



Frontiers

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Aiming *high*

Boeing's Space Exploration team is working to support NASA—and seek new business opportunities.





EXPAND YOUR CLASSROOM.

The greatest classroom is the one that lies all around us.

Boeing proudly supports those who encourage students to explore the world wherever they find it.

 **BOEING**

Global corporate citizenship refers to the work Boeing does—both as a company and through its employees—to improve the world. This ad illustrates Boeing's commitment to all the teachers who encourage students to learn from the world all around them.

On the Cover

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Space for growth

Boeing and its predecessor companies have played an indispensable role in helping the U.S. space program attain its awe-inspiring achievements. Boeing's space team—including Pat Schondel (right), vice president of Business Development for Boeing Space Exploration—is pursuing projects, both with NASA and with private partners, to make sure it remains a critical partner in spaceflight.

PHOTO: BOB FERGUSON/BOEING
COVER IMAGE: NATALIE DIXON AND ELLIOT HARIK ARE HOUSTON-BASED EMPLOYEES IN BOEING'S SPACE EXPLORATION BUSINESS. PHOTO ILLUSTRATION: BRANDON LUONG/BOEING; EMPLOYEE PHOTO: BOB FERGUSON/BOEING; SHUTTLE PHOTO/NASA



Main Feature

36 Thank you for your support

Being a good corporate citizen is among Boeing's business strategies. It's a value that endures in large part through the efforts of its employees. Here's a look at some of the community volunteering activities Boeing people undertake.



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30 Home maintenance

With last month's delivery of the Starboard 6 truss segment, Boeing's work on creating major assemblies of the International Space Station is completed. Now comes the task of supporting ISS operations, including what's needed to outfit the ISS for its role as a science lab.

34 In a class of its own

The 787 Dreamliner is ushering in revolutionary advancements in aviation and technology. As part of these achievements, the 787 program and Alteon, Commercial Airplanes' training unit, have been hard at work together to revolutionize 787 training.

42 The signal is clear

The U.S. Navy is seeking a new signals intelligence aircraft, currently known as EP-X. Boeing believes it can provide the best value to the Navy through the capabilities the company and its teammates offer—and because Boeing can leverage its work on the Navy's P-8A Poseidon.

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Following battery installation, the Solar Array Wing is reinstalled on the S6 lower deck Integrated Equipment Assembly in preparation for the truss segment's delivery to the International Space Station last month. Boeing engineer Sam Amundsen is shown on the left; technician Elijah Walker on the right.

MELANIE GURNAVAGE/INDYNE

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Ethics and leadership: All of us help shape our work environment

Wanda Denson-Low
Senior vice president, Office of Internal Governance

Life's daily demands can create a lot of pressure. Home and family obligations, work expectations and our own desire to excel can create tremendous stress. Add the current economic environment, increased challenges for greater performance and the anxiety caused by layoffs, and you have a situation primed for higher risk and potential missteps.

Take for example this recent story about a Boeing employee. Because of work force reductions caused by changing business demands, she moved to a new proposal team. Also, she had just purchased her first home, and her young family needed her income to help pay the mortgage and living expenses.

Before this new assignment, the employee had been involved in a teaming arrangement where she had been exposed to competitor data that was also related to the new proposal team. In her words, she said she remembered from her ethics training that there could be a conflict of interest. Given the tough business environment at the time, she worried that if she spoke up, she would be taken off the team and there might not be another suitable position for her.

Her decision was to seek the advice of an ethics advisor, who assured her that she had done the right thing by alerting the company to the situation. The ethics advisor and her manager found another position for her on a different team.

While it might seem that the right answer would be clear, especially since we know the outcome, it's also understandable that when faced with such a personal dilemma, it took a lot of courage to speak up. The employee understood the potential risks to the company if she didn't tell anyone, and she took personal responsibility to protect her co-workers, the customer and the Boeing reputation. She also preserved the company's ability to compete for the program—which, if won, would sustain jobs at her location, proving that the ethical decision *is* the good business decision.

This story, like countless others, illustrates how our employees are demonstrating leadership at all levels of the company, regardless of job title. Leadership along with an open and inclusive work environment are essential in high-performing organizations. They are, by no coincidence, the same principles that drive an ethical culture.



The Ethics organization, part of the Boeing Office of Internal Governance, is launching an initiative called “Leadership Matters.” It isn’t a new program; it isn’t a program at all. “Leadership Matters” is a way to explain what employees are already doing to sustain a work environment where issues can be raised without fear of reprisal, and where all constructive input can be shared. Through everyday acts, employees shape the work environment by the way they conduct themselves and the choices they make. Every time we encourage open and productive dialogue, we are contributing to the kind of work environment where errors can surface and corrections can be made early.

When the Office of Internal Governance was formed, Boeing broke new ground by creating an integrated approach to mitigating and monitoring risk. As a result, we have become a benchmark for other companies looking to respond to increased regulatory demands and greater public scrutiny. By bringing together ethics, corporate investigations, audit and the export/import functions under a single organization, Boeing has an unmatched advantage for gathering and analyzing data from multiple sources, which enables us to identify and address potential weaknesses in proactive rather than reactive ways. It is a leaner and timelier approach that is leading us to higher-quality compliance, improved efficiencies and reduced cost to our businesses.

It is in this way, and through the leadership of our employees who are sustaining a culture of openness and inclusion, that we are making ethics and compliance our competitive advantage. ■

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

April 21–23: Boeing Lean+ Conference. Anaheim, Calif. See http://leo.web.boeing.com/Events/LEC/Spring2009/LEC_Spring2009.cfm on the Boeing intranet

April 22–23: *Aviation Week* 2009 MRO Military Symposium. Dallas. See www.aviationweek.com/events/current/mil

May 4–6: *SpeedNews* 7th Annual Aerospace & Defense Industry Suppliers Conference. Los Angeles. See www.speednews.com/ConferenceInfo.aspx?conferenceID=22

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

May 6–7: *Aviation Week* Bird Strike Prevention Forum. Chicago. See www.aviationweek.com/events/current/bird

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

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

Sept. 8–10: Asian Aerospace 2009. Hong Kong. See www.asianaerospace.com

Sept. 13–15: 15th World Route Development Forum. Beijing. See www.routesonline.com

Sept. 14–16: *SpeedNews* 10th Annual Aviation Industry Suppliers Conference. Toulouse, France. See www.speednews.com/ConferenceInfo.aspx?conferenceID=3

Sept. 14–17: American Institute of Aeronautics and Astronautics' Space 2009 Conference and Exhibition. Pasadena, Calif. See www.aiaa.org/content.cfm?pageid=230&lumeetingid=2074

Sept. 15–17: Cargo Facts 2009. Seattle. See www.cargofacts.com

Oct. 20–22: National Business Aviation Association 62nd Annual Meeting & Convention. Atlanta. See www.nbaa.org

Oct. 20–25: Seoul International Aerospace & Defense Exhibition 2009. Seoul. See www.seoulairshow.com

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

Dec. 2–3: *Aviation Week* Aerospace & Defense Finance Conference. New York. See www.aviationweek.com/events/current/fin

Dec. 8–10: *Aviation Week* MRO Asia 2009. Hong Kong. See www.aviationweek.com/events/current/mas

Corrections:

In "Wanna talk trade? Boeing's right there" (March 2009, Page 46), a sidebar to the article "The real deal," the number of airplanes Chinese airlines are expected to buy over the next 20 years was misstated. That number should be 3,700.

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

Glowing pyramids

A cluster of 14-foot high (4.3 meters) skylights rise from the roof of the Boeing factory in Everett, Wash., glowing like glass pyramids against the evening sky. The skylights were installed last year as part of the Future Factory upgrade project. They bring natural light into the world's largest building, reducing the energy required for interior lighting. Twenty-six skylights, each about 25 feet (7.6 meters) per side, were placed throughout the roof. **GENERAL CONSTRUCTION**



Quotables

“The progress on a daily basis is gratifying.”

– Scott Carson, *Commercial Airplanes president and CEO, on the status of the 787 Dreamliner, which will make its first flight in the second quarter of 2009, at the J.P. Morgan Aviation & Transportation conference on March 10*

“That’s an example of how a joint venture can provide value to India, and India can provide value to Boeing.”

– Shep Hill, *president of Boeing International, about the accomplishments of a joint venture between Boeing and Tata Industries Limited of India, in the March 6 Economic Times of India*

“It’s a true lifesaver.”

–U.S. Army Col. Newman Shufflebarger, *on the Army’s deployment of the Boeing CH-47F Chinook in Iraq and Afghanistan, in a March 5 Defense Daily report*

IAM PROMOTIONS

No promotions listed for periods ending Feb. 27 and March 6, 13 and 20.

ETHICS QUESTIONS?

You can reach the Office of Ethics & Business Conduct at 1-888-970-7171; Fax: 1-888-970-5330; Web site: <http://ethics.whq.boeing.com>

Gust of innovation

Boeing's interest in wind energy started an environmental legacy that lives on today

By Eve Dumovich

You know that Boeing has led the world in aerospace technologies and achievements. But did you know that Boeing once led the world in harnessing the wind for energy?

During the 1980s, Boeing built the largest wind turbines in history and constructed the first "wind farm." "Wind energy has a potential we are just now beginning to tap," said U.S. Rep. Mike McCormack (D-Wash.) on April 17, 1980, at the ceremony launching the Boeing-built wind turbine farm near Goldendale in southwest Washington. Breakthroughs such as these established a legacy that highlights the company's continuing commitment to pioneer environmentally progressive technologies.

Boeing entered the wind business after the Organization of Petroleum Exporting Countries oil embargo in 1973, which caused high fuel prices and long lines at gas stations. The U.S. Department of Energy asked for proposals demonstrating the commercial feasibility of wind power. In 1977, Boeing Engineering and Construction Company won the contract for design, installation and testing of 2,500-kilowatt wind turbine systems.

The resulting three 350-foot (107-meter) tall MOD-2 wind turbines at Goldendale began producing power in May 1981. The Bonneville Power Administration bought output of the Goodnoe Hills machines and integrated it into the regional power grid through lines owned by the Klickitat County Public Utility District, the county where Goldendale is located.

"The ambitious Bonneville Power Administration MOD-2 program will no doubt make the Pacific Northwest this country's leader in man's efforts to harness the wind," Washington state



“We are confident that [MOD-2 wind turbines] represent the beginning of production in quantities that will make a significant contribution toward easing the energy crisis.”

– T. Wilson, former Boeing CEO

Governor Dixy Lee Ray said at the time.

By the end of 1982, MOD-2 Boeing wind turbines also were operating in Medicine Bow, Wyo., and in Solano County, Calif.

The Goldendale and Wyoming sites were primarily research sites for Boeing, Bonneville Power Administration, NASA and Battelle Northwest Laboratories. The Solar Energy Research Institute also evaluated the suitability of megawatt-size wind turbines as a source of electricity.

The Solano MOD-2 turbine was the first built for a commercial customer and was sold to the Pacific Gas & Electric Company of San Francisco.

“The MOD-2 wind turbines are designed to be of commercial value. We are confident that they represent the beginning of production in quantities that will make a significant contribution toward easing the energy crisis,” Boeing CEO T. Wilson said at the time.

The MOD-2 wind turbines operated through 1986, until the tests had been completed, and then were dismantled. In 1985, their last full year of operation, the combined electrical output of the three turbines was 8,251 megawatt-hours—enough to power about 1,000 average Northwest homes for a year.

Project manager Peter Goldman called the five-year, \$55 million research project “an absolute success.” With the test finished, the Medicine Bow MOD-2 wind turbine was sold for scrap metal in 1987.

The next-generation Boeing-built wind turbine, the MOD-5B, was barged to Kahuku, Hawaii, in 1986 and was running by July 1987. It weighed 939,000 pounds and had a 320-foot-diameter, two-blade rotor on a 200-foot steel tower (426,000 kilograms, 97.5 meters and 61 meters, respectively). By Nov. 20, 1987, the turbine completed its first 1,000 hours of operation and had produced enough electrical energy for 1,500 homes.

Early in 1988, operation of the turbine was transferred to Hawaiian Electric Incorporated, then to the Makani Uwila Power Corporation and kept in service intermittently until late in 1996. At that time, due to financial difficulties, the wind turbine was shut down along with the rest of MUPC and passed to the property owner, Campbell Estates.

With no prospects for continued operation, Campbell Estates

decided to disassemble and scrap the MOD-5B. Before this decommissioning, the DOE and the National Renewable Energy Laboratory salvaged the drive train gearbox and generator in July 1998.

Although Boeing left the wind turbine business during the late 1980s, the Boeing-built wind turbines set several world records for size and power output. In 1987, the MOD-5B was the largest single wind turbine operating in the world. It featured the first large-scale variable-speed drive train and a sectioned, two-blade rotor that enabled easy transport of the blades.

The Boeing wind turbine R&D program pioneered many of the multimegawatt turbine technologies in use today, including steel tube towers, variable-speed generators, composite blade materials and partial-span pitch control, as well as aerodynamic, structural and acoustic engineering design capabilities.

Boeing continues to pioneer advancements in environmentally progressive energy sources that offer the potential to reduce greenhouse gas emissions. The company’s wholly owned subsidiary Spectrolab is one of the world’s leading solar cell manufacturers, and its Earth-based concentrator cells have achieved 40.7 percent efficiency in converting sunlight to electricity. To help move aviation closer to a sustainable fuel supply, Boeing has partnered with airlines, engine companies and fuel processing technology leaders and supported four test flights highlighting the technical feasibility of using sustainably grown, advanced-generation biofuels that do not compete with food crops or for water resources, such as jatropha, camelina and algae.

And last month, Boeing and Vestas, the world’s largest manufacturer of wind turbines, said they’d seek opportunities to work together on joint research projects that further the development of environmentally progressive technologies. ■

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PHOTO: During the 1980s, Boeing-built MOD-2 wind turbines operated in Washington state, Wyoming and California. **BOEING ARCHIVES**

A world of difference

Earth Day is celebrated this month. Here are five simple ways to help the environment anytime, both at work and in your community.

The world will commemorate Earth Day on April 22. That's no small matter to Boeing, which is improving its environmental performance by pioneering progressive technologies and reducing its environmental footprint. The company is pursuing five-year goals to improve energy efficiency and recycling rates and reduce greenhouse gas emissions intensity 25 percent by 2012, with a similar goal for hazardous waste reduction.

To help the company achieve these aggressive goals, Boeing employees have stepped up to take part in many activities. "We all play a critical role in improving environmental performance," said Mary Armstrong, Environment, Health and Safety vice president. "Thanks to employees, we have made tremendous progress over the past year. But we must continue to drive environmental thought and action into all we do."

With Earth Day taking place this month, here are five simple actions you can take at work and at home—not just on Earth Day, but throughout the year—to protect the environment and help Boeing reach its environmental targets.

- 1. You've got the power!** Turn off your computer monitor, lights and equipment when you're not using them. Make sure that you turn on any energy-saving features. **Benefits:** Helps Boeing achieve its target of a 25 percent increase in energy efficiency; reduces greenhouse gas emissions.
- 2. Take part in a "ride" of passage.** Instead of driving, start or join a carpool, or walk, bike or use mass transportation instead. By leaving your car at home twice a week, you could cut greenhouse gas emissions by more than 1,500 pounds (680 kilograms) per year. **Benefits:** Supports local community goals for reducing greenhouse gases.
- 3. I'll drink to that!** Recycle beverage containers such as paper cups, aluminum cans and plastic soda bottles. Also, if you're getting a beverage from a soda fountain or a coffeepot, put your drink in a reusable mug, glass or cup instead of a paper or Styrofoam cup. **Benefits:** Helps Boeing achieve its target of a 25 percent increase in solid-waste recycling rates.
- 4. Think before you ink.** Print as a necessity, not as a convenience. In March, Boeing began using 30 percent post-consumer paper. If you must print a document or an e-mail, use black-and-white, two-sided (duplex) printing. For instruc-



tions on duplex printing and more information, visit http://mps.web.boeing.com/green_tips.cfm on the Boeing intranet. **Benefits:** Using less paper helps cut waste and save money.

- 5. Lend a hand.** Participate in an Earth Day event at a Boeing site or in your community. Boeing's business strategy includes good corporate citizenship, and taking part in environmental activities supports that strategy. For more information about Earth Day activities, visit <http://ehs.web.boeing.com/enviro/earthday.asp> on the Boeing intranet. **Benefits:** Enables Boeing to achieve its business goals and Global Corporate Citizenship objectives. "Boeing improves lives and communities worldwide," said Anne Roosevelt, vice president of Global Corporate Citizenship.

To read Boeing's environment report, which highlights the company's environmental actions and commitments from a product, operations and community perspective, visit www.boeing.com/aboutus/environment on the Boeing external Web site. To learn more about environmental activities at Boeing, including ways to get involved in these efforts, visit the Environment Information Center (<http://ehs.web.boeing.com/enviro>) on the Boeing intranet.

"Since Earth Day last year, we've seen so many inspiring environmental success stories from all around Boeing, and I continue to be amazed at the ability of our colleagues to drive change and make a difference at their sites," said Mark Arvizu, senior manager of Environment, Health and Safety and the enterprise environmental programs manager. ■

PHOTO: Boeing employee volunteers, like the two pictured here, have participated in several tree-planting activities of TreePeople, a California-based environmental advocacy group. TONY ROMERO/BOEING

People in the Neighborhood: A clean **sweep**

For Ray Burton, tidiness connects to Lean and safety

Editor's note: This article marks the start of "People in the Neighborhood," an occasional series in which Boeing Frontiers profiles an employee who explains how his or her job fits into Boeing's overall goals.

For the last three years, Ray Burton (right) has served as a Housekeeping team leader in Wichita, Kan. Here he discusses what he does in a typical day and how his work connects to Boeing efforts to boost productivity and safety.

I do a lot of different things in a day. I do ordering and stocking of cleaning and paper products. We go through existing internal supply channels to do this, instead of going off the process. That way, **we get more accomplished** than if many people were trying to do the same job.

I also check with other teammates to see what they need as far as tools and supplies to help them do their jobs. One of the jobs I do is to fill kitting boxes with cleaning materials, like OS1 calls for.¹ Each site had so many products that it was costing Boeing quite a bit. We 5S'd all our products and went to **single packets** of cleaning materials.²

We're always looking for ways to improve our processes. We try to keep our expenses to a minimum. When you **take ownership of your work**, then you're always looking for ways to cut costs or do things in a better way.

We have the flat Unger microfiber mops instead of the old cot-



BEVERLY NOWAK/BOEING

ton-string mops. The Unger mops are lighter, so they're easier to use. And another part of our **safety improvements** is that we got rid of bleach and ammonia products. That way, you don't inhale fumes when working with chemicals.

Safety is everyone's responsibility. We 5S our closets so that we don't have a lot of clutter. We don't have extension cords strung out. You want to **go home in the same condition** that you came to work.

At the end of the day, I go home and feel like I've **accomplished what I set out to do** at the start of the day. I get the satisfaction of knowing that I've taken ownership of a job and have done the best I could.

– Junu Kim

- ¹ Operating System 1, a program to simplify and standardize housekeeping at Boeing
- ² A process for Leaning out a work area to keep it organized, reduce waste and maintain standardized conditions. 5S stands for Sorting, Simplifying, Sweeping, Standardizing and Self-Discipline.



Six in the mix

Employees in the Everett, Wash., factory began final assembly last month on the sixth 787 Dreamliner, the last designated for flight test. The airplane, designated ZA006, will be powered by General Electric GEnx engines.

In all, assemblies for approximately 30 Dreamliners currently are in production throughout the supply chain. The 787 Dreamliner has orders for 878 airplanes from 57 customers.

ED TURNER/BOEING

The next stage, set to **ignite**

You can't write the history of U.S. space exploration without mentioning Boeing. Here's what the company's doing to ensure it's in forthcoming chapters of the story.



By Eric Fetters-Walp

When astronaut Neil Armstrong put the first human footprints on the moon 40 years ago, it was the crowning moment in a seven-year, Herculean effort by the U.S. space program to reach that goal.

Boeing-built space hardware was essential to helping astronauts reach their destinations in the Apollo era, as well as throughout the decades of Space Shuttle and Space Station missions that have followed. And the company is poised to do it again as a contractor on the Constellation program, the NASA effort that aims for a return to the moon by 2020. With a proud history of helping the U.S. space program at every turn, Boeing's future role in space is still being written. And the company is pursuing projects, both with NASA and with private partners, to make sure it remains a major participant in spaceflight.

On the immediate horizon is NASA's shift from the Space Shuttle program to Constellation. Although the new NASA administrator nominated by U.S. President Barack Obama may have different views, outgoing administrator Michael Griffin has strongly urged that shuttle flights end by 2010 to focus resources on the Constellation program.

"Our customer, NASA, is transitioning out of the shuttle program after 30 years. With the changes they're going through, we have the opportunity to continue to be a strong provider of the services they need," said Pat Schondel, vice president of Business Development for Boeing Space Exploration, Integrated Defense Systems.

That opportunity resonates with Space Exploration teammates. "Working on the International Space Station has provided the invaluable experience of building and sustaining a highly complex and technical large scale system in space," said Elliot Harik, a mechanical and structural engineer with the Space Station program. "The tools and skills that we are developing will be 'must haves' for support of the next major manned spaceflight program, whatever shape it might eventually take."

The Constellation program will be propelled by a new class of rockets, the Ares I and Ares V, which are designed to launch astronauts and cargo into low-Earth orbit. Boeing in 2007 won a \$515 million contract to produce the upper stage of the Ares I rockets. Eventually, the company could produce 23 upper stages. In addition, Boeing was awarded a contract with a total value of \$799 million to produce the avionics for the Ares I upper stage. (The Ares I rocket includes the Orion crew exploration vehicle, which will be built by Lockheed Martin.) Boeing also is competing to produce the Ares V rocket, a heavy-launch vehicle able to send NASA's large Altair lunar lander and other cargo to the moon, as well as the Altair lander itself. These contracts are expected to be awarded as soon as 2012. Other contracts in the offing include ground and launch support for Constellation.

Meanwhile, Boeing remains focused through 2010 on helping to manage the remaining shuttle missions, which aim to finish construction on the International Space Station, for which Boeing is the prime contractor. Boeing recently secured an extension of its ISS sustainment contract. What happens then, however, will depend on how many Constellation contracts Boeing wins.

"The good thing about the transition is that our highly talented and capable work force will be available to work on NASA's next-



"We're only 3,500 out of 161,000 employees, but the work we do for human spaceflight provides a really powerful image for Boeing."

— Pat Schondel, vice president, Business Development, Boeing Space Exploration, Integrated Defense Systems

generation spacecraft for its mission to the moon, Mars and beyond," said Schondel.

With a gap between the end of shuttle missions and the ramp up of the Constellation program, however, there's also worry. The United States won't have its own capability to reach the space station, and NASA contractors such as Boeing may have to trim space-related jobs. "For us, the worry in that gap is what our people will do," Schondel said.

Brewster Shaw, Space Exploration vice president and general manager, said uncertainty is a constant right now for NASA and its contractors. Much will depend on decisions yet to be made by the Obama administration.

"Of course, in all of that uncertainty, there's plenty of opportunity we can pursue," Shaw said.

That's why Boeing is aggressively looking at an array of possibilities in space, near and long term, with and without NASA. High on the list are services that will be needed after the shuttle's retirement and before the first Constellation launches. To that end, Boeing has had dialogue with other companies that hope to ship cargo to the ISS after the space shuttle retires.

Meanwhile, Boeing space managers are studying the potential

PHOTOS: Boeing's work in U.S. space exploration efforts includes supporting space shuttle launches. The company is eyeing additional ways to support NASA in its forthcoming activities.

EMPLOYEE PHOTO: BOB FERGUSON/BOEING; SHUTTLE PHOTO: NASA; PHOTO ILLUSTRATION: BRANDON LUONG/BOEING; PAT SCHONDEL PHOTO: BOB FERGUSON/BOEING



“The tools and skills that we are developing will be ‘must haves’ for support of the next major manned spaceflight program, whatever shape it might eventually take.”

– Elliot Harik, mechanical and structural engineer

BOB FERGUSON/BOEING

growth of launch services for private cargo and passengers, a sector that already has attracted many startup companies, Schondel said. “We really are at a nexus of understanding the demand that would warrant us going to space on a commercial basis,” he said.

Boeing already has a well-established satellite launch business through the proven Delta II and Delta IV rockets. (United Launch Alliance, a joint venture combining the Delta and Atlas rocket programs of Boeing and Lockheed Martin, provides space launch services to U.S. government entities, including NASA.) “We have had some success in recent years selling our services to customers both domestic and international,” Shaw said.

Paul Eckert, international and commercial strategist for Space Exploration, said there may be commercial opportunities involving the International Space Station, where the zero-gravity laboratory environment is ideal for biotechnology and materials research.

A 50-YEAR LEGACY

With its involvement in the shuttle and space station programs and their predecessors, Boeing can point to a half-century of experience as it competes to provide key components for the Constellation program. Indeed, the history of U.S. space exploration can't be told without Boeing and its predecessor companies.

Just after World War II, Douglas Aircraft and Boeing pioneered long-range missile propulsion systems that advanced rocket technology for future space missions. North American Aviation introduced the X-15 rocket plane in 1959, which served as a test platform for pre-spaceflight experiments. North American also built the launcher used to test the escape system and heat shield for the first manned Mercury spacecraft. It later built the Apollo space capsules, and North American's spinoff, Rocketdyne, went on to make engines that powered every U.S. space program through the end of the 20th century.

When President John F. Kennedy committed the United States in 1961 to reaching the moon, Boeing President William Allen sent 2,000 executives to NASA to coordinate activities. The company also provided overall systems integration for the entire Apollo project and built the first spacecraft to orbit and photograph the moon in the mid-1960s. Boeing, North American and McDonnell Douglas built all three stages of the Saturn V rocket. In addition,

Boeing designed and built the Lunar Roving Vehicle used on subsequent moon missions to explore the surface.

The hand-in-hand relationship continues today. Boeing is one of NASA's largest contractors, and the company was named the Kennedy Space Center's 2008 Large Business Contractor of the Year and the Marshall Space Flight Center's 2008 Large Business Prime Contractor. Boeing went on to win the NASA agencywide award for 2008.

However, that long track record of success with NASA doesn't guarantee Boeing future space exploration contracts, Shaw said: “We have to resell ourselves each time.”

That's the job of Space Exploration. The mission and reach of this business has always been bigger than its relative size within Boeing, Schondel said: “We're only 3,500 out of 161,000 employees, but the work we do for human spaceflight provides a really powerful image for Boeing.” Schondel added the division has benefited greatly from support across the entire Boeing enterprise in all its efforts.

“The work we do here is some of the hardest that Boeing does. The people who come up in that environment and the skills they



“Of course, in all of that uncertainty, there’s plenty of opportunity we can pursue.”

– Brewster Shaw, Space Exploration vice president and general manager

learn make them highly valuable to Boeing. You can name people all over Boeing who cut their teeth here,” Schondel said. Among these people, according to Schondel: IDS President and CEO Jim Albaugh and Commercial Airplanes President and CEO Scott Carson.

Harik of the Space Station program noted that he’s gained skills that he feels will serve him throughout his career. “One thing you learn very quickly working on a program as large and complex as the International Space Station is the importance of communication and effective teamwork,” he said. “For projects of this scale to be effective, there must be constant communication and a truly team-oriented outlook. Learning how to function and contribute within a team of this nature has been very rewarding.”

Shaw said the work done by Space Exploration is important to more than just the company. “It’s important to our work force. And everybody recognizes the high-tech, cutting-edge business we’re in. It’s important from a brand standpoint,” said Shaw, a former astronaut who flew on three shuttle missions. “But it’s also important because a robust space program is important to the United States.”

In a speech at last year’s National Space Symposium, Albaugh emphasized that point: “We must maintain our technology leadership position in space ... as we send men and women back to the moon and beyond ... as we further connect our world and understand it better ... and as we protect [the United States] by enhancing our space-based ability to watch and warn, protect and respond.” ■

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PHOTOS: (FAR LEFT) Apollo 11 commander Neil Armstrong (left) and Apollo 17 commander Gene Cernan (right) toured one of the Altair mock-ups at NASA’s Johnson Space Center in December 2008. The Altair lunar lander, which Boeing hopes to build for NASA, will take human beings to the surface of the moon for the first time since Apollo. In the background are Wayne Ottinger, who worked on the Apollo lunar lander training vehicle, and Jack Schmitt, Apollo 17 lunar module pilot. NASA

(LEFT) An artist’s conception of the Ares I rocket. NASA selected Boeing as the prime contractor to produce, deliver and install avionics systems and produce the upper stage for Ares I. NASA

Space for business

Boeing is keeping an eye on new growth opportunities far above Earth

Researching new treatments for serious diseases, expanding tourism to the stars and placing solar-power-generating stations miles above the planet may one day spur growing commerce in space.

While Boeing pursues contracts to help NASA explore new frontiers, the company also is keeping a close eye on potential business opportunities up above.

It wasn't long into the rocket age before the commercial uses of space were recognized. In 1962, a rocket built by Douglas, now part of Boeing, placed the first private satellite into orbit to transmit television signals. Since that era, Boeing has built and launched scores of satellites for the private sector.

According to Paul Eckert, international and commercial strategist for the Space Exploration division of Integrated Defense Systems, Boeing's traditional space commerce business has been focused on commercial satellites and their launches, now performed mostly through the United Launch Alliance, a joint venture between Boeing and Lockheed Martin. "The question is, will there be other markets as big as or even more successful than the commercial satellite market?" he said.

Although that question is yet to be answered, plenty of startup firms are betting on new ventures in space, most notably tourism. Virgin Galactic, which plans its first suborbital passenger flights in 2010, says more than 200 people have reserved the \$200,000 tickets. Another firm, XCOR Aerospace, hopes to offer flights at half that cost, and others aim to offer similar services.

Brewster Shaw, vice president and general manager of Boeing Space Exploration, said that Boeing has ongoing relationships or an interest in partnering with a number of small firms that are working on commercial space vehicles or related products.

"We look at each opportunity and see if it's applicable to our core capabilities, to see if we can add value to it," Shaw said, adding that Boeing carefully weighs the risk-payback ratio of potential commercial space ventures. After all, pushing forward into space doesn't make sense if it can't eventually be profitable.

According to Eckert, one relatively low-risk venture is pursuing commercial opportunities, including research, aboard the International Space Station (of which Boeing is the prime contractor). Other less glamorous space services, such as robotic servicing of satellites and basic launch support, also present possible mar-

It's a real **blast**

Boeing and its predecessor companies have supported the United States' space efforts for more than 50 years. Here's a quick look at some of the notable achievements.

A Douglas Thor-Able rocket launches NASA's Pioneer I spacecraft 79,173 miles (127,416 kilometers) into space, the farthest distance at that time for an Earth-launched object.

NASA selects McDonnell Aircraft as prime contractor for Project Mercury, America's first manned orbital spacecraft. NASA also awards Douglas Aircraft a contract to design and produce the Delta rocket.

A Douglas rocket places Tiros I, the world's first weather satellite, into orbit.

In the first suborbital flight of a Mercury spacecraft, Alan Shepard becomes the first American in space. NASA names McDonnell Aircraft as prime contractor for Project Gemini. North American and Boeing are selected as contractors for the Project Apollo program.

In the first orbital flight of a McDonnell-built Mercury spacecraft, John Glenn becomes the first American to orbit Earth. A Douglas-built Delta rocket launches the first privately built satellite into space.

Boeing starts building a space center in Kent, Wash.

1958

1959

1960

1961

1962

1964

“We look at each opportunity and see if it’s applicable to our core capabilities, to see if we can add value to it.”

– Brewster Shaw, Space Exploration vice president and general manager

kets for Boeing, said Eckert. “We’re equal to or better than other companies in all these areas.”

The most prevalent space commerce market, satellite launching services, is getting more competitive as the number of nations with space programs increases. In addition to its own U.S.-based launch operations, Boeing is a 40 percent partner in Sea Launch, a venture that includes partners from Norway, Russia and Ukraine. Sea Launch is scheduled to carry out its 30th commercial satellite launch this month.

As the future of space commerce evolves, Boeing is contributing to the emerging market by organizing and sponsoring industry discussions and space investment summits such as Space Investment Summit 6, a May event in Orlando, Fla., of which Boeing is a major sponsor. Eckert hopes that these events will encourage more private investment into commercialized space services.

“There’s a whole cluster of things, and Boeing has the potential to be involved in all of it,” he said.

– Eric Fetters-Walp



PHOTO: Boeing Space Exploration vice president and general manager Brewster Shaw (from left) is shown with senior NASA leaders Doug Cooke, Danny Davis, Steve Cook and Jeff Hanley with a model of the Ares I rocket at NASA headquarters in Washington, D.C. NASA

The McDonnell-built Gemini spacecraft flies for the first time.

The first Hughes Space & Communications Surveyor spacecraft lands on the moon. The Boeing-built Lunar Orbiter sends back the first pictures of the moon.

Launched by the Saturn V, Apollo 8 takes the first astronauts around the moon.

Apollo 11 makes the first manned moon landing.

Astronauts use the first Boeing Lunar Roving Vehicle on the moon.

The McDonnell Douglas Skylab, the first U.S. space station, is launched. The Boeing-built Mariner 10 launches to collect data from Venus and Mercury.

1965

1966

1968

1969

1971

1973

(Continued on Page 18)

After the last launch

Space Shuttle program teammates prepare for biggest transition in Space Exploration unit

Rich Clifford knows personally the value that Boeing's engineering expertise brings to NASA spaceflight missions. As a former astronaut with more than 600 hours in space, including a six-hour spacewalk, Clifford says the Boeing Space Shuttle team's work is nothing short of lifesaving.

Clifford, now the deputy Space Shuttle program manager for Boeing, also knows that the team's recognized commitment to excellence will be critical to NASA during its biggest transition in decades. Next year, NASA's Space Shuttle program is scheduled to end to make way for the Constellation program, which will take human spaceflight out of low-Earth orbit to the moon, Mars and beyond. Constellation includes a new fleet of spacecraft that will succeed the shuttle and enable the next phase of exploration.

Clifford and other leaders within Space Exploration, part of Integrated Defense Systems, recognize the transition will be a difficult time for employees. "You can't turn on the news and not be worried," said Ed Statham, orbiter engineering manager in Houston. "I have to stay focused on my work, but I can't say my family hasn't expressed concern about the transition, especially during these tough economic times. We've had the discussions."

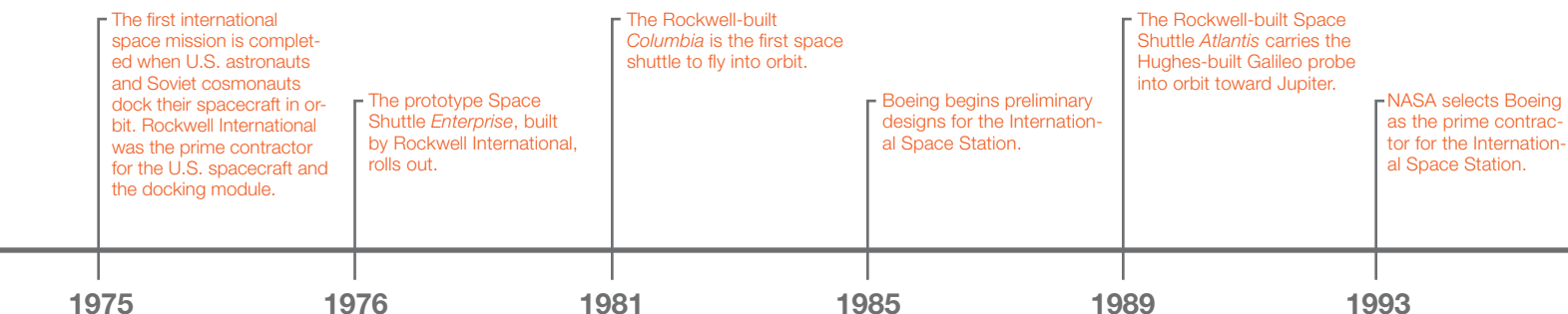
Jeff Goza, who leads the Houston hydraulic group, said he's doing whatever he can, including having earned his MBA degree, to ensure that he has the skills that will be needed.

Boeing is taking a proactive approach to the challenge: Identify what skills will be needed for future work and provide opportunities for employees to develop them. "We have several training opportunities within the engineering function," said Clifford, including classes in systems engineering, avionics and mechanisms. The company also is working to increase productivity and efficiency, in part so that individuals and organizations can take on new opportunities.

Employees who have specific critical skills and who agree to stay with the shuttle program until the last flight will be eligible for a retention incentive plan, which is intended to help them transition to other work after the program ends.

Lynna Wood, a flight software project engineer in Houston, appreciates the company's commitment to retaining skilled workers and to helping them retrain. "I don't know any other company that would go to these lengths," Wood said. "It speaks very highly of Boeing to help its people prepare for the future."

It's a real **blast** (Continued from Page 17)





“It speaks very highly of Boeing to help its people prepare for the future.”

– Lynna Wood, flight software project engineer

So far, the approach to retaining key staff is working. Even with the shuttle’s scheduled retirement less than two years away, Clifford said the attrition rate is only about 2 to 3 percent, and most of those employees have moved to other Boeing projects or to NASA. “The secret is good communication,” he said. “I’m open about everything—no hidden agendas. I hold open forums, and I answer questions and concerns frankly.”

Wood said she appreciates this openness. “When folks get worried, they want and need information. I think management has recognized that,” she said.

Boeing also has a steady partner in NASA as it moves toward transition. Almost from the day the shuttle’s retirement was announced in 2004, NASA began working with its contractors to plot a smooth transition. NASA and prime shuttle contractor United Space Alliance, a joint venture between Boeing and Lockheed Martin, worked with Boeing on retention incentive packages and agreed to fund them, providing a significant boost to Boeing’s overall transition efforts.

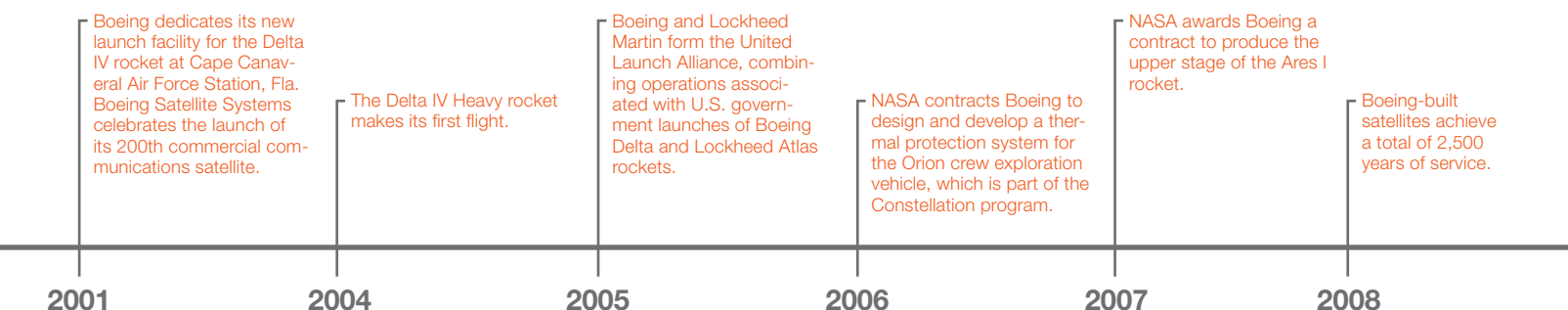
Another facet of Boeing’s transition strategy is a robust effort to win new space exploration contracts under the Constellation program. Boeing engineers already are working on the upper stage

and avionics of the Ares I, the rocket that will launch astronauts into space. In February, Boeing submitted proposals for Ares V study contracts, the heavy-lift launcher for cargo, including the payload shroud, the Earth-departure stage, the core stage, avionics and software. At Kennedy Space Center, Fla., Boeing is pursuing the Exploration Ground Launch Services contract. EGLS will support the Ares I Crew Launch Vehicle, the Ares V Cargo Launch Vehicle, the Orion Crew Exploration Vehicle and the Altair Lunar Lander, beginning with the Constellation ground systems activation and continuing through the International Space Station and Lunar missions. Any of these projects would create new opportunities for the Space Exploration work force.

And in the meantime? “We’re focused on flying the remaining Space Shuttle missions safely, while taking advantage of all relevant training opportunities,” said Goza. “We are going to be ready.”

– Melissa Mathews

PHOTOS: Rich Clifford (from left), Lynna Wood and Jeff Goza are among the Space Exploration team members who are supporting future space shuttle launches while preparing for the transition resulting from this program’s end. ELIZABETH MORRELL/BOEING



They've got the

haul world

Supply Chain Logistics' improvements optimize shipments of freight and boost productivity

in their hands

By Kathleen Spicer

Moving aerospace parts and materials from point A to point B sounds fairly straightforward. But try coordinating more than two million shipments a year—from ramps to rocket launchers to airplane wings—between suppliers, freight forwarders and Boeing factories. And watch for freight that requires unique shipping, such as specialized tooling in unwieldy protective crates, or that must comply with regulations, such as dangerous-goods packaging. And do it all while meeting Boeing schedule and cost criteria for freight transportation.

That's the task that Shared Services Group's Supply Chain Logistics team tackles. It's a job that's critical to ensuring Boeing businesses operate properly. To best serve these programs, SCL began an improvement effort in 2007 that's fundamentally transformed the way it does business and supports Boeing production programs—and that ultimately helps reduce costs and risk, while increasing the efficiency of freight delivery.

"People always ask us, 'how can we reduce freight costs?'" said Michelle Johnston, SCL manager. Among the organization's newer tools to accomplish this is the Ryder/Transportation Management Services (TMS) improvement plan. "With TMS, we can provide increased visibility to logistical information across the supply chain to help our business partners take advantage of more cost-efficient shipping choices."

The innovation that makes this all possible is an integrated information system that instantly provides Boeing shipping requirements to Ryder, Boeing's logistical partner. This is done using Exostar, Boeing's



“Optimizing freight shipments across Boeing’s supply chain will help Boeing meet customers’ requirements for quality and value.”

– Tom McClelland, SSG Enterprise Service Delivery leader



By the numbers:

Shared Services Supply Chain Logistics

2 million

Number of shipments processed through Supply Chain Logistics each year

161,000

Number of exports SCL processes annually

350 million

Dollar value of freight costs SCL coordinates each year

49.5 million

Dollar value of freight-cost savings SCL realized in 2008

45 million

Dollars per year SCL saves through logistics expertise, freight management contracts and freight bill processing oversight

electronic supplier purchasing exchange. Beginning this month, Ryder will also take on the freight payment process to make the overall process more efficient.

The opportunity for cost savings is significant, said John Frolker, Boeing Engineering, Operations & Technology liaison with Ryder and Exostar in Bellevue, Wash.

Hypothetically, there could be multiple trucks—some full and some half-full—taking Boeing freight from Southern California to Washington state at relatively the same time, Frolker said. Working with Ryder gives Boeing timely visibility into those shipping details “so we can optimize shipping priorities and choose to use one full truck by one supplier instead of using two half-full trucks from different suppliers,” he added. “Now we’ll have the capability to look at this information and make more logical, cost-saving choices while continuing to support our businesses.”

And helping business partners make better decisions is what SCL does best.

David Huntsman, Material Management manager in Commercial Airplanes, noted that TMS can provide answers to questions such as how much is spent on freight to build a 737 airplane or whether it’s economically smarter to ship certain parts—such as premium freight—biweekly or monthly, or by rail or ship, to meet production requirements, he noted. “The new SSG process will enable us to have the information we need to increase our performance,” he said.

The new model also enables a more proactive planning approach to freight transportation management—a major benefit of putting common processes and “demand-management” capabilities into the hands of SSG business partners. Demand Management is an SSG business strategy that helps business units control costs when deciding on the services needed to best support their business needs.

“While gathering and verifying shipping data in Phase One (of SCL’s improvement effort), we’ve already been looking at how we ship premium freight, which may prove to be an area where costs can be reduced,” said Karen Fischer, procurement analyst for Supplier Management in Integrated Defense Systems. “During Phase Two, we’re looking forward to using this information to open up opportunities to boost efficiency and save costs.”

ONE ROAD, ONE PLAN

Johnston said the next steps are clear. “As we work with business partners to drive priorities, our plan will be achieved by promoting common processes across the enterprise and providing demand-management tools and services to our business partners,” said Johnston.

While Phase One of the project is under way, Phase Two makes load optimization a reality by further integrating information and processes with Ryder later this year.

“Optimizing freight shipments across Boeing’s supply chain will help Boeing meet customers’ ongoing requirements for quality and value,” said Tom McClelland, SSG Enterprise Service Delivery leader. Most important, McClelland added that SSG is working closely with business partners to make sure their needs are being met.

“I trust the SCL folks,” said Huntsman. “They’ve engaged us in their improvement process, and we’re working together to solve problems and make better choices that in the end benefit us all.” ■

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PHOTOS: (LEFT) Shared Services’ Supply Chain Logistics team supports Boeing business partners by moving parts, materials and products to where they need to go. Here, a Boeing 601 model satellite is loaded onto an oversized freighter for its flight from Los Angeles to Kazakhstan, where it was prepared to be launched into orbit. **SALLY ARISTEI AND GLADYS WICKERING/BOEING**

(RIGHT) Forklift driver Todd Ruthruff moves a set of Boeing 777 ailerons delivered from Casa in Spain—and coordinated through SSG Supply Chain Logistics—to the 40-55 Building shipping and receiving area in Everett, Wash. **GAIL HANUSA/BOEING**

From trash to cash

This SSG group works to generate the most value for unwanted items

By Jeff Wood

Every day, trucks and trailers pull up to the loading docks at Boeing Reclamation sites in Southern California and Washington state's Puget Sound region, laden with the byproducts of manufacturing and various items that Boeing no longer requires. A jumble of aluminum alloy shavings from milling machines, scrap cut from titanium plates, discarded iron and steel, lengths of tubing, copper wire, rejected parts, broken or obsolete electronics, building materials and even airplane seats and office furniture emerge from the parade of vehicles.

Yet a date with the dump is not a foregone conclusion. Shared Services' Site Services Reclamation group, along with Surplus Sales, is part of the Investment Recovery and Distribution organization. This team's work ensures that discarded products and materials are disposed of properly—and that Boeing captures the optimum value from assets it no longer needs. In addition, ensuring the materials are reused or recycled supports the company's commitment to environmental stewardship and helps meet its goal to increase recycling rates at major manufacturing facilities 25 percent by 2012. Each Boeing site also has a process to follow for handling unwanted items safely and efficiently.

"We ensure that discarded Boeing aircraft components and government property are completely destroyed so that they can never find their way into the market or be installed on an aircraft," said Investment Recovery and Distribution manager Ken Botham.

But even completely destroyed components and other seemingly worthless discards retain some value, according to Bernard Hulscher, asset administrator of Puget Sound Investment Recovery and Distribution in Auburn, Wash. During a typical month in 2008, the Puget Sound Reclamation group processed about 4.5 million pounds (2.04 million kilograms) of material to recover between \$4 million and \$6 million, Hulscher noted: "That money flows back to the programs, helping cover the cost of doing business."

Materials that are separated and sorted into uniform commodities, such as aircraft aluminum, high-temperature alloys and light or heavy iron, bring the highest prices when they're put out for bids, according to Hulscher. But separating and sorting takes time and space. The group worked closely with the SSG Lean Office and the Site Services team to optimize processes, speed



up cycle times and reduce storage requirements in conjunction with Reclamation's recent relocation to Auburn from more spacious leased facilities in Kent, Wash. "We now handle the same volume of material in about half the footprint of our original operation," Hulscher said.

The Southwest region Investment Recovery and Distribution group, based in Long Beach, Calif., handles surplus sales and reclamation. According to regional manager Stephen Hayashida, these sites don't get as much scrap metal. "Our revenues are primarily from the sale of a wide variety of surplus machinery and equipment, which can be worth many thousands of dollars—sometimes upward of \$1 million," he said. Surplus Sales in Southern California processes eight to 10 bids per month. These bids earn \$6 million to \$10 million annually, according to Hayashida.

The centerpieces of the reclamation effort are the aluminum compactors at Boeing Fabrication's Auburn and Frederickson, Wash., facilities. Metal chips are collected from machining and milling operations and shredded to a uniform size. Then the chips are compressed into cylindrical "briquettes," each weighing about 5 pounds (2.25 kilograms). According to Hulscher, these briquettes bring top bids because they are ready to be melted down into ingots that are sold directly to manufacturers.

Discards such as worn office furniture and construction materials that cannot be sold through the Surplus Web site are broken down into commodities and sold as scrap metal. Materials such as wood products, plastic and fabric are disposed through recycling and solid waste procedures.

With a focus on finding value and improving environmental performance, reclamation continues to provide Boeing programs with opportunities to reuse or recycle materials—and to recover costs. As the saying goes, "one man's trash is another man's treasure." ■

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PHOTO: In Frederickson, Wash., Lloyd Wray (left), with Shared Services' Investment Recovery and Distribution group, and Lee Kuhre, a senior environmental manager, show a briquette fabricated from metal chip waste. These briquettes are sold to metal recyclers. MARIAN LOCKHART/BOEING

Special handling

New enterprisewide safety effort under way

By Jennifer Cram

David Unruh is a wing and aft-body final assembly landing gear lead on the 787 Dreamliner program in Everett, Wash. He and his team understand how following workplace safety procedures plays a big role in doing their jobs right.

“Our ultimate goal is simple: It’s to go home every night just as safe and healthy as when we arrived,” he said.

To help Boeing employees work together to improve workplace safety, the company recently unveiled a new effort called Safety Now. Building on the environmental targets Boeing established in 2008, which helped align employees across the company to a single environmental purpose, Safety Now set an aggressive safety target: a 25 percent reduction in the number of injuries resulting in lost work (lost work day case rate) by 2013.

“A safe workplace is every employee’s right and a critical driver to help us increase our productivity and improve our performance,” said Mary Armstrong, Environment, Health and Safety vice president. “Only by having everyone working together—and working safely—can we continue to meet our customers’ expectations and deliver high-quality products and services.”

Safety Now will improve workplace safety through three key areas: employee and leadership involvement; a new company-wide safety management system; and targeted investments that improve the design of key manufacturing processes. “We must bring a tremendous level of intensity and focus to create injury-free workplaces at our operations,” said Doug Briggs, enterprise safety director, who’s leading a cross-functional team that will help drive workplace safety performance improvements throughout Boeing.

Over the next few months, Boeing will provide additional information and tools to help those on the front lines, who already hold regular safety discussions, identify potential safety risks and act to improve the safety of their workplaces. “Safety is demonstrated by example,” said Armstrong. “Active and visible safety leadership by each of us will help drive change.”

Teams also can use existing platforms such as Lean+ to help identify and eliminate safety and ergonomic risks. Training on how to embed environment, health and safety thinking into Lean+ is available on the Boeing intranet at http://leo.web.boeing.com/ProductService/EHS_Course.cfm.



“Our ultimate goal is simple:
It’s to go home every night just as safe
and healthy as when we arrived.”

— David Unruh, 787 Dreamliner program

With the new common safety management system, the benefits to employees and the company are clear: one safety language, a consistent way to identify risk and shared expectations. For example, when employees move or change assignments, they won’t have to spend time learning a different safety system. The system also will comply with OHSAS 18001, an international standard for occupational health and safety, to help the company improve it continually. Other critical components of the safety effort include embedding ergonomics and safety principles early in the design of manufacturing processes and making targeted investments to improve high-risk manufacturing processes.

“We’re finding that the best incremental opportunities for enhancing workplace safety are in the areas of better tools and work platforms, improved fabrication and assembly processes and the handling of parts and materials. Engaging our people who do those tasks is the key,” said Sandy Postel, Commercial Airplanes vice president of Manufacturing & Quality.

And Boeing employees already are engaged. “We don’t take safety for granted,” said Jodi Thomas, office administrator at Ogden, Utah, an Integrated Defense Systems location that’s worked four million hours without an injury resulting in lost work.

“We have pockets of safety excellence. Many teams have gone years without a lost work day. By aligning these proven and effective practices into a single safety effort, we can set a new standard of safety performance throughout Boeing,” said Aileen Yankowski, Compliance and Services director for EHS. ■

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PHOTO: David Unruh (left), landing gear lead for the combined 787 wing assembly and aft-body final assembly teams, works with Jeff Garrett to prepare a 787 main landing drag brace. The team actively focuses on workplace safety, identifying safety risks and holding regular safety discussions. GAIL HANUSA/BOEING



A leader in deed

Dave Irwin inspires excellence by example

By Stacey Holloway

The unit had been conducting its annual training and team-building classes for two days at Missouri's Camp Crowder. The training concluded with the unit's soldiers told to rappel from a 30-foot (9-meter) tower. Many of the soldiers nervously questioned the rope's strength and the tower's stability.

David Irwin, then colonel and brigade commander and highest-ranking officer on the installation, didn't hesitate. "He climbed to the top, strapped up and went off first," said Command Sgt. Maj. Charles E. Jones, U.S. Army. "Next came a round of cheers followed by a rally of the troops eager to be next up the tower."

"Normally field officers expect non-commission officers to take care of everything," said retired Sgt. 1st Class Jim Snyder, recalling his impression of then-2nd Lt. Irwin during their first field exercise. "Irwin was different. I instructed the troops in their mission and dispersed them. When Irwin arrived, he asked where the troops were and said he felt it was his responsibility to perform what he expected of the soldiers."

Irwin's ability to chart the course has earned him an outstanding reputation with Army peers and Boeing teammates. Last summer he became commander of the 35th Engineer Brigade in the U.S. National Guard and was promoted to brigadier general. In addition to his part-time service in the Guard, he's supporting the growth activities of Integrated Defense Systems' Global Services & Support business by leading its Training Systems & Services organization in efforts to grow into a new market. As program manager for the new TSS subdivision known as Ground Forces Training, Irwin has responsibilities including leadership, growth and execution of Ground Forces Training programs. When asked about his role, Irwin spoke to GS&S' aggressive growth goal over the next five years and TSS playing a part. "We are good at what we do, providing quality training products and services to aviation customers, but we need to expand into ground forces training," he said.

Examples of ground forces include armor, infantry, field artillery, logisticians and medics in the Army and Marine Corps, all of which are new areas of interest for the IDS training business.

"The customer has expressed a need for a training environment for ground forces that is equivalent in sophistication to the same

immersive environments used to train aviators," said Irwin. "By using our existing technology and leveraging the rest of Boeing, whether through Future Combat Systems or previous work with the U.S. Navy and Marine Corps, we believe Boeing can meet the customer's needs for ground forces training."

Under Irwin's leadership, Boeing last year received its first ground-based training contract, the Fires Center of Excellence Integration contract. Boeing and teammate Creative Technologies Inc. provided independent recommendations for a new organization structure and developed a training strategy and supporting technology roadmap for this Army air defense and field artillery training center. The contract was completed in February.

Irwin's next step is to use Boeing's great capabilities to improve ground forces training. Meanwhile, according to Jones: "Soldiers still talk about how Irwin led the way that day in the training exercise up the tower, and how they would follow his leadership anywhere." ■

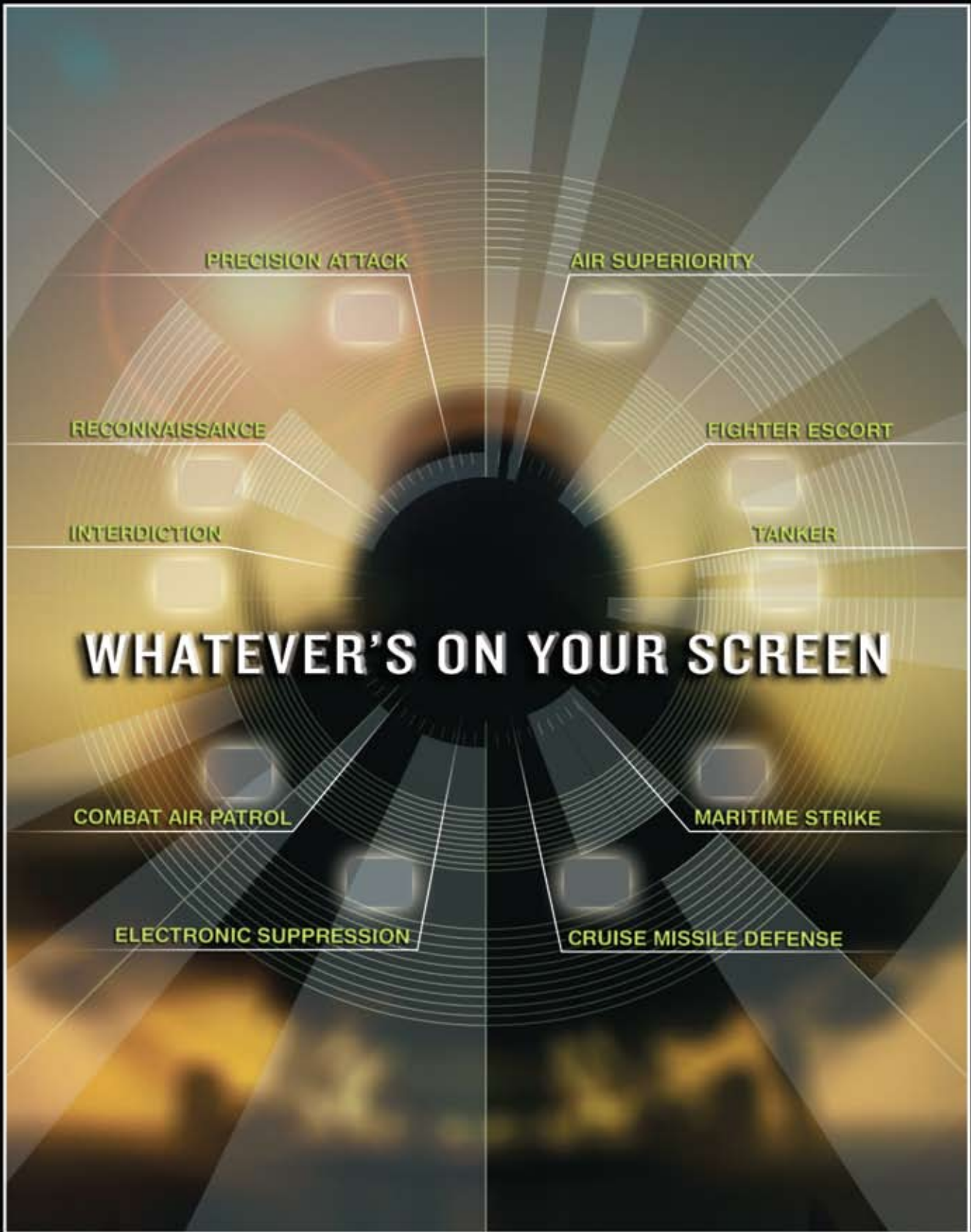
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PHOTO: Dave Irwin's ability to chart the course has earned him an outstanding reputation with both U.S. Army peers and Boeing teammates. U.S. ARMY

Rules to live by

What makes for a good leader? Here are some basic rules, according to David Irwin, program manager for the Ground Forces Training subdivision at Boeing.

- "Never ask your people to do something you would not do yourself."
- "Care about your people. People don't care how much you know until they know how much you care."
- "Be willing to admit when you don't know something. My dad was the smartest man I've ever known, and he liked to say, 'The smartest man I ever met knew what he didn't know.'"



This three-page F/A-18E/F team ad developed by Integrated Defense Systems supports current domestic and international sales efforts. The ad positions the Super Hornet as a uniquely capable multirole fighter that can meet all mission requirements. It's scheduled to run in military trade and congressional publications. Please turn the page to see the continuation of this ad.



IT'S

F/A-18E/F SUPER HORNET.

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READY.

The F/A-18E/F is the world's most advanced multirole fighter, providing the warfighter with an unmatched range of capability. The stealthy, network-enabled Super Hornet delivers outstanding range and payload in a fully integrated suite: including AESA radar, simultaneous air-to-air and air-to-ground operations, and all-weather integrated sensors and weapons. So whatever the mission or requirement, it's ready—today and tomorrow.

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Improvements potted

In San Antonio, creativity and persistence lead to a solution that helps in multiple ways

By Deborah VanNierop

The Paint Slingers are no strangers to paint or to patience. The 15-person team can apply paint to a prepped KC-135 Stratotanker in two hours and need only an additional 30 minutes to paint a C-17 Globemaster III.

But it took this San Antonio-based Employee Involvement team two years of patience and persistence to find a way to improve a common piece of equipment, a wheeled paint-pot system. The work, however, has paid off and the team has achieved a business model trifecta. “The new system reduces potential for injuries, saves money and reduces our operational impact on the environment,” said Robert Morales, second-shift paint and de-paint manager.

The team, led by Luis Flores Sr., consists of the second-shift paint and de-paint employees at San Antonio’s Global Services & Support facility. Most have been working at the facility for at least 10 years, and all were aware the old system needed to be improved.

“Trying to fill the pots was difficult,” said team member Eulalio Martinez, “because they were very tall. I had to lift the 5-gallon buckets of paint just about over my head and be very careful to make sure it all ended up in the pot.”

Additionally, the pots and connected paint hoses were cleaned with paint solvent that was then drained into buckets and consolidated in 55-gallon drums and removed from the facility as hazardous material. In 2008, the paint shop generated more than 7,000 pounds of waste (about 3,200 kilograms), which cost almost \$3,000 in disposal fees.

So, the team began talking about how the system could be improved. The discussions often became heated because everyone wanted to ensure their concerns and ideas were heard, Morales recalled. “But that was important because the team learned a lot about inclusion and diversity,” he added. “At the end of the day, we all agreed that everyone is entitled to an opinion. The team learned to be open-minded enough to find value in those opinions.”

Sketches were drawn, changes were made, more sketches, more changes, until the team felt ready to create a prototype. After contacting the system’s vendor, they continued to fine-tune

“We are continually looking for and welcome ideas that help reduce impact to our environment and help us meet our waste reduction goals.”

— Hope Gonzalez, environmental specialist

the project and started to see what they considered a worthwhile paint-pot system.

The pot was shorter and more user-accessible. The new system also allowed for four paint hoses to be used, but unlike the old system, the hoses could be used one at a time. The hoses not in use remained paint-free, reducing the amount of cleaning solvent needed. The final improvement was a plastic liner inside the pot. “The liner eliminates the need for any solvent to be used to clean the pot,” said Flores. The liners cost less than \$1.50 each, and cleanup is easy as emptying a kitchen trash can.

“It was great to be involved with a team that benefited so many areas, especially materials and waste,” said Hope Gonzalez, a San Antonio environmental specialist. “We are continually looking for and welcome ideas that help reduce impact to our environment and help us meet our waste reduction goals.”

Companywide, Boeing is targeting 25 percent improvements in solid waste recycling rates, energy efficiency and greenhouse gas emissions intensity and has a comparable goal for hazardous waste reduction by 2012 at its major manufacturing facilities.

Before the new system, the team used 60 gallons (227 liters) of solvent while painting a KC-135 aircraft. Now they use half that amount. The team also reduced the amount of solvent used on a C-17 aircraft from 90 gallons to 40 (341 liters to 151).

But the impact didn't stop there. The team found that by reducing the amount of solvent used, the new system saves more than \$300 per KC-135 aircraft and more than \$500 per C-17. Based on the projected aircraft paint schedule, the Paint Slingers expect to see an annual savings of more than \$10,000.

However, what's more important to the team is that the customer continues to get the same great product they have come to expect. “It's great to be able to come up with ideas to save money for the company, but we really take pride in the fact that we continue to provide the best quality possible to our customer,” said team member Edward Cruz.

Despite the extended time the project took to complete, teammates agreed it was worth the effort. The San Antonio Leadership Team acknowledged that by recommending the Paint Slingers for advancement to Stage 4, the highest level of maturity an Employee Involvement team can achieve.

Looking back on the experience, the Paint Slingers have some advice to offer to other Employee Involvement teams. “Don't give up,” said Roland Lamothe, “and stay focused on the task no matter how long it takes to reach the goal.” Added Earl Evans: “There's a saying that's used pretty regularly around Texas that sums up what we did: ‘Just get-'er-done’.” ■

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PHOTOS: (LEFT) Eulalio Martinez removes a bag of paint residue from the new paint-pot system while Luis Flores Sr. opens a hazardous waste container. The duo are members of a team that improved and redesigned painting processes—and helped cut waste and costs. **(TOP)** Global Services & Support employees in San Antonio apply primer to an aircraft as they prepare it for a fresh coat of paint. LANCE CHEUNG/BOEING

We've only just b

Boeing delivers its last major element for International Space Station, but continues to support the orbiting outpost

By Diane Stratman

Look in the sky on a clear night at the right time, and you can see the most ambitious engineering project in world history. The International Space Station shines like a bright star now, and if all goes as planned, in about a year and a half it will be what NASA envisioned decades ago: the most capable space laboratory ever constructed. Once complete, the station will be home to as many as six astronauts at a time, who will work on experiments that run the gamut of scientific disciplines.

With the station assembly scheduled to finish in mid-2010, Boeing completed its part last month, with Space Shuttle *Discovery's* delivery of the Starboard 6 truss segment, solar arrays and fresh batteries. The truss will support a pair of solar arrays whose power-generating capability will allow the ISS to reach its full capacity of enabling six astronauts to live and work on station.

"It's bittersweet," said Dave Cormack regarding closeout of station assembly. As Boeing's flow manager for last month's mission, Cormack has been responsible over the past eight years for ensuring that everything flows smoothly with assembly scheduling and testing. "I always get a thrill watching the station fly over; once it's complete, it'll be brighter than ever," he said.

But the last delivery of Boeing-built elements doesn't mean Boeing's work is done. ISS engineer Bob Levy has worked on the station's solar array modules and helped figure out how to initially power them up in space. In 1989, he was one of more than 1,000 people working on the design details of the station's power modules. "That was nearly 20 years ago; now we're finally transitioning from assembling the station to operating it as NASA envisioned," he said. In the future, Levy and others will focus on keeping the station's electrical generation system operational.

With six or possibly seven remaining missions to the ISS through spring 2010, future deliveries will include the remaining portions of the Japanese Experiment Module, with its exposed experiment platform; a Russian miniature research module; and Node 3 and Cupola, which will give astronauts a better look outside the ISS. As the prime contractor and integrator, Boeing ensures all station elements properly mate with their connecting counterparts.

Once station assembly is complete, Boeing will continue to



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“We’re finally transitioning from assembling the station to operating it as NASA envisioned.”

– Bob Levy, Space Station program engineer



sustain, operate and maintain the station with its full crew living and working on board. Boeing will provide the integration support as NASA launches the remaining payload racks intended to outfit the ISS in preparation for its full utilization as a National Laboratory. These science racks contain the equipment necessary to conduct important research that could lead to a better understanding of the human condition when exposed to long periods of time in microgravity, as well as scientific findings important to man’s existence on Earth.

What will occur on board the International Space Station once it’s fully operational? NASA envisions at least a decade of routine research operations; multiply that by the number of astronauts, and the ISS will provide well over 25,000 crew-days in orbit. This uninterrupted, long-term access to space will allow researchers to rapidly acquire the large data sets needed to validate new concepts and confirm previously unobserved phenomena. Scientists will be able to make multiple experiment runs in succession, obtaining statistically significant results in a manner of weeks or days instead of years. Research aboard the station will span bioastronautics, earth science, fundamental biology, physical sciences and space product development.

Levy’s been enthusiastic about space exploration since the fourth grade, when he dragged a television to school so that he and his classmates wouldn’t miss a moment of an Apollo launch. Now, he can look up into the skies and know that he and many Boeing employees have been an important part of not only building and assembling the space station but of achieving its marvelous potential. ■

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PHOTO: (FAR LEFT) Boeing technicians install new batteries on the Boeing-built Starboard 6 truss element, launched on Space Shuttle *Discovery* last month. **DAVE BRINKO/INDYNE (LEFT, ABOVE)** During a spacewalk in March, astronaut Richard Arnold, a crewmember of space shuttle mission STS-119 (flown on *Discovery*), works to permanently attach the S6 segment to the International Space Station. **NASA (LEFT, BELOW)** In this image taken last month by a STS-119 crewmember, the S6 segment is held by the International Space Station’s robotic Canadarm2. **NASA**

Air vigilance

Boeing's most advanced command and control solution is set to revolutionize global air defenses—and comes from Australia

By Karinne Logan

Welcome to Royal Australian Air Force Base Tindal, about 1,800 miles (2,900 kilometers) northwest of Sydney. Inside a Defence Operations Centre, the air is thick with tension. RAAF operators manning consoles intently watch and process the surveillance images on the monitors in front of them. The screens show the airspace thousands of miles to the north, east and west of their location and all aircraft within it.

Overhead, a Wedgetail Airborne Early Warning & Control aircraft identifies a potential hostile threat north of Australia. The tactical data information is displayed in near real-time on the console operator's screens. With a click of the mouse and without a word spoken, commands appear on an encircling Super Hornet's head-up display instructing the pilot to change course. The Super Hornet is now on target to engage the threat and prevent a potential strike on Australia.

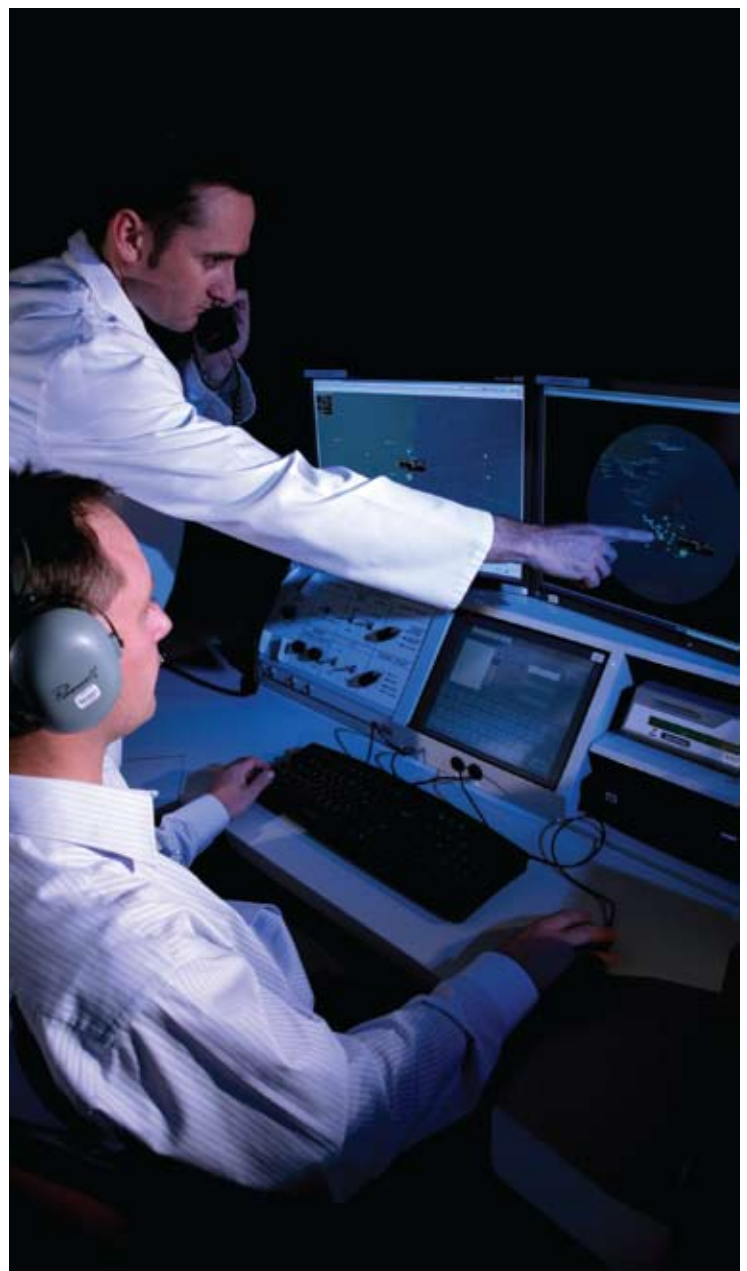
While this is a fictional scenario, the technology being used isn't. This is Vigilare, one of the world's most sophisticated command and control (C2) systems. It has the potential to change the face of air defense C2 systems—and enhance Boeing's reputation as a truly global developer of advanced defense technology.

Vigilare is the name given to the integrated air battle management system Boeing Defence Australia is delivering to the RAAF. The system not only provides better capabilities than existing C2 systems, but it's a product that Boeing hopes will fuel growth in international sales—which Integrated Defense Systems envisions as a major area of expansion. Together with the strategic high frequency communication system Boeing is delivering to the Australian Defence Force, Vigilare is Boeing's first significant defense product developed outside the United States for international sale.

"Later this year, the team will present to the Australian warfighter a system that will greatly increase the security of this country," said Steve Parker, Boeing vice president of Network & Space Systems Australia. "Australia may not have been known internationally for its cutting-edge developmental projects, but Vigilare will change that."

WHAT MAKES VIGILARE REMARKABLE

Vigilare works by combining information in near real-time from



“It is of vital importance to the capability of the Australian Defence Force and, once delivered, will be a key foundation stone of Australia’s air defense and network-centric capabilities.”

– Steve Sheedy, director-general, Surveillance and Control Branch, Australian Defence Materiel Organisation

a wide range of platforms, sensors, tactical data links and intelligence networks to deliver tactical- and strategic-level surveillance operations and battlespace management in the air and joint domains. The live inputs from these sources are then fused at two Regional Operations Centres manned by RAAF personnel—one at RAAF Base Tindal, and another on Australia’s east coast at RAAF Base Williamtown. Each ROC contains sophisticated information and communications systems, including consoles that display to RAAF operators a recognized air picture of the battlespace from the various ground- and air-based defense sources. It is from here that the RAAF will control and command the skies above them.

What makes Vigilare so remarkable and more advanced than other C2 systems currently on the international market is a combination of cutting-edge technology, fully integrated tactical data links within a single operational human-machine interface, easy customization, and a unique “record and replay” training capability.

As the most recent addition to the C2 domain, Vigilare boasts advanced technology not available elsewhere. Its operator interface is one of the market’s most user-friendly and can be customized. There also is significant automation within the system, meaning fewer operators and maintenance staff are needed.

Vigilare also can integrate with all Boeing products, from F/A-18 Super Hornets to P-8s and AEW&C aircraft, which is an obvious draw card for countries that are existing Boeing customers.

In addition, Vigilare provides an interactive “record and replay” capability that enables both real and fictional scenarios to be replayed multiple times. Changes can be made to each scenario to create a different outcome. This innovative feature offers significant benefits by enabling customers to enhance both operator training and strategic planning.

The complexity of Vigilare is something that isn’t lost on Air Commodore Steve Sheedy, director-general of the Surveillance and Control Branch of the Australian government’s Defence Materiel Organisation. “It is an extremely complex system-of-systems type project requiring the merging of data from a large number of dynamic and disparate sources,” he said. “It is of vital importance to the capability of the Australian Defence Force and, once delivered, will be a key foundation stone of Australia’s air defense and network-centric capabilities.”

WORLDWIDE INTEREST

Although the system isn’t scheduled for delivery to the RAAF until 2010, it’s already generating significant international interest. That was evident at the International Defence Exhibition and Conference held in Abu Dhabi, United Arab Emirates, in February.

“We showcased Vigilare for the first time outside Australia to an attentive audience intrigued to know more,” said Nan Bouchard,

vice president and general manager of Command, Control and Communications (C3) Networks, the U.S.-headquartered IDS division under which Vigilare falls. “With national security high on the global agenda, a number of Middle Eastern countries asked for demonstrations during IDEX, and as a result, we have received several requests for additional briefings.”

Vigilare’s appeal goes beyond the Middle East. Asian nations already are knocking on Boeing’s door and the company sees the region as a future market.



“As IDS increases our global presence, we will look for other opportunities to do similar developmental projects while managing the inherent risk. We will leverage these projects to gain access to new markets, global talent and sponsorship around the world for Boeing,” said Steve Goo, vice president, IDS International Operations. ■

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PHOTOS: (LEFT) Vigilare design engineer Hugh Webster (seated) and tactical data links test engineer Jason Brennan review a battlespace management test mission that demonstrates the integration of simulated surveillance data from aircraft flying in Australian airspace. **HEIDI SNOWDON (ABOVE)** Hugh Webster (left) and Lee Davis, deputy Vigilare program manager, give a presentation on Vigilare’s capabilities during the recent International Defence Exhibition and Conference in Abu Dhabi, United Arab Emirates. **LORENZO CORTES/BOEING**

A **class** ahead

The 787 is bringing advances not only in jetliner performance but also in airline training programs



By Scott Lefebber and Tom Brabant

The Boeing 787 Dreamliner makes its first flight this year, marking a historical and technological milestone in aviation. Equally important, though often overlooked, is the complex training that helps make this dream a reality.

The 787 program and Alteon, Commercial Airplanes' training business unit reporting to Commercial Aviation Services, have been hard at work together to revolutionize 787 training to produce the best-qualified mechanics, pilots and flight attendants. Just as the 787 is a game-changer, its training program is much different than those of the past. One key objective of 787 training is to replicate the airplane in the classroom and bring digital, performance-based data to customers. All phases of 787 training use simulation, which allows students to practice on the same tools they will actually use on the airplane. Here's a look at the various elements of 787 training.

MAINTENANCE TRAINING

With the 787, a mechanic's main troubleshooting tool is a laptop computer. The Maintenance Performance Toolbox, an online repository, provides the mechanic with the real-time maintenance information needed to maintain and repair the airplane. And unlike previous training programs that used data intended just for training, maintenance training courses for the 787 will link to actual support data in the Maintenance Performance Toolbox.

"Part of training is becoming comfortable with the airplane's troubleshooting tools," said Jeff Haber, manager of 787 maintenance training.

Using interactive 3-D models, each student can walk around the airplane virtually, collect the tools needed and walk step by step through the troubleshooting process. With the laptop and access to the Maintenance Performance Toolbox, the mechanic practices the same skills in the classroom that will be used on the job.

"The maintenance laptop picks up fault codes that tell the mechanic what is wrong with the airplane—much like a car mechanic working on a modern engine," said German Rangel, maintenance training simulation lead. "Through simulation, students can correct the fault in exactly the same way they would in the field."

FLIGHT TRAINING

Computer-based training allows students to gain practical airplane systems knowledge using high-tech desktop simulation tools. They can then integrate this systems and procedures knowledge within the flight deck environment through the 787 Flight Training Device (FTD). The FTD provides flight crews with the same airplane systems and interfaces as a full-flight simulator, including electronic flight bags and head-up displays for both pilots.

This makes the FTD ideal for instrument and airplane system familiarization and procedure proficiency. It also provides a smooth transition to the 787 full-motion simulator, which allows pilots to become proficient in maneuvers and airplane handling characteristics, including takeoffs, approaches and landings.

The 787 training program is designed to expediently transition crews that fly other Boeing airplanes. The high degree of commonality between the 787 and the 777 allows "differences" training from one model to the other in only five days without the use of a full-flight simulator. Commonality between other Boeing

models and the 787 builds on the success of the Shortened Transition and Rating courses, which reduce the transition time for pilots because tasks common among models do not have to be relearned. As a result, pilots can be trained to the 787 in as few as 13 days. The 787 transition course for pilots previously flying non-Boeing models to the 787 takes 20 days, which is one day less than previous similar courses required.

"These reduced training times result in cost savings for Boeing and for our customers by reducing training costs and limiting the time their pilots are away from their home base," said Don Reiter, manager, 787 training.

CABIN SAFETY TRAINING

Boeing received U.S. Federal Aviation Administration provisional acceptance last month on the 787 cabin safety training program. The two-day training course, designed by Boeing cabin safety experts with input from airlines and industry, provides 787 customers with a framework to customize their own cabin safety programs.

The program outlines the basic processes and guidelines flight and cabin crew must follow when operating the 787. The course includes training in airplane familiarization, lighting and communication, doors, slides, evacuation, water and waste systems, and special features. The course also includes training with a hands-on cabin door device.

According to Brad Becker, manager, Cabin Safety Training, every airline is required to get approval of its own cabin safety training programs. The Boeing program is the baseline for customers and provides the framework they can use to customize their own plans.

Training consists of one day in a formal classroom setting and one day performing evaluations in a realistic environment using a cabin door device.

787 TRAINING THROUGH ALTEON

Alteon will have 787 training suites located around the world. Each suite includes a full-flight simulator and a host of flight training equipment, maintenance training tools and a hands-on door trainer device. Alteon's strategy of providing training campuses close to customers' home bases reduces airlines' training-related costs such as travel and crew down time.

Operators that purchase the 787 can choose from a selection of training options that give them more flexibility than ever. Each customer receives training points, or credits, that can be redeemed for various Alteon training services.

In addition, 787 training is environmentally progressive. Digital, Web-managed training and the use of personal computers for learning and even note-taking means reduced waste, energy, travel and costs for customers and Boeing.

"Our goal is to make carriers' transition to the 787 as easy as possible," said Reiter. "The digital technology and commonality of this airplane allow for equally remarkable training solutions that will truly provide value to our customers." ■

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PHOTO: Cameron Forrest (left), instructional systems and technologies lead, and German Rangel, 787 maintenance training simulation lead, facilitate a discussion on 787 maintenance training at the Seattle Alteon training campus. MARIAN LOCKHART/BOEING

Citizens of the world.

Meet some of the many Boeing employees who give their time, talents to charities

Visited an aquarium? Watched a Special Olympics competition? These are two of the many places where you might find Boeing teammates supporting their communities.

A growing number of employees are applying their knowledge and job skills to volunteer efforts outside work. By doing so, they're helping build stronger, more vibrant communities, according to Patrice Mingo, director of strategic programs for Global Corporate Citizenship. "Boeing people generously contribute their time, expertise and money to local charities and nonprofit groups," Mingo said, referring to the many projects employees participate in—often held under the auspices of Employee Volunteer Councils—and to the monetary contributions they make to the Employees Community Funds of Boeing.

Traditional volunteering remains a valuable initiative, Mingo said, but Boeing is evolving toward a more skills-based volunteering mindset: strategically applying much-needed skills and talents to nonprofits seeking hands-on expertise. "Volunteering is a strong driver toward 'One Boeing.' As world citizens, we can focus less on our differences and more on how we leverage our unique skills and talents to make positive change in our communities," Mingo said.

For National Volunteer Week—which takes place April 19–25 in the United States—*Boeing Frontiers* looks at some of the many employees who contribute their skills to drive positive change in their communities.

— Geoff Potter

Katie Lewis

Environment, Health and Safety – Renton, Wash.

Volunteer organizations: Washington Alliance for Better Schools, an after-school math and science program for grade-school students; the Washington State University Imagine Tomorrow energy competition; and Inner City Outings, an outreach program of the Sierra Club providing opportunities for youth to explore, enjoy and protect the natural world.

Volunteer work: I want to get kids excited about—or at least give them the opportunity to explore—science and the natural world. This is my first year with WABS, where I co-teach a weekly after-school science program. For two years, I've been involved with the Imagine Tomorrow "Power Your Future" competition, in which teams of high school students address challenges related to sustainable solutions for energy and the environment.

How does your job translate to volunteerism? Through the Boeing leadership attribute to inspire others—together with the fundamental EHS principles to promote and support the well-being of our communities and to take responsibility for environmental protection and excellence.

Most rewarding part of volunteer work: Seeing students' interest and excitement for the sciences and natural world grow. With kids, it's an early investment with lifelong results.

Advice on volunteering: We're all busy, so choose a volunteer position that requires a reasonable amount of commitment for your situation.

— Katherine Sopranos

MARIAN LOCKHART/BOEING

BOEING

波音

Michael Paone

Commercial Aviation Services – Beijing

Volunteer organization: Special Olympics East Asia, which offers children and adults with intellectual disabilities year-round training and competition in Olympic-type summer and winter sports.

Volunteer work: I help establish the strategy for Boeing China's Special Olympics support. Our first major project was to establish bocce teams in Beijing and throughout China. The sponsorship led to a significant Chinese presence at the 2007 Special Olympics summer games in Shanghai. Now that bocce is well established in China, this year we're focusing on getting soccer better established there. I also provide volunteer assistance.

How does your job translate to volunteerism? Managing people and projects and speaking in front of large audiences are skills I use while working with the Special Olympics. Charitable organizations can't survive without volunteers. Volunteers with special skills are very important to the success of any charity.

Most rewarding part of volunteer work: Attending events and experiencing the joy athletes feel when they are victorious and the sorrow they feel when they are not. The pure emotions are inspirational.

Advice on volunteering: Making time to volunteer is a tough choice, but once you do, the feeling of accomplishment more than makes up for the effort.

– Katherine Sopranos





Kim Armstrong

Learning, Training and Development – Long Beach, Calif.

Volunteer organization: Aquarium of the Pacific in Long Beach, Calif., whose mission is to instill a sense of wonder, respect and stewardship for the Pacific Ocean, its inhabitants and ecosystems.

Volunteer work: I've been dedicated to the aquarium for seven years, assisting the Veterinary Services and Education departments. I help shape the aquarium's education strategy, which is to expand e-learning into the community—specifically to get youths excited about science, technology, ecology and health. I've worked on many interesting projects to help the aquarium operate more efficiently, such as helping teams plan a new animal care center and creating a computerized data-analysis system for animal collection and care records.

How does your job translate to volunteerism? I wanted to stretch myself and align with an area where I could provide my talent and really make a difference. Working with the aquarium, I leverage my skills and experience in education, computer research and data analysis, communications, instructional and curriculum design, and Lean+ learning and training. My work with the aquarium aims to economically and efficiently improve learning and development solutions.

Most rewarding part of volunteer work: Knowing that my contributions make a difference—not only in the health and well-being of the animals but also in the educational experiences that the aquarium's visitors will have. Nonprofits can't afford to staff their organizations with every skill they need, and they depend on volunteers to help fulfill their missions. Volunteers bring a gift of their time and talents, and organizations really value their contributions.

Advice on volunteering: Even if it is just a few hours a month, every volunteer makes a difference. Go with your passion.

– Katherine Sopranos

PAUL PINNER/BOEING



Scott Strickland

Space Exploration, Integrated Defense Systems – Kennedy Space Center, Fla.

Volunteer organization: FIRST (For Inspiration and Recognition of Science and Technology) Robotics, a nonprofit dedicated to inspiring the next generation of engineers and innovators.

Volunteer work: I've been involved with FIRST for 12 years, helping high school students with the complex process of designing, building and testing a robot for national FIRST competitions. I'm working with students from Titusville High School and Astronaut High School in Titusville, Fla. The students get to observe what I do as an engineer while the team solves difficult design problems. How would a student know what an aerospace engineer does? Teachers do a great job of teaching, but experts in the business can help expose students to problem-solving methods, tools and a career path.

How does your job translate to volunteerism?

My mechanical design skills and experience translate directly to helping the team build a robot. In turn, I think my experience on the FIRST team helps me be a better leader. Setting goals, watching the big picture and engaging team members are skills that apply to both my Boeing job and mentoring a FIRST team.

Most rewarding part of volunteer work: The friendships developed with mentors and students—and seeing students from the team pursue an engineering career. I'm still in contact with some students from over 10 years ago.

Advice on volunteering: Find something you enjoy doing and you are more likely to stick to it. Involve your family, if possible.

– Katherine Sopranos

KEVIN GILL/INDYNE

What's on your mind?

The biennial Employee Survey is coming. Here's why Boeing wants to know what its people need to become more engaged.

By Susan Birkholtz

Boeing employees soon will have the opportunity to again exercise an important responsibility as stakeholders in the enterprise—spending about 25 minutes telling the company what's on their minds. Launching May 18 and running through mid-June, the biennial Employee Survey provides employees with the “voice” to let managers know what's working in their teams, functions or business units and what needs to be worked on—and to participate in the solutions.

Boeing Frontiers recently spoke with John Messman, who heads the survey effort for Boeing's Employee Relations function, to find out why the company remains committed not only to finding out what employees need to become more engaged but also to ensuring that leaders respond to the input and take action.

Q: How would you describe an engaged employee?

A: Highly engaged employees are fully invested in their work. They take responsibility for their own success while doing all they can to contribute toward the success of their teams and of the company. They ask, “What's in it for us?” instead of “What's in it for me?”

Q: What's the biggest influence on whether an employee is engaged?

A: Managers definitely have the most influence over whether their employees are engaged. In fact, ensuring that their teams are engaged is a key responsibility for managers. Engagement is strongly linked to just about all of the Leadership Attributes managers are expected to model, in fact. The Employee Survey is a tool Boeing uses to gauge what we are doing right and what we need to improve on. It is up to managers to take advantage of this tool, to listen closely to the feedback they receive through their survey results, and to work with their teams to develop action plans, using the online tool, to address the areas needing improvement and to monitor progress along the way.

Q: The company is facing tough economic times. Why spend money on a survey?

A: Maintaining and improving employee engagement and productivity is more important than ever in a challenging business

environment like this one. If we're to weather the current economic downturn and remain competitive, we need every employee to be on board with the direction we are heading.

Q: What would you say to employees who question whether the survey really can lead to change?

A: I'm sure there are employees who have not experienced any change in their work experience as a result of their Employee Survey feedback. At the same time, however, we know about many leaders who have taken the data and are modeling the right behavior in listening to their employees and taking action. We need all managers to respond this way. That's why we continue to stress the importance to managers who receive reports to use the vendor-provided online action planning tool to create action plans based on their survey results and to follow through on those plans.

Q: The average positive response to the question on the 2008 Action Survey about whether employees have seen changes taking place as a result of the 2007 Employee Survey was just 41 percent. Why the low score?

A: We are taking this particular score very seriously. Obviously, the intent of our asking employees for feedback is for managers—assisted by their teams—to develop plans that act and improve on what the feedback says. There's no other reason to do the survey. Everyone needs to step up to the plate and work together to make change happen.

Q: What tools do managers have to help them with their action planning?

A: Boeing provides a variety of training, technology and tools so managers can address the engagement of their employees. The action-planning tool itself provides managers with their data to run reports, links to helpful resources, a template to create their action plans, and tools to track progress on their action items.

In addition, on the Employee Survey Web site (<http://employeesurvey.web.boeing.com> on the Boeing intranet)



The engagement factor

Research indicates that there is a strong correlation between high levels of engagement and productivity. For example, a 2006 Conference Board study found that highly engaged employees outperform their disengaged colleagues by 20 to 28 percent. And a 2005 study by Sirota Consulting of 28 multinational companies found that the share prices of organizations with highly engaged employees rose by an average of 16 percent compared with an industry average of 6 percent. A coincidence? Not likely.

There also may be costs associated with a disengaged work force. A 2003 Gallup poll found the cost of disengagement to be between \$243 billion and \$270 billion annually due to low productivity. In one 2003 study by International Survey Research, companies with low levels of employee engagement experience a fall in their net profit of 1.38 percent, and operating margin fell by 2.01 percent over a three-year period. Conversely, companies with high levels of engagement found that their operating margins rose by 3.74 percent over a three-year period.

High levels of engagement are not easy for companies to achieve, however. According to a study by global consulting firm BlessingWhite, although North America has one of the highest proportions of engaged employees worldwide, fewer than one in three employees are engaged (29 percent fully engaged and 19 percent fully disengaged).

– Susan Birkholtz

Q: Is the survey really anonymous?

A: Yes, absolutely. That's a commitment we make to our employees. Boeing is not able to identify who said what. That's why we use an outside vendor. Only the vendor can identify respondents, and that information is kept strictly confidential. What's more, we do not issue reports of quantitative data or comments to managers when fewer than five responses were provided. We want to make sure that individuals cannot be identified in any way.

Q: Any last words to employees and managers?

A: Take the survey. Act on the results. This year, it's more important than ever. ■

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PHOTOS: (LEFT) "Highly engaged employees are fully invested in their work," said John Messman, who heads the Boeing Employee Survey effort. **BEVERLY NOWAK/BOEING (RIGHT)** The Employee Survey Web site features resources such as a searchable best-practices database that details what Boeing managers have done to successfully address engagement issues. **BOB FERGUSON/BOEING**



we have a searchable best-practices database that details actions other Boeing managers have taken to successfully address engagement issues within their teams. Kenexa, our survey vendor, provides a similar database compiled from more than 3,000 of their survey customers around the world that managers can access via the action-planning tool. A key differentiator study also is available on the Employee Survey Web site, which outlines the practices that have resulted in high levels of employee engagement at Boeing and have led to improved business results.

Q: What can employees contribute to the action-planning process?

A: Employees should play a big role in the action-planning process because they need to own and implement whatever changes ultimately are made to improve the engagement scores of their work group. To do that, they can volunteer to participate on action-planning teams and provide additional feedback to their managers to amplify what the survey results may indicate.

Q: What's the difference between Employee Engagement and Employee Involvement? And where does satisfaction fit in?

A: They are inter-related. Employee Engagement is an individual's personal attachment to his or her work on both an intellectual and emotional basis—in other words, what employees think and feel. Employee Involvement is one way employees can be engaged through actively designing, operating and continuously improving their work either on an individual or a team basis. Improved "employee satisfaction" should be a result from both.

Q: What improvements can we expect for the 2009 survey?

A: Each time we do a survey, we look at the questions to see if they need refinement or improvement. So some questions have been added and some have been removed. We also are improving the functionality in the reporting and action-planning tools. Perhaps most importantly, we are continuing to improve manager access to data so it can be even more useful to them.

An eye on the future

The U.S. Navy is seeking a new signals intelligence aircraft. Here's why Boeing thinks its EP-X provides the best-value solution.



By Eric Feters-Walp

Syd Abernethy knows firsthand how vital a role signals intelligence aircraft play in support of U.S. warfighters and coalition forces. He previously commanded U.S. Navy electronic warfare airplanes and flew the EP-3 Aries, the service's eyes and ears in the sky.

Abernethy, the former commander of Naval Air Station Whidbey Island, Wash., is part of a Boeing team working to develop a new 21st century signals intelligence airplane. Abernethy said that if Boeing wins the competition to design and build the Navy's new EP-X aircraft, it will be based on the P-8A Poseidon, a Next-Generation 737 military derivative aircraft Boeing is building for the Navy that will provide greatly enhanced anti-submarine warfare capabilities.

"Boeing's EP-X system will transform airborne intelligence, surveillance, reconnaissance and targeting for the U.S. Navy. It is designed for rapid future growth, adaptability and mission flexibil-

ity," said Abernethy, Boeing's EP-X Business Development manager for Integrated Defense Systems.

Boeing is one of three companies, along with Lockheed Martin and Northrop Grumman, that were awarded contracts in 2008 to refine EP-X concepts for the Navy. In the coming months, the Navy will solicit proposals and select contractors for the next phase of requirements development, with contract award expected by 2012.

Boeing executives said they feel the company can provide the best value to the Navy. Not only has the company teamed with capable partners, but it can leverage its work on the Navy's P-8A Poseidon and present the service with an aircraft that's already successful as a multimission platform.

"The Navy has already spent the money to militarize the 737, and there's a great deal of commonality between the P-8A and the EP-X," said Tim Norgart, Boeing director of business development for Airborne Anti-Submarine Warfare & Intelligence, Surveillance

and Reconnaissance. “Part of our premise is the Navy shouldn’t have to pay for that twice. We want to give the customer the opportunity to recapitalize on the investment it’s already made.”

WHAT’S NEEDED ON THE EP-X

After flying for four decades, the venerable Lockheed-built EP-3 Aries is “desperately” due for replacement, Norgart said. Like the Aries, the new EP-X must be capable of carrying a wide variety of surveillance technologies and a crew that can flex in size to meet mission needs. For the new aircraft, the Navy also wants additional signals transmission and receiving capabilities.

All that will allow the aircraft to improve on the EP-3’s mission of gathering and relaying crucial intelligence about opposing military forces during war or quietly keeping tabs on communications coming from potentially unfriendly parties. The EP-X will complete the triad of next-generation maritime aircraft the Navy plans to use to secure the U.S. coastline and other interests. Boeing’s

“We’ve established the model for how to design and build a militarized plane like this,” said Fred Bruner, Boeing P-8A Production Operations manager.

Choosing the Boeing 737 platform also would provide commonality in software, parts and maintenance work between the Poseidon and the EP-X.

“The argument that the Navy should be able to take advantage of the investment it already has made makes sense because of the small number of EP-3 replacements needed,” said Paul Summers, Boeing’s director of Airborne Signals Intelligence Campaigns. The Navy has said 19 to 26 aircraft is the right number for EP-X. For the P-8A, the Navy requirement is 108 planes.

Beyond that, the 737 is the right-sized airplane for the job, Summers said. The 737-based EP-X would be about 13 feet (4 meters) longer than the EP-3, with a similar crew capacity. It also would provide better speed, altitude capability and time-on-station performance than the EP-3. Abernethy said the 737’s



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– Syd Abernethy, Boeing EP-X Business Development manager

P-8A Poseidon and Northrop Grumman’s Broad Area Maritime Surveillance unmanned aerial vehicle are the two other legs of the triad.

With the P-8A, Boeing has demonstrated it can fully construct a militarized version of the 737-800 while staying on schedule and within cost. In fact, the P-8 program in January acquired a new customer—and its first international customer—when the Indian government selected the P-8I as the Indian navy’s new long-range maritime reconnaissance and anti-submarine warfare aircraft.

Final assembly on the first P-8A began a year ago at the 737 assembly plant in Renton, Wash., where the P-8A is built from the ground up specifically for its unique mission. That approach, which requires extra security measures and strict compliance with U.S. International Traffic in Arms Regulations, saves time and money compared to the old way of doing business: building a commercial airplane and then significantly modifying it afterward for the military.

reliability and availability of parts also would be a great advantage over the existing signals intelligence aircraft.

For its bid, Boeing has teamed with Argon ST and Raytheon. Fairfax, Va.-based Argon is a leading designer and developer of signals intelligence sensors and systems. Raytheon, whose technology is aboard the existing EP-3 airplanes, also is a member of Boeing’s P-8 industry team. It will be responsible for the EP-X’s sensors and multi-intelligence integration.

“Between the three of us, the Navy has a very capable and experienced industry team,” Summers said.

The need for a new signals intelligence aircraft is clear, said Norgart, who pointed out that situational awareness and intelligence

PHOTOS: (LEFT) Syd Abernethy is part of the Boeing team aiming to win the competition to design and build the U.S. Navy’s new EP-X signals intelligence aircraft. Boeing’s EP-X bid will be based on the P-8A Poseidon, a Next-Generation 737 military derivative aircraft. **MARIAN LOCKHART/BOEING** **ARTIST RENDERINGS: MATT WARDIAN/BOEING**

are more vital than ever in today's operations. The EP-3s have regularly supported ground operations in Iraq and Afghanistan.

"We've really seen over the past few years intelligence, surveillance and reconnaissance (ISR) come to the forefront. When you're fighting the war on terrorism, you can't have enough ISR assets," he said. "The P-8A and EP-X will continue to be important in gathering intelligence and protecting battle groups for the Navy."

For Boeing, winning the EP-X contract would not only complement its P-8A program, it would give the company an aircraft that might be attractive to the defense forces of other nations.

Having retired from the Navy two years ago, Abernethy said

it's great to be part of the EP-X program and involved in the competition. "I'm confident we're offering the service a better airplane and a more capable mission system for the future," he said. ■

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Tale of the tape: Boeing's proposed EP-X

Propulsion: Two CFM56-7B engines each providing 27,000 pounds (120,107 newtons) of thrust

Length: 129.5 feet (39.47 meters)

Wing span: 123.6 feet (37.64 meters)

Height: 42.1 feet (12.83 meters)

Maximum gross takeoff weight: 189,700 pounds (85,909 kilograms)

Speed: 490 knots (564 mph, 789 kilometers per hour)

Range: 1,200+ nautical miles (1,381 miles, 2,222 kilometers)

Ceiling: 41,000 feet (12,496 meters)

Crew: Five to 24

Boeing Company – BA

NYSE: Industrials/Aerospace & Defense

As of 3/20/09

\$36.31

Stock snapshot

52-week range:	
52-week high	\$88.29
52-week low	\$29.05

International competitors

EADS* – EAD.PA

As of 3/20/09	€12.46
52-week range:	
52-week high	€17.45
52-week low	€9.29

**prices in Euros*

U.S. stock indexes

S&P 500

As of 3/20/09	770.05
52-week range:	
52-week high	1,440.24
52-week low	666.79

S&P 500 Aerospace and Defense Index

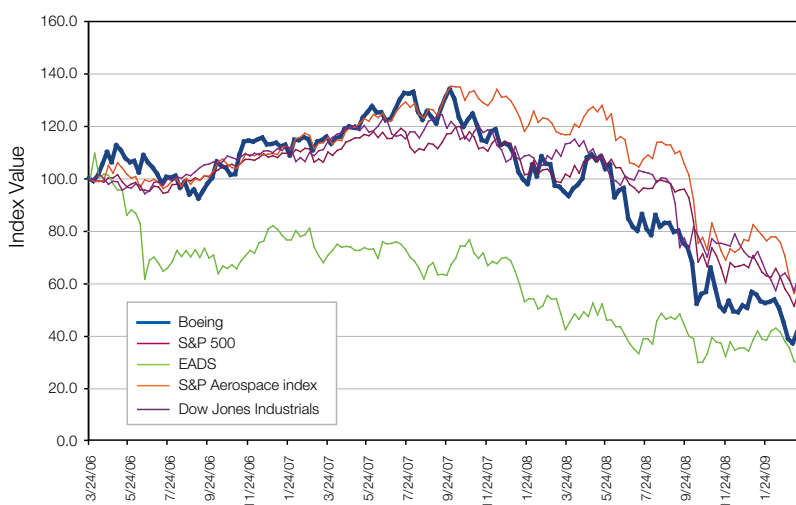
As of 3/20/09	244.13
52-week range:	
52-week high	362.26
52-week low	194.13

Dow Jones Industrials

As of 3/20/09	7,278.38
52-week range:	
52-week high	13,191.50
52-week low	6,440.08

Stock price chart

The chart below shows the stock price of Boeing compared with other aerospace companies, the S&P 500 index, the S&P 500 Aerospace and Defense Index, and the Dow Jones Industrials. Prices/values are plotted as an index number. The base date for these prices/values is March 24, 2006, 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 stock, ShareValue Trust performance

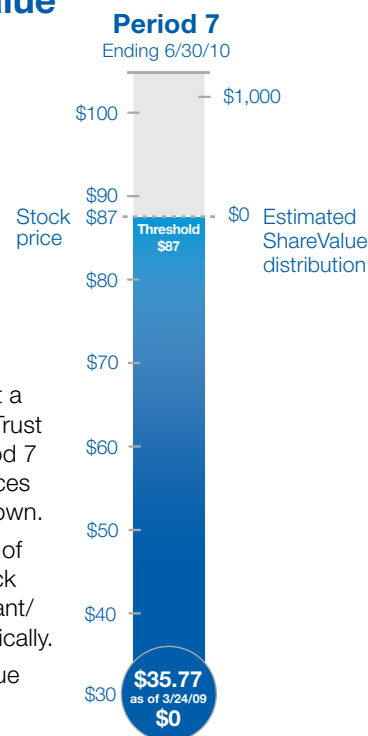
Sharevalue Trust is an employee incentive plan that allows eligible employees to share in the results of their efforts to increase shareholder value over the long term.

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

This graph shows an estimate of what a "full 4-year participation" 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 www.boeing.com/share.



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

55 Years

Norman Walker

50 Years

Gary Peterson

45 Years

Jerald Holly
Donald Kenkman
Roger Lemasters
Guy Neubert

40 Years

Danny Brillard
Jerome Budai
Paul Buehler
Joseph Campbell
Eli Chambers
Rodney Dreisbach
Gary Elder
Samuel Green
Donald Holdener
Karen Jeffries
Clyde Johnson
Thomas Jost
Salvatore Lantieri
Nelda Lee
Roger Miller
Andrew Mondt
Jackie Overkamp
David Russell
David Sasseen
Errol Sparks
Sessie Spencer
David Suttmoeller
William Vye
Kenneth Wyatt

35 Years

Donnamarie Aibinder
Timothy Andersen
Louise Avondet
David Bachman
Dennis Ball
Kim Barcheck
Dennis Barthule
Steven Bogdan
Jerome Bradke
Kenneth Bryant
Robert Cassidy
Joyce Close
Eugene Cobb
Raymond Cosner
Philip Dehnert
Bernard Derr
Domenic DiGennaro
Jose Fellores
Patrick Fox
Kathleen Gilbo
Katherine Green
Robert Gregg
Christine Guerrero
Joe Henderson
Lynn Hite

Jerry Holstien
Mirafior Jacobs
Carl Johnson
Tim Jones
Victor Keppler
Laurence Kilbride
Joseph Kollman
Robert Korhammer
George Lawson
Thomas Loyd
Michael Luse
Benjamin Lustig
Robert MacDuff
Eugene Marquez
Ronald Martin
Ronald McCowan
Bobby McGehee
Veronica McGillen
Kathleen McGrath
Gene McNeil
Roger Meyer
Randy Miller
William Mitchell
James Moore
Scott Moreen
Arlene Moreno
Donna Mudie
Denise O'Kane
Peter Olson
Albert Palizzi
William Phillips
Daniel Pipkens
Yolanda Porraz
Deborah Regan
William Rigtrup
Calvin Roland
Judy Ross
Nancy Sawyer
Ronald Schei
Lauro Schergat
Gregg Schmidt
William Sherman
Neill Smith
Faith Souza
Cheryl Steinberg
Dennis Trent
Marilyn Turner
Warren Vanwinkle
Lenzie Warren
Arthur Whelchel
Daryl Winegar
Michael Yee
Bryan Yoshida
Thomas Young

30 Years

Michael Abe
Jeffrey Ackerman
Floyd Adkins
Leo Ahearn
William Ahrens
Thomas Akada
Susan Allen
Alan Anconetani
Jeffrey Anderson

Jolanda Arnone
Darrell Athay
Steven Atkins
Barry Avers
Albert Babrocky
Lynn Bailey
Peter Baker
Paul Ballew
Michael Baril
Dale Barnhart
Sharon Barnhart
Cheryl Bartlett
David Beal
Sharon Beauclair
Brenda Bell
Terrence Belland
Greg Beloit
John Bembers
William Benner
Fern Bennett
Gordon Bennett
Jean Benning
Wayne Biles
Patricia Bishop
Henry Bittle
Sandra Blanchard
George Bolhafner
Daniel Boyd
Raymond Boyer
Joseph Brando
Kenneth Brewer
Thomas Brezarich
Michael Brick
Arthur Bright
Raylen Broadhurst
Gary Brooks
Ricky Brooks
David Brown
Ronald Brown
Don Brubaker
David Brumley
Rodney Bufford
John Buhner
Alan Burg
Richard Burge
Randy Burkel
Brenda Burks
Angelika Burns
William Burright
Gary Burt
David Bush
Peggy Campbell
Timothy Cannon
Marsha Carbery
Timothy Casey
Craig Caskey
Curtis Chappell
Bill Childs
Edward Cierebiej
Gregory Clark
James Cleveland
Kevin Cleveland
Geraldine Cloman
Ronald Coen
William Coffman

Phillip Collins
Larry Colshan
Cameron Cook
Jon Cook
Raymond Coon
Sharon Cossey
Michael Coursey
Robert Courtade
Harry Courtwright
Elisa Cox
Kevin Creech
Michael Crooks
Kevin Cummins
Nelson Curry
Daniel Dancosse
Jack Davis
Douglas Dearth
Michael Deckert
Margaret Delgado
Maddalena Delvecchio
Thomas Desgrosellier
Norman Dille
Phyllis Ditocco
Dennis Dobrowolski
David Doering
George Dombalagian
Phillip Dore
Valerie Dorsey
John Doubek
Joy Downing
Jim Duncan
Steve Esaki
Arthur Eschbach
Marin Faure
Fred Fieldcamp
Marla Flynn
David Forgey
Michael Fratus
Mark Fredrickson
Forbes Freeburg
Vickie Friend
Gwen Fujii-McLaughlin
Yukie Fujiwara
Wendy Gallegos
David Ganoung
Michael Garcia
Mark Garrett
Jean Gillespie
Richard Goddard
Tommie Graham
Thomas Greenside
Francis Gresko
Gerald Guerrero
Bryan Hagglund
Michael Hansow
Darrell Harris
David Hauck
Larry Heidler
Jeffrey Heinemann
Melbern Hellmann
Roger Hengel
Marc Henry
Lilia Hershenson
Siegfried Hess
James Hill

Peter Ho Sang
Ralph Hodgins
Terri Hoge
Charles Hooie
Ronald Hooker
Dennis Hoover
Raeleen Hoskin
Arthur Howell
Jeffrey Hoyt
Hsu Hsing
Philip Huddleston
Derris Humphrey
David Hutsell
Kiet Huynh
Faith Ivey
Nedra Jackson
Leonard Jacques
James Jahnke
Gregory Jenkins
Donald Jirucha
Kevin Johnson
Mark Johnson
Melinda Johnson
Vanessa Johnson-Smith
Dale Jones
David Jones
Ralph Jordan
Brian Kellogg
John Keough
Robert Kidwell
Steven Kilgore
Terry Kimp
Darren Kleisath
Ronald Kleven
John Knauss
Richard Knox
Thomas Kottke
William Kral
Richard Krotzer
Rick Krugh
Richard Kuramoto
Fred Kuzmer
Roger Lacy
Tim Lake
Hong Lam
Martin Lambert
Scott Langer
Randy Larson
Marc Le Pense
Thomas LeBlanc
Thomas Leding
Christine Lee
Robert Lee
Gregory Leggett
Don Leinweber
Jeffrey Leveque
John Leyda
Yvelyn Lincecum
Roosevelt Lindsay
Lawrence Lively
Debra Lloyd
Lee Lockhart
Orville Lof
Russell Loken

Robert Lones
Samuel Lopez
Douglas Lord
Stephen Lundin
Nhuan Ly
Lawrence Lyons
Robert Lyons
Beth MacMillan
Jefty Magers
Leslie Maldoon
Harjit Mangat
Robert Mann
Timothy Mark
Gary Marks
Loren Marston
Jason Martin
George Martinez
James Masterson
Laurie Mattson
Nick Mazzola
James McCaffery
Gordon McCaffrey
Linda McColgan
Craig McElfresh
Mark McGee
Doreen McKeown
Paul McPeak
James Medley
Scott Meier
Thomas Melograno
Ronald Merrifield
Frank Miano
Stephen Miesner
James Miller
Larry Miller
Susan Miller
Mark Minner
Donald Montague
Timothy Montgomery
Rex Munson
Kevin Murphy
Michael Murphy
Kevin Murray
Asif Nasar
Donnell Nealey
David Ng
Larry Nicklay
David Nitzsche
Kevin Norby
Richard Norwood
Elizabeth Ogden
Gordon Olsen
Vickie Onchi
Sam Pajji
Alexis Pangis
Frank Parnell-Smith
Robert Pasterick
Dale Payne
Gary Payne
Leslie Penner
Joseph Pernice
Kirk Peters
John Petty
Anne Phillips
Rodney Polson

Douglas Pompey
Janice Post
Ronald Potts
Nancy Preuss
Robert Pritchard
William Quinn
Susan Rahman
Charles Ratcliffe
William Rayburn
Russell Rector
Jonathan Reed
Thomas Regelein
Martin Reid
John Reyburn
Nancy Reynolds
Grace Richardson
David Robinson
Michele Robison
Phyliss Rodgers-
Banks
Ronald Rogers
William Rose
Connie Roundy
Beatrix Ruffier
James Salmon
David Salter
Kurt Sato
Randy Sawyer
Edward Schaubert
John Schmidt
Bruce Schmitz
Barbara Schneider
Richard Schoenleber
Evan Sharp
Jean Shelby
Brian Short
Joan Short
Reggie Shoup
Terry Sieveking
David Silkwood
Robert Smith
Vonnie Smith
Warren Smith
Robert Snider
Theodore Sommer
Donald Spradling
Leilani Staley
Susan Stark
Tom Sternberger
Mary Steuer
James Stewart
Diane Stipp
Richard Stiverson
Arthur Stone
Ralph Stout
Robert Sturton
Rochelle Swaab
Scott Taylor
Tracy Taylor
Jeffrey Tazioli
Brenda Terrill
Earnest Thompson
Robert Timm
Elizabeth Todak-
Norem
Kwan Tong
James Topinka
Perry Topinka

Donald Torcaso
Ronald Torres
Janice Totey
Diane Tribolet
Christopher Truxaw
Theodore Turner
Timothy Uhl
David Uhlorn
Terri Uva
Gerald VandenHeuvel
David VanDyke
Manuel Vega
Susan Wada
Deanne Waddell
Larry Walbridge
Patti Wallis
Leslie Warbus
Richard Weimer
Larry Wickliff
Gerald Wiech
Steven Willhight
John Williams
Gary Williford
Charles Willis
Timothy Wilson
James Winner
Jerry Winninghoff
Susan Wolfe
Diane Woltz
Brian Wood
Joseph Wood
Patricia Wright
Timothy Wright
Cheng Wu
Lo-Hsien Yu
Linda Zambrano

25 Years

Chris Alabrudzinski
Syed Alam
Al Aljilani
James Anderson
Steven Anderson
Rodney Andrews
Phillip Angel
Villy Angelico
Gregory Anguiano
Ronald Arnal
Debbie Avra
Shauneen Ayers
Rodney Backman
William Baer
E.J. Bailey
Alan Baker
Steven Balch
Lance Ball
Bradley Barnes
Diana Beauleau
Samuel Bechara
Charles Beckman
Dustin Bell
Steven Benjamin
Gary Best
Paul Betscher
John Bigler
James Black
Roger Blackwell
Jeffry Blanner

Michael Bodine
Bruce Boesiger
Allen Bohnert
Dianne Bradley
Myra Brent
Hazel Britt
Gregory Budig
Thomas Buller
David Buntz
Michael Bunyan
Thomas Burleson
Robert Burns
Annie Burton
Steven Calhoun
Greg Camden
Rana Campbell
Ralph Caruthers
Stephen Casey
Pablo Cejas
Genaro Cervantes
Steven Chan
Randall Chastagner
Cynthia Cheatham
Julie Chin
James Chrismer
Rodney Christensen
Pierre Clanet
Primo Colcol
Mark Cole
Deborah Conard
Milton Cornelius
Stacie Corrubia
Larry Cox
Julian Crane
Jill Crueger
Richard Dalton
James Daves
Robin Davick
David Davis
Mark Davis
Kenneth Dawson
Shirla Day
Maxine Delano
Alan Dellamore
Frank Demarco
Reese Dengler
Daniel Diel
Frank Dinh
Robert Dirden
Linda Druliner
Ramon Dullum
Tito Duran
Thomas Dyal
James Elliott
Paul Enz
Kathleen Essig
Kenneth Farquhar
Joann Fountain
Kimberly Frey
Michael Gail
Jon Gailey
Darren George
John Githens
Dennis Gladfelter
Susan Goetsch
Edward Gomez
Robert Gradle
Archibald Gray

Janiece Griffey
Kevin Groeneweg
Jerald Groninger
David Grotjahn
Jayanta Guha
Clarence Gutcher
Richard Guyse
Richard Hadden
Margaret Hall
Jimmy Hardin
Glenn Hartman
Eric Hauge
Robert Hawk
Dale Head
Daniel Hedges
Charles Heider
Stephen Henderson
Bernard Hernandez
David Hernandez
Jeffrey Hilgert
Michael Hodges
Bruce Holmes
Sing Hong
Russell Howard
Philip Isenhouer
Jack Jackson
Donald Jarratt
Jerry Jennings
Paul Jeroma
Benn Johnson
David Jones
Dwight Jones
John Joseph
Thomas Jung
Edward Karpinski
Theodore Kaufmann
Thomas Kedley
Angela Killens
Maurice Kinzler
Thomas Kitchen
Michael Kohls
Glenn Kornreich
Lawrence Kovatch
John Kramer
James Krick
Curtis Lapos
Dennis Larson
David Lashmet
Lori Laukat
Anthony Lawrence
Tim Lawton
Thanh Le
Mario Legaspi
Kathy Leinhauser
Mary Leon
Rita Lesley
Elsa Lewis
Frank Lima
Fernandez Lockhart
John Lodan
Jeffrey Long
John Lowe
Jose Lucio
Vijai Luthra
Gregory Manns
Jean Manriquez
Doyle Marks
Roger Marvel

Carla Mastracco
Charles Matich
Joseph McAleer
Sarah McColl-Taylor
Colleen McCrea
Evette McCree
Charles McHarg
John McIntyre
John McKechan
Carla Mettrick
Darrell Meza
Lewis Michael
Mark Michael
Trent Miller
Roy Mills
John Minicky
David Minteer
Peter Montoya
Mary Moore
Perry Moore
Stephen Moore
Roger Morris
Gregory Mottle
Douglas Mullis
Wayne Nakatsu
Clifton Naughton
Daniel Naugle
Lam Nguyen
Phuoc Nguyen
Nichola Notz
Daniel Oliver
Erin Omori
Joe Ortega
Richard Otto
Roberta Oyer
Monica Padilla
Sandor Palfi
Mahlah Pandora
James Parsons
Eugene Patnode
Kimberly Payne
Albert Pearson
Glenn Pesigan
Gregory Peterson
Bang Pham
Patrick Pittman
Salvatore Pizzati
Peggy Plunkett
Robin Quinn
Kevin Rapp
Sylvia Reese
Louis Reyes
Susan Rice
William Riley
Jill Risner
David Robert
Darrell Roberts
Rick Roberts
Johnnie Rogers
Alan Rosenburg
Vernon Rothwell
Susan Rowland
Juanita Rusher
Wayne Sakaguchi
Barbara Salvesson
Alan Sams
Conrad Santos
Bruce Sauer

Cory Saulness
Mark Savio
Lynda Scarborough
Stephen Schmidt
Erik Schwan
Mohammad Shamsi
Jeffrey Sharp
Larry Sharp
John Shillito
Jennifer Shylanski
Joseph Sidbury
Jesse Silva
Lorrie Sivich
James Smith
Karan Smith
Sue Soliz
Gary Southern
Christopher Sovich
Richard Spicer
Marilyn Spivey
Bonnie Stanhope
Jeannie Starks
John Stolting
Jeffrey Stonestreet
Keith Stratmann
Eric Streich
Timothy Stumpf
Robbie Sturza
Michael Sullivan
Dale Svenson
Victor Sweberg
Ricci Sylvester
Richard Tallant
Michael Tharp
Gary Thibault
Kenneth Thiele
Earl Thompson
Daniel Thomsen
Michael Tidwell
Michael Tipton
Jeffrey Todd
Cort Toland
Dennis Toney
David Tow
Paul Tricamo
Rettie Truesdell
Ann Turner
James Underbrink
Ernestina Valencia
Guadalupe Vargas
Douglas
Vossenkemper
William Wagner
Reid Wagoner
David Webb
Scott Welch
Daniel Wellman
Kevin Wenk
Richard Wilcox
Rowland Williams
Kenneth Winchester
Gregory Wood
Leonard Wroblewski
Steven Yager
Cynthia Yates

RETIREMENTS: The following employees retired in February from The Boeing Company.

Rosauro Amoranto, 31 Years
 Michael Anderson, 26 Years
 David Baker, 42 Years
 James Baker, 10 Years
 Kattie Bazar, 18 Years
 Gay Bennett, 28 Years
 David Bese, 35 Years
 Vinton Bettker, 41 Years
 Jon Bimler, 29 Years
 Frances Bishop, 22 Years
 Edward Booms, 30 Years
 Bobby Brewer, 28 Years
 Thomas Bristol, 39 Years
 Don Brown, 34 Years
 Lynda Browning, 20 Years
 James Burnworth, 28 Years
 David Byrd, 22 Years
 Richard Calkins, 17 Years
 Allen Cannon, 27 Years
 Larry Carr, 42 Years
 Nancy Carr, 36 Years
 Carl Chambers, 36 Years
 Ho-Pen Chang, 11 Years
 Christine Ciofalo, 9 Years
 Betty Clemons, 24 Years
 Robert Clifford, 15 Years
 William Cole, 21 Years
 James Combs, 47 Years
 Michael Crawford, 27 Years
 Ronald Crossen, 45 Years
 Andy Dao, 11 Years
 Dwight Davis, 30 Years
 James Davis, 41 Years
 Kerwin Davis, 29 Years
 Kenneth Decker, 24 Years
 William Desmul, 21 Years
 John Dickinson, 33 Years
 Douglas Dillon, 45 Years
 Pamala Dubois, 19 Years
 Robert Duee, 19 Years
 Roberto Duffy, 27 Years
 Harold Dunn, 22 Years
 David Dyrness, 38 Years
 Ronald Eastwood, 19 Years

Kathleen Edwards, 35 Years
 David Ewing, 20 Years
 Ralph Fiesta, 19 Years
 Bruce Fisher, 27 Years
 Constance Fleming, 29 Years
 Jeffrey Fleming, 31 Years
 Mary Foley, 27 Years
 John Fowler, 31 Years
 Stephen Gallemore, 10 Years
 Kenneth Gehring, 33 Years
 Thomas Gilbert, 32 Years
 Jeral Godfrey, 41 Years
 James Golden, 25 Years
 Charlotte Gollnick, 11 Years
 Sandra Gonzales, 36 Years
 Forrest Goodman, 29 Years
 Sandra Gordon, 12 Years
 William Gray, 39 Years
 George Greer, 38 Years
 Oren Hadaller, 36 Years
 Robert Hallmark, 25 Years
 Frank Hankins, 19 Years
 Michael Harp, 29 Years
 John Harris, 30 Years
 Patrick Heavey, 30 Years
 William Henry, 21 Years
 Susan Hercules, 27 Years
 Benjamin Higbie, 12 Years
 Allen Hight, 24 Years
 John Hopkins, 27 Years
 Frank Hornbeck, 37 Years
 Robert Houser, 7 Years
 Patricia Hovsepian, 12 Years
 Leobardo Huerta, 20 Years
 Barrie Hughlock, 19 Years
 Anthony Ingrassi, 29 Years
 Brenda Jackson, 37 Years
 Robert Jackson, 25 Years
 Donald Johnson, 27 Years
 Peggy Johnson, 20 Years
 Gregory Klepper, 36 Years
 David Knowles, 20 Years
 Donald Kolve, 38 Years
 Patricia Kostick, 9 Years

Kathleen Krischano, 34 Years
 William Lamar, 11 Years
 Donna Lane, 22 Years
 John Laramie, 45 Years
 James Ledford, 27 Years
 Virgil Lee, 26 Years
 Matthew Lentz, 34 Years
 Walter Lewis, 22 Years
 Philip Luther, 22 Years
 Phyllis Manson, 30 Years
 Carolyn Marshall, 12 Years
 Kathryn Martin, 29 Years
 Richard McClelland, 32 Years
 Nancy McKay, 23 Years
 Douglas Metz, 32 Years
 Donald Midkiff, 25 Years
 Thomas Moore, 32 Years
 Jerry Morehead, 30 Years
 Robert Muir, 32 Years
 Robert Mutch, 20 Years
 Hari Narayanan, 30 Years
 Betty Nettles, 29 Years
 Lucy Nietula, 34 Years
 Linda Nikolaisen, 21 Years
 Peter Noffke, 39 Years
 Walter Norton, 31 Years
 John Ortakales, 18 Years
 Gerald Padero, 33 Years
 Benson Pang, 28 Years
 Gary Parks, 29 Years
 Jerry Parsons, 21 Years
 Toshiko Pate, 25 Years
 Edick Petrossian, 29 Years
 Rochelle Phelps, 16 Years
 Theodore Pigg, 32 Years
 Darrell Plischke, 43 Years
 Patricia Ploudre, 13 Years
 Michael Polsen, 35 Years
 Carol Poticha, 6 Years
 Kenneth Raby, 22 Years
 Manuel Razo, 46 Years
 Leonard Reh, 29 Years
 Steven Reynolds, 25 Years
 Jeanne Richards, 22 Years

Christine Rushton-Hanneman,
 19 Years
 Gordon Russell, 28 Years
 Charlene Scammon, 30 Years
 Marc Schoen, 31 Years
 Debra Schroeder, 31 Years
 John Scrivens, 11 Years
 Donald Sedergren, 29 Years
 James Shearer, 41 Years
 Robert Simon, 23 Years
 John Smail, 35 Years
 Carol Smith, 31 Years
 Carole Smith, 40 Years
 Richard Smith, 21 Years
 Patricia Soroe, 34 Years
 Debra Spellman, 28 Years
 Mark Spero, 9 Years
 Sharon Speth, 30 Years
 Harvey Sprigg, 14 Years
 Robert Stafford, 31 Years
 Andrew Stefancik, 31 Years
 James Stephens, 21 Years
 Gabriel Stier, 18 Years
 Laura Sundell, 24 Years
 Lynn Thompson, 11 Years
 Gladys Torkelson, 23 Years
 Minnie Trentman, 26 Years
 Salvador Trinidad, 43 Years
 Walter Tullis, 22 Years
 Steven Vadman, 30 Years
 Thomas Vail, 34 Years
 Raymond Van Court, 20 Years
 John Vandermeulen, 21 Years
 Jack Voas, 22 Years
 Verna Warrick, 33 Years
 Ann Wasahington, 33 Years
 Charles White, 47 Years
 Leonard Whitlock, 36 Years
 John Wilcox, 34 Years
 Diane Williams, 21 Years
 Gayle Wilson, 18 Years
 Lawrence Wood, 31 Years
 Isaac Zere, 28 Years
 Robert Zimmerman, 37 Years

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

Dian Alyea, software engineer; service date Sept. 12, 1978; died Feb. 20
Lanette Bergmann, engineering technical support technician; service date March 27, 2000; died March 1
William Dolan, Fabrication inspector; service date Dec. 7, 1991; died March 4
Loren Holmes, software engineer; service date Sept. 9, 1991; died March 7
Johnny Hudson, systems engineer; service date April 28, 1997; died March 3
Michael McCullough, electronics technician; service date Sept. 5, 1981; died Feb. 27
David McFadden, electrical engineering design technician; service date March 27, 2000; died March 5

Martin Reichlin Jr., electrical technician; service date Dec. 12, 1965; died Feb. 26
Ronald Richey, test and evaluation engineer; service date Dec. 9, 2002; died Feb. 25
Clark Roberts, aviation maintenance technician and field inspector; service date Oct. 19, 2000; died March 7
John Salman, electrophysics engineer/scientist; service date Aug. 1, 1997; died Feb. 25
Bonita Wade, systems and data analyst; service date March 22, 1979; died Feb. 24
James Wai, systems engineer; service date Oct. 15, 2004; died March 1
Ricky Wilson, systems engineer; service date July 8, 1996; died Feb. 25



PHOTO: This American Airlines 767-300ER (Extended Range) made the first revenue flight of a 767 equipped with Aviation Partners Boeing Blended Winglets. The jetliner is shown after its arrival at London Heathrow Airport. AMERICAN AIRLINES

AMERICAN AIRLINES FIRST TO FLY 767 BLENDED WINGLETS

An American Airlines Boeing 767-300ER (Extended Range) last month made the first revenue flight of Aviation Partners Boeing's (APB) Blended Winglets on this jetliner model.

This highly visible technology—already flying on more than 2,850 Boeing 737s and 757s—could save each American Airlines 767 up to 500,000 gallons (1.9 million liters) of fuel per year while cutting carbon dioxide emissions by as much as 5,000 tons (4,500 metric tons).

“These winglets represent the largest piece of structure ever retrofitted to a commercial aircraft wing and will dramatically change forever both the appearance and performance of the 767-300ER,” said John Reimers, APB president and CEO.

APB is a joint venture of Aviation Partners Inc. and Boeing, reporting through Commercial Aviation Services in Commercial Airplanes.

BOEING NAMED TO FORTUNE'S 'WORLD'S MOST ADMIRABLE COMPANIES' LIST

Boeing was ranked 40th in *Fortune* magazine's new annual survey, the World's Most Admired Companies. The study, which polled more than 4,000 executives, directors and analysts, covered 689 companies in 64 industries across 28 nations. Boeing is the only aerospace company in the list's top 50.

In a second part of the survey, in which respondents were asked to rate companies in their own industry on nine reputational criteria ranging from product quality to financial soundness, Boeing was ranked No. 2 out of 15 aerospace and defense companies, behind United Technologies.

The *Fortune* survey combines the magazine's long-standing America's Most Admired Company and its former World's Most Admired Company surveys.

BOEING, MEXICANA GROUP AGREE TO 25-AIRPLANE 717 LEASING DEAL

Mexicana Group agreed to lease 25 Boeing 717-200 airplanes to be used by its Click operation, Boeing and Mexicana Group said last month. The deal makes Mexicana the first North American 717 operator outside the United States. The Rolls-Royce-powered 717s will replace Fokker F-100s operated by the airline.

“At a time when economic conditions pose challenges to airline operators and travelers, the 717 offers a wealth of value—greater fuel efficiency, lower maintenance costs, a modern flight deck and spacious interior,” said Tim Myers, Boeing Capital Corp. vice president for structured financing. “We're pleased to join forces with Mexicana to bring the 717 to the region.”



Boeing Houston Program Integration Flight Systems & Software Engineering team

If the space shuttle's Primary Avionics Software System (PASS) fails during a mission, the Space Shuttle program calls on us to ensure our Backup Flight System (BFS) is ready to safely complete the mission.

Our team of about 150 employees at Kennedy Space Center, Fla., Huntington Beach, Calif., and Houston designs and documents the flight software requirements for both the PASS and the BFS. We also design code and maintain the flight software for the BFS and the Multifunction Electronic Display Subsystem, a "glass cockpit" crew display that serves as the primary crew interface with flight software.

We've been doing this work since the beginning of the shuttle program, but we have continued to evolve as a team to work more efficiently and effectively. So it's no wonder we would take that same philosophy when it comes to our processes.

The saying, "If it ain't broke, don't fix it," is one we rarely use. We are continually looking for ways to improve our process via our Program Integration Lean Working Group. One improvement we recently tackled was the complicated BFS patch process. This process might qualify as "ain't broke," but it was one that could use some attention. Historically it's produced minor errors due to simple user misunderstandings. That's where our Lean+ team comes in. Thanks to a group of dedicated Lean+ champions, our team was able to improve the process and eliminate waste.

Our goals were simple: "Leaning out" the BFS patch process to reduce cycle time for patch creation (eliminate waste) and maintain patch quality (be error-free), while documenting the entire implementation process. We also wanted to create a "future-state map" that's easily understood by new personnel and that required less specialization.

Using our Lean+ toolbox, we moved forward with a Value Stream Mapping workshop last October. Our results were outstanding: We reduced cycle time by 75 percent, from 45 days to 11 days. The key enabler to the improved process was modifying



peer reviews into real-time engineering development reviews, or "scrums." We are also able to reduce signature cycles and conduct training for the development team.

Our team is just one of many within the Space Shuttle program continuing to make strong progress with our Lean+ initiatives. The entire program is constantly coming up with creative ways to improve and simplify processes without compromising quality. ■

PHOTOS: (TOP) From left: Hoa Nguyen, Karlos Steele, Blake Frere, Joy Cox, George Miller, Ulrica Fontenot, Douglas Corbin, Stephen Jayne, Paul Allen, Viet Nguyen. **ELIZABETH MORRELL/BOEING**

(ABOVE) Here is a look inside a space shuttle flight deck. Among the Flight Systems & Software Engineering team's many tasks: designing code and maintaining flight software for the space shuttle's "glass cockpit" crew display. **NASA**



BE YOUR OWN BIGGEST FAN.

Feeling good about others starts with feeling good about yourself.

Boeing proudly supports those who foster self-esteem in people everywhere so that they can realize the potential that lies within.

 **BOEING**

Global corporate citizenship refers to the work Boeing does—both as a company and through its employees—to improve the world. This ad reflects Boeing's commitment to initiatives that promote self-esteem and inspire people to achieve their highest potential.



A FLEET-SIZE COMMITMENT TO A COMMON SYSTEM.

Consolidated Afloat Networks and Enterprise Services (CANES) will ensure a common network computing environment for the entire U.S. Navy fleet, providing greater security and a more collaborative, effective warfighting capability. At Boeing, we understand both the vision and challenges of CANES. We stand ready to bring together our unique expertise with the best of industry to provide the best value solution.

 **BOEING**

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