q: Why the emphasis on CLR?

A: Advancing a culture of CLR is critical to our company's future success and to creating a sustainable competitive advantage for Boeing in competitive global aerospace markets. Our team's goal is to develop a culture where seeking, replicating and advancing best practices drive productivity, growth and program execution; a culture that harnesses the collective intelligence of diverse cross-enterprise groups; that listens to all ideas of individuals; and a culture that leverages new and emerging next-generation, or "Web 2.0", technology and communications channels. Simply put, we want to facilitate information sharing and collaboration enterprisewide, better connecting people to people and people to information.

Q: What are the benefits of a CLR culture?

A: For the employee, a main benefit will be time savings. Industry studies indicate that today, employees spend up to one-third of their time duplicating existing information, and managers spend 25 percent of their time searching for information. By

CLR-ly

evolving our culture of collaboration, learning and replication, we have an opportunity to substantially reduce those time drags and the accompanying frustration.

Other benefits include easier access to the data needed to do your job, improved access to subject matter experts, and the ability to interface and share expertise with people and organizations across the company.

Q: How does Boeing benefit from CLR?

A: The potential for increased productivity is significant. For example, if improved collaboration saves 80 percent of Boeing employees just one hour every quarter, the annual dollar savings to the company is in the tens of millions. There are bottom-line advantages, too, with greater collaboration expected to result in enhanced and more innovative products, greater customer satisfaction, increased contract wins and lower employee turnover, to name a few. There's also the savings in reuse of information and avoiding repeat lessons learned, moving us much closer to "no more reinventing the wheel."

Q: Encouraging Boeing people to collaborate, share and replicate best practices enterprisewide represents a major cultural shift for many. How will you address these challenges?

A: We know further developing our CLR culture will be difficult. After all, we're changing the very DNA of Boeing: We want employees to know that seeking and sharing across the enterprise is encouraged and expected.

The CLR team plans a combined top-down, bottom-up approach to ingraining this culture change at Boeing. Key members of the CLR team and I already are conducting "road show" presentations on CLR to senior executives and leadership teams around the company to introduce them to CLR, get them excited about the benefits and enable them to flow this information down to their teams. We are working on other cultural enablers, as well.

We already are seeing more and more people asking for help with collaboration. In response, we've launched a Web site (http://clr.web.boeing.com on the Boeing intranet) to provide "one-stop shopping" for employees looking for information on CLR, with links to related training, resources and success stories. The Web site will focus on leveraging existing tools and introduce emerging Web 2.0 tools as they become available. Already, limited pilots are being conducted on several new Web 2.0 tools, including the InSite corporate information-sharing network, and a large-scale "flash forum" we call FlyIn. The CLR team is helping evaluate the results of these pilots.

The Web site also will provide information on enterprisewide Communities of Practice. A CoP is a group of people that form around a topic, process, practice, tool or technology to share ideas, insights and information—and to help solve problems. Cross-enterprise CoPs are foundational to creating the networks that drive a collaborative culture.

Q: Are there security concerns with the widespread sharing of proprietary and sensitive information?

A: We are always concerned with protecting our company data. We will approach it carefully and thoughtfully in cooperation with appropriate Boeing- and customer-organizations that address data security. Existing company procedures and policies for data security will still apply. As you know, they are working well today for Boeing on e-mails and digital correspondence and for presentation of papers at conferences. But we must continue awareness campaigns reinforcing that all employees must protect information regardless of the sharing mechanism.

The benefits of wide-scale collaboration to Boeing are important. We will make sure that the proper controls are in place as we deploy this technology.

Q: How can employees help?

A: Work to further develop a CLR culture in your organization by actively collaborating and learning with others across the enterprise. Learn and employ the Seek–Adopt–Improve–Share model in your everyday work activities. Consider joining a Community of Practice in an area aligned with your job or career. For you subject matter experts, if an employee from another organization asks you for help, try to provide it, as appropriate. And finally, spread the word about the value of using standard solutions and leveraging the knowledge of others to increase productivity across the enterprise. ■

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PHOTO: John Pricco is leading an enterprisewide team that's looking further to advance and embed across Boeing a culture of collaboration, learning and replication—also known as CLR.

MICHAEL GAIL/BOEING

The Future, ***in sight***

Welcome to the revamped Everett facility, where an initiative to update features of the factory is boosting collaboration, efficiency—and employee satisfaction

By Anne Gose / Photos by Gail Hanusa/Boeing

Several decades and 3,000 widebody airplanes after opening, the Commercial Airplanes factory in Everett, Wash., is getting a second life and sporting a new look.

Skylights that illuminate the 747, 767 and 777 production lines, lots more conference rooms and meeting spaces, and new floor-to-ceiling windows in office towers that overlook the factory floor all are part of the Future Factory project.

As shown in the photographs over the following pages, Future Factory is transforming the workspace to create an environment that enhances collaboration, improves employee satisfaction and supports production system efficiencies (see Page 28 of the March 2007 *Boeing Frontiers*). More than midway through this multiyear project, approximately 3,000 employees have moved into renovated spaces, adapting to both a change in physical surroundings as well as a cultural shift in how they get their work done.

Five office towers supporting the 747, 767, 777 and 787 production lines are being renovated to streamline individual workspace and create more shared work areas. All employees, including executives, have soft-walled workstations open to the high ceiling.

The Future Factory team chose the open design based on research showing it's the right configuration for organizations that want to be highly interactive and nonbureaucratic. "Our area is quite pleasant, surprisingly quiet and my space offers plenty of room for me to get my work done," said Joe Doran, a 747 Quality engineer. "It gives you a sense of belonging on a team with the main players close to each other. It works."

Successful adaptation to an open office, however, requires a culture change as well as a flexible design that can support various organizational needs.

"The walls that used to literally and figuratively divide us are gone," said Beverly Wyse, vice president and program manager of the 767 Program. "This is a more logical use of space."

Brian Steinmetz, director of the 767 and Everett site Program Management Office, noted the benefits of open space work both ways. "Not only does Beverly have better access to the team, but we have better access to her. It's easier to confer with people on the team because I see them more often, and I find the same is true for our ability to find Beverly more easily and see her more frequently."

CONNECTION TO PRODUCTS

By making better use of existing structural components, the Future Factory project found a way to reconfigure the third and fourth floors of the office towers. Now, large storefront-style windows and exterior walkways overlook the factory floor, providing a sensory connection to the products. "The openness of it all encourages collaboration which, in turn, fosters a sense of one team with one common goal," Wyse said.

"The new windows make me feel part of something bigger and really open up the office towers to the factory floor," said Jo Ann Marshel-Wilbourne, a 767 Quality administrative assistant. "And when you take a break and go through the glass doors onto a walkway, it's invigorating to hear the factory activity."

The renovated towers offer three times the shared space compared with previous office layouts, in large part due to many more conference rooms of various sizes. In addition, two new types of spaces offer more options for small, impromptu meetings: collab-

PHOTOS: Left: Walkways outside Future Factory offices serve as space for employees in the Everett, Wash., factory to work, dine or meet—all with a view of widebody airplane manufacturing.

Right: Four vertical screens along the E aisle climb five stories above the factory floor in Everett, Wash. The screens help diffuse natural light from the skylight and also are part of the enhanced wayfinding system to help people find their way in the factory.

oration areas, which are casual, conference-type rooms without doors, and privacy rooms for private conversations.

According to John Akiyama, Future Factory program manager and a senior manager in Commercial Airplanes, about 150 formal and casual meeting spaces were built into the redesigned areas in 2008. “We work with each airplane program to accommodate its needs and to accomplish Everett site goals, including moving into the factory those people who should be nearer the production line," he said. "While disruptive during construction, these renovations and changes will help boost overall workplace productivity and efficiency.”

Two new multipurpose rooms designed for large meetings (75 to 100 people) are on the second floors of two towers for easy access from the production floor. Focus groups of employees representing the 747, 767 and 777 programs told Future Factory planners in 2005 that problem solving needed to occur shipside, closer to the airplane, and with the people who build them.

SKYLIGHTS: AN ILLUMINATING FEATURE

While construction crews cut holes in walls to accommodate windows, other workers are cutting holes in the factory roof for skylights. Of the 35 skylights planned, 26 already illuminate the production bays, each with 24 translucent panels of various shapes and sizes that together measure 25 feet by 27 feet (7.6 by 8.2 meters). Each skylight’s peak rises 13 feet (3.9 meters) above the factory roof.

According to workplace research and lessons learned from the Move to the Lake project at the Renton, Wash., site, access to natural light during the workday improves the work environment and thus employee satisfaction. “I see several skylights from my desk,” said Marshel-Wilbourne. “On those blue-sky days, I really can see rays of sunshine beaming into the factory. It makes me smile.”

“I can’t walk through the factory without someone pointing to the skylights and telling me how wonderful they are,” said Ross R. Bogue, vice president and general manager of the 747 Program and Everett site.

And, finally, because the Everett factory building is so big—98.3 acres (39.9 hectares) and the largest building in the world by

“The walls that used to literally and figuratively divide us are gone. This is a more logical use of space.”

–Beverly Wyse, vice president and program manager, 767 Program

PHOTOS: Above and top: The Everett site has 26 skylights completed atop the facility’s roof—such as the one above left, with Mount Rainier in the background. The photo at the top, taken from the factory floor, shows how the daylight from the skylight brightens the locale.

volume—Future Factory is improving how employees and partners find their way around. Also known as "wayfinding," new directional and location signage across the factory floor and tunnel help people get where they're going more efficiently. Circular blade signs that protrude from structural columns identify column numbers along the aisle; five-story perforated steel screens with column numbers add a vertical element and are identifiable across the bay; "You are here" maps are posted in key locations; and universal symbols help people find restrooms, cafes, stairs and elevators. All these elements create a rainbow of hues: Each factory aisle is painted its own color (purple, red, orange, yellow, green or blue). Gone is the dirty salmon-and-gray color scheme of decades past.

"When construction started on the Everett site more than 40 years ago, the culture and the people created a revolution—the 747," Akiyama said. "Now, with Future Factory coming on line, we have another winning combination. Our employees and our culture are going to transform the Everett site again—just watch."

For more information about the Future Factory project, visit http://futurefactory.web.boeing.com on the Boeing intranet. ■

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Photos of the remodeled Everett site continue through Page 51.

"Our employees and our culture are going to transform the Everett site again—just watch."

–John Akiyama, Future Factory program manager and senior manager in Commercial Airplanes

Newly remodeled office areas in the Everett factory offer several informal gathering places for employee collaboration. Proximity to the factory floor saves time for manufacturing employees who need to work with their office counterparts.

Everett Future Factory project, *by the numbers*

35 *Total skylights planned for the factory; 26 already have been installed*

150 *Number of meeting spaces within the redesigned office towers, three times more than in the old office areas*

3,000 *Number of employees to date who have moved into renovated Future Factory office spaces*

600,000 *Total square footage of factory space that ultimately will be renovated by the Future Factory project (55,741 square meters)*

PHOTOS: **The Everett facility features an abundance of conference rooms of various sizes, from privacy rooms (above, left) to larger gathering areas (top, right). While some rooms feature an airplane-related decoration scheme (Page 46, top left), others are decorated with a nature motif (above, left and right, and Page 46, left center).**

An evolution, *in motion*

Here's a list of milestones by year in the Everett Future Factory project

2005

– *Focus groups with employees across the programs help define Future Factory priorities*

2006

– *New Employee Service Center opens in heart of factory*

– *Renovated Everett Delivery Center opens*

– *Two Tully's Coffee Cafes open in factory*

– *One renamed and renovated food service cafe opens*

PHOTOS: Center: Casual gathering areas outside the Twin Aisle Café in the Everett factory provide diners and others with a view of the 777 production line. Shown are (standing at rear) Craig French, (seated at table, from left) Joe Doran and Allan Sherman, and (standing at front, from left) Ken Tsuru and Annette Mauldin.

Corners: Everett's wayfaring scheme makes it easy to recognize where within the facility you are. Signs feature not only a numerical and letter designation, but a color-coding scheme. These signs appear in both production areas and office spaces.

2007

– *Three more Tully's Coffee Cafes open*

– *Five renamed and renovated food service cafes open*

– *Employees move into three floors of a renovated office tower*

– *Second Employee Service Center opens*

– *One skylight installed*

2008

– *One more renamed and renovated food service cafe opens*

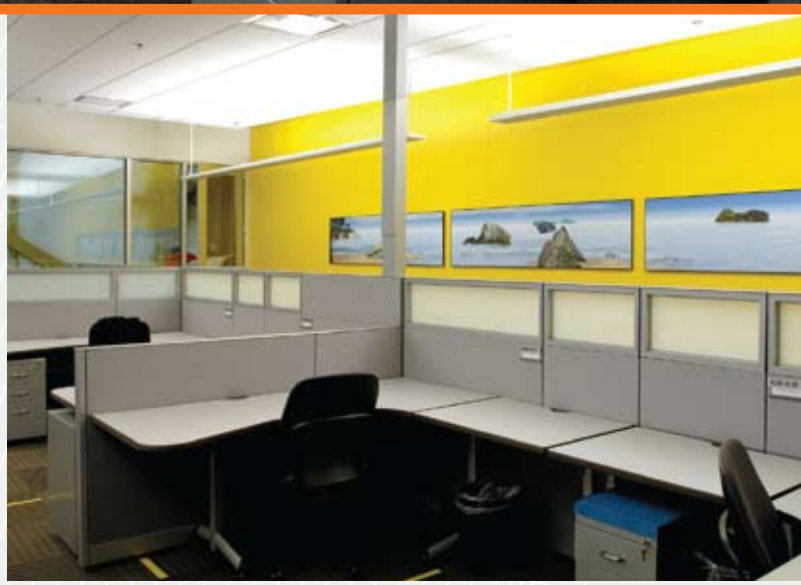
– *25 skylights installed*

– *Employees move into 14 renovated floors in eight office towers*

– *Two multipurpose rooms are complete*

– *Column blade signs, five-story vertical screens, universal symbols and tunnel signs are installed as part of the enhanced wayfinding system*

PHOTOS: Top: Soft-walled workstations are part of the open office environment. The accent colors of orange and red are part of the way-finding system. Desks and chairs are ergonomically adjustable. From most workstations, employees can see the factory floor through new large windows.



Above from left: **Executives have much smaller spaces and less furniture than in the past—and no doors or hard-walled offices; renovated restrooms have all new fixtures and nature-themed artwork; this second-floor multipurpose room can accommodate up to 100 people and is close to the 747 production line; nature-themed artwork and accent colors brighten the open-office environment.**

As part of Boeing Capital Corp.'s efforts to work closely with Chinese banks to encourage their involvement in aircraft leasing, BCC has sponsored three in-country aircraft leasing seminars in recent years. Here, BCC President Walt Skowronski (left) visits with Chairman Liu Mingkang of the China Banking and Regulatory Commission at a November "reunion" of seminar graduates.

Manage to get ahead

Boeing Capital Corp. navigates through today's market uncertainties

By John Kvasnosky

Maybe you've thought recently about selling a home or refinancing a mortgage. Did you wonder about questions such as: Have home prices bottomed out? Where are mortgage rates heading? What's my place worth in today's market?

If so, you can relate to the challenge of managing finances in the face of the most severe economic crisis since the Great Depression. Now imagine what it's like to be at a finance company, where products sell for tens to hundreds of millions of dollars a copy, and customers from across the world wanting deliveries seek loans from sources across many time zones.

Nowadays, work life is anything but routine at Boeing Capital Corporation, Boeing's financing unit. The BCC team is greeted daily with news of lenders cutting back or withdrawing from sectors, falling confidence levels in the world economies and wide swings in lending rates. The 160-strong work force of Boeing's smallest business unit is navigating through an extremely dynamic financial environment, looking to ensure customers are supported while minimizing associated risks that could impede the company's own ability to perform.

In the early part of the decade, BCC provided financing for Boeing and non-Boeing purposes. Today, however, it focuses solely on providing financing solutions to buyers of Boeing commercial and defense products. It does this primarily by connecting customers with third-party financing sources, with the goal of ensuring that no product deliveries are delayed by lack of financing. BCC's success also depends on its ability to manage risks in its own financing portfolio—concerns such as keeping its aircraft on lease and managing through airline defaults, to name a few.

Since BCC refocused its mission from one of growth to customer support, it's worked hard to reduce the size of its commercial aircraft portfolio—from $12 billion in 2003 to $6 billion today—and bring down its debt obligations ($9.2 billion to $3.7 billion in this period), to be prepared for any change in market conditions. In the process, it chalked up solid business-plan performances including an impressive string of large dividend payments to Boeing (see box on Page 54).

"We have had five years of tremendous accomplishments and success with our new mission. The good news is that our mission hasn't changed. The bad news is that everything else has," said

"Every time there's been a crisis, there's been a concern that the industry won't return to growth. But we know from experience that's not the case: People need to fly, and they will, on good, fuel-efficient airplanes."

–Kostya Zolotusky, managing director for capital markets development, Boeing Capital Corp.

BCC President Walt Skowronski.

The current global economic turmoil has left few unaffected. Airlines in particular have been hard hit. They've dealt with rising fuel prices (which have retreated from all-time peaks this summer). Then came the credit crunch, which squeezed their liquidity—access to available money to fund operations or acquire new aircraft—and threatened their ability to find affordable financing. To that, add reports of recent declines in global air travel due to recessionary fears.

As a result, BCC is again working together with customers in responding to restructuring challenges and preparing to potentially use the company's balance sheet to finance deliveries or provide other key support.

"For the last few years, we have been very good at getting our airplanes financed using third-party money. We haven't directly financed an airplane for more than two years," Skowronski said. "We monitor the market conditions closely, and we're seeing impacts to some of the key sources for aircraft financing, which means we could likely again find ourselves doing some direct customer financing in 2009." (See chart on Page 54)

Unlike typical "captive" financing companies, whose business revolves primarily around lending associated with product sales, BCC views product financing more as an enabler for closing some airplane deals, with Boeing being the "lender of last resort" when other financing is unavailable.

Despite the market turmoil, aircraft financing continues to be available, thanks in part to BCC's investor outreach work and financiers' belief in the value of Boeing products. At today's airliner production rates, and given current backlogs, there's a combined manufacturers' demand for between $60 billion to $100 billion annually in airplane financing.

BCC's success with third-party financing support is thanks in no small part to its comprehensive outreach program. It is aimed at informing and educating bankers and financiers, whose institutions fund aircraft purchases.

"Every time there's been a crisis, there's been a concern that the industry won't return to growth. But we know from experience that's not the case: People need to fly, and they will, on good, fuel-efficient airplanes. And as long as bankers and financiers see evidence of that demand, they'll support it," said Kostya Zolotusky, BCC's managing director for capital markets development. "Our job is to bring all the stakeholders together and present the facts and data on our airplanes, their performance and our customers' fleet needs. And that's the core of our message: The demand for aircraft is real."

For the near term, it appears that most airplane deliveries into early 2009 have financing secured. Going forward, however, financiers are likely to be highly selective, loaning or leasing to airlines with the best credit ratings.

European banks, which have been major players in recent years, have pulled back recently but are expected to return in early 2009. Meanwhile, regional banks—throughout Asia, especially in China, as well as Africa, the Middle East and elsewhere—have continued to increasingly support their local airlines. In fact, Skowronski recently returned from China, where Boeing Capital signed agreements with four leading Chinese banks doing airplane lending to jointly work to increase their global presence.

Following the major industry disruption that occurred after the Sept. 11, 2001, terrorist attacks, the U.S. Export-Import Bank (Ex-Im), the country's national export credit agency, provided major support to Boeing customers seeking financing. Today, thanks to a geographically broader Commercial Airplanes backlog and sustained demand for airplanes, Ex-Im is expected to provide even more support.

"Post 9/11, BCA's backlog was weighted by U.S. carriers and others who were not eligible for Ex-Im support. Today, more than 80 percent of our customers are eligible for Ex-Im support, whether in the form of loan guarantees or direct lending. And the bank has made its desire to help the industry during this crisis very clear. They're a valued partner to us and the industry," Skowronski said. He added that the bank's airplane lending activities have returned $1 billion-plus in profits to the U.S. government.

The crisis has also brought BCC a significant increase in the volume of customer requests for financial assistance. Fortunately BCC has seen only limited impacts to date, from some smaller-airline bankruptcies. Unscheduled aircraft returns are running higher than planned, which require additional remarketing efforts.

"We are being very selective in how and when we step in with the goal of helping key customers weather the storm they're going through. When we do, our goal is to create a win-win situation in which we provide temporary and measured assistance to certain airlines, and those airlines help us accomplish things that are important to us. Today, the potential financing demand we see on the horizon looks very manageable," Skowronski said.

He said as part of its prudent planning, BCC is preparing to turn to outside financial markets for money to finance customer aircraft if required, and recently BCC renewed with the government its ability to sell bonds if required to raise cash in the future. He added that as BCC looks to support its customers, it puts a high priority on not adding any undue risk to its balance sheet. In fact, BCC is inserting additional risk mitigation terms to further protect Boeing when negotiating new customer agreements.

Skowronski said BCC also is aggressively managing its leased-airplane portfolio. "Our single biggest asset concentra-

tion is our 717 fleet. We're very committed to working with 717 operators, our engine supplier, Rolls Royce, and Commercial Airplanes' Commercial Aviation Services operation to ensure that the 717 fleet continues to fly efficiently. The 717 is a great airplane in a time where fuel efficiency is desired," Skowronski said.

Like a real-estate investor choosing to take a long-term view of the current market crisis, Skowronski reflects on what BCC currently has going for it in its own portfolio of business resources.

"We are looking at an entirely different environment in which to perform our mission. But the mission hasn't changed," he said. "We are financing the best aircraft in the world at a time of high demand for our products. We have the strength of Boeing and its people. We have a very experienced and expert BCC team that's successfully been through many challenges. And we have the support of Boeing's leadership and the Boeing board of directors." ■

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BCC by the numbers

Here's some of what makes Boeing Capital Corp., the company's smallest business unit, a contributor to the success of Boeing customers as well as a solid financial performer:

60

Approximate percentage reduction of BCC's total debt between 2003 and the end of the third quarter of 2008 ($9.2 billion to $3.7 billion). The organization has significantly reduced its debt to allow for growth if market conditions demand.

160

Current number of BCC employees, most of whom work at its headquarters in Renton, Wash.

325

Approximate number of aircraft in BCC's portfolio, of which the largest single type is the fuel-efficient Boeing 717.

2 billion

The approximate dividend, in dollars, through third-quarter 2008 that BCC has contributed to Boeing over the last four years. That's helped in Being's overall efforts to deliver value to its stockholders.

6.1 billion

Current value in dollars of Boeing Capital's aircraft portfolio. BCC ranks among the top aircraft leasing companies.

State of the airplane financing markets

After recovering from disruptions following 9/11, the aircraft financing marketplace mostly hummed along into early 2008. In the last half year, Boeing Capital Corp.'s "stoplight" view of the health of aircraft financing players, particularly key sources, has changed significantly. It gives financiers like BCC pause over whether adequate financial market funding will be available for future deliveries, and prompts prudent planning for possible direct Boeing financing in some cases.

Capital providers	2003	2004	2005	2006	2007	2008
Leasing companies*	R/Y	Y	G	G	G	Y/R
Commercial banks*	R/Y	G	G	G	G	Y/R
U.S. public debt* / capital markets*	R	R	R/Y	Y	G/Y/G	R
Export credit agencies* (like U.S. Ex-Im Bank)	G	G	G	G	G	G/Y
Private equity / hedge funds	G	G	G	G	G	R
Tax equity funds, mostly in Europe	R	R	Y	Y	G	G/Y
Airframe and engine manufacturers	R	R/Y	G	G	G	Y
New sources of funding* (China, Middle East, other emerging markets)					G	G/Y

G Good availability of financing at market prices

Y Limited financing capacity and rising borrowing costs

R Temporarily not financing, very limited capacity or high borrowing costs

* Key sources of funding

Boeing stock, ShareValue Trust performance

ShareValue Trust is an employee incentive plan that allows eligible employees to share in the results of their efforts to increase shareholder value over the long term.

The program—which runs for 14 years and ends in 2010—features seven overlapping investment periods. The program is currently in Period 7.

The above graphs show an estimate of what a "full 4-year participant" ShareValue Trust distribution (pretax) would be for Period 7 if the end-of-period average share prices were the same as the recent price shown.

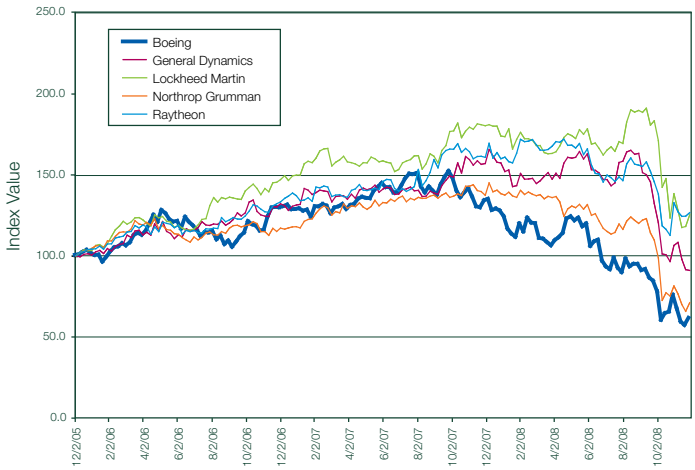
The share price shown is the average of the day's high and low New York Stock Exchange prices. Updates to participant/employment data will be made periodically.

For more information on the ShareValue Trust, visit http://www.boeing.com/share.

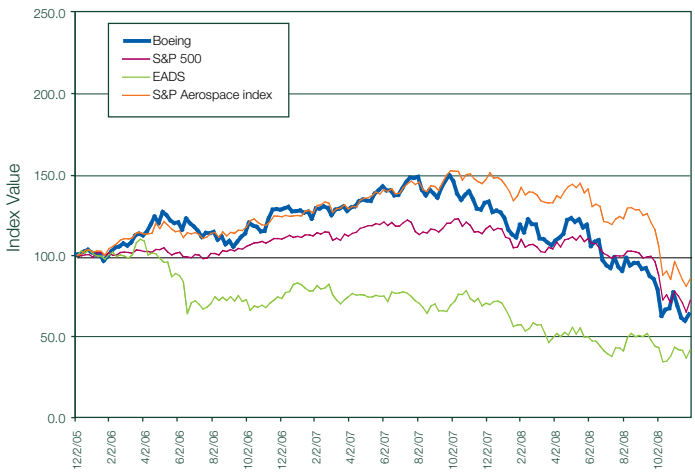
STOCK WATCH

The chart below shows the stock price of Boeing compared to other aerospace companies, the S&P 500 index and the S&P 500 Aerospace and Defense index. Prices/values are plotted as an index number. The base date for these prices/values is Dec. 2, 2005, which generates three years of data. The prices/values on that date equal 100. In other words, an index of 120 represents a 20 percent improvement over the price/value on the base date. Each data point represents the end of a trading week.

Boeing vs. U.S.-based competitors



Boeing vs. stock indexes and international competitors



Comparisons: 4-week, 52-week	Price/value as of 11/28/08	Four-week comparison		52-week comparison	
		Price/value as of 10/31/08	Percent change	Price/value as of 10/26/07	Percent change
BOEING	**42.63**	**52.42**	**-18.7%**	**92.54**	**-53.9%**
U.S. COMPETITORS					
General Dynamics	51.67	60.32	-14.3%	88.78	-41.8%
Lockheed Martin	77.11	85.05	-9.3%	110.67	-30.3%
Northrop Grumman	40.95	46.89	-12.7%	78.79	-48.0%
Raytheon	48.80	51.11	-4.5%	61.85	-21.1%
INT'L COMPETITORS					
EADS*	12.43	12.91	-3.7%	21.94	-43.3%
U.S. STOCK INDEXES					
S&P 500	896.24	968.75	-7.5%	1481.14	-39.5%
S&P 500 Aerospace and Defense Index	253.21	286.62	-11.7%	444.48	-43.0%

* Price in Euros

IN MEMORIAM /

The Boeing Company offers condolences to the families and friends of the following employees.

Robert Ballantyne, expediter; service date April 19, 1965; died Oct. 31
Bruce Burley, test and evaluation engineering manager; service date Oct. 20, 1993; died Nov. 16
Michael Chambers, locksmith; service date Feb. 14, 1979; died Nov. 4
Dennis Chadduck, sheet metal assembler; service date Feb. 11, 1986; died Oct. 29
Debra Christenson, quality systems specialist; service date Feb. 17, 1989; died Oct. 29
John Doka, software engineer; service date July 6, 1988; died Nov. 10
Gary Emard, project management specialist; service date Nov. 8
Gary Evans, design & analysis engineer; service date March 15, 1999; died Nov. 6
Barry Fagan, software engineer; service date June 1, 1997; died Oct. 19
James Gallagher, systems design & integration specialist; service date Sept. 10, 1979; died Oct. 24
Julie Hayes, software engineer; service date Sept. 27, 2004; died Nov. 20
Stanley Hodge, mechanic; service date July 27, 1981; died Nov. 16
Alfred Johnson, manufacturing helper; service date Sept. 28, 1977; died Nov. 2
David Kinzebach, procurement analyst; service date Aug. 24, 1979; died Oct. 21
Thomas Koerner, transportation analyst; service date June 28, 1984; died Nov. 19
Jana Lackie, Human Resources manager; service date Feb. 25, 1985; died Oct. 20
Gary Lammers, systems engineer; service date April 22, 2002; died Nov. 24
Matt McBee, employee development specialist; service date Nov. 26, 1984; died Oct. 22
Thomas Oliver, information technology; service date Aug. 27, 1990; died Nov. 11
Donna Putnam, product data management specialist; service date June 5, 1985; died Nov. 18
James Raighn, aircraft structures mechanic; service date Feb. 25, 1982; died Nov. 14
Richard Riley, project management specialist; service date July 19, 2001; died Nov. 19
Willard Simons, materials management analyst; service date Dec. 8, 1964; died Nov. 8
Dean Sorensen, integral fuel cell sealer; service date Aug. 22, 1996; died Nov. 18
Edward Spanutius, procurement analyst; service date May 29, 1988; died Nov. 17
Steven Thomas, process engineer; service date Sept. 16, 1998; died Oct. 19
Vernon Thompson, maintenance/mechanical machinist; service date April 22, 1968; died Oct. 19
Stephen Van Dillen, procurement analyst; service date April 19, 1990; died Oct. 26
Wayne Vanlandingham, Environment, Health & Safety manager; service date April 9, 1990; died Oct. 28
Donald Willis, machined parts finisher; service date Oct. 28, 1997; died Oct. 17
David Zumbro, systems engineer; service date Jan. 3, 2003; died Oct. 17

Congrat

Every year, Boeing employees are recognized by professional societies and institutions for their contributions to engineering and science. Here's a list of the Boeing people recognized in 2008 for their technical excellence.

AMERICAN HELICOPTER SOCIETY

2008 Howard Hughes Award: The Network Centric Operations Technology Development Team, which included Boeing

AMERICAN PHYSICAL SOCIETY

Fellow: Jeffrey H. Hunt

AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS

Associate Fellows: Kevin G. Bowcutt, Robert Terry Britt, Scott Carson, Michael Denton, David E. Morgan, Tom A. Mulder, Douglas G. Schwaab, Winston E. Scott, Robert W. Stoker, Steve Trejo, Hanching Grant Wang, David A. Whelan
2008 AIAA Aerospace Design Engineering Award: Alan Wiechman
Fellows: John H. McMasters (posthumously), Kenneth Sanger, Susan X. Ying
Air Transportation Systems and Operations Best Paper: Rob Mead, joint author with Richard Coppenbarger, NASA Ames Research Center, and Douglas Sweet, Sensis Corp.

AMERICAN SOCIETY FOR QUALITY

Fellow: Peter L. Andres
International Team Competition Gold Award: C-17 Universal Splice Machine Team

ASIAN AMERICAN ENGINEER OF THE YEAR

Asian Engineers of the Year: Paul D. Nuyen, Snehal R. Patel, David R. Shieh

BLACK ENGINEER OF THE YEAR AWARDS, CAREER COMMUNICATIONS

Supplier Diversity Programs: Oliver (Bo) Leslie
Outstanding Technical Contribution in Industry Award: Jonathon Saint Clair
Modern Day Technology Leaders: Toni Brown, Danny Howard, Darnita Martin, James Ramsey, Charles Stout

ulations!

CAREER COMMUNICATIONS

Top Supporter of the Historically Black Colleges and Universities Engineering Programs: Boeing
2008 list of "Most Important Hispanics in Technology": John Tracy, Jim Cisneros

FLIGHT SAFETY FOUNDATION

***Aviation Week & Space Technology* Distinguished Service 2008:** Dave Carbaugh

HISPANIC ENGINEER NATIONAL ACHIEVEMENT AWARDS CONFERENCE

Role Model of the Week: Maria Cardwell
Most Promising Engineer: Noramay Cadena
Luminary Awards: Luis Leon, José Amoedo

HUMAN FACTORS AND ERGONOMIC SOCIETY

2008 Jerome H. Ely Human Factors Article Award: Randall J. Mumaw

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS

Fellow: Kevin Wise
2007 Professional Achievement Award: Robert K. Menzel
2007 Outstanding Large Company Award (for outstanding support of the IEEE and its members): Boeing
Presidents Special Citation (for commitment to promoting diversity in the technical work force, in partnership with IEEE): Boeing

INSTITUTE OF INDUSTRIAL ENGINEERS

Ergo Excellence Award for Cost Savings: Boeing, for its 767 Overhead Video Monitor Lift
Ergo Excellence Award for Innovation: Boeing Interiors Responsibility Center, for its Versatile Bin Holding Carriage

INTERNATIONAL COUNCIL OF THE AERONAUTICAL SCIENCES

von Karman Award for International Cooperation in Aeronautics: Boeing 787 Dreamliner Program
Maurice Roy Award: Curt Graeber

INTERNATIONAL COUNCIL ON SYSTEMS ENGINEERING

Fellow: Ron Carson

INTERNATIONAL RESEARCH INSTITUTE

Maurice Holland Award: Ray Cosner (co-author)

NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

Fellow: Robert G. Becnel

ORGANIZATION OF CHINESE AMERICANS

Corporate Achievement Awards: Vivek Lall

ROYAL AERONAUTICAL SOCIETY

Fellows: John C. Dalton, Todd Zarfos

SAE INTERNATIONAL

Fellow: John C. Dalton

SOCIETY OF EXPERIMENTAL TEST PILOTS

Fellows: Dennis O'Donoghue, Doug Benjamin, John Cashman (retired)

SOCIETY OF HISPANIC PROFESSIONAL ENGINEERS

Hispanic in Technology Award: Julio A. Navarro

SOCIETY OF WOMEN ENGINEERS

Distinguished Service Award: Terri Morse
Distinguished New Engineer Award: Hayley R. McGuire

WOMEN ENGINEER MAGAZINE

Top Employer of Women Engineers: Boeing (No. 1 on list)

WOMEN IN AVIATION INTERNATIONAL

United Airlines Command Leadership Resource Training Scholarship: Crystal Harris
Association for Women in Aviation Maintenance Flight Safety International Principles of Troubleshooting Training Scholarship and Pratt & Whitney Maintenance Training Scholarship: Rhonda Lyons
United Airlines Maintenance Training and Command Leadership Resource Training Scholarships: Jennifer Hunt

WOMEN OF COLOR IN TECHNOLOGY

Research Leadership Award: Quynhgiao Le
Managerial Leadership Award: Dianne Chong
Pioneer Award: Rosaura Corral-Perez
Special Recognition: Rhonda Lyons
Technology All Stars: Angelica Davancens, Jade Hudson, Shoba Krishnan, Chung-Chiu Liu, Matiel Payton, Christine Wang, Janee Wang, Seraphine Wang
Technology Rising Stars: Noramay Cadena, Iris Chavez, Melissa McQueen, Bukola O. Olagbaju, Fernmarie Rodriquez, Jennifer Wenthe

105 Boeing inventors receive 2008 Special Invention Award

To commemorate the company's top innovators and inventions, Boeing Intellectual Property Management conducts an annual Special Invention Awards program. This year, Boeing recognized 105 inventors who worked on 38 inventions.

Here's a list of this year's Special Invention Awards winners by region.

MIDWEST REGION

Method, Computer Program Product, and Apparatus for Managing Decision Support Related Event Information: William E. Krechel, Kenneth G. Owens, Brian N. Slack

Seal Removal Aid: Michael M. Newton

Flight Replay System and Method: Todd C. Hampson, Margaret M. Tsai

Methods and Systems for Task Assessment Management: Gregory P. Bowman, Aaron F. Markowitz

Air Launch System Interface: James V. Leonard, Bob K. Menzel, James A. Simms

Variable Area Flow Duct Employing Secondary Flows & Fluidic Mixer with Controllable Mixing: Mori Mani, Matthew J. Wright, Chad M. Winkler

Processing Architecture for Automatic Image Registration: L. Andrew Oldroyd

Capacitive Plate Dielectrometer Method and System for Measuring Dielectric Properties: Christopher Y. Choi

Robust Control Effector Allocation: Joseph S. Brinker, Ryan D. Diecker, Eugene Lavretsky

Rotary Aircraft Download Alleviation Apparatus and Methods: Robert C. Heminway

Evaluation of Optical Distortion in a Transparency: Michael S. Dixon*, Philip L. Freeman, Michael P. Gleason, Robert Pless*, William D. Smart*, Matthew M. Thomas (* co-inventors employed by Washington University in St. Louis and recognized for their outstanding contribution)

NORTHWEST REGION

Fiber Optic Transceiver Module Having Built-In Test Capability and Associated Method: Eric Y. Chan, Dennis G. Koshinz

Laser Exterior Marking System and Portable Laser Projector and Enclosure: Lindsey M. Caton, William J. Dill, Kenneth E. Irwin III, Paul Jennerjohn, David A. Lindley, Pamela J. Manzer, Reynold R. Panergo, Paul G. Solecki, James C. Van Avery

Autonomous Vehicle Rapid Development Test-bed Systems and Methods/Closed-Loop Feedback Control Using Motion Capture Systems: Khaled Abdel-Motagaly, Brett M. Bethk**, Stefan R. Bieniawski, Gregory J. Clark, Charles A. Erignac, Jonathan P. How**, Gary R. Mansouri, Paul Murray, Paul E. R. Pigg, Ronald C. Provine, Emad W. Saad, James J. Troy, Mario J. Valenti**, John L. Vian (** co-inventors employed by Massachu-

Martha Ries, standing in the Museum of Flight in Seattle, holds a Special Invention Award plaque. Some 105 inventors who worked on 38 inventions were recognized in this year's Special Inventions Awards program. The program is run by Boeing Intellectual Property Management, which Ries leads. MARIAN LOCKHART/BOEING

setts Institute of Technology and recognized for their outstanding contribution)

Radio Frequency Signature Augmentation System: George A. Eastman, Kosal Svy

Shaper Router and Method: Roger E. Ahrnkiel, Bradley A. Pense

Multi-Axis Trim Processing: Jia Luo

Aerospace Vehicle Fairing Systems and Associated Methods: Nicolaas Voogt

Maintenance Interval Determination and Optimization Tool and Method: Roberto E. Altschul, Kenneth D. Bouvier, Brian C. Fredgren, Friedrich-Wilhelm Scholz, Shuguang Song

Combined Mortise and Tenon Joint Feature: Richard C. Burnham, Scott D. Button, Paul S. Dewar, Ralph D. Druckman, Chai Y. Indharasophang, James S. Griffing, Marc A. Spane

Methods and Systems for Modeling Processes in Airlines and Other Industries, and for Simulating and Valuing the Effects of Various Products and Services on Those Processes: Gerry R. Cutler, Kenneth J. Goosen, James O. Halvorson, Michael E. Irrgang, Michael W. Maple, Michael B. McLaughlin, Peter L. Smith, Philip L. Trautman

Laminate Material Testing Methods and Systems: Barry A. Fetzer, Jeffrey R. Kollgaard, Jeffrey G. Thompson, Clyde T. Uyehara

Annular Acoustic Panel: Geoffrey E. Harrison

Flow Restrictors for Aircraft Inlet Acoustic Treatments, and Associated Systems and Methods: Ronald F. Olsen

Method and Apparatus for Composite Part Data Extraction: Phill J. Fisher, Jamie A. Kessel, Paul J. Shirron, Donald M. Mullins

Load Reducing Stores Launch Tube: Matt H. Travis

Integrated Aeroelasticity Measurement System: Darin W. Brekke, Dan J. Clingman, Hank O. Hinnant Jr.

SOUTHWEST REGION

Object Detection System and Method Incorporating Background Clutter Removal: Thomas P. Weismuller, David L. Caballero

In-flight Control System Stability Margin Assessment: Thomas F. Brozenec, Richard Y. Chiang

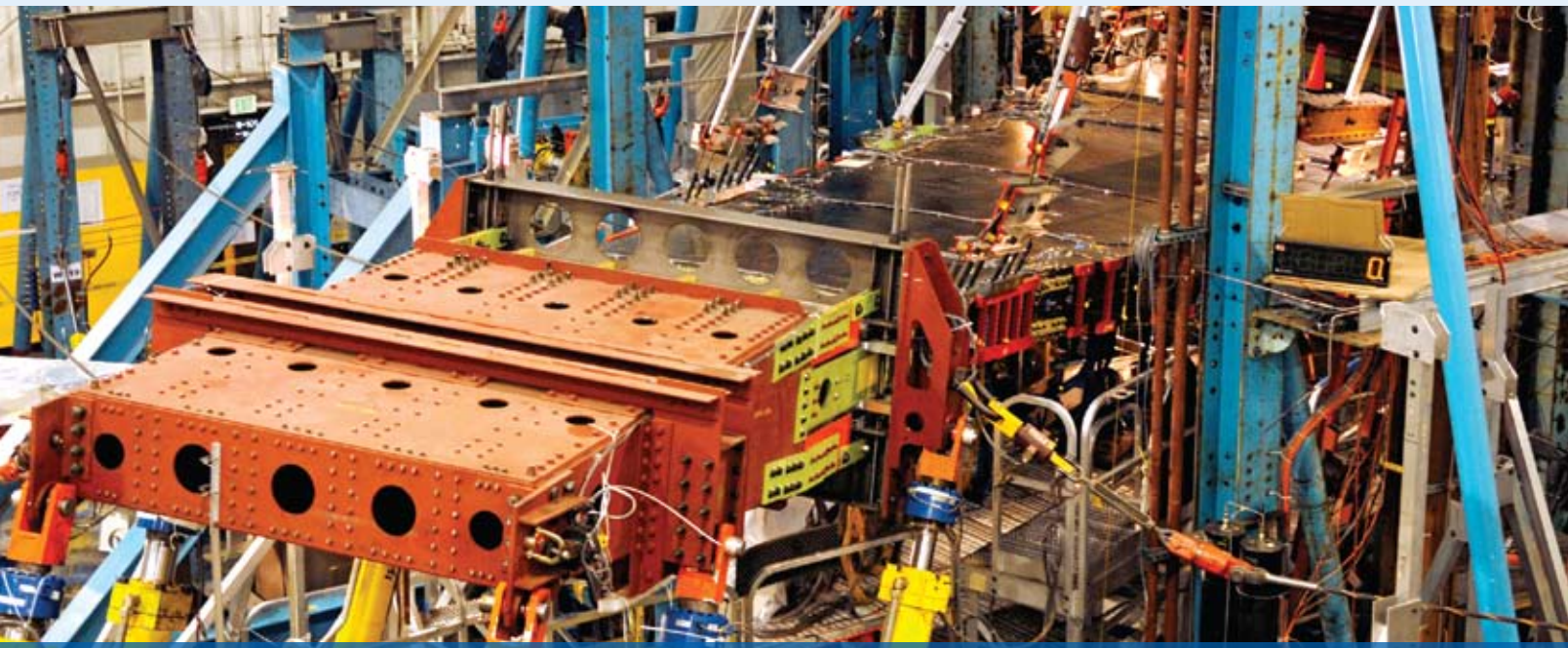
Visualization of Ad Hoc Network Nodes: David B. Manser

System and Method for Inducing a Pyrotechnic Type Shock Event and Pyrotechnic Shock Simulation System and Method: Chhour M. Thong, C.C. Lee

Efficient Software Interface for Automated Test Equipment: Hien D. Dam, William W. Moy, Kemper J. Eick

Window Average Statistics Model for Pointing Stability Jitter Analysis: Richard Y. Chiang

Spacecraft Low Tumble Linear Release System: Richard W. Aston, Michael J. Langmack, Torger J. Totusek



787 wing box passes test

Boeing completed destructive testing last month on a full-scale composite wing box of the 787 Dreamliner, the first Boeing all-composite wing box ever built. To meet certification requirements, the wings must withstand loads up to 150 percent of the highest aerodynamic load the jet could ever be expected to encounter. MONICA WEHRI/BOEING

BOEING SHANGHAI AVIATION SERVICES RECEIVES FAA CERTIFICATION

Boeing Shanghai Aviation Services Co., Ltd. (Boeing Shanghai) recently received its U.S. Federal Aviation Administration Repair Station Certification. The certification allows Boeing Shanghai to conduct operations under Part 145 of FAA regulations.

Initially, Boeing Shanghai is conducting heavy maintenance on Next-Generation 737 airplanes. There are more than 235 Next-Generation 737 airplanes flying in the East Asia region, with more than 260 on order. The facility also performs nondestructive testing and other maintenance services.

Future plans call for expansion into twin-aisle airplanes, beginning with the Boeing 767-300. The company, a joint venture between Boeing, Shanghai Airport Authorities and Shanghai Airlines, eventually will enter the passenger-to-freighter conversion business.

WORLDWIDE AIR FREIGHT TRAFFIC SET TO TRIPLE THROUGH 2027

Boeing expects world air cargo growth to expand 5.8 percent annually over the next two decades, with worldwide air freight traffic tripling through 2027, according to the newly released Boeing World Air Cargo Forecast 2008/2009.

Air cargo traffic will grow over the long term despite current near-term market weakness and worldwide economic uncertainty. “Our research tells us that long-term economic growth, freighter fleet renewal and moderating jet fuel prices will stimulate air cargo traffic growth,” said Randy Tinseth, vice president, Marketing for Commercial Airplanes. “These positive prospects will prevail despite the industry’s concerns about current economic challenges.”

Boeing predicts the world freighter fleet will increase to 3,890 airplanes from 1,950 during the 20-year period. Large freighters such as the Boeing 747 and 777 ultimately will represent 35 percent of the fleet, compared to 26 percent today, while providing 74 percent of total capacity. More than 75 percent of the 3,360 freighters joining the fleet—2,500 airplanes—will come from passenger-to-freighter modifications, while 860 will be new-production freighters.

To see the report, visit www.boeing.com/commercial/cargo.

CREATIVE SERVICES VIDEOGRAPHERS RECEIVE NATIONAL AWARDS

Shared Services Group’s Creative Services team was recognized in 2008 by two national organizations—The Telly Awards and The Communicator Awards—for excellence in video production.

In St. Louis, Tim Reinhart garnered two bronze Tellys, as well as an Award of Excellence and four Awards of Distinction from the Communicator Awards. Meanwhile, Bob Carrick captured a bronze Telly, a Communicator Award of Excellence and three Communicator Awards of Distinction.

In El Segundo, Calif., Alex Veloz took home a Silver Telly award, while Paul Fiamengo, John Painter and Steve Dexter each won a Bronze Telly. Each of these videographers also received Communicator Awards of Distinction.

Creative Services provides design, layout, photography, writing and editing support to *Boeing Frontiers*.

COMMUTING PROGRAM OFFERS TAX RELIEF, HELPS CUT TRAFFIC

Boeing now offers a pre-tax program for U.S.-based employees using eligible public transportation and vanpools. Through the program, employees can purchase eligible commuting credentials via payroll deduction. Boeing supplier WageWorks administers the purchases for employees registered for the pre-tax purchase program.

For more information, visit the Enterprise Commute site on the Boeing intranet at http://commuting.web.boeing.com/Enterprise.

FCS PLACES 8TH ON *TIME* MAGAZINE'S 2008 LIST OF 50 TOP INVENTIONS

The Future Combat Systems' Active Protection System (APS) earned a spot in *Time* magazine's Best Inventions of 2008. The Nov. 10 issue listed the APS in eighth place in the annual list of 50 top inventions.

The APS detects and destroys incoming rocket-propelled grenades and other short range threats, protecting Soldiers and their equipment. It was developed for FCS by Raytheon as part of the BAE Systems' Hit Avoidance System which will be employed on FCS Manned Ground Vehicles. The *Time* article likened the APS to "Star Wars for soldiers." This past summer the APS successfully detected, tracked and defeated rocket-propelled grenade threats during a series of design verification tests in Huntsville, Ala.

"APS is one of several active and passive protection measures in the Hit Avoidance System," said Joe May, program manager, MGV Hit Avoidance System. "Its development has been a true team effort by the U.S. Army, BAE, Raytheon and the Boeing/SAIC Lead Systems Integrator team."

35 BOEING HR PROFESSIONALS EARN 2008 EXCELLENCE AWARDS

Thirty-five Boeing Human Resources professionals received the company's 2008 HR Excellence Awards in late October.

"These awards call out the best among us—individuals and teams who set high expectations for themselves and others, inspire us by finding a way and deliver results that benefit the business," said Rick Stephens, senior vice president, HR and Administration.

The awards were presented in three categories recognizing leadership, service and functional excellence. More than 90 nominations were received for the newly revamped awards program.

Leadership Excellence Awards: This award recognizes the highest level of engagement within HR, based on their teams' exemplary employee survey scores.

- Joelle Denney, supporting Commercial Airplanes Sales and Marketing, Renton, Wash.
- Fran Plushner, supporting Contingent Labor Programs in Shared Services Group, Long Beach, Calif.
- Pat Ritz, from Boeing Employee Relations, supporting the eastern region, St. Louis
- Lorrie Smith, supporting Rotorcraft Systems in Integrated Defense Systems, Philadelphia

Functional Excellence Awards: This award recognizes the importance of functional excellence.

- Learning, Training and Development Virtual Classroom Team: Tom Adair, Tara Bluhm, Tyree Buchanan, John Farra, Janis Hilt, Roy Howell, Michael Hurley, Steven Jenks, James Johnson, Gregory Lusk, Kimberly Nordrum, Scheryl Schmidt, Robert Shultz, Jack Welsh
- Boeing Employee Survey Team: Jill Antonen, Maritza Avila, Jim Glickert, JoAnn Houlihan, Rick Siem, Frank Zemek
- Michael Richey, Learning, Training and Development Technical and Professional Development, Everett, Wash.

Service Excellence Awards: This award recognizes outstanding client service.

- Salary Management Team: Sandy Graf, Paula Kelly, Debra Pumala-Curry, Becky Romero, Jane Sykes
- Sandy Rufkahr, Phantom Works Human Resources, St. Louis
- Terry Wolf, Global Benefits, St. Louis
- Elaina LaVigne, Commercial Airplanes Fabrication Division Human Resources, Auburn, Wash.
- Julie Myers, IDS Space Exploration Division Human Resources, Pasadena, Texas
- Pamela Zednick, Disability Management, Everett, Wash.

This year, 35 Boeing Human Resources teammates received the organization's 2008 HR Excellence Awards. CAL ROMANESCHI/BOEING

Supply Chain Management

20/20 Vision Team

We're a Stage 4 Employee Involvement Team at the Global Services & Support site in San Antonio. Our job is to ensure parts are acquired and delivered to our program customers just in time. These programs are: KC-10 Contractor Logistics Support, KC-135 Programmed Depot Maintenance, KC-135 Global Air Traffic Management, C-17 Globemaster III Sustainment Partnership and the C-130 Avionics Modernization Program.

Our team tracks hundreds of supplies and parts ordered every month. Through customer feedback, we found that sometimes items were not getting into the hands of the mechanics in a timely manner. In some cases, they weren't received at all. While the system was working, we felt there was room for improvement, and we took the task on as our Employee Involvement (EI) team project.

Our team began reviewing the process for ordering and receiving supplies. Through a root-cause analysis, we quickly identified problems within the system.

We went to the warehouse where ordered inventory is held until paperwork is completed and the item released to the requestor. We found a backlog of items being held due to paperwork problems, part or serial number issues and receipt duplication. We knew it was important to get those items into the hands of the mechanics who needed them.

We collaborated with individuals from each of the programs, including the backshops, to identify the issues. We developed a process flow for all inventory orders, discussed and created a scrap policy, created a new Supply Discrepancy Reports procedure and sought Supplier Management approval to activate the new system. The new SDR system allows for the efficient tracking of each item, limiting nonconformance issues that prevent items from being delivered.

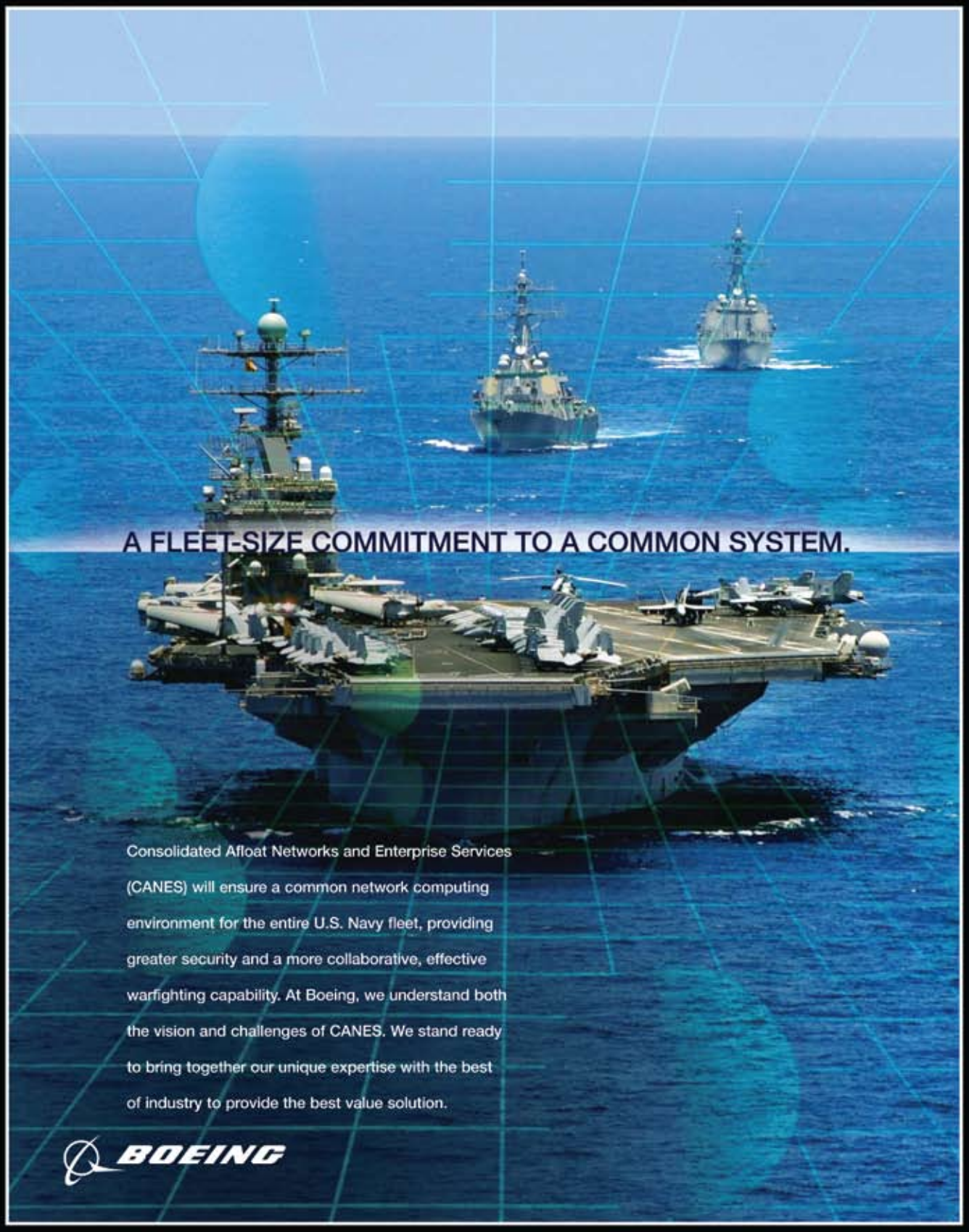
To date we have cleared more than 82 percent of the backlog items. This effort reflects an estimated cost avoidance of $1.2 million.

Everyone is very pleased with the results, which we could not have achieved without the support of every program on site. This was a tough task, yet we knew we could find a way to improve the process to benefit every aspect of the business—the mechanics, the suppliers and our customers. Our goal from the time we started the project was to ensure that the items needed to do the job would always be available.

As a Stage 4 EI Team, we are already working on our next continuous improvement project and seeking to mentor other teams.

From left: Becky Sanchez, Debbie Eng, Jason Kindschuh, Cynthia Paz (EI facilitator), Gary McDaniel, Kaylene Garza, Bob Zapata, Cheryl Holzum.

LANCE CHEUNG/BOEING



This new Integrated Defense Systems print ad supports Boeing's efforts to win Consolidated Afloat Networks and Enterprise Services (CANES), a fleet-wide effort by the U.S. Navy to bring a common network environment to about 300 ships. The ad highlights Boeing's commitment and expertise that will help make CANES a reality. Look for this ad in key military trade publications.

"Mt Fuji" is the fourth in a new series of advertisements reinforcing Boeing's partnership with Japan, a relationship that began more than 50 years ago. "Mt Fuji" highlights Boeing's collaboration with Kawasaki Heavy Industries on the production of the CH-47 Chinook. The ad currently is running in Japanese publications including Nikkei Business, WING, Nikkei Shimbun, President *and* Toyo Keizai.