



# Frontiers

[www.boeing.com/frontiers](http://www.boeing.com/frontiers)

NOVEMBER 2008 / Volume VII, Issue VII

## The right direction

Boeing-built GPS satellites help people avoid getting lost. Here's how this team found its way to meeting a production requirement.



MADE WITH JAPAN

世界が待ち望んでいた、より快適な空の旅の創造。  
その長年の夢が、ボーイングと東レのコラボレーションによって現実になりました。  
ボーイングの次世代旅客機、787ドリームライナー。  
翼や胴体など、機体重量の約50%に東レと共に開発した  
革新的素材、炭素繊維複合材を採用。  
金属に比べ、疲労に強く腐食しにくいこの夢の素材によって  
これまで軽いとされていた機内の気圧と湿度をより快適な状態に保ちます。  
しかも軽量で強度の高い新素材によって設計された機体は  
燃料効率を向上させ、より快適な長距離飛行を実現しました。  
ボーイング787ドリームライナー。  
世界の夢を形にするボーイングと日本企業のパートナーシップ。  
さあ、一緒にすごいです。

 **BOEING**

*"Temple Lake" is the first in a new series of advertisements reinforcing Boeing's partnership with Japan, a relationship that began more than 50 years ago. "Temple Lake" highlights Boeing's collaboration with Toray Industries on the composite materials used in the wing and fuselage of the 787 Dreamliner. The ad currently is running in Japanese publications including Nikkei Business, WING, Nikkei Shimbun, President and Toyo Kezai.*

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## THE WAY, FOUND

To meet a customer's high-volume production need, members of the Global Positioning System (GPS) IIF satellite team—which includes the employees shown above—tapped expertise from around Boeing, including programs at Integrated Defense Systems and Commercial Airplanes. Thanks to these contributions, the GPS team made improvements that not only helped it meet this production requirement—but also boosted productivity. **BOB FERGUSON AND DANA REIMER/BOEING**

## ON THE COVER

Model rendering: Leo Cronin; color, lighting and background: Linda Matsumoto; cover concept: Brandon Luong

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## YOUTH IS SERVED

Why is Boeing investing in community programs that support early-childhood learning? Because research is demonstrating the importance of laying a strong foundation in the early years of life—a foundation that can help pave the way to professional success.

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This NASA image of Hurricane Ike was taken from the International Space Station in September, two days before the massive storm made landfall in Texas. A Boeing response team worked diligently after the storm to bring the Boeing Houston facility, which sustained damage, back to working order. NASA

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### A real pick-me-up

In September, Hurricane Ike struck the United States' Gulf Coast. Among the regions sustaining storm damage was the Houston metropolitan area, home of a Boeing facility. Here's a look at what the site's recovery team did to get this location running again.

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### On special assignment

Earlier this year, Boeing communicator Randy Jackson traveled to Iraq as an embedded journalist to document the programs and people of Boeing in this theater of war. Here are some of the sights Jackson saw during his trip.

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### The power is on

To help meet its companywide environmental commitments, Boeing is transitioning its ground vehicle fleets to fuels that offer environmental benefits such as reduced emissions of carbon dioxide, the main greenhouse gas linked to climate change concerns.

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### No news is good news

It can be a challenge when a first-of-its-kind airplane moves down the assembly line. But thanks to efforts to incorporate best practices, this summer's assembly of the first-ever BBJ 3 went smoothly.

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This summer, sea trials for Boeing's new electronic attack aircraft, the EA-18G Growler, took place on the aircraft carrier USS *Dwight D. Eisenhower*. Here's an account of what it was like for Boeing employees on board the carrier supporting U.S. Navy personnel during the trials.

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Thanks to its Joint Warfare Integrated Systems Assessment system, Integrated Defense Systems can realistically simulate for customers the effects of performance improvements or new hardware on warfighting systems. The JWISA also gives Boeing insight on forthcoming customer needs.

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### A material issue

For seven years, suitcase-sized containers packed by Boeing's Gary Pippin have been circling the globe attached to the outside of the International Space Station. These containers, filled with samples of materials being exposed to space, are part of a collaborative research effort.

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## Meeting our challenges as one company

John Tracy  
Chief technology officer, Boeing  
Senior vice president, Engineering, Operations & Technology

**R**ecent economic events demonstrate that we live in challenging, unpredictable times—times that threaten the health of our global economy and the business institutions that support it.

To a significant extent, such events reflect a breakdown in business discipline and show how quickly resulting problems can spread through industry, the United States and the world. Everything we do in business today affects—and is affected by—global market conditions. Only those who learn how to operate in a strategic, disciplined and agile way will grow and prosper.

Boeing plans to grow and prosper. In fact, we plan to be the strongest, best and best integrated aerospace company in the world. And we plan to do this by operating more efficiently and effectively as one company. This is because our greatest strength lies in all of the tremendous talent, technology, production and business resources we have across the enterprise.

By integrating these resources, strengthening functional discipline and acting as one, we will be stronger than any competitor. We will be able to share our knowledge, technologies and data with greater efficiency and strategic effect, to quickly marshal and deploy our resources to meet any challenge, and to flawlessly execute our programs for our customers. But if we allow ourselves to remain divided by our different business cultures, geographic sites, systems, processes, training and more, then we will face each challenge as separate, weaker groups. We'll be unable to leverage the power and resources of others—and more likely to fail in the face of stronger competition and unpredictable events.

The drive to unify and strengthen our company by significantly reducing the amount of variation and complexity among the systems, processes and training used in our various functions today is no arbitrary exercise. Achieving this goal is essential to our long-term survival and therefore in the best interest of all concerned—employees, customers, investors and suppliers alike.

But achieving this goal is as challenging as it is essential. In the Engineering function alone, we had more than 6,500 systems and

10,300 documents—all reflecting the individual preferences of the function's different businesses, sites, programs and subdivisions.

We are significantly reducing these numbers in a way that does not disrupt the ongoing efforts of current programs, and ensuring that what we implement represents the most practical, efficient, effective and reliable solutions from an enterprise perspective.

In all Boeing functions, we have enterprise teams reviewing the multitude of systems, processes and training with a view to simplifying, standardizing and strengthening the function. This process, by the way, is playing an important role in helping employees across the enterprise see things from a broader perspective, and to appreciate that Boeing is greater than the sum of its parts and must deal with larger issues.

The candid discussions taking place in these teams also are helping build a more open culture, where diverse views are shared and respected, and the best decisions for the enterprise are accepted—even when they run against personal preferences. Such instances represent small but important steps toward working together for the good of our company as well as our own programs, functions or business units.

In addition to these integration efforts, enterprise functional teams are working together to better integrate and strengthen cross-functional efforts. The Enterprise Engineering function, for instance, is working with the Program Management, Operations and Supplier Management functions to clarify their respective roles, responsibilities and authority to eliminate conflicts, maximize the efficiency and effectiveness of their interaction, and ensure first-time quality results.

Our culture is beginning to evolve toward a more integrated, disciplined, one-company approach to more successfully compete globally, execute our programs and deal with challenges that may arise. We're still early in this drive toward functional excellence, but we are picking up momentum as more and more employees work together to address our larger challenges—and to ensure continuous growth and productivity improvements far into the future. ■

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# CALENDAR /

**Nov. 5–6:** 2nd Annual Aircraft Valuation & Investment Conference. Dublin, Ireland. See [www.aviationindustrygroup.com](http://www.aviationindustrygroup.com)

**Nov. 5–7:** SpeedNews 13th Annual Regional & Business Aviation Industry Suppliers Conference. Indian Wells, Calif. See [www.speednews.com/ConferenceInfo.aspx?conferenceID=23](http://www.speednews.com/ConferenceInfo.aspx?conferenceID=23)

**Nov. 17–20:** National Defense Industrial Association's 8th Annual CMMI Technology Conference and User Group. Denver. See [www.ndia.org](http://www.ndia.org)

**Nov. 19–20:** Aviation, the Environment & Emissions Trading Conference. Brussels, Belgium. See [www.aviationindustrygroup.com](http://www.aviationindustrygroup.com)

**Nov. 26–27:** 9th Annual Managing Aircraft Maintenance Costs Conference. Budapest, Hungary. See [www.aviationindustrygroup.com](http://www.aviationindustrygroup.com)

## 2009 /

**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](http://www.idex2009.com)

**March 10–15:** Australian International Airshow and Aerospace & Defence Exposition. Geelong, Australia. See [www.airshow.net.au](http://www.airshow.net.au)

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

**March 31–April 2:** Aircraft Interiors Expo. Hamburg, Germany. See [www.aircraftinteriors-expo.com](http://www.aircraftinteriors-expo.com)

**May 6–7:** Airline Purchasing Expo 2009. London. See [www.aviationindustrygroup.com](http://www.aviationindustrygroup.com)

**June 15–21:** Paris Air Show. Paris. See [www.paris-air-show.com](http://www.paris-air-show.com)

**July 20–23:** 19th Annual Symposium of the International Council on Systems Engineering. Singapore. See [www.incose.org/symp2009](http://www.incose.org/symp2009)

**Sept. 8–10:** Asian Aerospace 2009. Hong Kong. See [www.asianaerospace.com](http://www.asianaerospace.com)

**Nov. 15–19:** Dubai Airshow 2009. Dubai, United Arab Emirates. See <http://dubaiairshow.aero>.

## 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.

# SNAPSHOT /

## I can see clearly

U.S. Navy Aviation Machinist's Mate 3rd Class Kyle Alhers wipes off condensation formed on the canopy of an F/A-18C Hornet assigned to the "Fist of the Fleet" Strike Fighter Squadron (VFA) 25 aboard the Nimitz-class aircraft carrier USS *Ronald Reagan* (CVN 76). MASS COMMUNICATION SPECIALIST 3RD CLASS GARY PRILL/U.S. NAVY



# QUOTABLES /

**“Jobs in today’s global economy are created and sustained only through productivity improvements and customer-focused innovation.”**

—Jim McNerney, Boeing chairman, president and CEO, when discussing Boeing’s third-quarter financial performance, during an Oct. 22 conference call

**“It didn’t really take long to fall in love with this and realize its capabilities.”**

—Maj. Andreas Lavato of the U.S. Marines, an experienced military helicopter pilot serving in Iraq, on the Bell Boeing V-22 Osprey tiltrotor aircraft, in an Oct. 20 Associated Press report

**“You’re carrying more people and burning less fuel. That means less carbon going into the air.”**

—Jim Walsh, American Airlines’ managing director—environmental, on the airline replacing its MD-80 jets with new Boeing 737s, in the Oct. 21 *Fort Worth (Texas) Star-Telegram*. Compared to the MD-80s, the airline says the new 737s generate about 25 percent fewer emissions per seat for each hour of flight and are 35 percent more efficient.

## IAM PROMOTIONS

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

## 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](mailto:ethicsline.ethics@boeing.com); Web site: <http://ethics.whq.boeing.com>

# Ace in the hole

The Minuteman program, the largest and longest running program in Boeing history, celebrates its golden anniversary

Test launches of the Minuteman missile took place at Cape Canaveral, Fla., as shown in the two launch photos here. This year marks the 50th anniversary of the Minuteman program.

BOEING ARCHIVES



By Michael Lombardi

**T**he defense of colonial America depended on an elite militia that could be counted on at a moment's notice to take up their muskets and protect their towns and villages. They were the "Minutemen."

During the Cold War, the defense of the United States again required an elite force that could be called upon at a moment's notice. While the mission was the same, the realities of modern warfare and advances in military technology made it necessary that the new Minuteman be a nuclear-armed ballistic missile. A Boeing-led team of defense industry partners worked to create and sustain the Minuteman, a program that marks its 50th anniversary this year and still serves a vital role in defending freedom.

In the early days of the Cold War, the United States concentrated its research and development efforts on aviation and nuclear weapons. The resulting leadership in these technologies gave America a military edge over the Soviet Union and created a deterrent to potential aggression.

That edge gradually eroded starting in 1955, when the Soviet Union successfully tested a hydrogen bomb. Over the next two years, that nation proceeded to surpass the United States in rocket technology. This became alarmingly clear to the American public when the Soviets launched Sputnik 1, the world's first sat-



ellite, in October 1957. The successful test of the hydrogen bomb coupled with the ability to put a satellite into orbit meant that the Soviet Union, in theory, could attack the United States with intercontinental ballistic missiles, a weapon for which there was no defense—other than the threat of nuclear response. The danger was so stark that it was considered a national emergency.

The United States made development of a reliable, rapid response, ballistic missile the highest priority. On Feb. 27, 1958, the U.S. Air Force received approval from the Department of Defense to begin research and development on the new missile, designated Weapon System 133-A and called the “Minuteman.”

The design of the Minuteman called for a three-stage, solid-fuel missile that was to be extremely reliable, quick to launch, have a high capability for survival, maximum simplicity, and be able to remain on alert in its silo round-the-clock for many years.

In October 1958, the Air Force announced its selection of Boeing as the assembly and test contractor for the Minuteman missile. This began one of the most complex, largest and longest running programs in Boeing history. At its peak, it would employ 39,700 people located at Boeing sites in Seattle and at the missile final assembly site in Ogden, Utah.

Thornton “T” Wilson, Boeing’s initial Minuteman program manager and, later, company chairman, said of Boeing’s role in the program: “We were involved in some complicated systems management tasks, where detailed planning, schedule discipline and safety were all important and had to be integrated and relied on in the program.”

To build, test and deploy the missiles, Boeing teamed with nine other contractors, including North American Aviation’s Autonetics Division in Anaheim, Calif. Autonetics, a pioneer of inertial guidance, was selected to develop the guidance and control systems for Minuteman. At the program’s height, nearly 30,000 employees were working on the design and manufacture of the precision inertial guidance system that gives Minuteman its incredible accuracy. (In 1996, Autonetics joined Boeing when Boeing acquired Rockwell International’s aerospace and defense businesses.)

The first launch of a Minuteman took place at Cape Canaveral, Fla., on Feb. 1, 1961, and within a month construction began on the first base for the missile. On Nov. 17, 1961, the first successful launch from a silo occurred, and one year later Initial Operational Capability was achieved.

The first operational Minuteman site was Malmstrom Air Force Base, Mont., where the first 10-missile “flight” was rushed into activation on Oct. 27, 1962, at the height of the Cuban Missile Crisis. U.S. President John F. Kennedy referred to the missiles as his “ace in the hole” during this historic standoff with the Soviet Union. Within five years, 1,000 missiles were operational in six wings based in Montana, Missouri, North Dakota, South Dakota and Wyoming.

In 1975, a modernized Minuteman force was stabilized at 450 Minuteman II and 550

Minuteman III missiles, with the last Minuteman III delivered from Ogden on Nov. 30, 1978. In all, Boeing had deployed 150 Minuteman IA, 650 Minuteman IB, 500 Minuteman II, and 550 Minuteman III missiles.

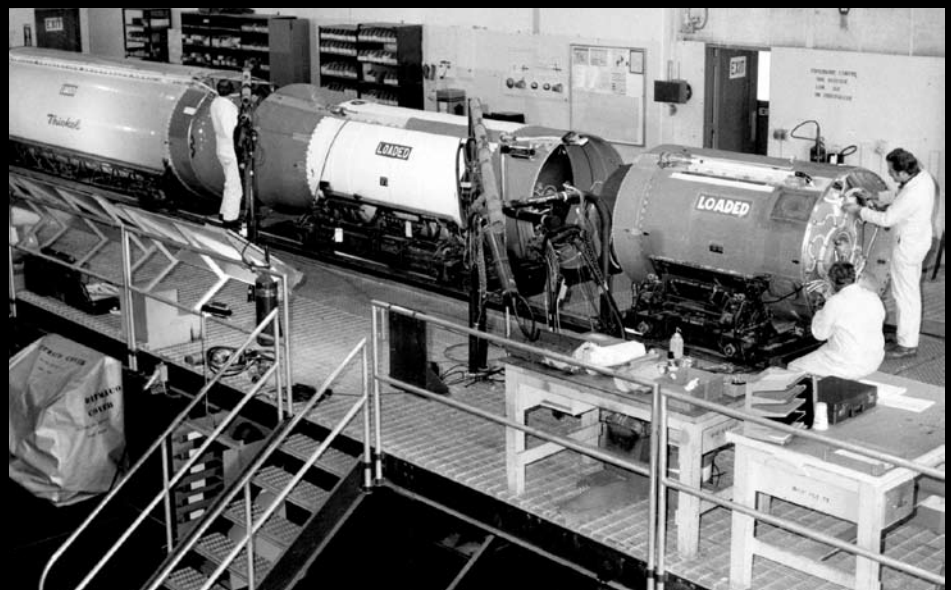
Today, 450 Minuteman III missiles continue to serve America as part of the United States Strategic Command that also includes the U.S. Navy’s Ohio-class ballistic missile submarines and Air Force B-2 and B-52 bombers. Boeing employees at Anaheim and Ogden continue to provide support, sustainment, testing, training and upgrades for Minuteman, including work on guidance, flight controls and the ground system. The largest upgrade is the Minuteman III Guidance Replacement Program. This highly successful program, scheduled to wrap up next month, extends the service life of the Minuteman’s guidance system to beyond 2020. Other Minuteman work at Boeing includes depot level repair of Minuteman III inertial guidance systems at the Boeing Guidance Repair Center in Heath, Ohio.

The Minuteman program was highly successful and established Boeing as a leader in large-scale system integration. Because of this, Boeing would be called upon by NASA to perform a similar function for the Apollo/Saturn program, directly contributing to the success of that program. Boeing’s competency in large-scale system integration was key to subsequent wins of major programs such as Ground-based Missile Defense and Future Combat Systems.

The Boeing leadership in managing complex programs and customer focus that made Minuteman a success is still evident on that program today. In a recent surprise audit by the Defense Department, the Boeing ICBM Systems program received a perfect 100 percent grade.

“After 50 years, that is remarkable,” said Peggy Morse, director of Boeing Strategic Missile Systems. “It shows how we pride ourselves on meeting the warfighter’s needs everyday with 100 percent accountability.” ■

*michael.j.lombardi@boeing.com*



**The Minuteman missile’s final assembly site was in Ogden, Utah. By the time the last Minuteman was delivered in 1978, Boeing had deployed more than 1,800 missiles. BOEING ARCHIVES**

# A life, returned

How taking the Mayo Clinic Health Assessment helped an employee spot and fight cancer

Last fall, Cathey Nemish read about the \$50 incentive she could receive by completing the Mayo Clinic Health Assessment on [www.BoeingWellness.com](http://www.BoeingWellness.com). Seeing the gift card as a potential Christmas present, Nemish, a St. Louis-based member of Computing and Network Operations' Customer Engagement team, tried to complete the assessment. "I quickly discovered that I couldn't provide answers to the questions since it had been so long since my last physical," she said.

Still motivated by the gift card, Nemish scheduled a physical exam that led her doctor to recommend a follow-up test. She then received a call from her doctor's nurse requesting that she come into the office to discuss her results.

"I was very busy with work that day and somewhat frustrated by the need to go in. At age 55, I had been blessed with almost perfect health. I was taking no medications and had no known health issues," Nemish said.

That afternoon, Nemish and her husband met with her internist. "She reviewed the report from the radiologist. She began with, 'Cathey, you have advanced ovarian cancer,'" Nemish recalled. "We were shocked, since I had experienced no symptoms to date, except a little stomach pouch, which I had written off to being 55 and not exercising."

Within the following 24 hours Nemish saw two oncology gynecology surgeons. "The story was the same: surgery to remove the masses and extensive surgery involving several organs," Nemish explained. Both surgeons were surprised Nemish wasn't experiencing any symptoms.

"The surgeons both agreed that it was a miracle that I had discovered the cancer when I did," Nemish said. "I wasn't even experiencing nausea, had a wonderful appetite and was living a normal life in all respects."

The surgeon who performed the surgery said Nemish was fortunate to discover the problem when she did. Just a few months longer could have made it much more difficult, if not impossible, to address.

After surgery, Nemish began aggressive chemotherapy treatment for several months, rearranging her work schedule to accommodate treatments.

Today, Nemish's blood tests fall within the normal range and her latest CT scan was clear. She will receive monthly maintenance doses of chemotherapy over the next year and is now participating in a study being conducted by Washington University Medical School looking for an alternative and improved marker for identifying ovarian cancer.



**Cathey Nemish was diagnosed last year with ovarian cancer and has successfully undergone chemotherapy treatment. She said the Mayo Clinic Health Assessment helped lead to her diagnosis.**

RON BOOKOUT/BOEING

"As a result of this study, someday our daughters and loved ones could become aware they have ovarian cancer cells earlier than when most people find out today," she said.

Nemish said she's very grateful that her cancer was diagnosed when it was.

"I have an absolutely wonderful outcome. I have a chance," she said. "The bottom line is I would never have gone in for a physical, since I had no reason to believe I had any issues, had it not been for the \$50 gift card and the BoeingWellness newsletter that came to our home and was laying on my kitchen table that November day to remind me of the campaign.

"I will always be indebted," she added. "I received the chance to fight for my life. I have nothing but blue skies ahead. Boeing gave me back my life."

To take the Health Assessment, visit [www.BoeingWellness.com](http://www.BoeingWellness.com). This site also has information on topics relating to wellness, chronic conditions and other health-related matters. ■

## Health Assessment supports well-being of Boeing employees

How healthy are you? Take the Mayo Clinic Health Assessment at [www.BoeingWellness.com](http://www.BoeingWellness.com) and find out. Plus, receive a \$50 gift card when you take the Health Assessment by Nov. 30.

The Health Assessment offers you an excellent opportunity to assess your health and identify ways you can make healthy lifestyle changes. Or, you may find that you're right on track.

When you take the Health Assessment, you receive:

- A tailored health action plan.
- Tools and resources to manage your health.
- Free healthy lifestyle coaching.
- A \$50 gift card (if you complete the assessment by Nov. 30).

The gift card is redeemable at more than 300 merchants in the United States. Or, instead of receiving the \$50 gift card, eligible individuals can make a charitable donation, including donations to health-related charities.

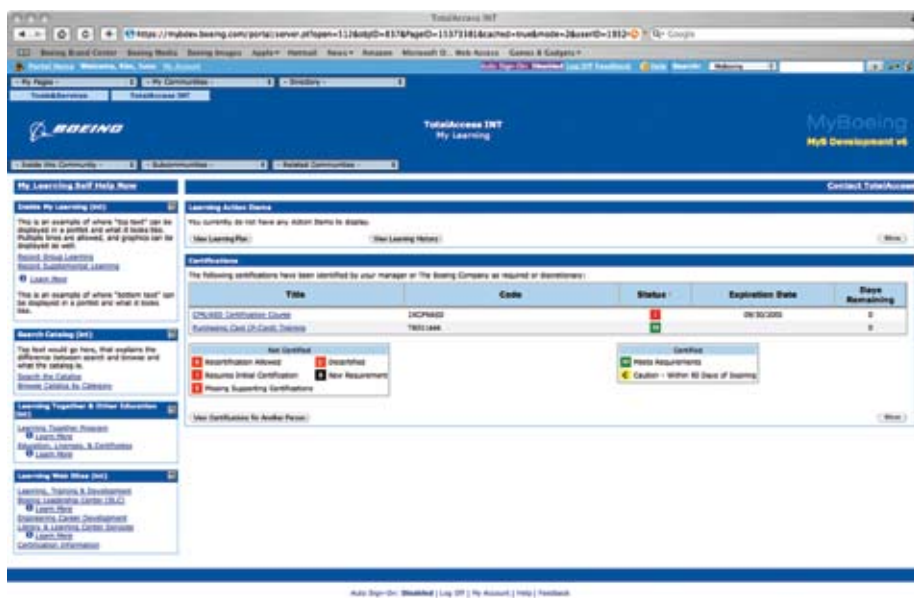
If your Health Assessment results show you need help losing or maintaining weight, managing stress, eating better or getting physically active, you can receive six months of free healthy lifestyle coaching from experts at the Mayo Clinic.

In addition, after completing the confidential Health Assessment, you can learn about the health management tools and resources that Boeing offers and receive a tailored action plan identifying your personal health profile. If you participated in the recent optional Boeing wellness screening at your worksite, have on hand your results when you complete the assessment; this will help ensure a more complete and personalized health profile.

If you're a Boeing employee—or the spouse or same-gender domestic partner of one and are enrolled in a Boeing health plan—you're eligible for the assessment and the gift card. For more information, including details about assessment eligibility (including for employees of U.S.-based Boeing subsidiaries), the gift card and the coaching, visit [www.BoeingWellness.com](http://www.BoeingWellness.com).

# Training on demand

## My Learning on TotalAccess goes live in January



**The new “My Learning” system on TotalAccess will be the one-stop resource for learning, training, development and certification requirements. Above is a sample screen shot of the site, which goes live in January.**

Employees, business partners, suppliers, contractors and others with a Boeing-issued BEMS ID soon will have a new way to access and manage all of their training and certification requirements.

Starting Jan. 2, 2009, the new “My Learning” system on TotalAccess will be the one-stop resource for learning, training, development and certification requirements. The simple, streamlined tool consolidates more than 27 platforms and replaces legacy systems including Training Tracker and Training Server.

“This new system is a game changer for employees and business partners who need to stay up to date with real-time information on their training and certification requirements,” said Bill Epstein, My Learning program manager. “It simplifies access to learning and training data, delivers training updates on demand, improves visibility into current and future requirements, and streamlines records and reporting management.”

The new system is the result of extensive collaboration and partnership between Boeing business units, functions and support groups across the company to build a system that meets the needs of all users.

Visit <http://mylearning.web.boeing.com> on the Boeing intranet for the latest information on the My Learning project. This site also offers resources such as Five-Minute Trainers and answers to frequently asked questions.



Patrice Dupass, GPS IIF Electrical Power Sub-system lead, holds a GPS receiver in front of a GPS IIF satellite at the Boeing satellite factory in El Segundo, Calif. At this location, 12 GPS satellites are being built on a pulse line. Next to the satellite are Cliff Davis (standing), integration lead, and Victor Visessonchok, test engineer.

PHOTO: BOB FERGUSON AND DANA REIMER/BOEING  
GPS RECEIVER ILLUSTRATION: BRANDON LUONG/BOEING

# They found the way

How the ‘Never Lost’ team helped Boeing’s satellite team implement ideas from around the company—and meet the demanding production requirements of a GPS spacecraft contract

By Dave Garlick

**T**he charge was to build 12 Global Positioning System (GPS) IIF satellites—incorporating the newest GPS technology and capability—for the U.S. Air Force. Build them on time and on budget; deliver all 12 spacecraft within a 36-month time frame and make sure each one works perfectly.

The hard part wasn’t building the satellites. It was the number 12 that posed a challenge to Integrated Defense Systems’ satellite division. “The going wisdom has been to build satellites in twos or threes like a craft shop, so we were forced to think way outside the box and not be afraid to try new things,” said Dave Kadota, GPS manufacturing engineer and part of a 12-person team charged with figuring out the solution.

The GPS Assembly Integration and Test team met the challenge by asking a question: Why not apply to satellite manufacturing the process Boeing has used in building aircraft—the pulse line? After all, it’s helped improve productivity in programs at both IDS and Commercial Airplanes. The team knew part of that solution would be to change an entire building culture. “It was a little like asking the people who hand-build Lamborghinis to start churning them out on an assembly line like Corvettes. That wasn’t going to happen overnight,” Kadota said. The team persisted and the idea was hashed out, researched and presented to GPS program director John Duddy who enthusiastically endorsed it.

“We—as well as the Air Force—were really excited about applying the pulse line to spacecraft,” he said. Among the improvements it created: It cut the travel distance of a space vehicle in the factory by 2,000 feet (610 meters).” In the satellite building, that’s a big deal because moving a precisely engineered satellite requires painstaking planning and flawless execution. A pulse-line configuration clears obstacles and makes much of the movement easier and safer. Creating a visual factory flow also provides a strong psychological boost to the team because they can see the final product as it moves, step by step, closer to the door.

In addition, the pulse line, which has been in operation since July, enables:

- A predictable workload and level production
- Reduction of work in progress, flow, touch time and defects

- Quicker responses to abnormalities
- Improved communications
- Optimization of resources.

In other words, by being willing to tap expertise from around Boeing, the GPS team made improvements that not only helped it meet a customer’s high-volume need—but also boosted productivity. In fact, by the time the last of these satellites are built, the team anticipates an estimated 40 percent decrease in number of days needed to complete building the spacecraft, along with an estimated 30 percent drop in costs.

“The benefit of being part of a large diverse organization like Boeing,” Kadota said, “is that there are so many ideas and resources across the board that can be shared. In our case, we borrowed and gave thanks to those who lent.”

Over time, all Boeing’s satellite production lines will adopt pulse line manufacturing, but the GPS program is considered optimal for introducing the process. “With 12 satellites on order, the GPS program is ideal for a manufacturing pulse line because similar satellites can easily adapt to a process that mirrors mass production,” said Craig Cooning, vice president and general manager, Space & Intelligence Systems.

## PULSE LINE, DEFINED

So, what exactly is a pulse line? A pulse line is really a modification of the traditional assembly line. But instead of the satellite actually moving down a conveyor belt, it is moved from one work area to the next in a steady rhythm, like a pulse.

The pulse line is far more efficient than the older style of satellite construction which was more like a craftperson’s shop, which simply utilizes factory floor space as it becomes available. The pulse line divides the available space into work areas. The speed the satellite is moved, or “pulsed” from one work area to the next, depends on the work performed in one or two work areas critical to every satellite. Engineers know this work will take a certain amount of time, equipment and support, so the satellite only pulses forward when the work in that critical cell is done. This way, the satellite is “pulled” into the next work area instead of be-

*(Continued on Page 15)*

# Finding yourself is quite simple

GPS might seem complicated, but it's rooted in elementary trig principles

The GPS receiver is becoming another one of those gadgets we can't live without. The relatively small device has all but replaced the tried-and-true street map to help us get from point A to point B. But how does it do this? The concept behind GPS—made possible by the process of elimination and a little trigonometry—is powerful, but really very simple.

To understand GPS technology, you have to start with the concept of 2-D. Think of it as a flat plane that only has the dimensions of depth and width.

Imagine you are somewhere in the United States—lost. You ask a friendly fellow where you are. He says, “You are 1,066 miles (1,715 kilometers) from Seattle.” That's a start, but not entirely useful. You could be anywhere on a circle around Seattle (except in the Pacific Ocean) that has a radius of 1,066 miles.

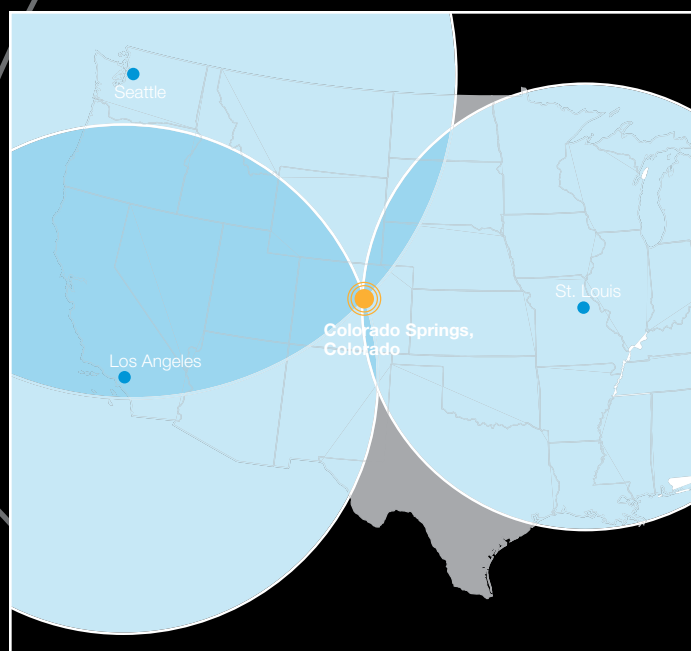
So you ask the same thing of the next person you see. She says, “You are 828 miles (1,333 km) from Los Angeles.” That helps a little more, because now you can combine this information with the Seattle information and come up with two circles that intersect at two points (that's the trigonometry part). You know you are at one of those two points.

The next person you talk to says, “You are 772 miles (1,242 km) from St. Louis.” Aha! Now you have enough information to eliminate one of the two earlier possibilities, because three circles can only intersect at one point. You now know you're in Colorado Springs, Colo. (See map above)

Now that there's no spot on any flat surface you can't find, let's add another dimension: height, or altitude. This same concept works in three-dimensional space—meaning that we're taking into account not only your location but also your elevation. This time, you are using spheres instead of circles, and GPS satellites instead of pen and paper.

A GPS receiver uses radio signals from the satellites orbiting above you to find your location on Earth. Think of the GPS satellite as the center of an imaginary sphere. You are at the other end of a radius line X number of miles away on the outside of that sphere. Your exact location will be where three or more spheres intersect. Here's how that works.

Let's say you're trying to find out where you are after a hike into the wilderness. You pull out your trusty GPS receiver and turn it on. The receiver calculates the distance between itself and at least three GPS satellites, based on the speed of light (186,000 miles per second or 300,000 kilometers per second) and the distance the signal traveled (determined by the time it took the



signal to arrive from the satellite). The receiver crunches all those numbers and finds that it is a certain number of miles away on the surface of an imaginary sphere around that satellite.

Now the receiver locates another satellite and does the same calculation. When two spheres intersect they form a circle, and the receiver knows it can only be located somewhere on that imaginary ring that forms where two spheres intersect.

By connecting with a third GPS satellite, the receiver can now narrow down its possible position to just two points, one in space and one on Earth. Indeed, the receiver thinks of Earth (including its atmosphere) as a fourth sphere, and since the trigonometry-savvy GPS device knows that four spheres can only intersect at one point, your position—and altitude—can now be determined.

It sounds simple. But don't forget that along with Earth rotating on its axis, the satellites are in constant motion in their orbits.

For the sake of accuracy, most GPS receivers generally try to find four or more satellites to improve accuracy and provide more precise altitude information. Commercial GPS signals are accurate enough for you to pinpoint your location within 3 meters, which is enough for most of us to find ourselves. The military can obtain much more accurate positioning.

—Dave Garlick

ing “pushed” forward by the next satellite coming up behind it.

Tracy O’Leary works in production control, which means she’s responsible for getting the right parts to the right people working on the right spacecraft and at the right time. She said in her 25 years at the satellite factory, this is the first time all the pieces required for a pulse line have been put into place.

“We have been putting some Lean elements into practice on a smaller scale—for instance, keeping parts near the spacecraft so technicians wouldn’t have to hunt for them. But everything really came together with GPS, and now we can take full advantage of that efficiency,” she said.

The pulse line is organized like a surgical ward, to ensure all tools, supplies and equipment are available exactly where they’re needed and when. “Surgeons—and satellite assemblers—don’t want to run around fetching things,” said Kadota. “We set up the line so that everything needed at a particular work area is right there within reach.”

To ensure information flow, each cell has a scoreboard that shows who’s working on the spacecraft, what work has been completed, what needs to be done, how long it will take and how things are going.

The decision about what information goes on the scoreboard is a collaborative effort. “What happens more often than not is that managers think they know what technicians need or like to see, but they don’t always get it right,” said Kadota. “We’ve tried to be mindful of what is important to the people on the floor.”

The GPS team has until November 2011 to deliver all 12 satellites. If they are late, the expense could be substantial. “That’s

**Dave Kadota, a manufacturing engineer, helped find a way to build 12 GPS satellites on a pulse line and start a culture change along the way.**

JOSEPH ORSILLO/BOEING



**“The benefit of being part of a large diverse organization like Boeing is that there are so many ideas and resources across the board that can be shared. In our case, we borrowed and gave thanks to those who lent.”**

—Dave Kadota, GPS manufacturing engineer

motivation!” said Larry Souverielle, deputy program manager for GPS IIF. “Everyone, from upper managers to floor technicians, is looking for ways to improve the build process.”

According to Souverielle, by the time teammates get to the last satellite, they should be able to build it in about 247 days—much less than the 426 days if done conventionally. And the existing process has costs that are 30 percent higher than the new way. “I think we’ll do better than the plan, which in itself is great progress,” he said.

As exciting as all of this is, the GPS team realizes none of it is novel. Many of these ideas come from Lean processes implemented in manufacturing lines at Commercial Airplanes, as well as Integrated Defense Systems’ C-17 airlifter.

### NEVER LOST TEAM GETS IN GEAR

There’s a 20-person Employee Involvement team in El Segundo, Calif., made up of production control experts, industrial and vehicle engineers, technicians and quality control people. They call themselves the GPS Never Lost EI team.

Their mission: Put together a world-class pulse line for Boeing’s satellite factory in that city. That’s exactly what they did—and in the process, they literally changed the future of satellite manufacturing at Boeing.

With an open mind and a willingness to learn and adapt, they set out on field trips to two Boeing locations that have successfully implemented a pulse line: Long Beach, Calif., where the C-17 is manufactured; and Renton, Wash., home of the 737 production line.

“We had never built satellites on a pulse line, so we were open to learn from teammates across Boeing who’ve been through the process,” said Rebecca Taylor, the team’s facilitator. “And the cooperation we got was phenomenal. Just an incredible willingness to share success stories.”

First stop: Long Beach, where the C-17 aircraft has been assembled using a pulse line system and deriving significant benefits from Lean improvements since 1998. While there are definite differences between building a gargantuan airlifter and building an SUV-sized GPS satellite, the team saw where it could borrow

(Continued on Page 16)

ideas and best practices.

"It really slows things down if people working the floor have to leave their work area to search for a part, resolve an issue or get support," Taylor said. "So, the C-17 factory's work-cell structure and the surgical ward approach were things we knew we'd use."

Alan Worrell, a Lean manufacturing manager at C-17, said EI teams from across Boeing come to C-17 to see Lean principles in action. He and his group always impress on them that team integration is the key.

"Everything begins with the EI team. Every step has to start and be deployed through the employees. Their interest, their activity and their involvement is at the heart of Lean, and none of this works without it," he said.

Next stop for the Never Lost team: the 737 production line in Renton.

The 737 line is used as a model—to Lean practitioners across Boeing and other companies—of how manufacturing should be done. There, they met Renee Leach, 737 industrial engineering and Lean manager. She and her group are charged with showing Boeing teams as well as outsiders how the ultra-Lean 737 factory has reinvented itself.

Leach stressed to the satellite EI team how critical it is for them, once they learn Lean principles, to take that knowledge and figure out how to make it work in specific applications. Accordingly, the team snatched up, among other things, the factory's scoreboard idea—that is, showing on an actual scoreboard all the vital information technicians need to know about the platform they're assembling.

"We saw right away that we could emulate their scoreboard," said Phil Kozel, manufacturing engineer and Never Lost team member. "There are some similarities between building satellites and building a plane, for instance, both require a lot of processes happening all at once. Seeing how the other organizations work made me appreciate how much transferrable knowledge there is at Boeing."

The EI team returned to El Segundo, armed with these and other Lean concepts and ideas. They shared what they learned with teammates, and today, in the satellite factory, GPS satellites are beginning to be assembled on a pulse line similar to what's



**Two Boeing technicians study the second of 12 GPS IIF satellites. Soon, these 12 spacecraft will be part of the 32-satellite GPS constellation.**

BOB FERGUSON AND DANA REIMER/BOEING

been integrated so successfully in other parts of Boeing.

How do the C-17 and 737 teams feel about sharing what's worked for them? "We're one company. It's important to share our successes," said Leach. "We've enjoyed a measure of success here in Renton, but we also know the journey's long and we're not at the end. We love to share, and at the same time, we're continually learning." ■

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# The biggest GPS story you never heard

In 2007, a Boeing team supported the Air Force in a successful upgrade of a computer system. No one noticed the transition—and that's a good thing.

To most people, Sept. 14, 2007, was just another workday. But had things gone awry for a Boeing team supporting the GPS system, it could have been Black Friday all over again.

On that day, a Boeing team in conjunction with the U.S. Air Force transitioned the on-orbit GPS system from one legacy ground control computer system to an upgraded system. And they did it live.

But the day came and went without notice. And that was good.

About 40 people on the GPS transition support team fanned out across the world to places like Hawaii, the Kwajalein Atoll in the Pacific Ocean; Diego Garcia in the Indian Ocean; Ascension Island in the Atlantic Ocean; Cape Canaveral, Fla.; and Colorado Springs, Colo.

Then, in phases over the course of that evening and the next day, the team began to move command and control from the mainframe-style computer system that had been running GPS since the 1980s, onto a new and upgraded Unix-based system and a Windows-based system.

If the team wasn't successful in this task, there would have been numerous prob-

lems, since GPS is so deeply entrenched in our lives. It's the foundation for how we do our banking and make our purchases. It's used by soldiers on the ground every day. It's attached to ground vehicles, helicopters, fighters, aerial tankers, bombers and ships. It has become routine on commercial airliners, cruise ships and cars. It even monitors the earth's fault lines.

But on that day, the system worked as usual—thanks to the Boeing/Air Force team responsible for the successful transition.

Despite the smooth transition, those who were part of the operation will tell you that the task was anything but easy: "It was like changing the engines on

two truckloads of dynamite going down the road at 80 miles per hour," said Leland Horn, GPS sustainment manager.

However, Horn said he wasn't surprised things went well. "We had a sound plan, five years of planning and preparation, numerous tests and dry-runs to be sure it would work," he said.

—Dave Garlick



In this 2007 image, U.S. Air Force Tech. Sgt. Dana Ammend, a space systems operator with the 19th Space Operations Squadron at Schriever Air Force Base, Colo., uploads navigation and timing data to GPS satellites using the Architecture Evolution Plan system.

STAFF SGT. DON BRANUM/U.S. AIR FORCE

## GPS may get boost from Iridium

While the GPS system itself continues to be upgraded, Boeing is also working on developing potential enhancements by pairing GPS with the Iridium low Earth orbit communications satellite constellation.

Under a \$153 million contract the U.S. Navy awarded this summer, Boeing will work to demonstrate technologies of the system known as High Integrity GPS. The Iridium satellite system is currently operated by Boeing Service Company, a fully-

owned subsidiary of Integrated Defense Systems.

"Our research concluded that significant low-cost improvements to GPS can be achieved by using existing signal platforms and systems such as the Iridium constellation," said Dave Whelan, IDS Advanced Systems chief scientist.

The system also is believed to have the potential of increasing access to location signals in areas where GPS signals may

be weak or unavailable. Work on the contract is expected to run through 2010.

The system and technology originally was created and developed within Boeing Phantom Works and transitioned to IDS Advanced Systems at the end of 2007. "This is a great example of a team working across Boeing to potentially bring new, important capabilities to our customer," Whelan said.

—Marc Sklar

# Back on its feet

Insurance industry estimates for damage Hurricane Ike caused in areas along the U.S. Gulf Coast, such as Seabrook, Texas (above), ran up to \$50 billion. The storm's eye passed over the Boeing facility in Houston. GETTY IMAGES

Hurricane Ike shut down Boeing's Houston facility for 12 days. Here's what the site's 'rideout team' did to get the location ready for business.



By Adam Morgan

On Sept. 13, Hurricane Ike, a massive storm with winds of 110 mph (177 kph), made landfall near Galveston, Texas—just 30 miles south of Boeing's Houston site. The eye of the storm passed directly over the Boeing site and NASA's Johnson Space Center.

More than 2 million residents in southeast Texas were without power in the days following Ike, which packed hurricane-force winds extending more than 100 miles (160 kilometers) from the eye of the storm. Estimates for losses caused by Ike run up to \$50 billion.

The Houston area is just now beginning to return to a state of normality. Among the entities getting back on their feet: the Boeing site, where approximately 2,200 people work. That recovery is a testament to the efforts of the facility's response team, which faced obstacles from a lack of fuel to a late-in-the-game caution about possible water contamination.

"Our team on the ground was able to bring the site to a safe and operational status in under a week and a half, while also dealing with the stress and worry of their own personal property," said Paul Diggins, director of Operations and the Houston site.

## FIRST RESPONDERS

The Houston site suspended operations Sept. 11-22 to adhere to mandatory evacuations and allow employees time to prepare for Ike and get their homes back together after the storm.

A small group of employees dubbed "the rideout team" worked behind the scenes to ensure the site was safe to return to work. The team, led by Richard Rivas (Facilities and Maintenance Operations manager) and Scott Van Dusen (Boeing Fire Protection Multi-Ops specialist), faced several challenges on their way to initially assess site damage: They had to get past large, downed trees blocking city streets and major floods in several areas, including directly in front of the headquarters building for the Boeing Space Exploration business.

"It was a little surreal to drive to the site immediately after the storm," said Van Dusen, incident commander for the recovery team. "It looked like a war zone. There were large trees blocking

**PHOTOS:** Left: Hurricane Ike's storm surge caused flooding at the home of Boeing employee Anita Gale; the water shown is about 6-to-10 feet (1.8-to-3 meters) above normal level. ANITA GALE/BOEING Center: This area just outside Boeing Houston's building 91-51, where employees take work breaks, was riddled with storm debris. PATRICK ARMSTRONG/BOEING Right: The Kemah boardwalk, near the Houston site, sustained damage and flooding.

**"Our team on the ground was able to bring the site to a safe and operational status in under a week and a half, while also dealing with the stress and worry of their own personal property."**

—Paul Diggins, director of Operations, Houston

the road, water everywhere, damaged houses and buildings, and no power anywhere."

Indeed, Van Dusen said he used his truck's winch to pull trees off the road, just so he could get to the site.

Since the area was under mandatory evacuation, Van Dusen and Rivas were among the first to reach the Boeing facility after the storm, using their first-responder badges to clear security checkpoints. Upon arrival, they met with a security team led by Pinkerton Government Security, whose members staffed the Security Control Center and maintained communications with the Enterprise Crisis Management Center for the duration of the storm.

The team's first priority was to inspect the structural integrity of the office buildings. Structurally, the buildings suffered little damage; the worst was a 16-foot split (4.9 meters) in the roof of Tower II, home to a large number of Space Shuttle employees.

Once the buildings were determined safe to enter, the team began assessing the damage inside. According to Rivas, there was a significant amount of water on the sixth floor of Tower II

from the roof damage. Furthermore, one of the doors of the cafeteria was blown open from the wind and had broken a window, leading to a lot of debris and water entering the cafeteria.

### LONG DAYS TO RECOVERY

Because the facility had lost power, essential equipment had to be run using emergency generators. However, the fuel supply for the generators was meant for temporary power outages, and the site was expected to be without power for up to a week. Unfortunately, as most of Houston and all of Galveston also were without electricity, authorities had prioritized resources for hospitals, emergency vehicles and other essential functions. As a result, the Federal Emergency Management Agency tapped Boeing's fuel contractor for emergency services, Van Dusen said.

With its fuel supply dwindling, the Houston site arranged for and received fuel from Boeing's San Antonio site until a contractor from outside the area could arrive. The fuel shortage also affected the site's ability to secure contractors for site cleanup: With gas in short supply and many filling stations closed and without power, many contractors were unable to get to the site.

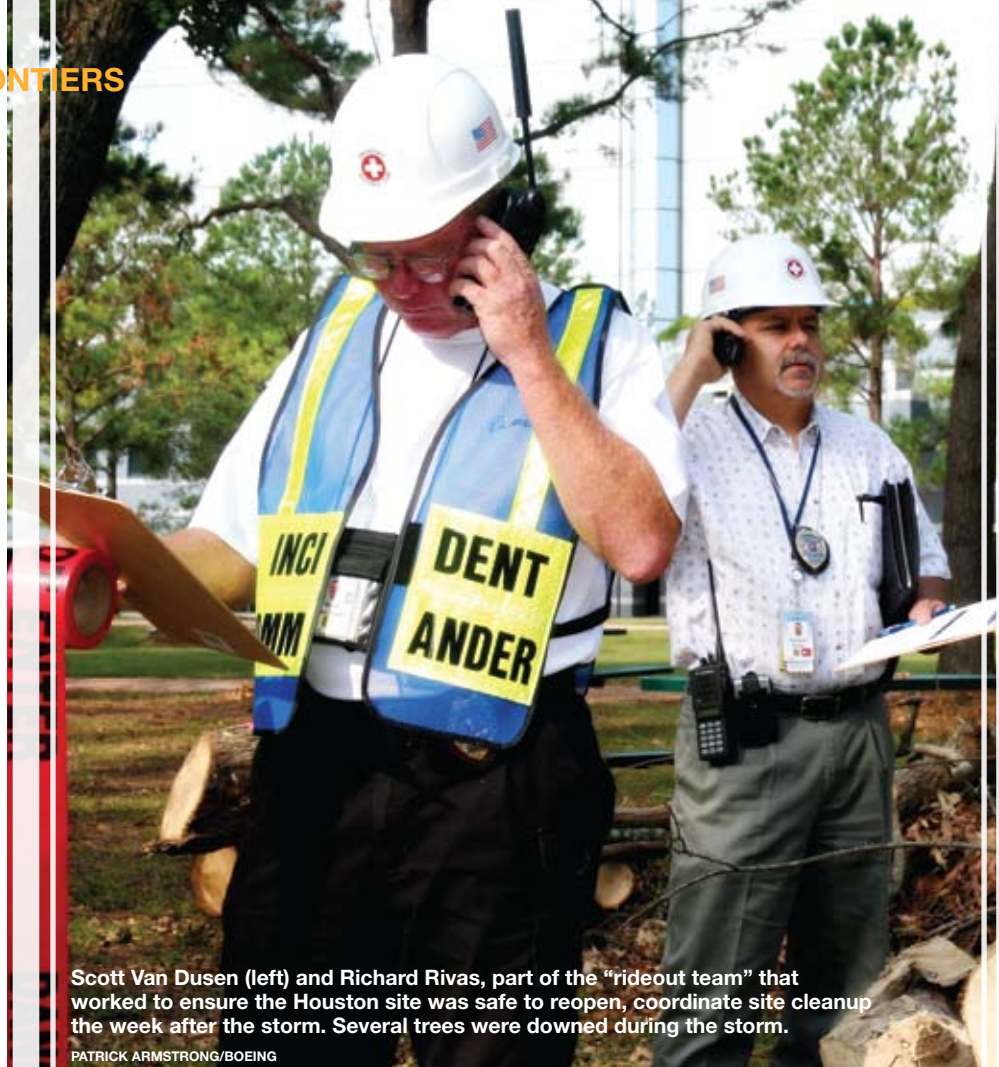
The site faced other challenges throughout the week.

- Days before the facility resumed operations, the city sent the site a notice warning that drinking water could be contaminated. The team had to flush all the water lines at each building, including all drinking faucets, ice machines, sinks, and restrooms. The site also purchased more than 2,000 bottles of water to have on-hand just in case the issue was not resolved when employees returned to work. (Fortunately, the team resolved this issue before employees returned.)

- A main generator ran out of fuel before additional supplies arrived at the site, which caused the system's large batteries to die. Using his connections from 20 years as incident commander for the local fire department, Van Dusen contacted a local fire department that allowed him to bring the generator batteries to their station for recharging.

The site also implemented lessons learned after Hurricane Rita, which struck the Gulf Coast in 2005. Most notable: Not powering down a regional data center that supports Houston and elements of Boeing sites in Huntsville, Ala., and San Antonio and Richardson, Texas. It takes approximately 8 to 12 hours to power the site down; in 2005, that fact prevented those involved from being able to evacuate the area in a timely manner.

"When you intentionally power down, there are a certain percentage of servers, disk drives, network switches, etc., that will not come back up when you bring power back online," said Craig Zook, lead network designer for Space Exploration.



**Scott Van Dusen (left) and Richard Rivas, part of the "rideout team" that worked to ensure the Houston site was safe to reopen, coordinate site cleanup the week after the storm. Several trees were downed during the storm.**

PATRICK ARMSTRONG/BOEING

"By not powering down, we were able to avoid any significant restart failures and the Houston Regional Data Center remained accessible to the rest of Boeing throughout the storm and recovery period," Zook added.

Overall, the rideout team brought the site back to full operations in a very short time considering all it faced. With so many without power and essential items unavailable, the team faced some extreme conditions. Critical members of the rideout team lived at the site 24 hours a day during the recovery, sleeping in shifts in temporary cots.

"Each one of the individuals who participated in these recovery efforts exemplified the Boeing Leadership Attributes, especially Finds a Way, Delivers Results and Inspires Others," Diggins said. "The site is extremely proud to have such professionals on the team."

The Houston site is sharing lessons learned from its experiences with enterprise emergency teams, to help other Boeing sites prepare and recover from natural disasters in the future.

For more images of Houston's recovery efforts, visit <http://spaceexploration.ids.web.boeing.com/communications/docs/lke-image-FNT.ppt> on the Boeing intranet. ■

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Crews clean up debris at the Houston site after it was pounded with winds over 100 mph (161 kph) during Hurricane Ike. The site suspended operations from Sept. 11–22 to ride out the storm and ensure the site was safe for employees to return. PATRICK ARMSTRONG/BOEING

# Employees helping employees



Major storms affect more than just business facilities. They touch communities, homes and people—and they inspire outpourings of support.

In the aftermath of Hurricane Ike in September, Boeing employees from across the Houston area joined together to assist teammates in need. From helping remove debris from teammates' homes to donating needed items, these employees displayed the true strength of the Boeing community.

One program the Houston site implemented in the week after the storm was "Project Generator Share." Through this program, an employee without power and who needed a generator could connect with employees who had unused generators.

"This was an excellent program, and I really appreciated the site's coordination efforts," said Michelle Lewis, project management specialist with Space Exploration. "Once I heard about the program, I called the number and received a call back in about 30 minutes from someone with a generator. It came from someone located in my neighborhood, so it worked out really well."

Once Lewis got her power back and no longer needed the generator, the program was able to place that same generator with another employee in need.

Another way employees helped teammates in need was through the Employees Community Fund of The Boeing Company, a unique employee giving program that allows employees to support the needs of their local communities via tax-deductible, recurring payroll deductions or one-time gifts. ECF of Boeing Houston, in cooperation with ECF of California and support from

Global Corporate Citizenship, coordinated a special relief effort for employees in hardship situations due to Hurricane Ike. By following the ECF of California model used to assist employees after the Southern California wildfires in 2007, employees and retirees affected by the storm were able to apply for direct aid to secure basic necessities for themselves and their families. ECF of Houston, California and Richardson, Texas, pooled contributions totaling \$65,000 for this effort. In addition, ECF of St. Louis and Mesa, Ariz., both made monetary contributions to the American Red Cross in support of disaster relief efforts in Houston.

Meanwhile, Boeing matched employees' donations dollar for dollar and retirees' contributions at 50 cents on the dollar to the American Red Cross General Disaster Relief Fund. To date, employees have donated \$83,322. In addition, Boeing made a \$500,000 donation to the American Red Cross in support of Hurricane Ike disaster relief.

"Donations help disaster victims get necessary human-needs services during a very trying time," said Patrice Mingo, director of Strategic Programs for Global Corporate Citizenship. "The outpouring of support by Boeing people from around the globe when a disaster strikes shows the deep concern they have for the health and welfare of their colleagues."

—Adam Morgan and Katherine Sopranos



Michelle Cooper (left), fleet manager for the Duwamish Corridor in the Puget Sound region, watches as intern Nadira Dossa takes a turn in the driver's seat of one of Boeing's new electric scooters. Approximately 500 electric utility vehicles already are being used in Puget Sound facilities. ED TURNER/BOEING

# Environmentally driven

Boeing vehicle fleet aims at reduced emissions of greenhouse gases

By Bill Seil

**T**he engines of innovation are in high gear at Boeing sites throughout the enterprise as vehicles powered by alternative energy sources are reducing the company's use of fossil fuels.

Fleet Support personnel, working with the Environment, Health and Safety organization and Shared Services' Conservation Initiative team, are shifting to vehicles that use fuels that offer environmental benefits such as reduced emissions of carbon dioxide, the main greenhouse gas linked to climate change concerns.

Boeing has committed to reduce greenhouse gas emissions companywide over the next five years, even as its business grows. In this early stage of the vehicle program, electric and biodiesel vehicles are the most easily deployed around the company. In the future, natural gas and hydrogen are likely to grow in use.

## NORTHWEST LEADS THE WAY

Boeing's Pacific Northwest sites alone operate about 5,300 vehicles, ranging from forklifts to trucks. That represents about 65



Electric utility vehicles used at Boeing plants can be recharged by pulling an electric cord from the cab and plugging it in to a standard electric outlet. ED TURNER/BOEING

percent of the company's U.S. vehicle fleet, and they consume around 80 percent of all the fuel used by Boeing company vehicles. This high consumption rate has made Northwest fleet managers the natural choice to lead the push to alternative fuels.

Larry Cameron, vehicle maintenance and fleet manager, Fleet Support, said electric utility vehicles, often referred to as "scooters," have been particularly successful replacements. Another alternative to pickup trucks and vans are neighborhood electric vehicles, which can carry loads within a plant. (They can also take loads to other plants within a limited distance; however, they're slower than pickup trucks, with some of the higher-speed vehicles traveling up to 35 mph, or 56 kph.)

About 500 electric utility vehicles are already being used in Boeing's Puget Sound area facilities. Over time, Cameron expects that two-thirds of Puget Sound's nearly 900 pickup trucks can be replaced by these vehicles. This would create significant savings, since the cost of electricity to fuel a utility

## “It’s a great example where doing the right thing to reduce air emissions also adds to the company’s bottom line.”

—Jeff Nunn, SSG Conservation Initiative program manager

vehicle averages around \$100 per year.

The electric utility vehicles, designed to carry two to four people, are quiet and comfortable. And since they have fewer moving parts, they’re easier to maintain. There are some trade-offs, however. For instance, Cameron said they’re narrower than a pickup. Also, electric vehicles also require inside floor space to park and recharge in Seattle—something that’s not always easy to find in a busy factory.

### FOR THE GOOD OF BOEING

While the Northwest region has taken the lead in researching and acquiring alternative fuel vehicles, the change is an enterprisewide effort. Every two weeks, Boeing Fleet Support focals from the Northwest, Southwest, Midwest and East regions hold a teleconference to talk strategy. They began by addressing the challenge at a high level, then examine each site, looking for opportunities.

While vehicle selections vary among regions, the enterprise is benefiting from research and benchmarking being performed by the Northwest team.

The benchmarking covered large corporations, governmental fleets and a major university. Cameron noted that Boeing, compared with the benchmarked companies, has an older fleet: About 38 percent of its vehicles are at least 10 years old, and in the Northwest region, that figure is 55 percent. As Boeing replaces these older vehicles there will be opportunities to shift to alternative fuels.

In addition to benchmarking, the company is exploring market opportunities. Cameron, on average, speaks with two vendors a week. He asks about environmentally friendly vehicles that are currently on the market and new models that will be introduced over the next couple of years. There are a number of attractive options.

Hybrid automobiles are part of this future. Boeing’s Northwest region currently operates approximately 100 sedans, and only a few are hybrids. The goal is to replace the remainder of the fleet with hybrids over the next 10 years.

Boeing also has had success in add-

ing biodiesel to its selections of alternative fuels. The Northwest region is currently using a 10 percent biodiesel blend, and St. Louis and Mesa a 20 percent blend, in their diesel vehicles.

“Introducing biodiesel has been fairly seamless,” Cameron said. “There’s no conversion involved.”

### EYES ON NATURAL GAS

In 2009, Cameron plans to devote more attention to compressed natural gas as a fuel source. While supplies of natural gas are plentiful in the United States, there are problems with using it to power company vehicles. First, costly fueling stations would have to be built at company sites. Vehicle fill-ups are also a concern, since they can take two to three hours. Vehicles fueled by natural gas can travel 200 to 300 miles without a fill-up; however, there’s no guarantee you’ll find a fueling station on long-distance trips. Still, Cameron believes natural gas is a fuel that is worth considering: It’s clean, affordable and easily acquired.

In the decades ahead, Cameron believes hydrogen will be a major source of fuel. While hydrogen fuel cells have been available for some time, there is no infrastructure to support hydrogen-powered vehicles. Experts predict it could be 2030 before hydrogen becomes practical as an automotive fuel.

### LEAN AND GREEN

The push for more environmentally progressive vehicles is part of Boeing’s strategy—clearly laid out in its 2008 Environment Report, at [www.boeing.com/aboutus/environment/environmental\\_report](http://www.boeing.com/aboutus/environment/environmental_report)—to reduce the environmental impact of the company’s operations and of its products and services.

“Fleet operations represent a significant component of our internal environmental footprint and a key opportunity for both environmental and productivity improvements,” said Jeff Nunn, SSG Conservation Initiative program manager. “It’s a great example where doing the right thing to reduce air emissions also adds to the company’s bottom line.”

Indeed, the switch to electric-, biodiesel and natural gas-powered alternatives is estimated to help cut the company’s use of fossil fuels for fleet operations by 20 percent over the next five to eight years; reduce fossil fuel emissions by 18 percent; and reduce maintenance and fuel costs by 15 percent.

The reaction of Boeing employees to alternative fuel vehicles at work also has been positive, Cameron said. A careful selection process has helped ensure employees get the right vehicle for the job.

Cameron has enjoyed the opportunity to participate in the transition to alternative fuels. “Of course, I still like to hear the throaty sound of the V-8 engine in my own car. I haven’t gotten over that yet,” he said. “But when you look at the performance of these new vehicles, it’s just as good as you get from a gasoline-powered engine.” ■

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Many of the diesel trucks in Boeing’s fleet are fueled with a 10 percent biodiesel blend. ED TURNER/BOEING

# A smooth trip down the line

What made assembling the first BBJ 3 a big deal? The fact that it wasn't a big deal

Doug Christensen (from left), Jordan Peterson, Mark Garvin and Todd Thackray are part of a multidiscipline team that worked to ensure that the first BBJ 3 would proceed through assembly without any disruptions.

MARIAN LOCKHART/BOEING

By Kathrine Beck

As the first BBJ 3 made its way down the 737 moving line at the Renton, Wash., plant this summer, people took note of just how well the new derivative was integrated into the factory flow.

"This went really well because everyone was prepared. The customer was happy and delivery went smoothly," said Todd Thackray, customer engineer for the Boeing Business Jets program.

Doug Christensen, a product development engineer on the BBJ program, agreed. According to Christensen, challenges were met and rework was minimal because of "efforts to make sure Renton best practices were used" when preparing for the first BBJ 3. Employees from the BBJ program and the factory worked together closely, and far enough in advance, to prepare for the changes that were coming, he explained.

An airplane that's the first of its kind, such as this first BBJ 3, can be a challenge on the assembly line, since parts, plans and tools can differ from those used on existing models. What distinguishes the BBJ 3 from previous BBJ models is that it's built on the Next-Generation 737-900ER (Extended Range) platform, providing customers with a larger cabin and longer range. An additional challenge

was that the BBJ 3 also includes a new flight deck head-up display that had never been certified for the 737-900ER.

"Change creates risk," said Jeff Raybuck, manufacturing engineering planner with the 737 Product Integration and Improvement team. It's his job to make sure any changes in parts, plans or tools on a particular airplane don't create rework or increase cycle time. Not only is it important to deliver the airplane in a timely fashion, but a problem with any one airplane can jeopardize the flow of airplanes that come out of the Renton plant.

"Our team is made up of focals who take ownership of concerns and share information," Raybuck said. "It works together for three or four months before the build cycle begins to make sure all engineering changes are integrated."

Raybuck also helps make sure that parts are available by using a line-of-sight tool, which helps ensure required new parts are defined and ordered properly and arrive in time.

Raybuck and his team worked closely with another team led by Jordan Peterson, 737 project integration manager. Peterson said that when a unique airplane such as the first BBJ 3 is built, his team begins by determining changes and areas of risk. Then, they make sure first-line managers and mechanics in the factory know about the changes and what to expect.

For example, they prepared a Microsoft PowerPoint presentation with drawings that compare the BBJ 3 interior with a conventional airline 737 interior. BBJ interiors are installed outside of Boeing, bringing up questions on the 737 line about exactly how the empty interior should be configured to accommodate installation elsewhere. The presentation was given to the first-line managers in the affected areas, who shared the information with their teams.

"This process helped a lot," Peterson said. "Everyone knew what was coming, so there weren't any surprises."

Cooperation and planning paid off for both the BBJ program and the factory. "It was a good working-together experience, and I think the results showed that. This airplane had a lower than average number of nonconformances. Everything was on schedule and came in quite nicely," Raybuck said.

Christensen agreed. "It was terrific. The airplane moved through the factory with minimal issues and the airplane was ready for delivery on time. We really benefited from Renton best practices, and from the 737 processes that have been put in place since the last new BBJ model was introduced, to make sure the airplane was smoothly integrated into the product line." ■

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Modeling and Simulation engineer Laura Wilson and Systems engineer Robert Kramer help Boeing understand the capabilities customers want, and develop systems to meet those needs, as part of the Joint Warfare Integrated Systems Assessment team.

RICHARD RAU/BOEING

# A look inside

A simulation tool assesses battlefield assets, reveals future customer needs

By Marc Sklar

**W**hen military leaders seek performance improvements in the effectiveness of their forces, or want to assess the impact of a new piece of hardware, new Concept of Operations (CONOPS) or a new or enhanced network, they need an extremely sophisticated system to explore their options.

Integrated Defense Systems has that in the Joint Warfare Integrated Systems Assessment (JWISA). This modeling, simulation and experimentation (MSE) system gives IDS an edge in developing the programs that will be its future—as well as insight on forthcoming customer needs. “With JWISA, we are at the front end working with the customer, looking at a gap we think may exist through a disciplined engineering approach, and seeing where potential solutions might fill that,” said Keith Trumbull, Strategy Integration manager for Advanced Boeing Military Aircraft. “This also helps us, because we are doing this jointly with the customer, so we’re doing it before we’ve actually done a lot of engineering.”

JWISA was also created to have a disciplined process for determining experiments to run in Boeing’s Virtual Warfare Center, one of the customer engagement centers operated by Advanced Systems’ Analysis, Modeling, Simulation and Experimentation organization. The result: Insight that ensures Boeing focuses investment and effort in the right places.

“The JWISA process is helping us explore the customer needs and design space for mobility systems, both emerging and future,” said Tom Gurbach, director, Advanced Global Mobility. His team used JWISA in developing concepts of operation supporting U.S. Army and Air Force mobility capabilities in battlespace environments. “It saves cost by helping us narrow the areas of performance-effectiveness tradeoffs before committing to design solutions and invites customer participation in a manner that builds confidence in the development process.”

The ultimate payoff for Boeing will be more sales. “JWISA is helping to grow business here in Denver,” said Alan Feldkamp, director, Colorado Operations, Network and Space Systems. He noted that his team is using JWISA for the Space Tracking Surveillance System, a Missile Defense Agency program pursuit.

The VWC is networked with Boeing’s numerous MSE facilities and can be tied into simulators, customer facilities and even operational systems (aircraft and others) as needed. That network is enabled by the web of Boeing employees located companywide.

Team members are enthusiastic about working on JWISA. “The best part of my job is working in the simulation environment where you can find the strengths and areas for improvement in systems before they are delivered to the warfighters,” said Laura Wilson, Modeling and Simulation engineer.

The team’s small and flexible nature makes it Lean by default, but the teammates continue to seek ways to improve their performance. “We’ve designed our systems so we’re quickly able to put together configurations, ‘fly’ them in a warfighting battlespace and find out whether that configuration works or not. Then we can quickly reconfigure and try something different,” said Don Kenney, technical fellow, JWISA chief analyst. “It’s almost a life-cycle design process.”

With all the preparation for performing an experiment with the customer, “game day” is quite intense. “A good day for us is when the operators, the warfighters, leave and they’re worn out. They’re sweaty and they feel like they were engaged in combat, doing the things they needed to do, and we’ve learned lessons together,” said Stuart Voboril, JWISA project manager.

That engagement is helping ensure future business for Boeing. “We really are trying to be a partner for growth for IDS,” said Trumbull. “This process, we think, is a disciplined way to go out and explore our future, experiment with the warfighter, and figure out where the opportunities lie.” ■

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ON THE NETWORK,

*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.



# A special assignment

What a Boeing communicator saw as an embedded journalist in Iraq

In May, Boeing Global Services & Support communicator Randy Jackson journeyed to Iraq to document the programs and people of Boeing in this theater of war. Jackson entered Iraq as an embedded journalist deploying with the U.S. Marines and U.S. Army. His objective: Find the stories of Boeing Field Service Representatives and many of Boeing's military products, and tell them to Boeing employees worldwide through the company's intranet.

Jackson detailed his visit through a blog accessible through Boeing News Now, the company's news site on the Boeing intranet, as well as videos he shot during this trip. The blog, titled "Dispatches from Iraq," was an up-close and personal voyage into the dangerous world where coalition forces are fighting the war on terror. Not only was the blog well-visited, but many readers commented that they felt as though they were there along with Jackson in his travels through the war zone. To read the blog, visit <http://dispatchesfromiraq.blog.boeing.com> on the Boeing intranet; links to the videos are at [http://video.whq.boeing.com/videos\\_ids.html](http://video.whq.boeing.com/videos_ids.html), also on the Boeing intranet.

Shown here are some of the photos Jackson shot to further document the dedication of hundreds of Boeing employees and customers who are on station in Iraq. ■





**PHOTOS (Clockwise from top right):** U.S. Marine MV-22 Pilot Capt. David Bennett goes through his preflight check list before a night mission; a Marine MV-22 tail gunner mans his station while on patrol above Iraq (gunners always are secured with a safety harness); crewmembers of a Marine squadron refuel their MV-22 tiltrotor aircraft; an AH-64 Apache returns from a mission over Sadr City to its base; U.S. soldiers walk to a waiting Boeing C-17 Globemaster III that will fly them out of Iraq and to an airbase in Kuwait; U.S. Army AH-64D Apache Pilot Capt. John James refers to technical data from his aircraft displayed on his laptop after a mission; a U.S. Air Force maintenance crewman in Kuwait inspects one of the C-17 Globemaster III's four Pratt & Whitney F-117 engines after its return from Iraq.

ALL PHOTOS: RANDY JACKSON/BOEING

# Bottlenecks eased

AEW&C team gets involved, trims engineering response times

By Maureen Jenkins

**W**hen it comes to problem solving, it often works best if those closest to the challenge create the solution.

And that's just what the PRIMER team supporting Airborne Early Warning & Control (AEW&C) did earlier this year when it came to streamlining engineering response times. Since February, this team-proposed solution has been contributing improvements that boost this developmental program's bottom line.

Made up of members of AEW&C's Integrated Product Teams (IPT), the PRIMER (Process Improvement in Engineering Response) team now more efficiently prioritizes and distributes engineering tasks throughout the program, which incorporates a variety of aircraft control and advanced radar systems into Boeing 737-700 aircraft platforms. About 20 design and manufacturing engineers have helped lead this Lean+ activity, continuously improving their own processes to boost value and productivity for AEW&C, a part of Integrated Defense Systems' Airborne Anti-Submarine Warfare and Intelligence, Surveillance and Reconnaissance Systems (ASW&ISR) division. Visual work flow aids—which include colorful status boards posted throughout the program's Kent, Wash., offices—help keep the team on track.

"We decided the IPT task was not just engineering, but engineering and planning," said 1st Pass Quality Project Coordinator Sylvia Swanson. Team members come from across Aircraft Systems, including Structures, Wiring, Payloads/Interiors and Mechanical/Electrical Sub-systems as well as Business Operations, Industrial Engineering and Change Management.

"Our vision is to morph it into a continuous improvement team where we form projects that will mitigate the bottlenecks," Swanson added. "We needed to be able to quantify our emergent statement of work and measure our cycle time. We decided as a program [this effort] was a cost-saving initiative, even though we couldn't easily attach a dollar figure to it. It was intuitively obvious it would save money and add value."

The PRIMER team's work reflects Boeing's enterprisewide Lean+ initiative, which accelerates continuous improvement by aligning and integrating successful efforts across the company.

Borrowing from practices already existing within Commercial Airplanes, Swanson and manager Mark Young devised the idea for this activity after visiting the 737 Lean group in nearby Renton, Wash. Within AEW&C, engineering work cycle times were too long and weren't measurable. Its work was on a different rhythm than the rest of AEW&C's supply chain, affecting on-time parts delivery.



After being formed, PRIMER needed to identify work product flow, determine how to measure it, and identify where quality "defects" were clogging up the engineering process. These defects required rework within teams, which cost the program time and money.

The solution began in February with an event led by Bob Sterley, a Lean consultant embedded within AEW&C's Aircraft Integrated Product Team. The goal: meet AEW&C's 2008 cost and schedule targets by reducing its engineering work flow time.

Sterley helped the group document its current process flows and propose new ones, taking emergent changes into account. PRIMER incorporated "Go/Slow Go" steps into the system. It wanted to reduce engineering work cycle times by 25 percent, and to reduce work defects by 50 percent. The team also set the standard of taking no more than 48 hours to resolve all emergent engineering requests while maintaining 100 percent on-time engineering releases that supported AEW&C aircraft deliverables. No small feat, indeed.

"We wanted to use a phased pilot approach," said Swanson.

**“Our vision is to morph it into a continuous improvement team where we form projects that will mitigate the bottlenecks.”**

—Sylvia Swanson, 1st Pass Quality Project Coordinator



team to show the metric of the cycle time. That's the idea of Lean+: (Making Lean+ changes) doesn't take that much longer, but it's a different way of doing things.”

Several months later, the PRIMER group is on track to meet its goals. Now, ownership of tasks is clearly defined. Management can easily see and track work flow, work load, and the engineering team's priorities. And as recognition for members who volunteered extra hours beyond their “day jobs” to streamline the process, PRIMER designed a team logo they wear on vests at the office.

“When you see success, this is what it looks like,” said Jim Welch, a Lean consultant now supporting AEW&C's Aircraft Integrated Product Team. “It's being able to identify challenges in their quick turnaround of support requests, and then for us to provide them the resources to overcome these challenges. The main thing I'm looking for is the learning they get from this.”

And the PRIMER team's idea is one that can be replicated across Boeing. “Zeroing in on the universal metric of time and establishing process duration standards will help us target process anomalies,” he said. “We can perform root-cause analysis on why those anomalies occur and then provide the proper resources to fix them. That's what Lean+ is all about—increasing productivity and providing better quality of life.” ■

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**PHOTO:** Colorful “status boards” help members of AEW&C's PRIMER team track engineering work flow across the program. Here, Perry Woodford shares information with (clockwise from top right) Eric Yost, Sylvia Swanson, Karl Rainwater, Mark White, Sheri Finley, Bryant Owen, Mark Swanicke, Steve Simmons, Diana Figgins and Linh Luong. MARIAN LOCKHART/BOEING

“We couldn't afford on this project to turn the program upside down.”

IPTs represented by members of the PRIMER team took turns implementing the new processes. AEW&C Structures went first and after receiving its “Go” decision, Payloads and Interiors was up next, followed by Wiring. The program's remaining IPTs then began using the PRIMER's processes.

By May, “every IPT had agreed to the work flow,” said Swanson, “had documented it online, had a board that documented it, and started measuring their cycle times.” Daily and weekly “tag-up” meetings also kept teams updated on their processes.

David Chapman, who leads design for AEW&C Interiors, is one who holds such gatherings and maintains a whiteboard in his area. The process “just makes things more efficient,” said Chapman, whose teammates go online to view engineering drawings that need follow-up action—and to view the changes that have already been made. “It's about what's going to work, not just what won't work.”

Said Swanson: “The largest challenge has been getting the

# Hands across the water



A Boeing EA-18G Growler launches from the flight deck of the USS *Dwight D. Eisenhower*. The U.S. Navy and Boeing recently worked together evaluating the EA-18G as it underwent initial sea trials aboard the aircraft carrier.

RON BOOKOUT/BOEING

## Boeing employees recap 11 days at sea during Growler trials on carrier

By Philip Carder

From our seats in the C-2 aircraft, there were just two small windows to look out. So once we departed from Chambers Field at Naval Station Norfolk, Va., I wasn't sure where we were in relationship to our destination—the USS *Dwight D. Eisenhower* aircraft carrier, miles off the United States' east coast.

We soon found out. With a loud thump, our aircraft landed and caught the arresting cable on the carrier's deck, and though our bodies seemed to stay in motion, the plane's motion was immediately halted. That was a sensation I won't forget.

I was one of 50 Boeing employees who spent nearly two weeks at sea this summer, supporting U.S. Navy personnel during sea trials for Boeing's new electronic attack aircraft, the EA-18G Growler. The trials—including both takeoffs and landings on board the carrier—evaluated the aircraft's performance under a variety of operating conditions. This type of evaluation of the aircraft in the environment where it will operate is a critical milestone as the Growler program moves forward toward its Initial Operating Capability phase in 2009.

The EA-18G Growler is a carrier-based electronic warfare version of the two-seat F/A-18F Super Hornet. Its electronic warfare capability involves the use of the electromagnetic spectrum to effectively deny the use of this medium by an adversary, while optimizing its use by friendly forces. The Growler's primary role in the battlespace is to jam, or suppress, enemy radar and communications to protect friendly assets in the air and on the ground (see Page 12 of the September 2006 *Boeing Frontiers* and Page

33 of the August 2008 *Boeing Frontiers*). A fleet of 88 Growlers is planned to support carrier air wings.

Lead flight test conductor Alan Wirth explained to me why evaluating the Growler at sea is vital to program success. "We're out there in the aircraft's natural operating environment," he said. "We're with the men and women who're actually going to fly this machine and those on deck who will actually launch and recover the aircraft. By being there, we experienced the real challenges they face everyday at sea, such as cross winds or the pitching deck. You can't simulate that."

I was awed by the sights and sounds on this massive sea vessel—it goes by the nickname, "Ike"—with its expansive flight deck, sophisticated maintenance facilities, myriads of passageways, and the heavily protected and off-limits nuclear-power engine room.

Ike is home to thousands of sailors who work and live on the carrier. Some of those sailors—who work in the lower decks—seldom see daylight during their days at sea. Thousands of meals are prepared daily, and the ship even has its own TV station with a news broadcast.

In contrast to natural elements at sea—the foamy aqua-white of the Atlantic and the warm, wet, salty air—there was the constant pounding of steam-driven catapults that can launch a 45,000-pound aircraft (20,400 kilograms) from 0 to 165 mph (266 kph) in just two seconds; and the groan of braided steel straining to halt incoming aircraft in less than 300 feet (91 meters) of runway.



On the launch deck, there was a constant buzz of intense, well-choreographed activity—team huddles, waving arms, thumbs up, fingers pointing—as aircraft were launched and recovered time after time. When it came time for the Growler to line up on deck to be launched, its roar was deafening. The jet blast deflector rose from the deck to disperse the jet's hot gases. The heat was searing. Then, with head-snapping speed, the aircraft shot off the deck. The rush of the jet's afterburners shook me to the core. There was nothing to brace to. You just had to ride through the noise, vibration and fury. Then, in a few seconds,

it was done. Thumbs up, back slaps and fist bumps said it all. Sailors stood tall alongside the Boeing team—success written on their faces.

After my four days, it was time to board the C-2 aircraft and head home. As we sat strapped in our seats, waiting to shoot off the ship's deck like a bullet, I thought of all the sailors, Navy civilians and Boeing team members who helped put the Growler through its paces. They all seemed to say the same thing in one way or another: "There's nothing better than seeing a good product working well in the hands of our warfighters at sea." ■

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# Life aboard Ike



Living on the USS *Dwight D. Eisenhower* aircraft carrier during the 11-day EA-18G Growler sea trial meant something different for each Boeing participant. Here are some of their comments:

**Rick Watts**, Boeing EA-18G Flight Test lead, said: "Being part of the very first landing and takeoff of the aircraft from the deck of a carrier was certainly a career highlight for many of us. It was extremely valuable for employees to get out there and experience what the customer environment is really like."

Test conductor **Leigh Farmer** talked about the sense of satisfaction of being on the Growler program from its inception and then hearing the roar of the jet as it successfully launched from the flight deck. "I feel very proud to be part of this team," she said. Farmer said working and living on the ship gave her an up-close perspective of the Navy. "It allowed me to interact and see how a group of people can come together and make an exceptional team," she said.

As manager of the Boeing Ship Suitability Program—and with many carrier trips under his belt—**Bill Laingen** monitored the Growler trials during the 11 days at sea. But, he also performs another key aspect of the program: training engineers to design to a sea-based environment. "One of Boeing's core competencies is detailed customer knowledge and focus," he said. "The more our engineers know about our customer and the environment our customer works in, the better our products will be and the better-equipped our warfighters will be. Having retired prema-



turely from the Navy for medical reasons, I can't think of a more meaningful task than one that combines my love of the naval service and aviation with teaching our engineers and managers about our amazing customer."

—Philip Carder

**PHOTOS:** Among the Boeing representatives taking part in the EA-18G Growler's initial sea trials on the USS *Dwight D. Eisenhower* (top) was Leigh Farmer (above). TOP: RON BOOKOUT/BOEING

U.S. Air Force Senior Master Sgt. Robert Fisher inspects a Boeing-built KC-10 at McGuire Air Force Base, N.J. During a recent mission over southwest Asia, Fisher passed the rare mark of 10,000 flight hours.

U.S. AIR FORCE

Rare ■  
air

## A U.S. Air Force flight engineer recently topped 10,000 flight hours—mostly in the KC-10 Extender, which is supported by Boeing

By Forrest Gossett

**O**n a late spring mission over southwest Asia, U.S. Air Force Senior Master Sgt. Robert Fisher, a 27-year veteran flight engineer, joined a very small group of those who have logged 10,000 flight hours—comparable to circling Earth more than 300 times.

Following a mission in April, Fisher—a member of the 380th Air Expeditionary Wing's 908th Expeditionary Air Refueling Squadron based at McGuire Air Force Base, N.J.—stepped out of a KC-10 Extender to the cheers of Air Force colleagues congratulating him on exactly 10,003 flight hours. That service includes 6,500 hours in the KC-10—which Boeing heritage company McDonnell Douglas built and for which Boeing provides contractor logistics support at Boeing San Antonio and support via field representatives.

As a flight engineer and systems specialist, Fisher works the various hydraulics, electronics and other systems during KC-10 missions. The KC-10 celebrated its 25th year in service in 2007. For the past 10 years, Boeing has conducted contractor logistics support for the KC-10 in San Antonio. Support services include depot maintenance, modification, aircrew training and inventory management. The team has provided depot-level maintenance for the fleet more than 700 times under the current Contractor Logistics Support contract. The quality of this support “takes the workload off the pilots so they can fly the airplane,” Fisher said.

How rare is 10,000 flight hours? Try a Google search. You'll get many hits on air platforms that have achieved 10,000 hours or programs that hit the 10,000-hour mark. But people posting 10,000 flight hours? According to Lt. Col. Tim White, 908th

Expeditionary Air Refueling Squadron commander, most flyers achieve 3,000 to 5,000 hours in a career.

“For Sgt. Fisher to eclipse 10,000 hours is a reflection of great dedication to the mission and the art of flying,” he said. “He is one of the greatest assets in the KC-10 community, and his work ethic speaks for itself.”

During his first four years in the Air Force, Fisher was a maintainer. In late 1985, he cross-trained as a flight engineer, and he's never looked back. Now, at over 10,000 hours of flying, he's at a point in his career when many airmen cease flying for administrative and support roles. But Fisher wants to keep flying. He said the KC-10 is a great platform, and he appreciates all the work that goes into maintaining the aircraft to keep it battle ready.

“I do not come in direct contact with the maintainers and contractors, like Boeing, in my role as an aircrew member, but we appreciate the work that is done to keep us flying,” he said.

He has supported many key campaigns for national security in his career including Bosnia, Somalia, and, for the last seven years, the global war on terrorism in various theaters.

“I just love the job. I love the people I work with and respect the heck out of them,” he said. “I'd like to say that I've given the Air Force all these wonderful things, but to be honest, the Air Force has given Bob Fisher way more than Bob Fisher has given the Air Force.” ■

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# KC-10 support: *Mission-ready 24-7*

There are many numbers in the story of the KC-10 Extender. The U.S. Air Force ordered the first KC-10 Extender in 1977 and the last in 1990. The current Air Force KC-10 fleet includes 59 airplanes. Each of these refueling tankers has a capacity of 326,450 pounds (148,075 kilograms) of fuel, or almost 48,000 gallons (about 182,000 liters).

For Boeing's Global Services & Support team that maintains the aircraft, the focus is on only two numbers: 24 and 7. "We deliver KC-10 readiness 24 hours a day, seven days a week to locations around the world. And we do that sustaining a 100 percent on-time delivery rate," said Mike Wright, KC-10 program director. "It's not an easy job, but we know it's important to get these aircraft back to the warfighter."

The KC/KDC-10 Contractor Logistics Support program was designed to ensure readiness of the Air Force fleet of KC-10 Extender aircraft and the Royal Netherlands Air Force fleet

of KDC-10 aircraft. The program was awarded in 1988, and Boeing has been the prime contractor since that time.

Boeing's KC-10 support services include depot maintenance, modification, aircrew training and inventory management. The team has provided depot-level maintenance for the fleet more than 700 times under the current CLS contract. Boeing also provides contractor-operated main base supply support for McGuire Air Force Base, N.J., and Travis Air Force Base, Calif. This includes issuing parts to the users and depot facilities and maintaining all ground support equipment.

In July, the program celebrated a milestone with its Royal Netherlands Air Force customer following the first flight of a KDC-10 modified with Boeing's Cockpit Upgrade Program. Boeing also maintains KC-10 supply locations in Germany, Japan and the Netherlands.

—Deborah Van Nierop



In this 2003 photo, a KC-10 Extender from McGuire Air Force Base, N.J., flies a mission over southwest Asia to support Operation Enduring Freedom. Boeing provides extensive support to keep KC-10 aircraft mission-ready.

U.S. AIR FORCE

# Pack for a long trip



Gary Pippin's 'suitcases' have traveled countless miles on the outside of the ISS in advancing materials research

In this 2001 photo, Astronaut Patrick G. Forrester prepares to work with the Materials International Space Station Experiment during a spacewalk. NASA

By Tom Koehler

**H**ow many miles do you estimate your suitcases have traveled over the years? Whatever the number, it's only a fraction of what Gary Pippin's have trekked.

For seven years, suitcase-sized containers packed by Pippin, a Technical Fellow in Boeing Phantom Works' Structural Technology organization, have been circling the globe while attached to the outside of the International Space Station.

Instead of clothes, Pippin's suitcases have been filled with test samples of materials as part of the Materials International Space Station Experiment (MISSE), a collaborative research effort involving Boeing, NASA, the U.S. Air Force and Navy, and other government, industry and university research organizations.

Thousands of samples of materials have been tested since MISSE began in August 2001. Among them: ceramics, composites, insulation, paint, active devices such as shutters and real-time data-recording instruments, and even biomaterials such as enzymes and cells.

The goal of exposing these materials in space, where harsh ultraviolet and particulate radiation, atomic oxygen and extreme temperature variation can cause them to degrade much more quickly than on Earth, has been to help engineers and scientists gain new insights into improving material durability and performance for future spacecraft. On Earth, the findings also could lead to improved coatings for aircraft, cars and buildings.

"Materials are really the enablers for all future technology," said Pippin, who helped create the MISSE team and has been a driving force in the experiments. "The advanced space vehicles of tomorrow will be crafted from materials with extraordinary resistance to the severe environment of space."

### LATEST TEST IN A SERIES

MISSE is the latest in a series of materials-in-space experiments, dating back to tests on Skylab in the 1970s and continuing with NASA's Long Duration Exposure Facility (LDEF) and space shuttle experiments in the 1980s and 1990s.

LDEF was a bus-sized materials exposure experiment similar to MISSE. It was launched in 1984 and orbited for more than five years. When it was recovered, researchers were fascinated to find that some of the materials on board had eroded away entirely, while others had been reduced to shreds.

"We can simulate exposure in the laboratory, but nothing substitutes for space itself," said Pippin, indicating that atomic oxygen in low-Earth orbit in particular has a way of stealing carbon, hydrogen, nitrogen and other elements from the surface of materials.

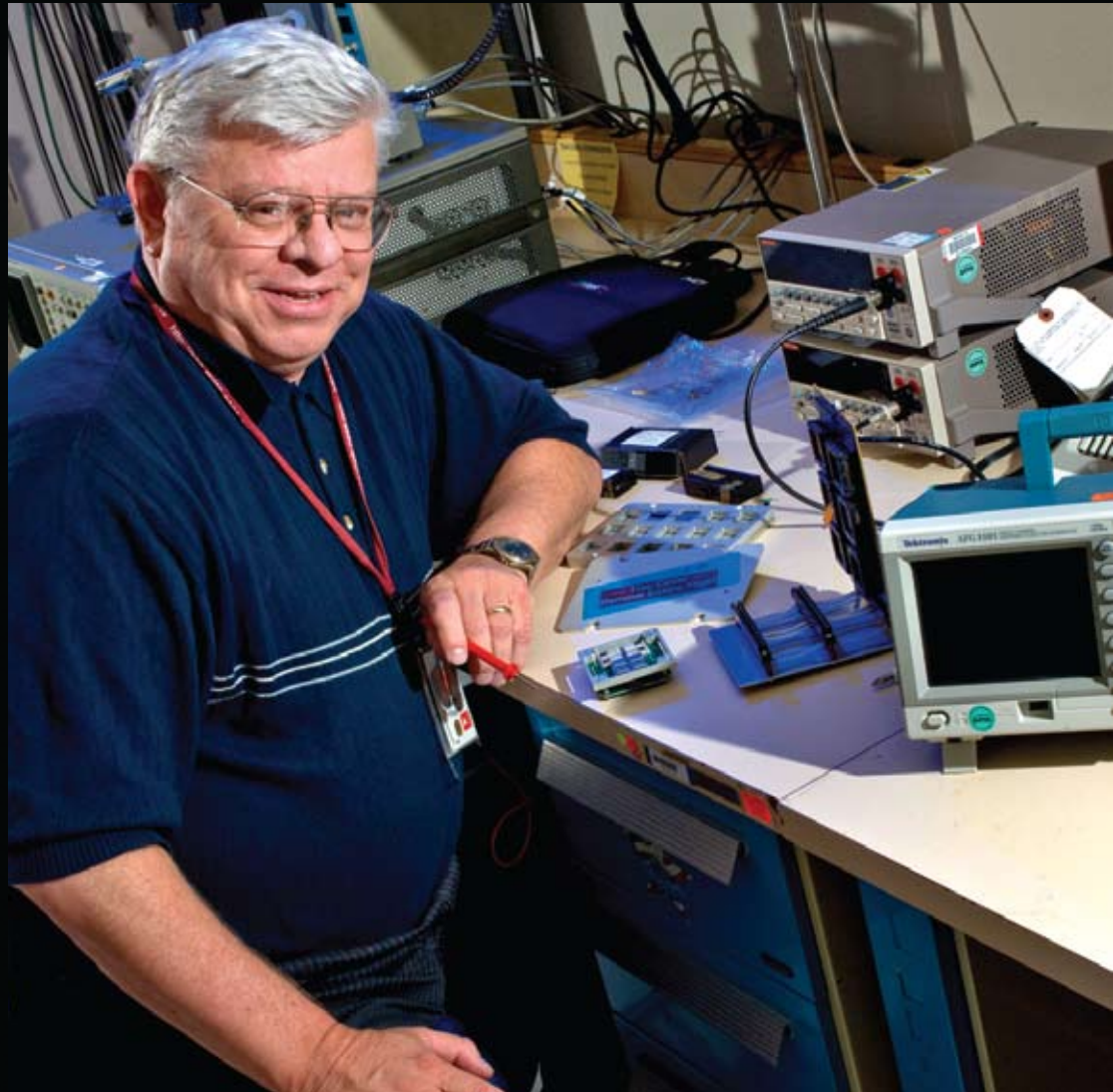
When Space Shuttle *Endeavour* launched in March, more than 1,000 new materials were on board to be tested as part of MISSE-6, the sixth MISSE project.

Combined, MISSE-1 through -5 exposed more than 2,000 independent materials samples to the harshness of space and provided a wealth of information for the MISSE government-industry-university team. Created as long-duration experiments, MISSE-1 and -2 were returned to Earth in July 2005 after four years on orbit. Samples on MISSE-3, -4 and -5 were returned to Earth after one year on orbit. MISSE-7, planned for next year, will be connected to the power system on the ISS, with data and communication links.

"This work has been a great source of pride for me and has reflected well on Boeing as a leader in applied materials science research and engineering," said Pippin, a former professor at the Colorado School of Mines who's worked at Boeing since 1985. "MISSE has created opportunity for many small experiments that would not have otherwise taken place."

Pippin has co-authored more than 25 papers to share information collected by the MISSE packages with the aerospace

community at large, and is quick to credit the cooperative nature of the MISSE team for its success. In particular, he cited Bill Kinard, a retired senior research scientist at NASA Langley Research Center in Virginia, for being instrumental in moving the research forward. In addition, within Boeing he cited the close working relationship between Phantom Works and Integrated Defense Systems, including work at the Boeing Radiation Effects



**Gary Pippin, at the Boeing Radiation Effects Laboratory in Seattle, has been a key researcher involved in the Materials International Space Station Experiment series since 2001.**

MARIAN LOCKHART/BOEING

Laboratory in Seattle.

And when asked just how many miles he estimates those suitcases have flown, Pippin said, "The number starts with incredible and ends with wow!" ■

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# Simplifying complexity

A new approach is improving capabilities that made Boeing famous

By Jay Spenser

Customers worldwide depend on Boeing for advanced aircraft, electronic and defense systems, satellites and spacecraft, launch services, information and communication systems, and environmental technology solutions. These high-tech products and services depend on the company's proven ability to develop, field and support complex systems.

The new Systems Engineering and Analysis Domain is improving this Boeing strength. Responsible for technologies including modeling and simulation, complex systems integration and operations analysis, the domain also is tasked with examining how Boeing uses its knowledge in support of these vital activities.

The Systems Engineering and Analysis Domain is one of eight technology domains created in 2008 under the Enterprise Technology Strategy. The ETS seeks to ensure that the right technologies are developed at Boeing, now and in the future (see Page 40 in the May 2008 *Boeing Frontiers*). These domains, which cover the many areas of Boeing research and development and draw talent from Integrated Defense Systems, Commercial Airplanes and Phantom Works, implement this strategy. The domains, guided by the ETS, are working to maximize the yield of Boeing technology investments to create a sustainable technical competitive advantage.

## CORE TECHNOLOGIES

Very few companies in the world contend with the degree of complexity that Boeing takes in stride. For Marc Nance, Systems Engineering and Analysis Domain leader, and his team of experts, this success is the point of departure as they collaborate enterprisewide to define a more efficient future. Like the seven other domains, they are developing an enterprise-level domain technology plan—something that's never existed before—that will link and leverage the best of Boeing technology to more effectively meet the company's business goals.

"Right now we're turning the technology spectacles back on ourselves to see how we can improve our productivity and grow the business," Nance said. "Ultimately, our goal is to support the company's functions and programs with technologies, processes and tools that make it easier, simpler, more efficient, and more cost-effective for all of us to continue doing what we do best: designing, developing, producing, and supporting high-tech products and services."

Based on inputs received in a June requirements workshop and subsequent discussions at senior levels of Commercial



**Shannon Sheridan and Cecil Fields review a process model at the Product Lifecycle Management Laboratory in Huntington Beach, Calif. The Systems Engineering and Analysis Domain identifies PLM as a focus technology under the Enterprise Technology Strategy.** MICHAEL GAIL/BOEING

Airplanes, IDS and Phantom Works, two high-level core technology groups stand out within this domain as being particularly crucial to Boeing's success: Affordable Complex Systems Integration (ACSI) and Modeling, Simulation and Analysis (MS&A). Here's a look at these groups.

**Affordable Complex Systems Integration.** The domain's ACSI activities will improve the company's system-of-systems engineering, architecture, tools and processes to enable breakthrough performance and affordability across product life cycles.

"Defining high-quality processes and tools is crucial, but it's not the entire challenge," said Senior Technical Fellow Bill Seidler, who leads the ASCI Core Technology Team. "When you're exploring uncharted technical territory, you also need high-quality people with the right skills, and you need to grant them access to the right information. That's why the ETS and the domains also focus heavily on knowledge management."

Product Lifecycle Management (PLM)—a business methodology that tracks all aspects of a product through its creation, use and eventual disposal—is the key tool here. Widely used at Boeing, PLM falls within the this domain's purview. Because it already tracks people, processes, tools and information, PLM offers exciting opportunities for major improvements in knowledge management.



“The ETS and its domains help maximize the return on our R&D investments,” said Darryl Davis, president of IDS’ Advanced Systems organization. “One way we determine where we put our dollars is to understand our customers’ future capabilities needs through experiments with their operators in facilities like the Virtual Warfare Center (VWC) in St. Louis (see story on Page 25). In turn, those experiments provide us with feedback to help the ETS and its domains focus on the right key technologies to deliver these future capabilities.”

The VWC is the epicenter of customer-in-the-loop simulations at Boeing. This facility lets Boeing and military experts work side by side in tests employing high-fidelity models and state-of-the-art simulation technology.

“This domain isn’t just about creating better products; it’s also about creating these products better,” said AMSE Vice President Guy Higgins.

The Systems Engineering and Analysis Domain’s efforts synergistically complement other Boeing improvement activities as well, among them IDS Engineering’s 10X Lean+ Initiative. “Because the domain and 10X both focus on increasing productivity and reducing cost, both are critical to making the business more competitive,” said IDS Vice President of Engineering Charles Toups.

Mike Denton, vice president of Commercial Airplanes Engineering and leader of the Enterprise Engineering Function, likewise sees value in the domain’s efforts. “This domain is important to us because it helps us structure our requirements and implement large-scale processes and tools central to our commercial airplane development activities,” Denton said. “These processes and tools will let us reduce cost, shorten flow times, and leverage skills across the enterprise for more effective solutions to future challenges.” ■

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Aerospace engineers rely on computer-based design, modeling and simulation technologies that produce prodigious amounts of data. The PLM Function and Information Technology are supporting the domain’s work to identify critical processes and tools for managing this information more effectively.

“Executing an airplane program on time, within budget and with performance promises met is a classic complex-integration challenge,” said Pat Blanchet, the domain’s Commercial Airplanes focal. “Our domain is all about the processes, tools and focused technologies needed to execute flawlessly.”

**Modeling, Simulation & Analysis.** As computing technology developed over the decades, Boeing invested in capabilities that allow products and services to be modeled, simulated and analyzed more accurately. These fast-evolving capabilities are increasingly important across the enterprise.

In IDS, highly skilled engineers and analysts know how to employ and interpret the results of advanced simulation technologies. Their expertise lets Boeing military customers experiment with operational concepts and scenarios earlier than was previously possible. Because MS&A enables making informed decisions near the outset of a program that accurately and inexpensively frame requirements, it’s a powerful tool for reducing cost and mitigating risk.

## What it’s made of

Each of the Technology Domains under the Enterprise Technology Strategy manages a portfolio of Boeing technologies. For the Systems Engineering and Analysis Domain, these technology focus areas are:

### Affordable Complex Systems Integration

- Enterprise Framework and Infrastructure
- Product Lifecycle Management
- Virtual Enterprise Environment

### Modeling, Simulation & Analysis (MS&A)

- Customer-in-the-Loop Simulation
- External Customer Engagement MS&A
- Product, Process, and Resource MS&A

Research has shown that a person's early-life experiences are connected to the ability to achieve economic productivity as an adult. Boeing is giving increased attention and resources to early learning as part of the company's charitable investments in education.



# W

By Susan Birkholtz

**S**cientific discoveries over the past two decades have transformed how researchers, policymakers and the public think about early childhood.

Researchers have found that brain development is more vulnerable to environmental influences than ever suspected, and the effect of early environment on brain development is long lasting. What's more, studies show that this environment affects not only the development of connections in the brain, but also the way these connections are "wired."

"The trillion or so neurons that we all have in our brains are largely in place at birth, but they can't talk to each other until they form neural connections that allow electric impulses to flow between them," said Dr. Patricia K. Kuhl, co-director for the Center for Mind, Brain, and Learning at the University of Washington. "Think of telephone lines connecting houses. These telephone wires, or synapses, begin networking in a complex and interesting process after birth."

What does this have to do with Boeing? The answer is nothing less than the future success of its business, the U.S. aerospace industry and the overall global economy. Evidence indicates that cognitive, social and emotional capacities play important roles in achieving economic productivity in adulthood, and that these capacities are shaped by early life experiences with a child's parents and intimate caregivers.

That's why Boeing is giving increased attention and resources to early learn-



## Why Boeing invests in community programs that support early learning

# Aired

ing as part of the company's charitable investments in education, made through the Boeing Global Corporate Citizenship (GCC) function.

### WHEN LEARNING BEGINS

In the past, it was thought that "real learning" began when a child entered primary school. Now it's clear that it happens earlier. "Children are literally born learning," said Dr. Jack P. Shonkoff, founding director of the Center on the Developing Child at Harvard University in Cambridge, Mass. "Young children from the beginning cannot help but learn—they don't have to be taught to learn, they are naturally wired-up to learn."

Unfortunately, many parents and caregivers do not know how they can best take advantage of these early years to help children develop in a way that will make the most of their potential, both in school and in work.

The Institutes for the Achievement of Human Potential, a nonprofit educational organization near Philadelphia, is designed to do just that—instruct parents how to significantly enhance the development of their children by teaching them about how the brain grows and how to speed and maximize that growth.

"Society needs to do better by babies," said Dr. Janet Doman, director of the Institutes. Every company that wants to have a future should care about this issue. Any company that understands this will create a much better world."

That "better world" includes having a work force with the skills and capabilities

to meet the technological and scientific challenges the future will bring.

However, the current education system in the United States "is falling behind in the development of the kind of work force that the global economy demands," said Rick Stephens, senior vice president, Boeing Human Resources and Administration. Stephens speaks often about the importance of early learning to the preparation of the future work force.

"Of the 4 million children born each year in the United States, about a third do not graduate from high school," he said. "And of those who do, only 200,000 graduate college with science, technology, engineering or math degrees. In fact, a mere 60,000 of that number graduate as engineers."

### THE ROLE OF PARENTS

As research shows that parents are a child's first and most important teachers, Boeing's charitable investments in early learning focus on programs that provide information and related resources to parents, so that they can aid in their children's development.

"There's no more important role in the world than the role of parent in their children's lives," said Joyce Walters, who directs GCC's Education and Workforce Initiatives. "It's a tough job, and the more support and resources parents have in their children's important early years, the better the chance that those children are ready to learn when they start school."

Boeing recently committed \$5 million in support to America's Promise, a partner-

ship alliance committed to seeing that children have the fundamental developmental resources they need to succeed. According to the organization, these resources are represented by the "Five Promises" that young people need for success in life. "Caring adults," the No. 1 Promise, is the cornerstone of a child's development, on which success is built in both childhood and adulthood. According to America's Promise, although parents rank first, children also need to experience the support of caring adults in all areas of their lives. (The other Promises are listed on the organization's Web site at [www.americaspromise.org](http://www.americaspromise.org).)

This is why, in addition to parent training, Boeing also invests in programs that provide information and resources to caregivers, both formal (for example, day care workers) and informal (family members, friends), who, according to research, play a large but often overlooked role in children's development.

In addition, Boeing is investing in programs that increase the public's still-low awareness about the importance of providing children with quality early learning environments.

"Support for the first five years of a child's life is support for human capital development," said Samuel Meisels, president of the Chicago-based Erikson Institute. Erikson is one of only a few institutions of higher education in the United States whose central mission is to provide professional education and training in child development to those who work in early learning environments. "Evidence is quite



Boeing supports the Erikson Institute, one of only a few institutions of higher education in the United States whose central mission is to provide professional education and training in child development. JAY RUBINIC

clear that if we want to enhance the work force of the future, we need to begin in the earliest years. Boeing's contributions today will pay off for years to come."

### DATA PRECEDES SHIFT

According to Walters, Boeing started to invest in the early learning programs after the company wasn't seeing its investments in U.S. primary and secondary schools reap the benefits originally anticipated.

An analysis of the data indicated that many children enter kindergarten two-to-three years behind where they should be in their development—making success in school that much more difficult.

"That's when we knew that our education strategy needed to reach further back in the education process than we had traditionally focused," Walters said. "While we continue to invest in primary-secondary school education by supporting programs that develop teachers and school leadership and align curriculum, now we know it's just as important, if not more important, to make sure children are prepared for school once they get there."

Boeing is playing a leadership role among corporate funders, according to Rob Grunewald, an associate economist at the Federal Reserve Bank and responsible for a 2003 study about the economic

return on investment in early education initiatives. "Boeing is well-positioned to not only make strategic investments in early childhood, but also to provide leadership among members of the business community on this issue," he said.

According to Walters, Boeing will continue to lead, collaborate and convene other businesses in order to help place this vital issue—providing children with quality early learning environments—at the top of the agenda in communities throughout the enterprise.

"I believe we all have a role to play in making sure children get the best start in life as possible, even those of us who are not parents but have some connection to a child in our lives. It's not only the right thing to do, research shows it also makes good business sense," said Walters. ■

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# Aiding an early start

Where has Boeing support helped boost early-learning efforts? Here's a look at some of these investments.

- Boeing partnered with PNC Bank in Washington, D.C., and several charitable foundations to create a multimillion-dollar fund aimed at improving pre-kindergarten in the Potomac region. The goal for the initiative, tentatively titled the Early Care and Education Collaborative, is to raise at least \$1 million annually for four years for improving area early learning programs and promoting their importance to local policymakers. According to organizers, this effort marks one of the area's largest-ever partnerships between corporations and nonprofits.
- Boeing supports the Child Crisis Center, a Mesa, Ariz.-based nonprofit committed to preventing child abuse and neglect, along with this facility's Family Resource Center, which provides parenting classes focusing on the science of early-childhood brain development. Boeing funds helped develop the center's parenting programs, including a "boot camp" for new dads, a newborn baby-care class, a parent-support group, and a program to teach parents and babies how to communicate with gestures and signs before they learn to speak.
- Boeing recently signed on as a major supporter of "Sid The Science Kid," a new educational series produced by KCET-TV, the public TV station in Los Angeles, and The Jim Henson Company. The show promotes exploration, discovery and science readiness among preschoolers. A portion of Boeing's grant will fund a national educational outreach plan aimed at parents, grandparents and childcare providers. This plan is intended to expand the program's reach by offering information and resources on how to use the series' content to support the development of young learners.

—Susan Birkholtz

# 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.



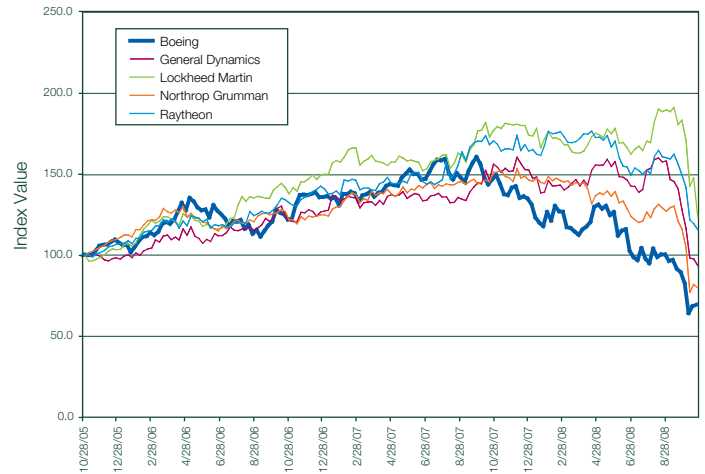
The above graphs show an estimate of what a “full 4-year participant” ShareValue Trust distribution (pretax) would be for Period 7 if the end-of-period average share prices were the same as the recent price shown.

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>.

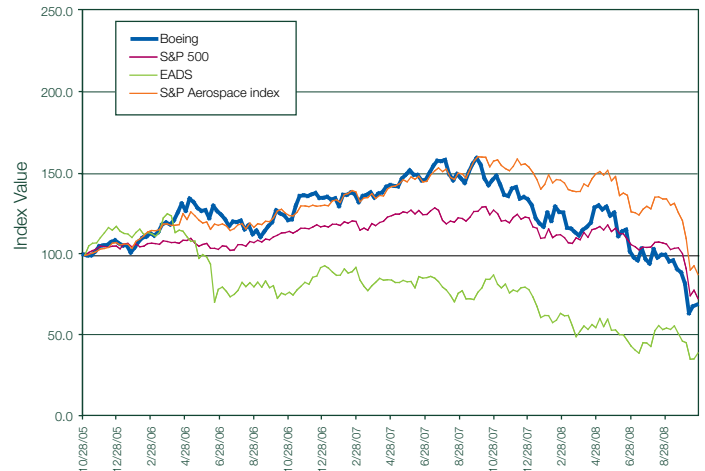
# STOCK WATCH

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 Oct. 28, 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 10/24/08	Four-week comparison		52-week comparison	
		Price/value as of 9/26/08	Percent change	Price/value as of 10/26/07	Percent change
<b>BOEING</b>	<b>45.24</b>	<b>58.32</b>	<b>-22.4%</b>	<b>96.02</b>	<b>-52.9%</b>
<b>U.S. COMPETITORS</b>					
General Dynamics	54.70	74.92	-27.0%	91.23	-40.0%
Lockheed Martin	75.84	112.55	-32.6%	108.61	-30.2%
Northrop Grumman	43.31	63.00	-31.3%	81.94	-47.1%
Raytheon	43.40	56.06	-22.6%	63.93	-32.1%
<b>INT'L COMPETITORS</b>					
EADS*	11.02	13.08	-15.7%	24.53	-55.1%
<b>U.S. STOCK INDEXES</b>					
S&P 500	876.77	1213.01	-27.7%	1535.28	-42.9%
S&P 500 Aerospace and Defense Index	252.05	348.09	-27.6%	453.84	-44.5%

\* Price in Euros

# SERVICE AWARDS /

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

## 65 Years

Herbert Meyer

## 50 Years

Arlyn Laue

## 45 Years

Thomas Campbell  
Ignace Dhondt  
Lindon Finley  
Richard Gerdes  
Joseph Harrington  
Roosevelt Jackson  
David Kroger  
John Laramie  
John Newborg  
Theodore Proske

## 40 Years

James Aikins  
Sharon Best  
Pamela Burdick  
Girindra Das  
Steve Doman  
Lionel Fuentes  
Roger Gallegos  
Ulrich Ganz  
Russell Gergely  
Gary Green  
Donald Gsell  
Robert Haverwold  
Daniel Healy  
Jimmie Jumper  
Gary Kalmer  
William Kelley  
Patrick Lyons  
Wayne Matherly  
Augustus Mays  
Roger McMahan  
Thomas Melson  
Ciro Ribaud  
Barney Shortridge  
George  
Speigelhalter  
Alvin Tellas  
Charles Thomas  
Robert Thomas  
Walter Werner

## 35 Years

Jeffrey Baker  
Thomas Barr  
Bennie Bolton  
Donald Boschert  
Joseph Burgess  
Gregory Carl  
Wayne Caughie  
Jerry Chase  
Susan Christenson  
Kunjoo Chung  
Ann Clark  
Frank Cline  
Jimmy Coley

Zeb Collins  
Rollie Cook  
Sherida Copeland  
Richard Costa  
Thomas Cushna  
Roger Edmark  
Richard Erickson  
Manuel Garcia  
Benson Grinspan  
Edwin Gumm  
Elizabeth Hemenway  
Eugene Herrington  
Rene Heuscher  
Monte Holland  
Robert Holmstrom  
Susan Hoppe  
Robert Howitz  
Alan Kain  
Kenji Kato  
William Kline  
Charles Lusk  
Jack Martin  
Gregory Massa  
Joann Meyers  
Harold Miller  
Janet Miller  
Foster Murphy  
Sumio Nagano  
Gari Oosterink  
Byron Osborn  
Patrick Paustain  
Lorelei Phelps  
Richard Pierce  
Sharon Ploof  
Calvin Powers  
Peggy Ray  
Joanne Reyes  
George Riley  
Jack Robinson  
Randolph Rodarte  
Charles Ruthford  
Gregory Sack  
Glen Sellers  
Stanley Skomski  
Billy Tennell  
Gloria Turner  
Joseph Urias  
Douglas Van Aken  
William Virostko  
Robert Voskamp  
Oran Webb  
Thomas Wells  
Carolyn Wilson  
Deborah Wood  
William Young

## 30 Years

Richard Absten  
Ralph Adams  
Richard Adams  
Ronald Aldinger  
Thomas Allchin  
Michael Allman  
Scott Amelung  
Drew Anderson

Tony Anderson  
Laurel Argyle  
Donald Ayers  
Wanda Bables  
Russell Baca  
Gregory Baker  
Kim Baker  
Janet Ballard-Seibel  
Terri Bean  
James Bellman  
Dominique Bergeron  
Donald Bickle  
Dallas Bienhoff  
Willie Blaylock  
Richard Blunk  
Dennis Boespflug  
James Bogard  
Michael Bolam  
Harold Bolton  
Pongsin  
Boontanond  
Gary Bosley  
Robert Bostrom  
Gary Bowyer  
Ralph Boy  
Sandra Boyd  
Archie Brenden  
Barbara Brock  
Kathleen Brown  
Willie Brown  
David Buhr  
Frederick Buldhaupt  
Vann Bullock  
Raymond Burcham  
Kylie Bygland  
John Byrd  
Rosemary Calandro  
Phillip Campbell  
Lynda Carlson  
Dean Carpenter  
Mark Carpenter  
Terry Carr  
Earnest Carter  
Scott Carter  
Timothy Cartmel  
Edwin Cassidy  
Martin Chamberlin  
Randy Charaba  
John Christy  
David Cibulka  
Jill Clark  
Michael Clendening  
Karen Clyne  
Greg Collins  
Joseph Connolly  
James Coogan  
Daelyn Coombs  
Ananth Coorg  
Deborah Coty  
Robert Cowne  
Von Cox  
Donald Crews  
James Cunningham  
Cynthia Daniels  
John Daniels

Brian Davenport  
Sylvia De Leon  
Brian Decato  
Barbara DeJarlais  
Jack Delange  
Brian DeLuca  
George DePalmo  
Kingston Derosa  
Robert Desmond  
Daniel Devlin  
John Dingman  
Michael Dix  
Charles Dombay  
Kenneth Donaghue  
Jack Dove  
Michelle Downie  
Timothy Dunn  
Wayne Durham  
David Dye  
John Edwards  
Mac Edwards  
Dan Ekoos  
Anthony Elliot  
Deborah Esparza  
Kevin Espeseth  
Stephen Estep  
Harold Ewing  
Dwight Failoni  
Terry Ferguson  
Steven Fisher  
Ronnie Flowers  
Francis Ford  
Cheryl Fox  
John Foy  
Lina Gagnon  
Jose Garcia  
Sandra Ginger  
Anna Gonzales  
Isrrael Gonzales  
Lawrence Goodwin  
Benita Gray  
Richard Gray  
Dwayne Greene  
James Greenwood  
Michael Greer  
Susan Gullstrand  
Ronald Hahn  
Robert Harger  
Timothy Harlan  
Randy Harrison  
Wendell Hatcher  
Chester Haugland  
Harrison Henninger  
Susan Henrie  
Donald Henson  
Pauline Hessel  
Kirtis Hickey  
Elton Hodel  
Bonnie Hoeing  
Douglas Hoff  
Rodney Hoffman  
Hunt Holden  
Russell Holley  
Darryl Holtmeyer  
Kathryn Hopkins

Gary Houghton  
Wayne Howard  
Susan Hubbard-  
Peters  
Ken Hugh  
Cheryl Hughes  
Douglas Hutton  
David Ice  
Teresa Ice  
Anthony Ivers  
Deborah Ivey  
Barry Jenkins  
Reginald Jenkins  
Dennis Jermstad  
Charles Johns  
Anita Johnson  
Colin Johnson  
Linda Johnson-  
Loterbauer  
Arnold Jones  
William Jones  
Walter Judd  
Edward Julian  
Richard Kantak  
Theresa Kartak  
Kathy Kearney  
Jodie Kelley  
Michael Kennard  
Leslie Kinney  
Mark Knoll  
Diana Kodad  
Greg Kraft  
Susan Krzyzewski  
Yo Kudo  
Michael Ladd  
Edd Lahar  
Tom Lambro  
Lacey Lange  
Scott Larsen  
James Lawless  
Gary Lebert  
Eldon Leggett  
David Leighton  
Richard Lewis  
Roger Lewis  
Gregory Lichty  
Barbara Lickiss  
Ralph Linderman  
Bryan Love  
Larry Luhsen  
Mark Lutz  
Harold Lyon  
Randall Macala  
Naseem Mahmood  
Nancy Malmanger  
Joseph Maniaci  
Boyce Marron  
Christopher Marshall  
Timothy Martin  
Ricardo Martinez  
Christine Matlock  
Augustus Mauldin  
James Maurer  
Clayton Maxwell  
Bruce May

Scott Mayfield  
Robin McCamont  
Richard McCleary  
Scot McKee  
Kitty McMahan  
Maureen Medford  
Ascencion Mendez  
Lorelei Mendivil  
Matthew Mercer  
Mark Michael  
Gregory Mihara  
Duane Miller  
Lorri Mino  
Gerald Mongrain  
Raymond Mooney  
Kenneth Morano  
Jerry Morehead  
Craig Morgan  
Donald Morgan  
Judith Morical  
Leona Morton  
Leonard Mudd  
Wayne Murray  
Kendall Naethe  
Cheryl Nakai  
David Nelson  
Kenneth Newsom  
Ronnie Niere  
Christopher Nokes  
Thomas Nowrey  
Peter Nucci  
Don Ogura  
Larry Olson  
Michael Orlando  
Richard Parks  
Dhirendra Patel  
Donald Patricelli  
Scott Paulson  
Ann Pepin  
Dianna Peterson  
Rick Peterson  
Robert Peterson  
Steven Peterson  
Debra Phillippi  
Dennis Pierce  
Eduardo Pina  
Anita Pinkosky  
Randall Platisha  
Daniel Platzer  
Guy Pledger  
Richard Pollack  
Jane Pollard  
Douglas Powers  
Keith Prarat  
Robert Pratt  
Barbara Prieto  
Larry Proulx  
William Radcliffe  
Linda Rangel  
Paul Read  
Kenneth Reed  
Kathryn Regeimbal  
Robert Repp  
Donald Requa  
William Rice

# SERVICE AWARDS / Boeing recognizes the following employees in November for their years of service.

David Richards  
 Judy Richardson  
 Richard Risberg  
 Steve Rivera  
 Alvin Roberts  
 Joanne Roberts  
 Barbara Robinson  
 Michael Rosenthal  
 Frank Rotter  
 Ralph Routier  
 James Ruiz  
 Betty Sage  
 Richard Sanders  
 Frank Santoni  
 Apolinario Santos  
 Randal Schafer  
 Robert Schempp  
 Mark Schiffner  
 George Schroeder  
 Jule Scott  
 Patricia Selby  
 Stephen Severson  
 Keith Shanko  
 John Shelton  
 Janis Shimojima  
 Michael Shintaku  
 Sarpal Sidhu  
 Gregory Smith  
 Linda Smith  
 Norma Snowden  
 Robert Sonsteng  
 William Spicer  
 Christina St. Paul  
 Evelyn Stallone  
 John Starling  
 Lance Steele  
 Scott Stewart  
 Timothy Stewart  
 Keith Stinson  
 Catherine Stokes  
 Thomas Street  
 John Stroud  
 Sharon Student  
 Gary Taki  
 Clive Taylor  
 James Terrell  
 Gerry Thomas  
 Charles Thompson  
 Marion Tinsley  
 Dennis Tooman  
 Richard Trenowski  
 Frank Troth  
 Roxanne Tucker  
 Julie Turnell  
 Luther Tyus  
 Diane Valdes-  
 Tomasevich  
 Richard Van Skike  
 Satyendra Vermani  
 Jim Villanueva  
 Robert Vorholt  
 Jeffrey Wakefield  
 Verna Wallace  
 Craig Walth  
 Eric Warburton

John Ware  
 John Warren  
 Kathleen Watson  
 Eva Wegener  
 Gerald Weisman  
 Wayne Werle  
 John West  
 Daniel Whiting  
 Robert Wiebusch  
 Gary Williams  
 Thomas Williams  
 Janice Williams-Ruffin  
 Patricia Willis  
 James Wilson  
 Mathew Wilson  
 Thomas Wilson  
 Terry Winger  
 Cathy Winterfeldt  
 Charles Woods  
 Marjorie Wooten  
 Michael Wuerth  
 Michael Zachau  
 Dale Zehms  
 Bruce Zimmerman  
 Larry Zimmerman  
 Thomas Zmiarovich

## 25 Years

George Adams  
 Victor Adams  
 Duane Akers  
 Jon Akers  
 Kenneth Allen  
 Randall Allen  
 Jerry Anderson  
 Van Anderson  
 Curtis Ashford  
 William Bailey  
 Richard Bard  
 Ralph Barrett  
 Elena Barrio  
 Kevin Barrows  
 David Betancourt  
 Bradley Bishop  
 John Blackwell  
 Justine Blalock  
 Helen-Cathleen  
 Blanscet  
 Brian Blaylock  
 Andria Boano  
 John Boose  
 Bert Bouquet  
 Raymond Bower  
 Bob Boyll  
 Alan Bracy  
 David Brauchle  
 Stephen Brooks  
 Charles Broughton  
 Daniel Brown  
 Daniel Buckley  
 Thomas Caramanico  
 Alesa Carlin  
 Meri Cartee  
 Dino Cerchie  
 Pamela Cerchie

Donald Clark  
 Dennis Cole  
 Mario Colombo  
 Donald Cook  
 Matthew Cox  
 Bruce Craig  
 Wesley Crow  
 Gloria Cvrkel  
 David Davenport  
 Frederick Davis  
 John Davison  
 Stephen Day  
 Steven Deluca  
 Jeffrey Demien  
 Jimmy Detrick  
 Edward Di Milia  
 David Diederick  
 Mary Dodd  
 Cathy Doser  
 Rex Douglas  
 Joseph Duffy  
 Craig Dupler  
 John Dworschak  
 Danny Eaton  
 Priscilla Ekins  
 Richard Esquibel  
 John Fain  
 Ali Fathiafshar  
 Robert Ferreira  
 Carol Ferri  
 Paul Fisher  
 Daniel Flores  
 Charles Foley  
 Thomas Folk  
 Larry Fothergill  
 Gerald Franks  
 Wayne Furumoto  
 Mary Fyda-Mar  
 Peter Fyfe  
 Lea Gardner  
 Mitchell Garland  
 Alban Gaub  
 Falvia Gee  
 John Geis  
 Jean Gilbert  
 David Ginsberg  
 Dan Gochnour  
 James Golden  
 Theresa Golden  
 David Gonzalez  
 Wayne Gooden  
 Douglas Graham  
 Kenneth Graham  
 John Grieco  
 Thomas Griffor  
 Gary Groop  
 Stephen Guzek  
 John Harback  
 Susan Harris  
 Colleen Hartman  
 Theresa Hew  
 Kevin Hezel  
 Julie Hippe  
 Stephen Howe  
 Eric Howell

Daniel Hunter  
 Joseph Hunter  
 Donald Hurst  
 Paul Huson  
 Jo Inafuku  
 Danny Iway  
 Pauline Jackson  
 Hossein Jafari  
 Hector Jasso  
 Guy Jergens  
 David Jones  
 John Kandler  
 David Kartes  
 Dennis Kast  
 Catherine Kellogg  
 Deborah Kelly  
 Bruce Keough  
 Joseph Kingswold  
 Gordon Kirkbride  
 Gary Kirkpatrick  
 Lee Kitson  
 Robert Knust-  
 Graichen  
 David Kocsis  
 Mark Koopmann  
 Kyle Kostoff  
 Alan Kurdziel  
 Steven Labonte  
 William Lane  
 Dean Lanway  
 Marianne Lemp  
 Curtis Leonard  
 Arthur Limon  
 James Loeffler  
 Perry Lowery  
 Chung Lu  
 Thomas Ludwinski  
 Judy Lunsford  
 John MacDonald  
 Douglas MacGregor  
 Miguel Macias  
 Shane Mahoney  
 Frank Manriquez  
 Steve Martin  
 Michael Marvel  
 Felene Mattena  
 Jeffrey Mayfield  
 Rodger McAdoo  
 Gerald McKinzie  
 Raymond McManus  
 Paul Meyers  
 Walter Mickelbart  
 Mark Miller  
 Richard Moore  
 Richard Munsey  
 Christopher Murray  
 Owen Nagao  
 Eric Nansen  
 Kent Ng  
 Cheryl Nielsen  
 Michael Nobles  
 Loyd Oakley  
 Elvira Ortega  
 Marianne Otte  
 Arthur Pabillon

Annice Parker  
 Justin Penn  
 Orellynette Perkins  
 William Perkins  
 Richard Philippe  
 Joel Pierce  
 Rachel Pinedo  
 Alan Pitts  
 Mark Powell  
 Lee Powers  
 Darryl Price  
 Michael Purcell  
 Gary Rafferty  
 David Rasmussen  
 Daniel Reeb  
 Ronald Reed  
 Gary Reimann  
 Sandra Reiss  
 Bruce Remington  
 Kevin Richmond  
 Sally Robot  
 Paul Robert  
 John Robison  
 Timothy Roede  
 George Rohr  
 Paul Rosadiuk  
 Coni Roush  
 Kenneth Rowland  
 Robert Ruble  
 Dino Lanway  
 Dwight Sabrowsky  
 Larry Saintz  
 Darrel Santala  
 Rafael Santamaria  
 Craig Schiefelbein  
 Victor Schiller  
 Jacqueline Schmid  
 James Schondel  
 Janis Schroeder  
 Mark Scott  
 Kenneth Shead  
 Wayne Shkurhan  
 David Shwalter  
 Joseph Shuster  
 Donna Sieker  
 Julie Sienko  
 James Simmons  
 Harold Skidmore  
 Susan Sloan  
 Randy Smith  
 Robin Smith  
 Thomas Spangler  
 Howard Springer  
 Robert Stanley  
 Bruce Stewart  
 Nancy Stieg  
 Douglas Stitch  
 Mark Studyvin  
 Daniel Summers  
 Vincent Tappel  
 Paul Tarbuck  
 Katherleen Tatum  
 Stuart Terashita  
 Steven Teutscher  
 Gregory Thomas

Sherri Tiffin  
 David Tilzer  
 Roxanne Tovey  
 David Underwood  
 Joseph Uribe  
 Dana Vana  
 Stephen Vance  
 Cheryl Verlander  
 Louis Vonwiederhold  
 Mike Vu  
 Cathy Watanabe  
 Terry Weir  
 James Welling  
 Rick Wilder  
 Harrison Williams  
 Stephen Wind  
 Joseph Wirth  
 Diane Wright  
 Tamra Yatkin  
 Sim Zoller

## RETIREMENTS / The following employees retired in September from The Boeing Company.

Thomas Allanson, 27 Years	Paul Enders, 12 Years	Rick Lim, 11 Years	Ruth Scanlan, 26 Years
Frank Alvarez, 36 Years	Michael Ferguson, 25 Years	Wilbert Lowe, 29 Years	Janette Schaefer, 20 Years
Gloria Arriola, 36 Years	Ronald Ferris, 26 Years	Jeffery Marcroft, 24 Years	Jonna Scott, 36 Years
Margaret Attebery, 23 Years	Shirley Fialko, 29 Years	Elias Martinez, 43 Years	Dolphus Shaddock, 34 Years
Marc Axelrod, 29 Years	Therese Fink, 36 Years	Avery McClellan, 21 Years	Timothy Shaver, 35 Years
Wayne Axelson, 8 Years	Roy Fisher, 21 Years	Donna Merry, 13 Years	Michael Sheedy, 20 Years
David Barnes, 30 Years	Scott Fishkin, 28 Years	Douglas Meyer, 25 Years	Mark Sherman, 23 Years
Diana Barr, 23 Years	Emma Flowers, 36 Years	Eileen Miyamoto, 28 Years	David Shirley, 29 Years
William Baumert, 25 Years	Mona Fountain, 10 Years	Mary Moe, 21 Years	Susan Shirley, 10 Years
David Berge, 46 Years	Ronald Fountain, 36 Years	Lavester Moore, 21 Years	Kenneth Sieracki, 29 Years
James Berryman, 17 Years	Edward Garcia, 44 Years	Gary Morford, 41 Years	Edward Simmons, 36 Years
William Bongiovanni, 21 Years	Arthur Gettler, 23 Years	Edward Morrison, 22 Years	David Simpson, 31 Years
Russell Booth, 30 Years	Edward Gilpin, 40 Years	Joanne Mulinski, 11 Years	Carolyn Sippel, 29 Years
Richard Bowers, 47 Years	Richard Grimm, 43 Years	Marty Munsell, 31 Years	Diane Smith, 23 Years
Joseph Brown, 20 Years	John Grover, 23 Years	Gaylen Neff, 33 Years	Joon Song, 40 Years
Stan Brown, 19 Years	Joseph Hendrickson, 29 Years	Molly Newman, 19 Years	Linda Stagg, 14 Years
Kim Brumble, 35 Years	Stephen Heyroth, 24 Years	Sandra Nouchi, 19 Years	Edward Streeper, 24 Years
Connie Brunsell, 23 Years	Mong Ho, 27 Years	Carol Nova, 15 Years	Jack Sunde, 22 Years
Roy Bullock, 19 Years	Carl Hoge, 11 Years	Gordon Oberg, 30 Years	Patrick Terpening, 40 Years
Hans Carney, 41 Years	Robert Houglan, 23 Years	Maryjune Opperud, 21 Years	Alfred Thomas, 28 Years
Charles Chahanovich, 21 Years	John Howard, 30 Years	Terry Osburn, 20 Years	Alfred Thompson, 22 Years
Allen Chen, 35 Years	David Hutchins, 24 Years	Douglas Ostgaard, 38 Years	Carl Todd, 22 Years
John Cochran, 23 Years	William Hynes, 22 Years	Greg Parker, 29 Years	Joseph Tomczyszyn, 36 Years
Charles Coffman, 23 Years	Mildred Jenkins, 20 Years	Alix Peterson, 20 Years	Nie-Long Tse, 27 Years
Lydia Copeland, 7 Years	David Johnson, 43 Years	Maria Pico, 28 Years	Ronald Vaughan, 23 Years
Margaret Corkern, 31 Years	Russell Johnson, 20 Years	Walter Polt, 7 Years	Thomas Weight, 8 Years
Herminia Cueto, 20 Years	Balvant Kapadia, 24 Years	James Portley, 44 Years	Cecil Welch, 22 Years
Gerald Daumit, 9 Years	Carman Karase, 27 Years	Joseph Price, 22 Years	Ronald Wellman, 31 Years
Alfredo Del Mundo, 32 Years	William Kirkland, 21 Years	Bernardo Quevedo, 49 Years	Michael Whisenton, 29 Years
Timothy Diener, 32 Years	Howard Knaggs, 28 Years	Dennis Reed, 33 Years	Dennis Williams, 30 Years
Paul Dillard, 26 Years	Harold Kozlowski, 21 Years	Ruth Reilly, 7 Years	Thomas Winkel, 25 Years
Deborah Dollard, 31 Years	Benny Krueger, 21 Years	Leland Rhodes, 45 Years	Gary Wong, 38 Years
Raymond Donofrio, 27 Years	Henry Kruger, 24 Years	Jeffery Robinson, 20 Years	Samuel Wong, 35 Years
Douglas Dornes, 35 Years	Shirley Langster, 26 Years	Cheryll Roche, 22 Years	
Bruce Edwards, 30 Years	Arthur Lehtinen, 34 Years	Alan Rosenberg, 23 Years	
William Elkman, 24 Years	Ronald Lermo, 25 Years	Rodolfo Santa Ines, 18 Years	

## IN MEMORIAM / The Boeing Company offers condolences to the families and friends of the following employees.

- Greg Bailey**, technical data designer; service date Oct. 1, 2004; died Oct. 1
- Michael Bertram**, factory service attendant; service date March 27, 1989; died Sept. 10
- Lee Bissonette**, infrastructure generalist; service date Aug. 30, 1989; died Sept. 6
- David Buck**, employee development specialist; service date Feb. 6, 1990; died Sept. 20
- Ronald Butswinkas**, systems engineer; service date Nov. 9, 1987; died Sept. 20
- Earnest Carter**, procurement cost analyst; service date Dec. 5, 1977; died Oct. 14
- Clifton Cumby**, database administrator; service date Sept. 25, 1985; died Sept. 14
- Michael Evans**, software engineer; service date July 26, 2000; died Sept. 26
- David Ford**, aircraft mover and equipment operator; service date Dec. 4, 1978; died Sept. 21
- Nancy Fosdick**, employee development specialist; service date Aug. 25, 1988; died Oct. 16
- Nathaniel Fraser**, property management specialist; service date Dec. 7, 1998; died Sept. 20
- Michael Germano**, integral fuel cell assembler; service date Dec. 2, 1996; died Sept. 30
- Graham Glover**, procurement agent; service date July 15, 2005; died Oct. 12
- Daniel Greene**, electrical systems assembler/installer; service date April 9, 1997; died Sept. 18
- Larry Gregg**, procurement agent; service date Aug. 22, 1985; died Sept. 20
- David Haddenham**, administrative assistant; service date Aug. 1, 1988; died Sept. 20
- Johnny Ibarra**, electrophysics engineer/scientist; service date Dec. 8, 1983; died Sept. 12

# AROUND BOEING /

## BOEING LAUNCHES 3RD ITALIAN EARTH OBSERVATION SATELLITE

Boeing on Oct. 24 successfully launched the third of four Italian Constellation of Small Satellites for Mediterranean basin Observation (COSMO) SkyMed spacecraft.

A Delta II rocket procured from United Launch Alliance for Thales Alenia Space Italia lifted off from Vandenberg Air Force Base, Calif. The COSMO-SkyMed spacecraft was deployed to low-Earth orbit approximately 58 minutes after liftoff.

"The third successful Delta launch for the COSMO-SkyMed program further strengthens Boeing's continued commitment to provide domestic and international commercial customers reliable access to space for science, defense and telecommunications services," said Ken Heinly, director of Boeing Launch Products & Services and president of Boeing Launch Services Inc.

Boeing Launch Services successfully launched the first two COSMO-SkyMed satellites in June and December of 2007.

## P-8A POSEIDON ENGINE RECEIVES CERTIFICATION

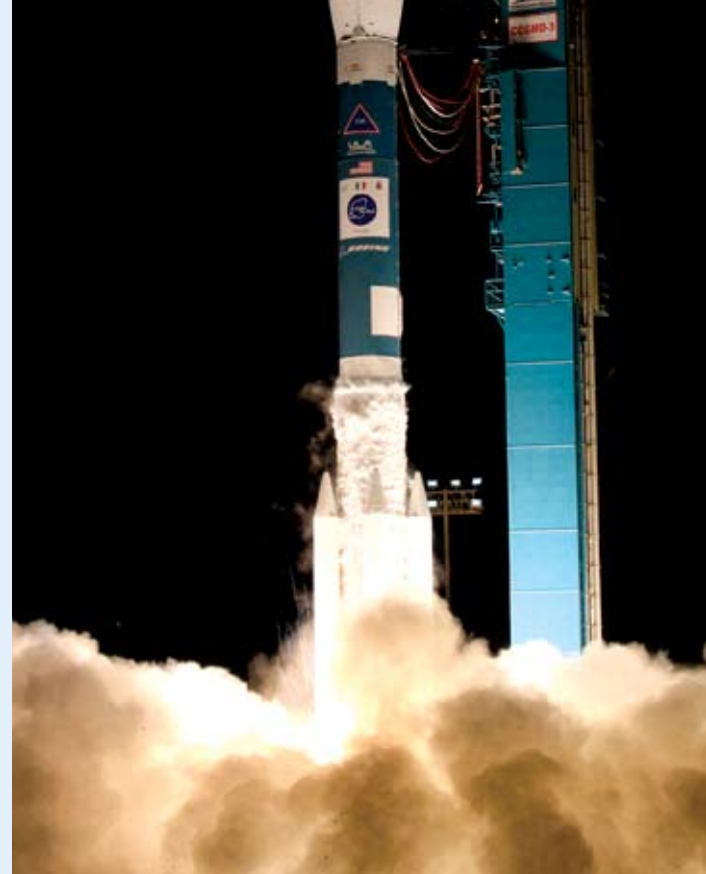
Boeing teammate CFM International recently received certification from the U.S. Federal Aviation Administration and the European Aviation Safety Agency for the CFM56-7B engine, which will power the P-8A Poseidon aircraft.

This milestone paves the way for flight testing in 2009 and initial operational capability for the U.S. Navy in 2013. A version of the same CFM6-7 engine also powers the 737 Airborne Early Warning and Control and C-40 aircraft.

The Navy plans to purchase 108 P-8As to replace the P-3C Orion. The P-8A is a long-range anti-submarine warfare, anti-surface warfare, intelligence, surveillance and reconnaissance aircraft.

Using a United Launch Alliance Delta II rocket, Boeing Launch Services launches the third Italian-built COSMO-SkyMed 3 on Oct. 24.

WILLIAM G. HARTENSTEIN/BOEING



## IN MEMORIAM / The Boeing Company offers condolences to the families and friends of the following employees.

**Kyu Kim**, saw operator; service date June 16, 1986; died Aug. 7

**Leo Lindbloom**, software technical analyst; service date Jan. 30, 1991; died Oct. 8

**Keith Luksan**, materials processor/requirements facilitator; service date Feb. 27, 1978; died Sept. 10

**Michael Mathews**, procurement coordinator; service date Sept. 5, 1978; died Sept. 7

**James McLaughlin**, programmer analyst; service date June 13, 1966; died Sept. 17

**Douglas Moorhead**, propulsion test and service technician; service date Nov. 15, 1982; died Sept. 20

**Michael Morgan**, engineering technical specialist; service date April 8, 1990; died Oct. 13

**John Munroe**, Materials, Processes & Physics engineer; service date April 10, 1985; died Sept. 27

**Kevin Pehr**, mechanical systems design and analysis engineer; service date May 15, 1985; died Oct. 4

**James Pierson Jr.**, numerical control tape laminator; service date Jan. 5, 1981; died Sept. 4

**Robert Raber**, facilities and plant maintenance specialist; service date June 8, 1998; died Sept. 27

**Thomas Richardson**, numerical control multiple tool and milling machine operator; service date Aug. 2, 1978; died Sept. 9

**John Shaver**, maintenance engineer; service date June 19, 1979; died Oct. 1

**Suresh Shukla**, computing architect; service date Dec. 1, 1977; died Oct. 15

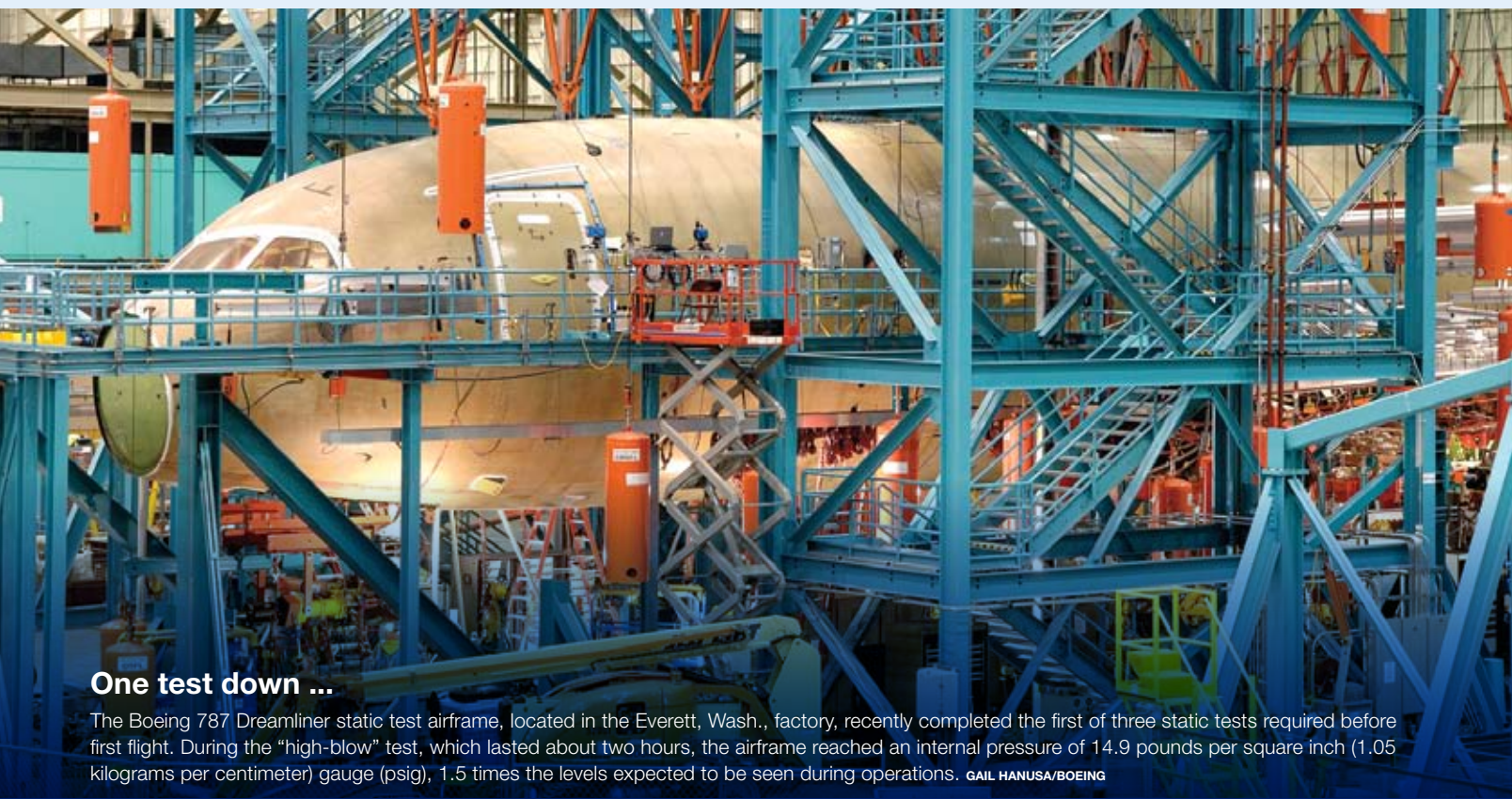
**Michael Steed**, sheet metal assembler and riveter; service date June 24, 1974; died Sept. 9

**Maureen Strong**, infrastructure generalist; service date March 26, 2007; died Sept. 29

**Linda Tjarks**, technical data designer; service date March 5, 1979; died Oct. 10

**Kuo-Kuan Tung**, software engineer; service date Nov. 17, 2003; died Sept. 16

**Carol Williamson**, procurement agent; service date May 20, 1977; died Oct. 8



### One test down ...

The Boeing 787 Dreamliner static test airframe, located in the Everett, Wash., factory, recently completed the first of three static tests required before first flight. During the "high-blow" test, which lasted about two hours, the airframe reached an internal pressure of 14.9 pounds per square inch (1.05 kilograms per centimeter) gauge (psig), 1.5 times the levels expected to be seen during operations. **GAIL HANUSA/BOEING**

### IDS BUSINESS UNIT'S NAME CHANGE REFLECTS GROWTH IN SERVICES MARKET

Integrated Defense Systems recently changed the name of its customer-support business to Global Services & Support.

GS&S, a \$7 billion business with more than 16,000 employees, serves military and government customers worldwide with a wide variety of products and services including maintenance, modifications, training, logistics, upgrades and other services.

The organization also has launched a new division, Defense & Government Services, which will compete in a 10-year, \$400 billion market that includes services for infrastructure support, aviation and logistics, information, support operations, and managed communications, as well as a broad array of other technical services.

"The name change better describes where we're headed," said GS&S President Dennis Mullenburg. "Our people serve customers globally, we are expanding into a huge services market, and we have a healthy core support business to execute."

### SMALL CHANGES ADD UP TO SAVE FUEL FOR 777 FLEET

To date, 170 Boeing 777s are scheduled to receive the new Performance Improvement Package that will improve fuel burn and reduce carbon dioxide emissions.

Continental Airlines, Air New Zealand, Delta Air Lines, El Al Israel Airlines, Austrian Airlines, Air France, KLM Royal Dutch Airlines and British Airways are among the 10 airlines investing in the new package in 2008, which will be introduced into service next

April. The Performance Improvement Package, which is available on the 777-200, -200ER (Extended Range) and -300 models, is included in the baseline configuration on newer 777 models, the 777-200LR (Longer Range), -300ER and Freighter.

The package includes low-profile vortex generators, an improved ram air system and drooped ailerons. These small changes will result in a 1 percent fuel efficiency gain, improving fuel burn by 1 million pounds (453,600 kilograms), or 146,200 gallons, per year. This will eliminate 3 million pounds (1.36 million kilograms) of carbon dioxide emissions per airplane each year.

The Performance Improvement Package demonstrates how Boeing's production programs and Commercial Aviation Services Product Development are working together to deliver LIFECYCLE SOLUTIONS to customers. LIFECYCLE SOLUTIONS are offerings that help customers maximize their operational and environmental efficiency and the lifetime value of their Boeing airplanes and fleet.

### BOEING TEAMS UP IN SUPPORT OF SUSTAINABLE AVIATION FUELS

Boeing and aviation, energy and academic leaders have teamed up to accelerate the development and commercialization of sustainable new aviation fuels. The new Sustainable Aviation Fuel Users Group makes commercial aviation the first global transportation sector to voluntarily drive sustainability practices into its fuel supply chain.

The group is chartered to identify and cultivate renewable fuel sources for commercial use that will reduce greenhouse gas emissions while lessening commercial aviation's dependence on fossil fuels and exposure to oil price volatility. Group members



have pledged that any sustainable biofuel used must perform at least as well as kerosene-based fuel but with a smaller carbon life cycle. The group will only consider renewable fuel sources that minimize effects on biodiversity such as fuels that require minimal land, water and energy to produce.

Airlines supporting the initiative include Air France, Air New Zealand, ANA (All Nippon Airways), Cargolux, Gulf Air, Japan Airlines, KLM, SAS and Virgin Atlantic Airways. Collectively they account for approximately 15 percent of commercial jet fuel use.

## CONFERENCE ATTENDEES FOCUS ON 'MAKING LEAN+ COUNT'

With a focus on "Making Lean+ Count," the fall 2008 Lean+ conference brought together 1,000 Boeing employees, along with Boeing customers and suppliers, last month for three days of presentations, workshops and tours designed to help them embed continuous improvement in their daily work.

Presenters and participants shared success stories and hard lessons learned as they work to better serve their customers, improve quality and productivity, and drive growth in a difficult economic environment.

"We go to a lot of meetings, but you don't always find something you can put your arms around and use. At this one I did," said Larry Hinojosa, a logistics specialist for Commercial Airplanes technical support in Long Beach, Calif.

The fall conference was sponsored by the Commercial Airplanes' Finance organization. The next Lean+ conference, sponsored by Integrated Defense Systems, is scheduled for April 21-23, 2009, in Anaheim, Calif.

## HOUSTON EMPLOYEE WINS VOLUNTEER SERVICE AWARD

Anita Gale, a Houston-based senior project engineer and Associate Technical Fellow, was named the 2008 winner of Boeing's highest award for volunteer service to the community.

In honor of her work co-creating, organizing and conducting the international Space Settlement Competitions with the American Institute of Aeronautics and Astronautics, Gale was named the 2008 winner of the Boeing Award for Exceptional Employee Volunteer Service. This award recognizes employee achievements in skills-based volunteering, or community efforts where volunteers use their professional or technical skills to benefit local nonprofits.


Also recognized were semi-finalists Yvonne Simms, a systems engineer from Huntsville, for her work with Girl Scouts of North-Central Alabama; and Edward Carr, a Finance employee from Renton, Wash., for his volunteer service with the Intercollegiate Ethics Bowl.

Gale received a \$10,000 check at the ceremony to deliver to the AIAA for use on the Space Settlement Design Competitions. Simms and Carr each received a \$2,500 check to present to the Girl Scouts of North Central Alabama and the Intercollegiate Ethics Bowl, respectively. Gale also received the William Allen Chairman's Cup, which recognizes her achievements. It will be displayed at the Houston facility where she works for a year before it is presented to the 2009 winner.

The awards were presented Oct. 16 in Chicago.



Yvonne Simms (left), Anita Gale (center) and Edward Carr (second from right) recently won awards in recognition for their community volunteering efforts. With these honorees are Rick Stephens (second from left), senior vice president, Boeing Human Resources and Administration, and Anne Roosevelt, Boeing Global Corporate Citizenship vice president.



# Non-Metallic Development Operations Team

The C-17 Globemaster III has a critical mission to carry large equipment, supplies and troops directly to small airfields, often in unpredictable conditions. To help support this, our team has worked to improve composite manufacturing techniques—to the tune of saving \$1 million over the past five years.

Our team at Boeing Integrated Defense Systems in Huntington Beach, Calif., in collaboration with the Phantom Works Stitched Composites Development team, has implemented several process improvements since 2003 for the composite fabrication of parts used in the C-17 Large Aircraft Infrared Countermeasures (LAIRCM) program. The most significant improvement was the implementation of a resin-infusion technology known as CAPRI (controlled atmospheric pressure resin infusion) that we applied to the fabrication of the forward fuselage fairings on the C-17 aircraft.

The CAPRI process was first developed by a team of Commercial Airplanes engineers with support from Phantom Works' AeroStructures, Manufacturing and Support Technologies organization.

In 2004, the CAPRI process was transitioned onto the C-17 LAIRCM program and has reduced our labor hours by 24 percent. We've also lowered the amount of raw materials purchased.

Previously, we manufactured the forward fairings using the resin film infusion technology, which required placement of the individual resin films on the part, vacuum bagging, and then curing in an autoclave for 14 hours—a long and laborious process. With the CAPRI technology we are able to produce one ship set (two fairings) in as little as four days. The fairings are laid out and stitched as dry fabric, then vacuum-bagged and resin-infused during an oven cure, resulting in completed parts without requiring an autoclave cure. This helps reduce infrastructure, operational and energy costs.

Our group specializes in a wide variety of processes that allow for the manufacture of composites at extremely high efficiencies, but the CAPRI technology has become state of the art for stitched composite fabrication.

**From left:** Peggy Walters, Aravia Mitchell, Ed Hipolito, Jason Jewell, Marc Wragg, Gabe Mata, Dave Brillhart, William Bogni, Jerry Butanda, Chris Almond, Frederick Holloway, Malcolm Howarth, David Clouse, Sharon Castaneda, Patrick Thrash, Nelson Valentin, Derrick Kimbrough. **MICHAEL GAIL/BOEING**

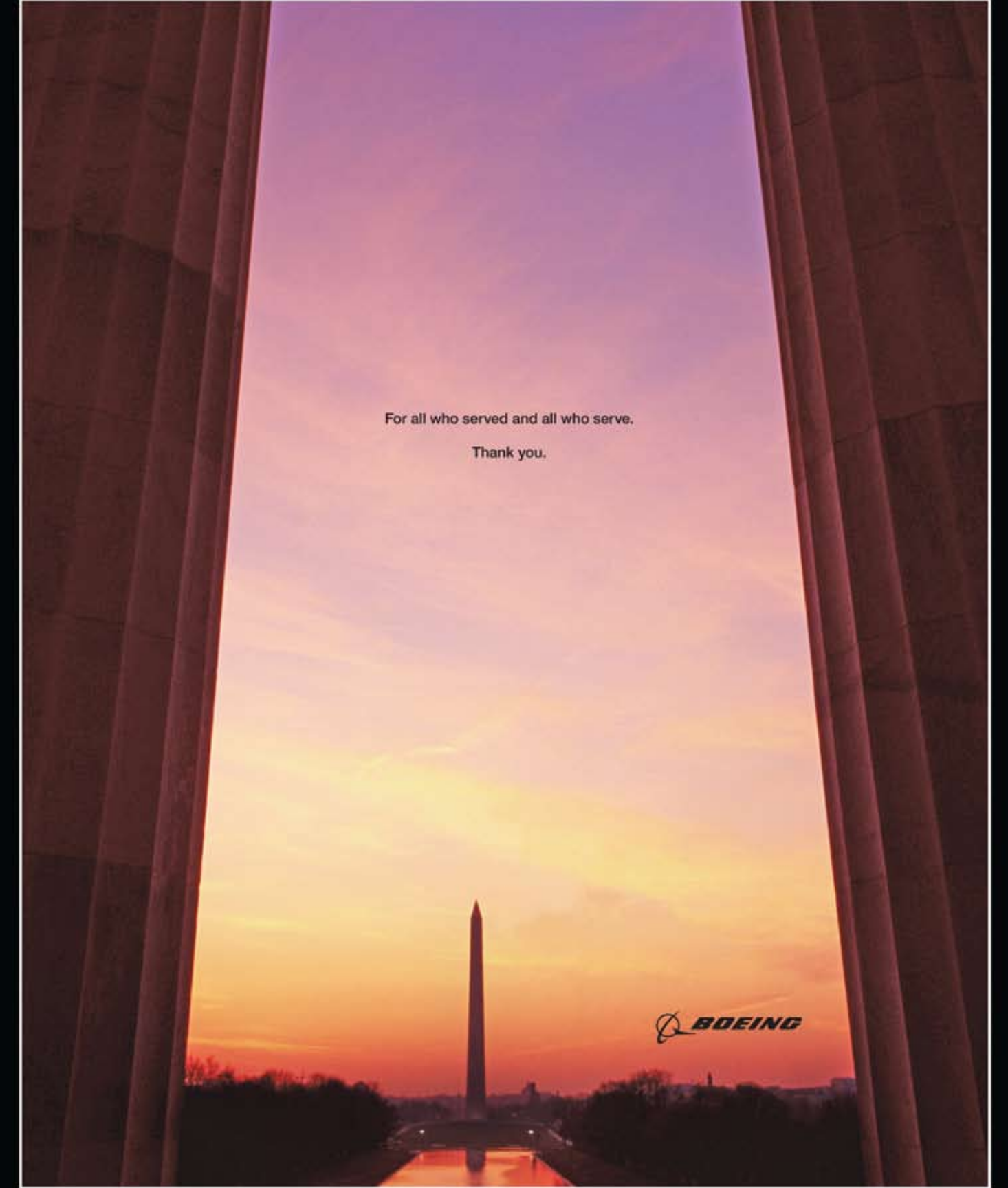


Child Life Program for Art and Music Therapy in the Cardiac Intensive Care Unit at The Children's Hospital of Philadelphia

**Today, you can change someone's life for the better.  
Tomorrow's good too.**

Today. Tomorrow. Pick a day, any day. And join the Employees Community Fund at [community.web.boeing.com/ecf](http://community.web.boeing.com/ecf). Contributions to the Fund in Philadelphia support The Children's Hospital of Philadelphia, the nation's first pediatric hospital and a pioneer in the field of childhood cardiac care. Please join us and make a difference in your community. Today and every day.





For all who served and all who serve.

Thank you.

 **BOEING**

*This ad was created to demonstrate Boeing's appreciation and gratitude to U.S. veterans. Part of an integrated effort, this print ad will run in The Washington Post and The Washington Times, as well as in more than 70 regional, trade and military publications. The campaign will also feature TV and online components.*