

# Frontiers

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



## GREAT JOB!

Mike Duffy, an aerodynamics engineer in Philadelphia, says he has the best job at Boeing. Look inside to read more about him—and others who say they have Boeing's best job.

### TECH'S 'CHALLENGE'

Warming to an important program, amid Alaska's chill.  
Center pullout, after Page 34

---

### HOW YOU CAN HELP

Jim McNerney: 5 things you can do to make Boeing better. Page 6

## BOEING AND THE WHEREWITHAL OF WIMBORNE.

It takes an excellent company to do one thing well. It takes an extraordinary company to do many things well. Which is precisely why Boeing values its partnership with Cobham. A partnership that produces state-of-the-art results on projects ranging from Unmanned Air Vehicles to Future Combat Systems. One of the many things Cobham does well, is being a good partner.



*This is the seventh in a series of new ads created to build awareness of Boeing and its many valuable partnerships in the United Kingdom. Boeing, the largest overseas customer of the UK aerospace industry, currently partners with more than 300 businesses and universities around the country. The advertising campaign has appeared in The Sunday Times, The Economist, New Statesman and other UK publications, and complements current Boeing business and communications activities in that nation.*



**ON THE COVER:** Aerodynamics engineer Michael Duffy is based in Philadelphia.

Photo by Fred Troilo

# Frontiers



GAIL HANUSA PHOTO

**COVER  
STORY**

## **GREAT WORK** 14

Tony Baxter (above) says he has the best job at Boeing. In this photo essay, *Boeing Frontiers* takes a look at some of the people from across the enterprise who also say they have the best job in the company.

**THE NEXT  
'CHALLENGE'**

*Boeing Frontiers* includes a new pullout edition of *Challenge*, a Boeing Engineering, Operations & Technology magazine. Among the many stories in this issue: An explanation of what Boeing is doing to provide a more disciplined approach to its development program activities.

**CENTER  
INSERT**



**41**

The objective of the Composite-Virtual Resource Center: provide composite technology experience to engineers. Examining a tension-test sample for composite repair are (from left) Randy Taylor, Karsten Overa, Max Duarte and Mike McCutchen. A 787 Dreamliner composite barrel section is in the background.

## COMMERCIAL AIRPLANES

### Haul of fame

**38** Nippon Cargo Airlines is a launch customer for the new Boeing 747-8 Freighter. The Japanese cargo carrier's business plan reflects Boeing's evolving relationship with its airline customers—and demonstrates how Boeing works to help its customers succeed.

### Ending the paper chase

**36** Online Work Instructions is a new Boeing-designed paperless system that's making life easier for Commercial Airplanes mechanics and inspectors. It's also saving Boeing and its customers time and money.

### Preparing for the future

**41** Production Engineering, the 787 Program and other development projects teamed this year to address an emergent shortage of engineers skilled in composite materials. The result: the Composite-Virtual Resource Center.

## COMPANYWIDE

### How to top 2006

**6** Boeing had a big year in 2006. In this month's Leadership Message, Jim McNerney, Boeing chairman, president and CEO, thanks employees for their efforts in making 2006 successful—and challenges them to come up with ways to make 2007 an even better year.

### To help support families

**60** Boeing is contributing its process-management expertise to help the Children's Administration for the Washington State Department of Social and Health Services improve its operations. This marks another instance of how Boeing is helping improve the communities where its people work and live.

## INSIDE

**6** Leadership Message  
**8** Letters

**9** Notebook  
**10** Historical Perspective

**12** New and Notable  
**62** Milestones

**65** Around Boeing  
**66** Spotlight

46

U.S. Air Force 1st Lt. Matt Woodfield (left) “flies” an F-15C trainer with instruction from Steven Peterson, lead technician at the F-15C Mission Training Center at Langley Air Force Base, Va.



BOB FERGUSON PHOTO

## INTEGRATED DEFENSE SYSTEMS

### Building the future today

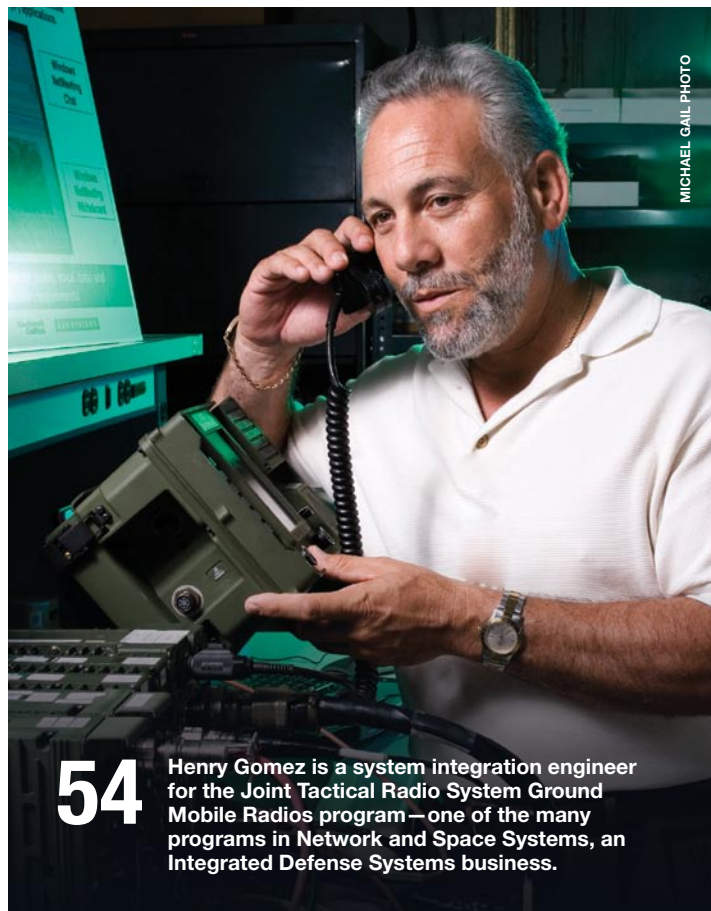
**54** The Network and Space Systems business of Integrated Defense Systems is the home of “game changing” programs such as Future Combat Systems, the Ground-based Midcourse Defense program and space-exploration efforts. Here’s a profile of this business.

### Keep ‘em flying

**48** Recent anniversary milestones in the KC-135 and KC-10 tanker programs reflect Boeing’s unrivaled position in the tanker market—and the important role people of the IDS Support Systems business unit play in keeping tankers flying.

### Training together

**46** Boeing is applying its experience with networked training to programs for U.S. coalition teammates. The start of recent training trials on a U.K. program represents the latest achievement in this market for Boeing, the leader in this business.



MICHAEL GALL PHOTO

54

Henry Gomez is a system integration engineer for the Joint Tactical Radio System Ground Mobile Radios program—one of the many programs in Network and Space Systems, an Integrated Defense Systems business.



**Jim McNerney**  
Chairman, President and Chief Executive Officer  
The Boeing Company

“Great job—and thanks!  
I am very proud  
of our entire team!”

## 2006: Great start on our journey; long way yet to go

To the people of Boeing:

2006 has been an exceptionally strong top-line year for Boeing. Both Commercial Airplanes and Integrated Defense Systems—with solid support from Boeing Capital—won substantial new business with compelling product and service solutions for our customers. At the same time, we strengthened our focus on improving Boeing’s productivity and delivering on our promises related to existing business.

Great job—and thanks! I am very proud of our entire team!

As we close out a first-rate year, it’s time to begin thinking through how we sustain our momentum on this journey. Our customers depend on us, and the competition requires and the marketplace demands that we become better at what we do—year after year.

We will sustain our momentum by doing five big things:

- 1. Listen even harder to our customers.** There is no business without customers, and our profitable growth depends on how well we anticipate and satisfy their needs.

While I could cite a number of examples, here are two specific proof points:

By listening very carefully to our U.S. Air Force customer about what it really wanted in terms of capability, risk and schedule, Boeing won the \$10 billion CSAR-X Combat Search and Rescue helicopter program. The Boeing HH-47 solution features proven technology and is a low-risk solution for the customer.

The 787 Dreamliner continues as a prime example of a commercial product designed around customer needs—a comfortable and efficient way to transport passengers directly from where they are to where they want to go. Because Boeing listened, and because the 787 helps our airline customers achieve their goals, it has become our most successful new commercial airplane program ever.

These programs and others remind us again that when we listen to and satisfy our customers, market success follows. We know how to do it right; we must ensure we do it consistently.

- 2. Execute and deliver as promised.** Boeing has built a sizable backlog of orders; now we must meet our commitments. Our customers—whether they are commercial

ANDY GOODWIN PHOTO

airlines or governments—face enormous business and budget pressures. They rely on us, but they have choices. Most of our programs performed well in 2006, but in a small number of cases we let our customers down. We can't do that again. The only sure way to lose both existing backlog and new opportunities is to execute poorly.

We also have positioned ourselves uniquely with our broad-based systems-integration strength across commercial, military and space markets. We have the potential to offer solutions that virtually no other company can match. That's particularly true on derivative programs—defense systems based on commercial platforms, such as the pending U.S. tanker program, the P-8A, Airborne Early Warning and Control, Airborne Laser and more.

Turning our potential into realized business growth requires that we strengthen interfaces between businesses and build a sense of shared destiny. That's extra work, I know; and everybody's already busy. But working together across businesses—and using our functions to tie us together through consistent processes—provides unequalled competitive advantage.

**3. Become better leaders. We are all leaders at some level. Effective, inclusive and empowering leadership should be our shared goal. The tools available at Boeing to help us learn how to do that are unmatched, and my expectations are high!**

In 2006, we defined the attributes we want in Boeing leaders: *chart the course, set high expectations, inspire others, find a way, live the Boeing values and deliver results.* And we have been shaping our performance, pay and promotion systems—as well as our leadership and learning programs—around them. In 2007, our Leadership Center will roll out a retooled set of leadership courses that focus on developing leaders at all levels; these courses will draw on Boeing leaders to model and teach leadership.

As we improve individual leadership capabilities, we'll improve Boeing's business performance. Because better leaders make better companies. Or, said another way: As our leaders grow, our company will grow, too.

**4. Improve productivity in everything we do. We have four enterprisewide productivity initiatives (Lean+, Internal Services Productivity, Global Sourcing and Development Process Excellence) designed to serve as opportunity-creation tools. They exist to help us meet our business plans through sustaining, accelerating and replicating best practices across and throughout the company. Year over year, productivity improvement is a competitive imperative that supports our customers and enables the company to invest in the future of our programs and businesses.**

We are beginning to see results:

- Continuing productivity gains in factories
- Thousands of employees learning new concepts through Lean training

- Application of Lean principles and practices in offices and support organizations, with suppliers, and with customers
- Implementation of best practices based on benchmarking from inside and outside Boeing

So far, approximately 800 productivity-improvement projects have been entered into our Initiatives Database (meaning they are either completed, in work or planned). We expect these will result in hundreds of millions of dollars of savings that will help us meet our business plans and invest in our future. And I believe it's just the beginning of what we can accomplish.

The initiatives are designed to leverage our collective potential—and help Boeing become greater than the sum of its parts. The true power of this company will come into play when we adopt more standard processes and systems as well as a consistently collaborative attitude for drawing on each other's best practices.

There are several great examples of how one of our business units has adopted a best practice from another, helped move Boeing toward a standardized process, clarified expectations and created shared accountability for quality between Boeing and its suppliers. Here is one:

Until recently, IDS had absorbed the financial impact of nonconforming items received from suppliers. Now it uses a faster, more efficient process pioneered at BCA: If suppliers' products don't conform to specification, IDS debits their accounts through the new, standard process. Everybody wins. Suppliers understand what's expected of them and have real incentive to deliver first-time quality; they also have the opportunity to reduce costs and raise their performance. Boeing saves costs and drives productivity improvements through the enterprise. And customers have greater confidence in our products and relationships.

**5. Stay focused on doing the right thing. While it is critically important that we perform well as a business, it is even more important that we do it in the right way. We face extraordinarily high expectations. Lives depend on our products and services. The pressure of business can lead people—ethical people—to cut corners that they don't even know they're cutting. We must continue to open up our culture and talk with each other regularly about what's right, what's wrong, what's required, and how individual decisions can affect the reputation of the entire company. It takes years to build a reputation for integrity, and a single moment to destroy it. And it's up to every one of us to see that doesn't happen.**

There you have it: a path for sustaining momentum on our journey together. It's up to each of us to find new ideas that our customers value, reach higher, lead more effectively, execute better each and every year, and do the right thing—always! It's what we should expect from ourselves and from each other, year after year.

I'm excited to be on this journey with you—at a company that matters so much to so many around the world! ■

# Frontiers

**Publisher:** Tom Downey

**Editorial director:** Jo Anne Davis

## EDITORIAL TEAM

**Editor:**

Paul Proctor: (312) 544-2938

**Managing editor:**

Junu Kim: (312) 544-2939

**Designer:**

Heather Dubinskas: (312) 544-2118

Cal Romaneschi: (312) 544-2930

**Commercial Airplanes editor:**

Dick Schleh: (206) 766-2124

**Integrated Defense Systems editor:**

Diane Stratman: (562) 797-1443

**Engineering, Operations and Technology editor:**

William Cole: (314) 232-2186

**Shared Services editor:**

Mick Boroughs: (206) 919-7584

**Copy editor:**

Walter Polt: (312) 544-2954

## CONTRIBUTING EDITORS

**Boeing Capital Corp.:**

Donna Mikov: (425) 965-4057

## ONLINE PRODUCTION

**Production manager:**

Alma Dayawon: (312) 544-2936

**Web designer:**

Michael Craddock: (312) 544-2931

**Graphic artists:**

Heather Dubinskas: (312) 544-2118

Cal Romaneschi: (312) 544-2930

**Web developers:**

Lynn Hesby: (312) 544-2934

Keith Ward: (312) 544-2935

**Information technology consultant:**

Tina Skelley: (312) 544-2323

## How to contact us:

**E-mail:**

BoeingFrontiers@boeing.com

**Mailing address:**

Boeing Frontiers  
MC: 5003-0983  
100 N. Riverside Plaza  
Chicago, IL 60606

**Phone:**

(312) 544-2954

**Fax:**

(312) 544-2078

**Web address:**

www.boeing.com/frontiers

Send all retiree address changes to Boeing Frontiers, MC 3T-12, P.O. Box 3707, Seattle, WA 98124-2207

**Postmaster:** Send address corrections to Boeing Frontiers, MC 3T-12, P.O. Box 3707, Seattle, WA 98124-2207 (Present addressees, include label)

## Nice work, everyone

Your October 2006 issue is the most inspiring one you have done! The content, format and themes are super. It makes me proud to have been on the Boeing team for over 30 years and to know the company is still paving the way to the future.

—Jim Graham  
Seattle

## Remember the Guppy

The November 2006 issue includes the following words in the table of contents for the story “Big Plans”: “At first glance, there’s no doubt that the 747 Large Cargo Freighter ... looks like a unique airplane. But there’s more to this aircraft than its one-of-a-kind shape.” Although the 747 LCF’s shape is unusual, there was at least one other airplane with a similar shape: the Canadair CL-44 Guppy, originally manufactured and later modified in the 1960s. Similar to the 747 LCF, this airplane had an enlarged fuselage that started aft of the flight deck, a swing tail, and prominent fairings for the tail’s hinges. The



airplane differed visually from the 747 LCF primarily in having turbo-prop engines and in being smaller in size.

—Joe Schell  
Everett, Wash.

## “Your October 2006 issue is the most inspiring one you have done!”

—Jim Graham, Seattle

## Mini cars, big space?

Your November 2006 article on the 747 Large Cargo Freighter states that the volume of the main cargo deck (65,000 cubic feet, or 1,840 cubic meters) is big enough to carry 80 Mini Cooper cars. I checked the specs of the Mini Cooper. The auto’s dimensions are 3.4 meters long by 1.4 meters wide by 1.35 meters high. That’s 6.426 cubic meters per car, or 227 cubic feet. If the LCF’s main cargo capacity is 65,000 cubic feet, then 65,000 divided by 227 equals 286

mini cars that can be carried by one 747 LCF. Filling it with just 80 Minis would be a waste of precious cargo space.

—Mir Ibrahim Ali  
Auburn, Wash.

## Answers to frequently asked questions

Here are answers to some of the most frequently asked questions we at Boeing Frontiers receive. For answers to other frequently asked questions, please see this page on our Web site: [http://www.boeing.com/news/frontiers/st\\_faq.html](http://www.boeing.com/news/frontiers/st_faq.html)

**Q: What is Boeing Frontiers?**

**A:** Boeing Frontiers is a monthly magazine committed to telling its core audience—Boeing employees—Boeing’s global story and relaying news and information about the company’s strategic transformation. The magazine aims to provide context and analysis to Boeing

developments; in other words, it looks to explain the “why” and the “how” of what Boeing does. Through this strategy, the magazine complements Boeing News Now, the company news page on the Boeing Intranet (<http://boeingnews.web.boeing.com>), which focuses on daily and breaking news.

**Q: When does Boeing Frontiers appear?**

**A:** In general, the magazine is scheduled to appear at Boeing worksites on the first Friday of each month. The exceptions are in December, when it’s scheduled to appear on the second Friday, and in January, when the magazine is not published. The online version of the issue—avail-

able on the World Wide Web at <http://www.boeing.com/frontiers>—is posted by the Monday after the print version’s scheduled release date.

**Q: Can I share Boeing Frontiers with people outside of Boeing, such as my friends and family?**

**A:** Yes. The magazine meets all relevant company procedures governing the release of information outside Boeing.

**Q: Are retirees included in the In Memoriam listings?**

**A:** Unfortunately, no. In Memoriam features the names of people who were full-time Boeing employees—or such employees on medical leave—at the time of their passing.

## Letters 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

**THE LEADING EDGE** Boeing Phantom Works engineers Matt Stout (left) and Norm Princen inspect the leading edge of the X-48B Blended Wing Body concept in California. Boeing has built two 21-foot/6.4-meter-wingspan X-48B prototypes to further explore and validate the structural, aerodynamic and operational advantages of the BWB concept as a potential future military aircraft. Ground testing is under way, in preparation for flight testing in early 2007.

BOB FERGUSON PHOTO

## QUOTABLE

**T**he 747-8F has a lighter empty operating weight [than the A380] and, because it came to market later, it also has the benefit of new engine technology.”

—Richard Pinkham, a Singapore-based consultant for the Centre for Asia Pacific Aviation, in a Nov. 21 Bloomberg News report. Korean Air in November said it’s purchasing five 747-8 Freighters, along with 10 777-300ERs, and five Next-Generation 737s

**B**est value had to do with mission capability as it is related to cost, and as it is related to schedule.”

—Susan Payton, U.S. Air Force assistant secretary for Acquisition, about the Air Force decision to select the Boeing HH-47 helicopter for its Combat Search and Rescue program competition, at a Nov. 9 press conference

**M**ore than ever before, companies are seeing the link between good health and productivity.”

—Beth Bierbower, vice president of product innovation for insurance provider Humana, discussing the value of company-provided wellness programs, in the Nov. 6 issue of *Time*. For more on Boeing’s wellness resources, see Page 28 of the October 2006 *Boeing Frontiers*.

## IAM PROMOTIONS

No promotions listed for periods ending Oct. 27 and Nov. 3, 10, 17 and 24.

## ETHICS QUESTIONS?

You can reach the Office of Ethics & Business Conduct at 1-888-970-7171; Mail Code: 14-14; Fax: 1-888-970-5330; TDD/TTY: 1-800-617-3384; e-mail: [ethicsLine.ethics@boeing.com](mailto:ethicsLine.ethics@boeing.com); Web site: <http://ethics.whq.boeing.com>

# Dual role, more capabilities

F-15E, with many new technologies, first took to the air 20 years ago

By LARRY MERRITT

Just after 11 a.m. on Dec. 11, 1986—20 years ago this month—an F-15 Eagle, designed for double duty as a fighter and a bomber, roared down the runway at Lambert–St. Louis International Airport and took to the air for the first time.

Gary Jennings, F-15 project test pilot for McDonnell Douglas (now part of Boeing) flew that 75-minute flight. “It was a great flight,” Jennings said after landing. “It flew very well, very much like the best performance yardsticks we have: the other F-15s we deliver.”

Although the new Eagle did look a lot like the other approximately 850 F-15s delivered up to that time, it was truly a new aircraft.

Besides its new charcoal-grey paint scheme, the plane had a back seat for a

second crew member to operate a ground-attack weapons delivery system. Its cockpit incorporated the latest in advanced avionics, controls and displays. More powerful engines increased its performance. An internal redesign with a stronger structure allowed heavier takeoff weights and doubled the original F-15’s service life.

The plane also had a new designation and name: the F-15E Strike Eagle.

The original F-15 had been designed as a multirole aircraft, continuing a McDonnell Douglas tradition that included the F2H Banshee, F-101 Voodoo and the F-4 Phantom. But because of the F-15’s unsurpassed air-to-air record, the Eagle’s air-to-ground capabilities did not receive as much notice.

That changed when U.S. Air Force officials began looking for a replacement for its fleet of F-111 strike aircraft. They wanted an aircraft that could do everything the F-111 could do—carry heavy, precision-guided payloads long distances at night and in bad weather—but, unlike the F-111, an aircraft that could carry out bombing missions with no fighter escort. This led to the formation of the Dual Role Fighter program.

In the meantime, using company funds,

McDonnell Douglas had been working on such an aircraft, converting an early two-seat F-15B trainer as a strike-fighter flight demonstrator.

After a six-month flight evaluation and competition between two of the United States’ frontline fighter aircraft, the F-15 and the F-16, the Air Force selected the F-15 as the aircraft best suited to fill its new dual-role fighter mission.

Engineers in St. Louis developed innovative technologies that allowed the F-15E to take on air-to-ground missions while maintaining its superior air-to-air capabilities.

One of these was “tangential weapons carriage” for the F-15’s conformal fuel tanks. To add range to the F-15C air-superiority fighter, engineers had designed long, slim tanks that hugged each side of the Eagle’s lower fuselage. For the F-15E, engineers used computer-aided design and drafting techniques to add two rows of 6-inch (15-centimeter) stub pylons to the tanks for attaching weapons. These replaced the larger, heavier bomb racks that had attached to the aircraft’s underside. The new design held the bombs closer to the fuselage, reducing drag and giving added lift.

More innovation involved a large air-combat simulator built in St. Louis to develop such new F-15E technologies as improved radar, a low-altitude terrain-following system, forward-looking infrared sensors and enhanced navigation systems. The simulator was the first to integrate both air-to-air and air-to-ground combat missions simultaneously. Pilots and backseat weapons-system operators flew hundreds of bombing runs in an actual F-15E cockpit inside the simulator, using real data fed



BOEING ARCHIVES PHOTO

This January 1987 photo shows F-15 project pilot Gary Jennings and senior systems operator John York performing a test flight over Missouri. The mission was the F-15E’s second flight and its first with two crew members.



**At the first F-15E's rollout ceremony, which took place one week after its Dec. 11, 1986, first flight, hundreds of employees and guests converged on the aircraft for a closer look.**

to the aircraft's new central computer. Long before the real F-15E made its first flight, the simulator F-15E had successfully handled surface-to-air threats, engaged in air-to-air combat and negotiated complex paths to ground targets.

The simulator proved to the Air Force

what the F-15E could do. "That's the beauty of simulation," project pilot Jennings said. "It was tangible; you could touch it and you could fly it before the same equipment was flown in the real airplane."

The F-15E made its public debut a week after its first flight. Then—Secretary of the U.S. Air Force Edward Aldridge, the principal speaker, called the Strike Eagle unveiling a "landmark event in the modernization of our tactical air forces." Aldridge added that the new aircraft followed a "trail blazed by the original F-15 Eagle as one of the safest, most capable aircraft in our inventory ... the latest chapter in a real success story."

Since then, 236 F-15E Strike Eagles have been delivered to the U.S. Air Force, and 72 F-15S derivatives have been delivered to Saudi Arabia. Also, Israel has received 25 F-15I Thunder strike fighters. In 2005, deliveries of 40 more-advanced versions, the F-15K, began to the Republic of Korea Air Force. And in 2009 Singapore will receive its first F-15SG.

With the Strike Eagle's broad capability and ability to integrate future advanced technologies, it promises to maintain its place in the sky as the world's premier multirole fighter for decades to come. ■

*lawrence.e.merritt@boeing.com*

# Serving up Raptor wings, Seattle style

Welcome to the place where a massive oven ‘cooks’ F-22 wing skins

By DOUG CANTWELL

Joe Habersetzer and his team at Seattle’s Composite Fabrication and Assembly Center use a mighty big oven to “cook” the fiber-composite wing skins for the world’s most advanced air-dominance fighter, the U.S. Air Force F-22 Raptor.

It’s actually one of two 25-by-90-foot (7.6-by-27.4-meter) cylindrical autoclaves, among the largest in the world, which were originally built to cure the massive composite wings of the Air Force’s B-2 stealth bomber.

The F-22 Assembly Center will celebrate a major milestone in mid-December when it delivers the 100th set of Raptor wings. As a first-tier partner in the F-22 program, Boeing builds the wings and aft

fuselage, integrates the avionics and leads the pilot/maintenance training effort.

Before the Raptor wing skins find their way to the autoclave, CFAC specialists perform an unlikely combination of robotic magic and highly skilled hand layout to sculpt them into existence. With help from a programmable contour-tape-layup machine, they laminate as many as 400-plus layers of graphite fabric in fairly small pieces, some of them only a few inches square.

This approach allows teammates to arrange the fabric for maximum flexibility over contoured areas and to increase thickness at designated stress points such as drill holes. The entire wing-surface layup is programmed into the contour-tape-layup machine in paint-by-number fashion to achieve the appropriate thicknesses.

Before it’s sent to the autoclave, each wing skin is covered with a special plastic material and sealed around the edges. A vacuum unit is attached that evacuates every tiny bubble of air from between the layers of graphite material.

“Porosity is our nemesis,” Habersetzer

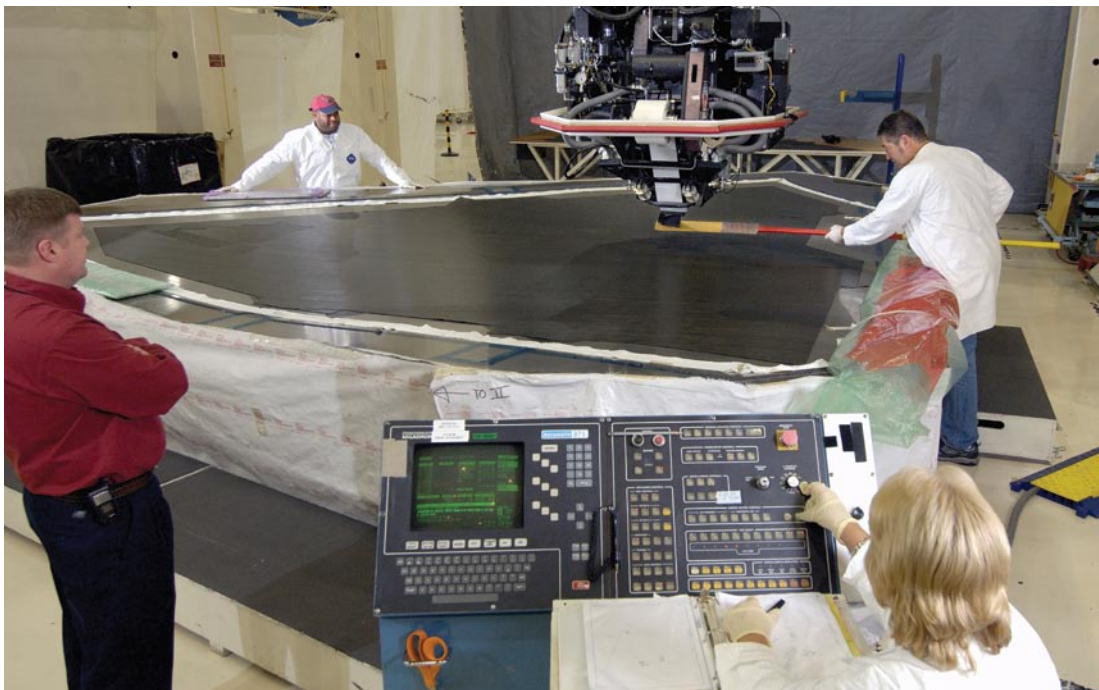
said. “Air trapped between the plies of graphite would seriously degrade the skin’s strength, and we’d have to surplus some very expensive layups if we ever got lazy about the evacuation process. So we don’t.”

Once evacuation is complete, each skin is cured in the autoclave for a total of 18 hours at 350 degrees Fahrenheit (177 C). That’s followed by a post-cure at 440 F (227 C).

To ensure that no air bubbles have survived, the skin goes to nondestructive test for an ultrasound checkup. Still riding on its contoured stainless-steel fixture, the skin then moves to a massive five-axis router that trims it with laser precision to final dimensions. The router bit is blasted continuously with a liquid coolant during this operation to prevent any buildup that might change its radius—even minutely.

Since delivering Raptor No. 1’s wings in 1996, the F-22 team has continually improved its quality, cost and delivery performance, and CFAC technicians keep pace as they lay up, evacuate, cure, test and trim these state-of-the-art composite wing skins. ■

*doug.cantwell@boeing.com*



At the Developmental Center in Seattle, operator Arnaldo Rivera (background, right) works with a robotic contour-tape-layup machine to sculpt an F-22 Raptor wing skin into existence. Once operator Pam Parker (foreground) has programmed the CTLM, the machine applies small segments of graphite-composite fabric, laminating them to varying thicknesses for greater flexibility over contoured areas or added strength at stress points. Quality Assurance inspector Anthony Jackson (background, left) and manager Joe Habersetzer keep an eye on the proceedings.

MARIAN LOCKHART PHOTO

# Damaged C-17 returned like new

## Boeing team spends more than 1 year on job

A C-17 that ran off the runway at Bagram Air Base, Afghanistan, in August 2005 was delivered back to the U.S. Air Force in November after more than a year of extensive repairs.

It took more than 88,500 hours of work, 5,000 parts and a lot of ingenuity to get the heavily damaged Globemaster III back into service 15 months after the mishap. A recovery team working around the clock for two months got the plane airworthy enough to fly back to the C-17 plant in Long Beach, Calif. There, the Repair and Modification Services (RAMS) team worked for more than a year on the largest repair job ever on a C-17. (For more on the repair effort, see Page 28 of the February 2006 *Boeing Frontiers*.)

A landing-gear pod and the bottom barrel of the airplane from just behind the nose to the main landing gear had to be replaced. Both instances were firsts in sustaining the Air Force fleet of C-17s. During the last two months of the project, crews were on the

job seven days a week, 12 hours a day. The aircraft had to pass all the same flight tests as a new C-17 rolling out of the production area.

“The dedication of all the people working to repair this airplane was phenomenal,” said Mike Ray, senior manager, Recovery and Repair Modification Services. “The Air Force made a conscious decision to bring the aircraft to the Depot Center because of the reputation of the men and women working on the RAMS team in this facility. The Air Force knew we could get the job done right the first time and on schedule.” ■

—Brad Mudd



JUANITO HOLANDEZ JR., PHOTO

Boeing test pilot Norm Howell boards a C-17 for flight testing in early November. The aircraft had been severely damaged in Afghanistan in 2005. Howell helped fly the crippled jet back to the Boeing facility in Long Beach, Calif., after the incident.

## 787 team prepares for test

As the 787 Dreamliner begins to take shape around the world, employees in Everett, Wash., are preparing for 787 static testing. The south bay of the 40-23 building at Everett is being converted into a test facility for the 787 full-scale static test. The purpose of the test is to validate the static strength of the 787 airframe by applying external loads using 160 computer-controlled hydraulic actuators. Results from the test will be compared with analytical predictions to validate the design.

The static test article, a structurally complete 787 airframe, will be the second 787-8 off the production line. Nonstructural items such as electronic equipment, interior furnishings and selected systems components will be omitted. The test features a series of conditions where external loads are applied to the test article in varying magnitudes. These loads will strain the airframe to not only the maximum load the airframe may experience in a service environment, but also to design maximum loads multiplied by a factor of safety. Except for certain special cases, the factor of safety is 1.5 and is intended to cover variations and unknowns associated with material properties, loads, stresses and stiffness.

The 787 full-scale static test is scheduled to start in July 2007.

JENNIFER REITZ PHOTO

Construction is under way on the superstructure that will be used to static test the Boeing 787 Dreamliner. The steel structure is 208 feet (63.4 meters) wide, which allows a free span greater than the wingspan of the 787 airframe.





**Elsa Baker**  
San Antonio

Boeing performs KC-135 Programmed Depot Maintenance work in San Antonio. There you'll find Elsa Baker, a quality-assurance specialist with Integrated Defense Systems' Support Systems business, among the Boeing employees conducting major overhaul work on U.S. Air Force KC-135 tankers. "The great working relationship I have in my department makes me feel like part of the team from the time I report for work until the end of the day," Baker said. "The maintenance managers, [Quality Assurance] inspectors and I work to make sure the Air Force gets a quality product."

# You're doing Great work!

Who's got the best job at Boeing? Meet some employees who proudly make that claim

If there's one phrase we on the *Boeing Frontiers* staff have heard repeatedly from people across the enterprise, it's "I've got the best job at Boeing."

In this photo essay, *Boeing Frontiers* shows our readers a selection of employees who feel they have the best job at Boeing. They come from all around the company—not only in terms of business-unit and functional-organization representation, but also with respect to geography and job duties.

The array of individuals depicted here reflects the fact that Boeing's success is driven by employees who apply their unique talents each day to support the company and its objectives. These people may come from different backgrounds and be versed in different skills. Yet they share a common denominator: They take pride in working together to meet their customers' needs and to improve their teams' processes.



**Doris Brazzle**  
Huntington Beach, Calif.

For office administrator Doris Brazzle, having the best job at Boeing isn't only about the trust and respect she's received from her management throughout her Boeing career. She currently has a leadership role with the local branch of the Administrative Support Process Improvement Network team. What's more, she's a focal for administrative best practices. And she supported Huntington Beach's California Award for Performance Excellence assessment by providing CAPE auditors information on how the A-SPIN team was deploying administrative best practices and processes. "I am very proud to lead a team that contributes to streamlining processes and takes an active role in knowledge-sharing activities," she said.





MIKE GOETTINGS PHOTO

## Vincent Farrell

Mesa, Ariz.

Flight-line technician Vincent Farrell believes he has the best job at Boeing. “I get to work on the world’s greatest attack helicopter, the AH-64D Apache Longbow,” said Farrell, who provides finishing touches and works with the customer before the aircraft is delivered. “I may not be in the [U.S.] Army any longer, but I still get to feel involved in what I did while I served.”



GAIL HANUSA PHOTO

## Kelly Buchanan

Everett, Wash.

Kelly Buchanan said being a Production Support Engineering manager on the 777 line in Everett is the best job at Boeing because “I’m on a team with empowered and motivated people who have the unique opportunity to work directly with the manufacturing teams on the 777.” As the 777 implements a moving line, Buchanan said, she recognizes the magnitude of the change that’s occurring—as well as the accompanying challenges. “We talk in our team meeting about reducing waste and working hard to pass on no defects. Everyone knows we need to climb the mountain together or we all fall,” she said.



JIM ANDERSON PHOTO

## Mat Chaudhry

Bellevue, Wash.

As an Enterprise Help Desk instructor with Shared Services Group, Mat Chaudhry combines his passion for education, research and the human learning process with developing Lean-driven solutions for Boeing’s training and learning programs. He values the relationships established through the classroom experience. “I enjoy working with technology, but it’s the human side I enjoy most,” he said. Chaudhry said his work also provides him with the skills and leadership abilities to become a better corporate citizen.



DAVID MARTIN PHOTO

**James Morales**  
St. Louis

At the F/A-18E/F Super Hornet final assembly facility in St. Louis you'll find James Morales. His many duties range from applying form-in-place sealer on watertight doors to being a team leader of a High Performance Work Organization. "I have had the privilege to work with many talented, dedicated and knowledgeable people, both on the shop floor and with support teams," Morales said. During his tenure in St. Louis he's handled many different tasks. "When the hangar doors open and a new F/A-18 Super Hornet rolls out of our department, I am reminded that I work for the best, with the best—and on the best. For me, it doesn't get any better than that."



JIM COLEY PHOTO

**Jim Brennan**  
Renton, Wash.

As a member of the capital planning team in Shared Services Group's Finance organization, Jim Brennan sees nearly all aspects of the company—from future technology requirements to manufacturing tools and equipment on the shop floor to financial planning and accounting requirements at the corporate level. He said he feels privileged to be working with people from all levels and functions. "I am truly fortunate to work with some of the brightest people in the world," Brennan said.



GINA VANATTER PHOTO

**Sue Johnson**  
Long Beach, Calif.

When Susan Johnson was very young, her grandfather gave her a hand-made present: a set of brightly colored wood blocks shaped like books and with the names of classic novels painted on them. That started her passion for wanting to become a librarian—which she is now for Boeing at the C-17 Technical Order Library in Long Beach. "The C-17 Technical Library has provided me with my dream job, working in my very own library," she said. As the librarian, Johnson collects and maintains more than 1,000 bound technical orders pertaining to the C-17 aircraft. "Thank you, Boeing, for all the happy hours doing the work I love to do so much."



TONY ROMERO PHOTO

## Yolanda Anderson

Seal Beach, Calif.

Yolanda Anderson, an Ethics advisor, said using her talents and skills to assist employees with issues and concerns makes her job the best. "I greatly treasure interacting with people and providing a sensitivity of awareness for interests of people from all cultures," said Anderson, who works on the Ethics Line. Anderson enjoys instructing and helping managers, employees and customers, as well as encouraging questions to ensure understanding. "I also have the advantage of working with an exceptional staff," she added.

## Rita Moore

Renton, Wash.

As a graphic designer in the Marketing organization of Commercial Airplanes, Rita Moore is given many opportunities to use her talents. She's painted the 777-200LR on a glazed porcelain piece given to the president of Pakistan International Airlines, the airplane's launch customer. She created 13 original oil paintings for BCA's 2007 calendar. And she sculpted the head and hands of Bill Boeing from clay, then led the creation of a 7-foot-tall sculpture of Mr. Boeing made from scrap, surplus and salvage airplane parts. The sculpture is now at the 737 factory in Renton, Wash., and includes a very personal touch: the wristwatch of Moore's late husband, an aviation buff. "When your job centers around your passion in life—which for me is art—well then, as my husband used to say: 'You don't have a job, you have a position,'" Moore said.

BOEING FRONTIERS December 2006/January 2007



FRED TROILLO PHOTO

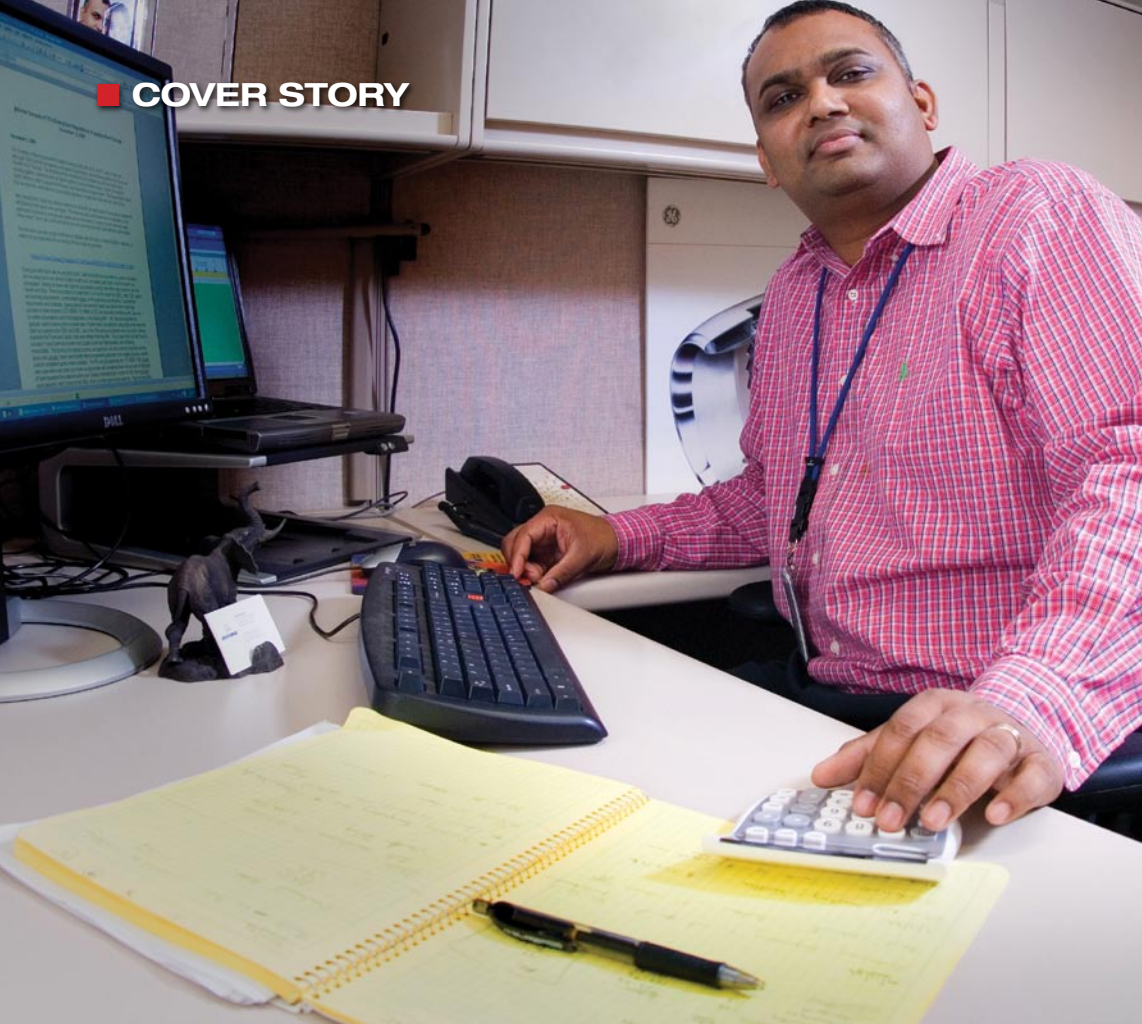
## Mike Duffy

Philadelphia

"Rotorcraft is the future of aviation," said Mike Duffy, an aerodynamics engineer with Rotorcraft Systems in Integrated Defense Systems, "and I'm on the cutting edge." Duffy supports design, provides aircraft performance data and assists on new business concepts for the Bell Boeing V-22 Osprey tiltrotor aircraft. "This aircraft is going to be a major player in the war on terror," he said.

JIM ANDERSON PHOTO





**Raj Naicker**  
Everett, Wash.

For Raj Naicker, having the best job at Boeing means doing what's best for Boeing. As a procurement cost analyst for BCA Global Partners, he performs cost analysis and helps negotiate with suppliers to keep Boeing's costs as low as possible. He also works with suppliers to lean their processes so they can provide products in an economical and timely manner. "I have the best job because I get a chance to make a difference to the bottom line," Naicker said.

*Bottom left*

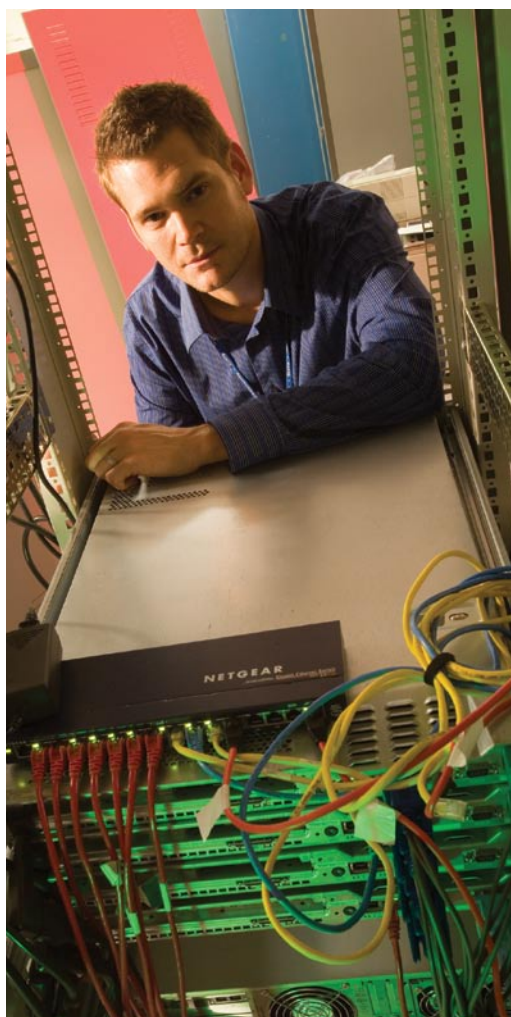
**Deborah McCulley**  
Auburn, Wash.

It's funny how things turn out sometimes. After being recalled in 2004 from a layoff, Deborah McCulley was placed in Auburn—a location with unfamiliar people and surroundings. "To my surprise, it was the best thing that could have happened to me," said McCulley, an inspector at the Boeing Fabrication facility in Auburn. "I've been fortunate to meet and work with great people who make my job an enjoyable one. There's never a dull moment around here, and I wouldn't trade my experience for anything."

GAILL HANUSA PHOTO



MARIAN LOCKHART PHOTO



DAVID MARTIN PHOTO

*Bottom right*

**Bill Czarnik**  
St. Louis

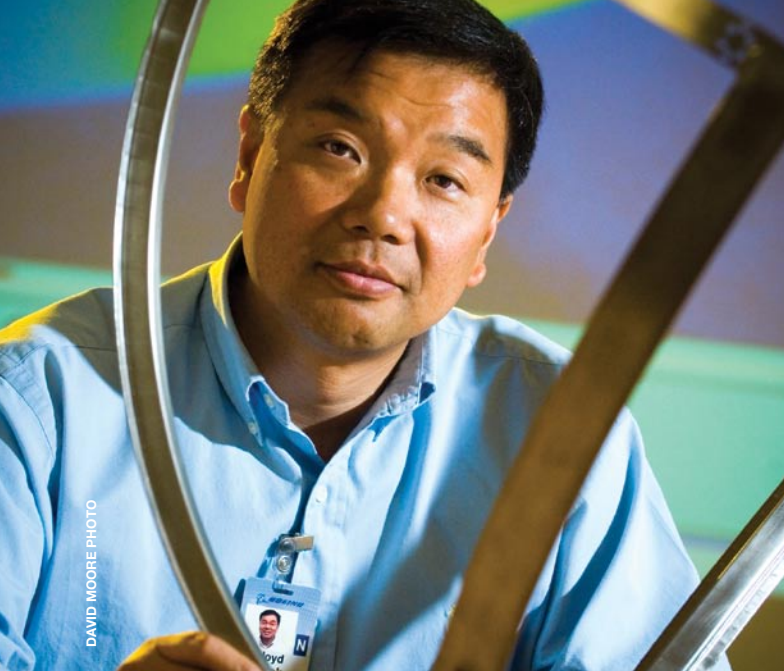
As a member of the F-15 Information Technology team, Bill Czarnik has his dream job. "Boeing provides history-defining products and services to the world," he said. "We are creating the future." Yet it's not just the F-15 that inspires him, it's the people he meets. Czarnik recently worked in Saudi Arabia and said the people there taught him many things about their culture. He became good friends with one Saudi, in particular. "We share many passions, the most important one being family," Czarnik said. "We both hope someday we can introduce our families to each other. And we both hope for peace."



## Tony Baxter

Everett, Wash.

Tony Baxter has spent most of his 19 years at Boeing in what's now known as the Wing Responsibility Center. He works with the massive GEMCOR wing riveters that have been the backbone of Boeing wing production for more than 30 years. He's helped provide mechanical support for these riveting systems on the 737, 747, 757, 767 and 777 production lines. In his spare time, he and his son work on classic cars and race a stock car at Evergreen Speedway, near Seattle. "As you might guess, I have a love for all things mechanical, and Boeing has some of the most amazing machinery in the world to work on," he said. "That's why I have the best job at Boeing."



DAVID MOORE PHOTO



TED WHITESIDE PHOTO

## Lloyd Kwok El Segundo, Calif.

Lloyd Kwok isn't just a senior scientist at the Satellite Development Center. He's the SDC Propulsion Operations focal for Mission Assurance and Anomaly Investigation. "The satisfaction of convincing customers why we have a winning product for mission success is incomprehensible," he said. Being Lean helps him do things right the first time—which is crucial to fixing anomalies: "You actually become a heavyweight in your area of expertise by being lean."

## Dan Kurowski Wichita, Kan.

For Dan Kurowski, working as an aircraft modification manager on the C-32 executive transport aircraft is more than a job; it's an honor. "It's a privilege to work on an aircraft that transports U.S. leaders who shape world policy," he said. He added that the C-32 team—including (above from left) Brice Smith, Kurowski, Alan Vandyke, Dennis Morgan and Carl Keith—takes pride in its Employee Involvement, Lean and productivity improvements.



MARIAN LOCKHART PHOTO

## Michele Fay-Lonsdale Seattle

Do you work in the Puget Sound area of Washington state? Have you had customers driven to your worksite in a Boeing van? Your customers may have met Michele Fay-Lonsdale, a Passenger Service Driver with Shared Services Group's Licensed Transportation. "Those of us in Passenger Service are proud we are the 'first face' the customer sees when they arrive, and we provide them all with first-class service," she said. Among the reasons she said she's got the best job at Boeing: "I get to go around the world every day with our customers, as I never know who they are or where they're from until I pick them up."



PETER GEORGE PHOTO

## Marvin Owca St. Charles, Mo.

As a security officer, Marvin Owca feels he has the best job at Boeing. “I have a feeling of purpose, as we are protecting Boeing employees, assets and information,” Owca said. He started his career as a police officer outside of East St. Louis, Ill., where he was exposed, he said, to life at its best and worst. He then worked 29 years at a large corporation, retiring as chief of security and fire protection before joining Boeing full time in 2004. “My experience at Boeing has been great,” he said. “The company is very well respected in the community, and you are proud to tell people where you work.”



JIM COLEY PHOTO

## Kim Cherban Renton, Wash.

Kim Cherban (foreground, blue shirt) said working as “Moonshine” manager has been one of the best jobs he’s ever had in his 28 years at Boeing. “I have the best job in the world because I help eliminate waste through Lean,” Cherban said. Boeing’s Moonshine shops create “low-cost prototype solutions, and we do what it takes to get the job done,” he added. With Cherban are teammates Lance Schmucker (from left), Rick Covich, Pat Gibbs, William White, Ken Bundren, Greg Richardson, Mike Anderson and Ron Aasand.



KEN GRAEB PHOTO

## George Faris Long Beach, Calif.

As a Production Flight Test Loadmaster for the C-17 program, George Faris works with C-17 Globemaster IIIs that roll out of the Long Beach factory—and with aircraft already in the field. At Long Beach, he and his teammates conduct ground and flight testing, as well as acceptance inspections, of C-17s before delivery. On the road, the team supports ferrying of aircraft to and from depot, where upgrades are made to ensure the C-17 remains a fully modernized asset. His feelings about it all? “Right people, right job, right location, right airplane, right customer—right now!”



**Dennis Zeugschmidt**  
Arlington, Va.

To foreign-government representatives in Washington, D.C., the face of Boeing—and especially Integrated Defense Systems—could well be Dennis Zeugschmidt, who represents IDS to international customers in the U.S. capital and regularly visits with Asia-Pacific embassy officials to discuss Boeing's defense programs. Whether it's conversing with ambassadors, representing Boeing overseas, strategizing in team meetings or attending embassy receptions, Zeugschmidt said it's "all part of the best job in the company."

KEITH WOOD PHOTO





MARIAN LOCKHART PHOTO



EDWARD CROSS PHOTO

**Gail Roth**  
Seattle

Have you seen Boeing products in toys, models or video games? If so, Gail Roth has helped pave the way for companies to depict these products accurately. As a licensing specialist in the Intellectual Property Business, she licenses Boeing's trademarks for use in consumer products, including those from Sega and Microsoft. "It's a great job and a fun job where I meet people across the Boeing enterprise and work with manufacturers around the world," she said.

**Gary Wood**  
RAAF Williamtown, Australia

Gary Wood leads a team of seven people that support the Royal Australian Air Force's F/A-18 Hornets. They ensure production teams across two sites have serviceable ground-support equipment and the tooling to perform deep aircraft maintenance and modifications to the F/A-18 fleet. By incorporating Lean activities, the team has easier access to the 13,000 line items available for use, can conduct faster audits and more easily check item availability, and better manages ground support equipment and tooling. "The best job comes with a culture that fosters individuals to improve the business by breaking paradigms, raising issues or concerns and being empowered to promote ideas into reality," he said.



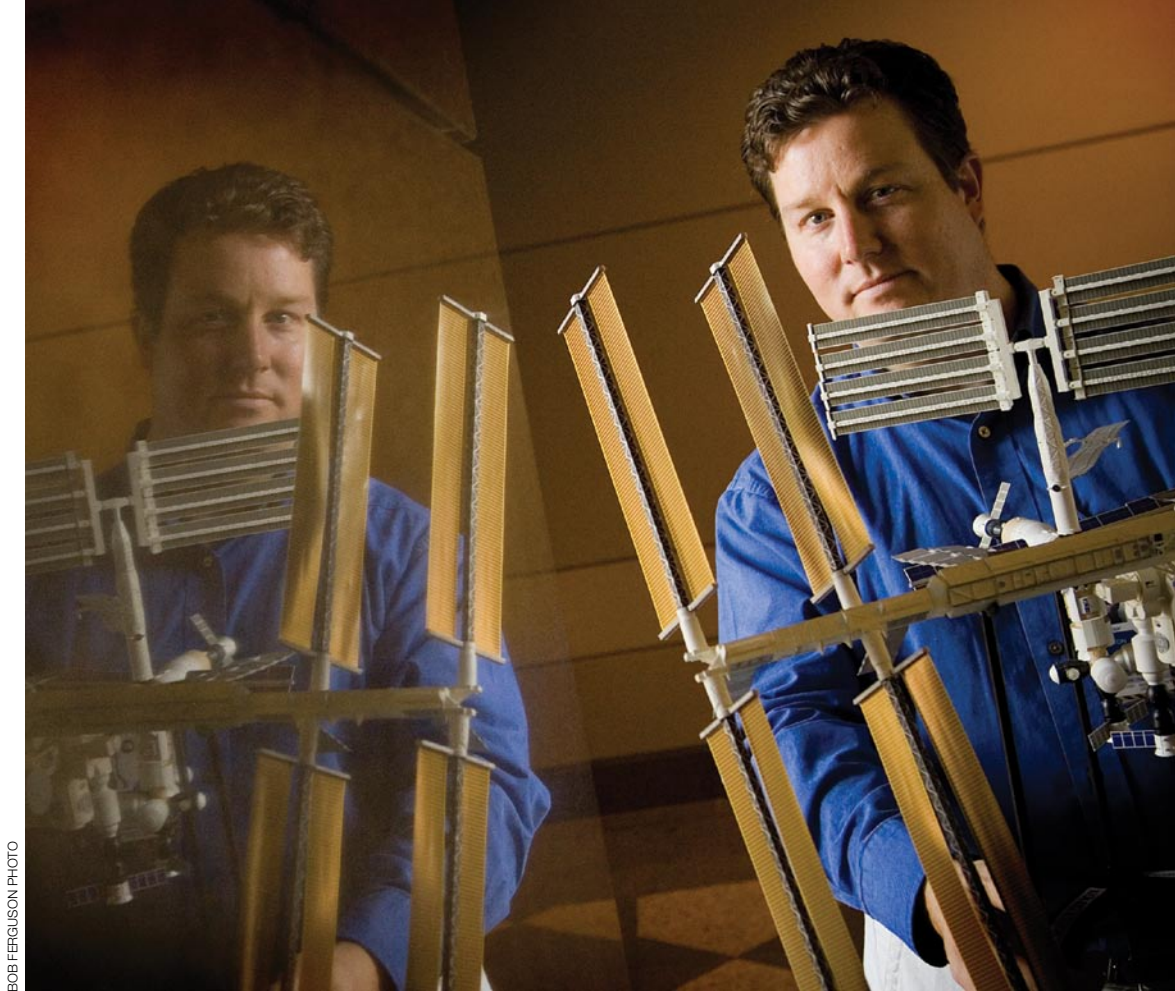
CRAIG BUSH PHOTO

**John Sidorek Jr.**  
Travis Air Force Base, Calif.

Mention how Boeing is a customer-facing business, and John Sidorek Jr. will know what you mean. He's the site manager at Travis Air Force Base for the KC-10 Contractor Operated and Maintained Base Supply program. Sidorek's team supports the 27 KC-10 Extender aircraft assigned to Travis by providing parts, material, ground support equipment maintenance and technical expertise to the maintainers. "I have the best team in Boeing providing the best support directly to the customer every day," he said. "I get to interact with U.S. Air Force commanders, enlisted leaders, maintainers, reservists and government civilians on a daily basis to ensure this vital warfighting asset is maintained and available for immediate deployment."

## Craig Stanton Houston

Craig Stanton's job is out of this world. As a Digital PreAssembly engineer for the International Space Station, he ensures space station elements that can't be preassembled on the ground have no interferences to berthing on orbit. Stanton said he gets to touch almost all of the major components of the space station and measure or reverse-engineer them—getting to understand the hardware from both drawings and hands-on experience. "It's really cool to see the station pieces as they're assembled on the ground, and then see the images and video from the completed assembly on orbit," he said.



BOB FERGUSON PHOTO



## Anjani Rathor New Delhi, India

Know what it's like to be on the cusp of something big? Anjani Rathor does. He's the Strategy & Initiatives focal for Boeing in India, one of Boeing's high-growth markets. "The environment is simply vibrant," he said. "India is now both a top-line and bottom-line opportunity, and Boeing is aligning itself in this market for the future. The opportunity to work and grow with this legendary company is a challenge and an education."



HUNTSVILLE CREATIVE SERVICES PHOTO

## Becky Martin Huntsville, Ala.

As the Supplier Diversity specialist for Missile Defense Systems, Becky Martin (right) identifies a need within Boeing and aligns it with the capabilities of small and diverse businesses. That helps provide a lower-cost product—and enables the program to mitigate risk and meet its delivery schedule. "It's rare that someone can work at a company and also be able to affect the quality of living for other individuals," Martin said.



JIM ANDERSON PHOTO

## Kirk Scherz Tukwila, Wash.

For Kirk Scherz, serving as a Communications Coordinator at Commercial Airplanes' Operations Center is comparable to a work experience at NASA Mission Control. "It's a unique and rewarding opportunity to participate in an innovative, technologically advanced, high-powered working environment," said Scherz, whose job involves in-service repair and maintenance support for Commercial Airplanes jetliners worldwide. He also collaborates with Operations Center team members in allocating the time, resources and services to satisfy customer requirements and support their schedules during Airplane On Ground events. "The most fulfilling part of this experience is serving our customers on the 'front line,'" Scherz said.



MICHAEL GAIL PHOTO

## Marc Axelrod Anaheim, Calif.

For Marc Axelrod of Safety, Health and Environmental Affairs program management, "Nothing is more satisfying than going home at the end of a hard day and knowing my teammates went home just as safe and healthy as when they came to work," he said. "Safety must be a top priority that requires everyone's continuous attention and effort. SHEA can help teach employees how to protect themselves, but we all must act to protect each other."



PETER GEORGE PHOTO

## Sarah Taylor St. Louis

Sarah Taylor is part of a team that builds F/A-18 Maintenance Trainers for the U.S. Navy. Her duties involve working with the customer to define training requirements and then collaborating with software and hardware engineers from Boeing and suppliers to build a trainer that meets the requirements. Her favorite part about her job? "Working with a diverse group of people, from end-user customers to aircraft engineers designing new F/A-18 systems."

## Anthony Pritchard Auburn, Wash.

"I enjoy playing with technology—which Boeing has given me a chance to do," said Anthony Pritchard, a coordinate-measuring-machine operator. CMMs are used for precision measuring and quality control of manufactured parts. Yet even a process involving a precision instrument can be improved. Pritchard took part in a 2005 Accelerated Improvement Workshop for the CMMs in his building. AIW participants determined a newer CMM—which will be installed in early 2007—would be faster, need less maintenance and create less downtime compared with the current model. "Stepping up to newer technology in software and hardware is exciting," Pritchard said.



JIM ANDERSON PHOTO

## Jennifer Wenthe Seattle

At work, Jennifer Wenthe, a materials engineer with Commercial Airplanes, gets to light things on fire. Well, OK, the technicians at her site do. But it's done for an important reason: One of her main job functions is to find fire-retardant materials for airplane interiors. "Not only do we light different materials on fire, we have the room to explore different materials and their capabilities," she said. "And we can experiment among our group, along with our suppliers, to adjust the materials so they meet our flammability needs without changing the materials' aesthetic and mechanical properties."



MARIAN LOCKHART PHOTO

DAVID MOORE PHOTO



**Tamika Hinton**  
 El Segundo, Calif.

“Where else can you help students, senior citizens, the environment, the arts, civic involvement and your office mate all in the same week?” asked Tamika Hinton, a Boeing community investor. By building relationships with community and internal stakeholders, such as nonprofit organizations, educational institutions, community leaders and Boeing employees, Hinton works to help make Southern California a better place for Boeing people to work and live. “Being able to impact so many lives on behalf of the company is a dream job come true.”



RICHARD RAU PHOTO

## Hoyt Wallace

St. Louis

"When I was a boy, I loved to look at airplanes and engines, draw pictures of airplanes and engine parts, and calculate thrust, speed and altitude," said Hoyt Wallace, a Technical Fellow with the Integrated Defense Systems Advanced Systems organization. Now, he does this for a living—and his efforts help to make the world a better and safer place to live. Said Wallace: "I have been telling my colleagues for years I have the best job in the company."

## Jan Fushikoshi

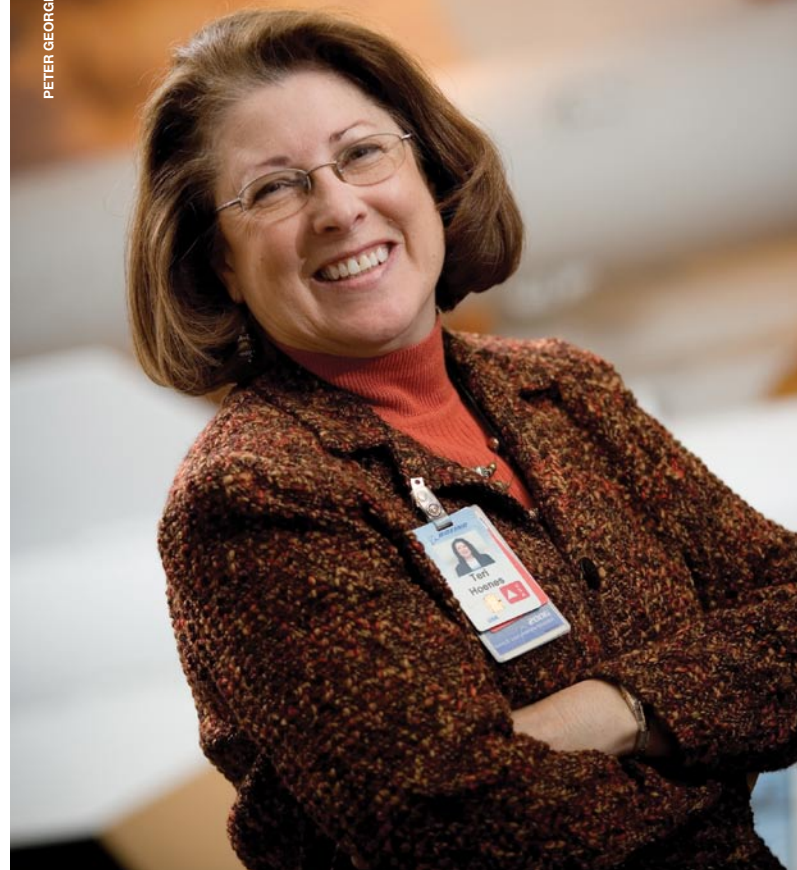
Everett, Wash.

For Jan Fushikoshi of the 787 Systems Integration Service Ready group, having Boeing's best job means working with great people on the 787 program. "The program is exciting, challenging and dynamic," she said. The biggest challenge: Bringing together all the players involved in the airplane's conformity and understanding the risks, mitigation plans and critical paths, she said. "There's excitement in the air because the 787 is one of our future airplanes."



GAIL HANUSA PHOTO

PETER GEORGE PHOTO



JIM ANDERSON PHOTO

**Tom Buyers**  
Renton, Wash.

Are Boeing solutions really helping customers? Tom Buyers, an airline economics analyst with Commercial Airplanes, works to prove this point. He collaborates with many teams within Boeing to help airline customers understand the financial impact of airplane maintenance programs—and to recognize the benefit of operating Boeing jetliners. “Working together with our customers and having the chance to see them smile and be more successful in their operation brings me tremendous satisfaction,” Buyers said.

**Teri Hoenes**  
St. Charles, Mo.

As a supplier program manager, Teri Hoenes said she truly feels “this job makes a difference for our programs and for Boeing.” As part of Supplier Management and Procurement, she supports the Supplier Partnership Initiative, which is sponsored and funded by the Small Diameter Bomb, Joint Direct Attack Munition and Naval Weapons programs, and the V-22 Osprey in Philadelphia. “The program utilizes a structured tool set and metrics to track progress, and it provides the opportunity to develop a true relationship with the suppliers we support,” she said.



PETER GEORGE PHOTO

**Paul Steingrubby**  
St. Louis

Parts and materials seem to be in constant motion on the dock at Building 101 in St. Louis—and they seem to be moving even faster since the team at the dock implemented Lean improvements. Paul Steingrubby, a Production Control analyst, said the dock is the starting place for every finished product created in this building. He also said, “I have the best job at Boeing because I go home every day with the feeling I have made a difference.” And as icing on the cake, Steingrubby said his teammates take pride in getting their job done and are “some of the most conscientious, dedicated and helpful persons” he has been associated with—ever.



PHAM ANH TUAN PHOTO

## Michael Mori Hanoi, Vietnam

Michael Mori uses his Customer Delivery Center flight-line experience to assist customers in the field. “There is not a better group of people who are doing 120 percent for our airplane operators to provide the best customer support in the world,” said Mori. Above from left are Tran Van Phuc and Nguyen Van Hong from Vietnam Airlines, Mori, and Boeing field service associate Linh Nguyen.

BOB SCHNEIDER PHOTO

## Bob Yazdi Long Beach, Calif.

Bob Yazdi, a certified Boeing Six Sigma Master Black Belt, enjoys every minute of his job in the Engineering Integration Process and Tools group. “My duties are aligned with my expertise, and I have extraordinary passion for deploying Six Sigma methodology,” said Yazdi, who helps improve engineering processes in Long Beach. He teaches the discipline, coaches students and also helped launch the Six Sigma training program in Long Beach. “Everything I do supports the Lean+ initiative, and I am motivated to do the best I can every day,” he said.







MARIAN LOCKHART PHOTO

JIM COLEY PHOTO

**Terri Conrardy**  
Renton, Wash.

Terri Conrardy, a case manager in Global Diversity and Employee Rights, is proud to be part of an “awesome” Alternative Dispute Resolution team that’s “passionate about the benefit and value of resolving conflict through Boeing’s mediation process.” She educates and trains participants in the alternative dispute resolution process, with the goal of resolving issues to the satisfaction of both the employee and the company. She noted that 83 percent of ADR cases are settled in the early stages. The ADR team applied Lean+ tools to the ADR process in a recent Accelerated Improvement Workshop to significantly reduce flow time and eliminate non-value-added steps. The team is excited about implementing the results of the AIW in 2007.

**Mike Jenkins**  
Renton, Wash.

We all appreciate it when our efforts have an impact on the products our teams create. That’s the basis of Mike Jenkins’ job. As a flight-line mechanic at Renton Preflight, he investigates “flight squawks”—flight discrepancies documented by a flight crew—on 737s. Jenkins works with flight crews, engineers, flight analysts and Manufacturing representatives to develop plans to correct flight squawks. “I am empowered to make improvements every day,” he said. “You can’t look at a 737 and not see something I helped improve.”



GAIL HANUSA PHOTO

**Tom Walton**  
Everett, Wash.

Tom Walton works “on the best airplane in the world”—the Boeing 777. As a propulsion service engineer supporting the 777 fuel system, “This job matches well with my interest in staying close to our 777s and keeping them flying,” Walton said. He’s not only passionate about his work, he’s passionate about serving the customer well. “I’m a Mr. Fix-it person, and my job enables me to work directly with airlines on practical, cost-effective, safe solutions for their in-service technical problems,” he said.

**Wenarto**  
Seattle

As a Commercial Aviation Services sales program manager for Japan, Korea and India, Wenarto feels he has the best job at Boeing. He interacts with colleagues from across Commercial Airplanes' CAS organization, including engineering and finance, as well as with customers and field-service representatives around the world. Wenarto continuously works to lean the CAS sales process and make improvements that benefit Boeing and its customers. He also feels Lean applies beyond the workplace. "Use Lean principles in your daily work and life," Wenarto advised. "Lean can be implemented successfully at work and at home."



MARIAN LOCKHART PHOTO

**Michael Snow**  
Seattle

Is there mind reading going on at Boeing? That's the kind of stuff Michael Snow, a principal scientist/engineer with Phantom Works, and his teammates are working on. "I am the principal investigator for Boeing's Augmented Cognition program, and the technologies and systems we are developing represent the first steps toward no-fooling mind reading," he said. "We're still many years off, but you can see how to get there from here."



JIM ANDERSON PHOTO

# Keep up the pace

## Joint venture supports Chinese market growth

By R. JEFFREY WOOD

Powered by a burgeoning economy and a rapidly expanding middle-income population segment, China will become the largest commercial aviation market outside the United States by 2025.

To support the demand, China will take delivery of 2,880 new airplanes over the next 20 years, according to the 2006 Boeing Current Market Outlook.

Boeing and two joint-venture partners took the first in a series of steps planned to help China prepare for that future, with a ceremonial groundbreaking in October for Boeing Shanghai Aviation Services Company, Ltd. This joint venture marks another example of Boeing's commitment to help airlines in regions with rapidly growing economies meet their rising demand for air transport services. By partnering and sharing its integration expertise, Boeing strengthens its airline customers and the commercial airplane market.

Originally conceived in 2002, Boeing Shanghai Aviation Services is a maintenance, repair and overhaul (MRO) facility located at Shanghai's Pudong International Airport. The joint venture will draw on the in-country work force to hire employees who have the skills necessary for servicing and updating airplanes.

Initially, Boeing Shanghai Aviation Services will offer Boeing customer airlines line maintenance, overnight maintenance checks and repair of deferred maintenance items. Construction begins in 2007 on the first of two hangars that will allow the joint venture to expand services to include heavy maintenance, interior modifications and passenger-to-freighter conversions.

Jim Brunke, Boeing vice president of Global MRO Services, said the facility brings together the capabilities, technologies and innovation needed to support the region's growing economy and air-transport market. "Boeing's role in the joint venture is to provide engineering expertise and a deep understanding of aircraft maintenance. We're committed to help eliminate constraints to commercial aviation growth," Brunke said.

Tim Premseelaar has been appointed Boeing Shanghai Aviation Services chief

executive officer to lead the multinational team. "The team brings energy, knowledge, experience, and dedication that will bolster Boeing's strong reputation in China and serve our customers well," Premseelaar said.

Joint venture partner Shanghai Airport Group brings extensive experience with large-scale airport operations and infrastructure, as well as established relationships with local and state regulatory authorities. The group, under the auspices of the Shanghai Municipal Government, manages and operates Shanghai's Pudong and Hong Qiao international airports. Shanghai Airport Group Chairman and President Wu Nianzu said Boeing Shanghai Aviation Services will promote efforts to establish Shanghai as an aviation hub serving 110 million passengers by 2015.

Joint venture partner Shanghai Airlines Company, Ltd., contributes experience in airline flight and maintenance operations. "Shanghai Airlines and Shanghai Airlines Cargo International will serve both as partners in the joint venture and as customers, providing a stable business base to the MRO," said Zhou Chi, chairman of Shanghai Airlines Co., Ltd. ■

*richard.j.wood@boeing.com*

**Construction on the Boeing Shanghai Aviation Services facility will begin in 2007 and is estimated to take up to two years. Plans call for a four-bay hangar, with each bay capable of housing widebody airplanes, as depicted in this illustration.**





JIM ANDERSON PHOTO

737 wing-line inspector Bill Tarbet uses Online Work Instructions for easy access to digital information, including installation plans, which used to be printed and displayed on metal flip files known as “cookie sheets,” shown to his right.

# Less paper, greater efficiency

## How using Online Work Instructions helps speed quality-related processes—and win one lunch

By KATHRINE BECK

It was 12:50 p.m., second shift, in the 777 wing line in Everett, Wash. A mechanic told quality inspector Larry Westerman that he needed some paperwork modified by a manufacturing engineer.

Westerman glanced at the clock. “It was 10 minutes until lunchtime,” he recalled. “I told him, I’ll bet you lunch we get this fixed by lunchtime.”

The bet was on—and Westerman won his cheeseburger and fries with four minutes to spare, thanks to Online Work Instructions.

OWI is a new, Boeing-designed paperless system that’s making life easier for Commercial Airplanes mechanics and inspectors—and saving Boeing and its customers time and money. Paperwork that formerly lived in a folder now has been moved to electronic computer work stations available throughout the factory.

Westerman said that under the old system, the change that won him lunch could have taken “a day, maybe a day and a half.”

OWI is part of ongoing efforts in Commercial Airplanes Manufacturing and Quality to improve and standardize processes. It also helps support Lean+, one of four Boeing companywide growth and productivity initiatives.

Deployment of OWI began in November 2005, starting with several areas in Renton, Everett and Frederickson, Wash. By October, the last assembly work area was converted to the new system. OWI is now in use at all Commercial Airplanes assembly sites in the Puget Sound region of Washington state, with possible future expansion to fabrication areas.

### PAPER TRAIL

It takes a lot of paper to build an airplane. Before OWI, BCA printed between 60,000 and 80,000 pieces of paper a day. Mechanics used installation plans with job instructions in words and pictures to

certify that work was properly completed and all steps had been properly performed. Both mechanics and quality inspectors signed off on the paperwork with their personal stamp.

Installation plans came with two copies—a green paper and a white paper. Mechanics used the white copy to make sure they were doing the job exactly as specified, and they kept it with them on the job for reference. The mechanic and the inspector had to sign off on the green paper, which Westerman said was stored “at a central location, but not always a convenient location.” Sometimes, a mechanic had to leave the work area and climb two flights of stairs to stamp the green paper. If there were missing stamps, mechanics and inspectors had to go back and make sure the work was done.

Now, the FAA has accepted the electronic signoff. The days of the hand stamp and inkpad are over, and paperwork is accessible to anyone who needs it via the closest computer station.

“Maybe there was some initial resistance. But if we took this away now, [mechanics and inspectors would] be really upset.”

—Tom Mlakar, Commercial Airplanes Manufacturing and Quality Systems Integration manager, on how Online Work Instructions, a paperless quality-inspection system, has made life easier for mechanics and inspectors

With OWI, there’s no confusion about signoffs. A blurred stamp is illegible, but an electronic signoff can’t blur. Paperwork can’t get lost, either.

And with OWI, there are no missing stamps, because the system doesn’t allow final buyoff of the job until all operations have the required stamps from mechanics and inspectors.

The OWI system also provides links to many other resources. Among them: the

nonconformance system that tracks discrepancies such as a cracked part or wrong-length bolt, gives instructions for correcting it and documents the fix.

And, OWI has links to drawings and to online “wizards” that help a mechanic know, for example, exactly how far to torque a bolt; to information on electrical hookups; and to specifications and standards.

If mechanics need to consult with a manufacturing engineer or get paperwork changed, they can use the OWI callboard function. The engineer can make the change immediately on the screen.

### ‘MECHANIC- AND INSPECTOR-CENTRIC’

OWI is updated through ongoing block-point changes to continuously improve the quality of the system.

Mark McGrath, IT manager, BCA Manufacturing Execution Systems, was responsible for designing OWI. He said when it came to designing and building the system, the needs of the mechanic and inspector were always foremost “because we’re in business to build airplanes. This is designed to be mechanic- and inspector-centric.”

OWI was built in consultation with mechanic and inspector subject matter experts in the factory. The subject matter experts also led deployment, teaching others about the system and troubleshooting. One of them was 737 Final Assembly functional test mechanic Glenn Konertz. “We’ve talked about going paperless and it’s here, and I’m glad to be a part of it,” he said.

“We’re saving money in places we didn’t anticipate,” said Tom Mlakar, BCA Manufacturing and Quality Systems Integration manager. “We didn’t realize how much time the inspectors spent just in checking that paper.”

Mlakar added that there were additional savings in avoiding paying for long-term storage or searching for completed paper, and in eliminating the lag time created when white and green papers were on a truck on their way to the plant.

“Mechanics and inspectors appear to be very happy with the system,” he said. “Maybe there was some initial resistance. But if we took this away now, they’d be really upset.” ■

*kathrine.k.beck@boeing.com*

# Phoenix rising

Takao Kusakari (from left), chairman of Nippon Cargo Airlines, and Masahiko Okabe, chairman of NCA customer Nippon Express, listen as Yukio Kojima, Boeing regional director of Marketing-Asia/Pacific, explains features of a 747-400 Freighter being built at Boeing's Everett, Wash., factory. NCA has ordered 747-400Fs and 747-8Fs as part of its expansion plan.

ED TURNER PHOTO

# Nippon Cargo Airlines' ambitious growth plan calls for new 747Fs

By MARIBETH BRUNO

Japanese business isn't what it used to be. Foreign CEOs, deregulation and merit-based promotion have turned conservative Japan Inc. into a marketplace where anything seems possible, even for the smaller players.

It was a sign of the times in July 2005 when All Nippon Airways sold its shares in joint venture Nippon Cargo Airlines to founding member NYK (Nippon Yusen Kaisha) Line, an ocean shipping company. ANA went on to form a joint venture with Japan Post as it pursues its own air cargo strategy.

NCA moved its headquarters to Tokyo's Narita Airport to be closer to its customers while starting work on the Phoenix Project, an expansion plan it introduced in May. Central to the plan is the purchase of several 747 Freighters.

NCA's purchase plan represents the latest step in Boeing's relationship with NCA—and illustrates how Boeing works to help its customers succeed. Not only is NCA involved in the design of the new 747-8 Freighter—it's one of this airplane's launch



Guests at the delivery ceremony for a new Nippon Cargo Airlines 747-400 Freighter examine the airplane's interior. 747-400Fs can carry a payload of 125 tons (113 tonnes); the 747-8 Freighter in production will be able to carry 148 tons (134 tonnes).

ED TURNER PHOTO

customers—but NCA's business model relies on Boeing employees and the services they and the company provide.

"We appreciate the friendliness and attentiveness of Boeing people all the way from top management through the field people," said Takuro Uchiyama, NCA president and CEO. "The assistance and support we receive is simply excellent—*daiichi*." (*Daiichi*

is Japanese for "the first" or "foremost.")

NCA, Japan's only international all-cargo airline, has used the Boeing 747 since 1985, when it began operations with two 747-200Fs on Tokyo-San Francisco and Tokyo-New York routes. Its fleet now includes eight 747-200Fs and three -400Fs. In 2005, it carried 371,490 tons (337,010 tonnes) of freight to 19 cities over 61 flights per week.

International Air Transport Association statistics rank NCA the 16th-largest freight airline in the world on a freight-tonne kilometer basis, behind Japan Air Lines at No. 12. *Air Cargo World* magazine ranks JAL 11th, NCA 21st and ANA 28th for 2005. These airlines are battling one another and rivals outside Japan for a top spot in the increasingly robust air cargo market. Boeing's World Air Cargo Forecast 2006/2007 predicts air cargo markets linked to Asia will continue to lead other markets through 2025, with 8.6 percent per year growth in the intra-Asia market.

"NCA urgently needs to lower its cost structure to be able to compete more effectively in this market," Uchiyama said recently at the airline's Tokyo office. "World-leading freighter operators, such as Korean Air Cargo and Cargolux, have already replaced their older freighters with much more fuel-efficient -400Fs and -400ERFs. So we are now accelerating fleet modernization."

NCA and Luxembourg's Cargolux became launch customers of the 747-8 Freighter in November 2005, the same month in

## TALE OF THE TAPE: BOEING 747 FREIGHTERS

	747-8F	747-400F	747-200F
Maximum takeoff weight	485 tons (440 tonnes)	437.5 tons (397 tonnes)	418 tons (379 tonnes)
Maximum range	4,475 nautical miles (8,288 kilometers)	4,450 n.m. (8,241 km)	3,610 n.m. (6,686 km)
Typical cruise speed at 35,000 feet	560 mph (901 km/h)	560 mph (901 km/h)	555 mph (893 km/h)
Payload	148 tons (134 tonnes)	125 tons (113 tonnes)	121 tons (110 tonnes)
Main deck pallets, 96-by-125 inches (244-by-318 centimeters) each	34	30	29
Fuel/payload ton for Tokyo-Amsterdam route	360 U.S. gallons (1,363 liters)/payload ton	466 U.S. gallons (1,764 liters)/payload ton	768 U.S. gallons (2,907 liters)/payload ton *
Noise level at takeoff, at London Heathrow Airport	QC2**	QC4**	QC8**

\* Route includes a fuel stop in Anchorage, Alaska.

\*\* An industry standard measurement for airplane noise—the lower the number, the quieter the airplane.



Nippon Cargo Airlines' Takuro Uchiyama, president and CEO (from left); Minoru Nagakura, Flight Operations senior vice president; Minoru Asanuma, 747 pilot; Hiroyoshi Hayashi, Flight Operations Engineering manager; and Noriaki Iwanari, FOE assistant manager, took part in the September delivery ceremony for NCA's third 747-400 Freighter, shown here with its nose door open. The freighter was named *NCA Phoenix* in honor of the company's Phoenix Project expansion plan.

ED TURNER PHOTO

which NCA released a draft of the Phoenix Project. The plan calls for NCA to replace its 747-200Fs with 747-400Fs through 2009, when it will receive the first of the eight 747-8Fs it has on order. By 2011, Phase 2 of the plan, the company expects to be operating a fleet of 10 -400Fs and eight -8Fs, supplemented with space on other carriers' flights. From 2012 on, NCA intends to continue to add more 747-8Fs, depending on market conditions.

"NCA's purchase of the airplane gave credibility to the 747-8F as the superior freighter into the future," said Larry Dickenson, vice president of Sales, Boeing Commercial Airplanes.

Both the 747-400F and the new 747-8F—which applies many of the new technologies of the 787 Dreamliner—improve on the 747-200F's cargo volume, fuel efficiency, range and noise reduction (see chart on Page 39).

The new freighters will allow NCA to take advantage of expansions at two of Japan's major airports. Extension work on one of Narita's runways, expected to be complete in 2010, will allow traffic there to increase from 200,000 to 220,000 flights per year. A new runway at Tokyo's Haneda Airport will add 30,000 more takeoff and landing spots when it opens in 2009; NCA is in discussions with the airport to begin operations there. The 8,200-foot runways will be long enough for -400Fs and -8Fs with less than a full load of fuel to reach many destinations in Asia.

In addition to buying better freighters, "We have made major organizational changes to sales and traffic functions in order to make ourselves more responsive to market change," Uchiyama said. "We are also recruiting and training our own crews and maintenance engineers in order for NCA to become a self-sustained, independent airline."

ANA will continue to support NCA with flight- and maintenance-related services until 2009. NCA is a customer for Boeing Commercial Aviation Services' Maintenance Performance Toolbox, receives flight charts and dispatch services from Jeppesen, and uses Alteon for flight-crew and maintenance training.

"Since NCA is setting up operations almost from scratch and has no legacy systems or aging and underutilized facilities to hold it back, it can select the most efficient way of running the operations side of its business going forward," said BCA Asia-Pacific Sales Director Kevin Heise. "It is choosing Boeing products and services to fill many of its needs."

Heise added that Boeing and NCA are "working together" not only on the 747-8F's design but also on the airline's engineering and maintenance operations, flight operations and route analysis. "The relationship of our two companies has become much stronger through NCA's becoming a launch customer of the -8F," Uchiyama said.

In his May 2005 introduction to NCA's anniversary publication *Flying High: 20 Years of Progress*, Uchiyama underscored the issues facing his company: sharpening international competition, rising fuel prices, and frequent changes in the outside environment.

"Let's have a strong spirit willing to take risks and meet challenges," he wrote. The recent introduction into service of new 747-400Fs demonstrated that NCA was "at a major turning point."

Likewise, in 2006, "We can't wait to have our 747-8Fs," Uchiyama said. "With them in our fleet, we will be one of the most cost-competitive airlines in the world." ■

*maribeth.bruno@boeing.com*



# Engineered for success



From left: Karsten Overa, director, Commercial Airplanes Integration and Support Engineering, and Composite-Virtual Resource Center sponsor; Max Duarte, C-VRC project manager; and Randy Taylor, Engineering site leader for Frederickson, Wash., discuss 787 composite test parts at the Boeing Developmental Center in Seattle. An all-composite 787 barrel section looms in the background.

## Composite-Virtual Resource Center takes next steps to boost skills

By ROCCO MACCARRONE AND MARY REGIMBAL

**M**etal. Aluminum. Alloys. For most of its history, Boeing has relied on various forms of metal as the core material for building airplanes. Indeed, Boeing engineers continue to be among the best in the world at working with metal.

But perhaps more than its metalworking expertise, the key to Boeing's success throughout the years is the company's ability to change and adapt to customers' evolving

requirements in a global environment. Today Boeing is flying into the future by demonstrating its ability to adapt in a huge way: changing the material used to build jetliners.

The future is with composite materials, as exemplified by the composite primary structure of the 787 Dreamliner, scheduled to roll out in 2007. Recognizing this shift, the 787 Program and other development projects teamed this year to address an emergent shortage of engineers with composite skills.

Headed by Karsten Overa, director, Integration and Support Engineering at Commercial Airplanes, this team of business managers and composite skills subject matter experts is creating the Composite-Virtual Resource Center within the Production Engineering community. The C-VRC will build a framework to help grow composite skills at Boeing through an

accelerated rotation and training program. "The idea of a virtual organization is that we can manage the skill development regardless of where the people are, rather than from a central physical location," Overa said.

The team's primary skill-development focus is on meeting urgent headcount needs and delivering the right kinds of skills at the right time for any program. Currently, the program is open to BCA Tooling Engineering and Manufacturing Engineering employees, as well as Integrated Defense Systems Manufacturing Engineering employees in the Puget Sound area of Washington state.

Two subteams, a business-model team and a technical team, developed the training.

The business-model team, led by Beth Pang, surveyed the Production Engineering community to develop an inventory of composite resources, including potential composite-skilled employees and the relevance and timeliness of their experience. The technical team researched and evaluated existing sources of composite training and adopted the Renton Airframe organization's list of composite courses as a baseline. The team created a skills-inventory checklist and identified basic elements for a composite skills database. The C-VRC used the results from the survey to advertise the University of Washington Composite Certification program and classes offered through the Ed Wells Partnership.

The C-VRC also is implementing a composite skills rotation program, where engineers will gain hands-on experience in addition to classroom training. Already, requisitions have been posted for six-month rotation positions at the Developmental Center in Seattle.

"The key to the C-VRC program being successful down the road is getting support right now, across the board, from the business units. A successful C-VRC will benefit the workers, future programs and the company. Everyone benefits," said Max Duarte, C-VRC project manager.

For more information, please contact Duarte at [max.c.duarte@boeing.com](mailto:max.c.duarte@boeing.com) or Pang at [beth.r.pang@boeing.com](mailto:beth.r.pang@boeing.com). ■

[rocco.a.maccarrone@boeing.com](mailto:rocco.a.maccarrone@boeing.com)  
[mary.e.regimbal@boeing.com](mailto:mary.e.regimbal@boeing.com)

# A hot place to visit

## British Apaches and crews visit Arizona, the right site to train for duty in Afghanistan

BY HAL KLOPPER

Mesa, Ariz.—the home of the Apache Longbow combat helicopter—is thousands of miles from Afghanistan. But just 70 miles from Mesa, in the desert community of Gila Bend, Ariz., the British Army has found an acceptable surrogate landscape for training.

There you'll find the Barry M. Goldwater Range, which has just what the British Army wanted: punishing dust, heat and mountains. It's the perfect place for the British Army to train its AH Mk1 Apache air and ground crews for potential service in Afghanistan and other hot spots around the world. The AH Mk1, the British equivalent of the AH-64D Apache Longbow, is already performing peacekeeping duties in Afghanistan.

To prepare for ongoing deployment in that region, the British Army recently sent six AH Mk1 Apaches to Arizona for training duty. The helicopters are among 67 assembled in the United Kingdom under license by AgustaWestland, as prime contractor, from kits built by Boeing Rotorcraft Systems in Mesa, the home of Boeing's Apache production programs. Although the production program ended a few years ago, Boeing continues to support the British Apache program with a small team in the United Kingdom and program-office employees in Mesa who help keep the Apaches maintained and spares flowing.

"Apache is an evolving aircraft. Working closely with AgustaWestland and the British Army helps to ensure they have the right systems in place and we have a solid understanding of what's needed in future upgrades," said Jerry Horgan, manager of the U.K. Apache program at Boeing Rotorcraft Systems. "Having actual British Apaches in Arizona makes it that much easier to build strong relationships for the future."

The terrain surrounding the Goldwater Range has given more than 400 British Army pilots and maintenance crew mem-

bers a chance to train in an environment similar to the one they'll experience in Afghanistan or Iraq when such deployment occurs. Typically, around 250 soldiers are in the training process at one time.

The soldiers, part of 3 Regiment in the British Army Air Corps (AAC), spent three months at the Western Army National Guard Aviation Training Site in Marana, Ariz., 30 miles south of Gila Bend. There, they trained with the National Guard experts and prepared for firing exercises that take them into the range for days at a time. The weather at the end of the three-month visit had relaxed somewhat since their arrival in August, when temperatures topped 100 degrees Fahrenheit (38C).

"While our pilots are getting valuable flight training, remarkably it appears the soldiers benefiting the most are the men and women on the ground," said Lt. Col. David Meyer, AAC, who is responsible for conducting U.K. training activities in Gila Bend. "Everyone is learning, and that's essential as we move forward."

The British Army has deployed a unit of eight Apaches in Afghanistan, performing ongoing defensive missions in support of the peacekeeping force there. The British regularly rotate crews in and out of Afghanistan, so having a large, fully trained force ready is a benefit the service appreciates.

"We regard environment training as absolutely essential before we go on operations," Meyer said. "We don't have a representative environment like this in the United Kingdom, so it's important we come abroad to understand the environments where our troops will be deployed. For many this is their first trip abroad, and for our pilots, the opportunity to complete their qualification training is essential."

Meyer added, "This type of training is the best we can do for our air and ground crews to ensure they are prepared." ■

[hal.g.klopper@boeing.com](mailto:hal.g.klopper@boeing.com)

BOB FERGUSON/PHOTO



**The Barry M. Goldwater Range is hot and dusty and surrounded by mountains—making it an ideal place for the British Army's AH Mk1 Apache air and ground crews to train for potential service in Afghanistan.**

# A high-power journey

Boeing-built primary power, cooling systems to be activated on ISS

By Ed MEMI

Think about wearing a bulky space-suit while connecting and disconnecting power cables about 140 times—while in a weightless environment. That's the task awaiting astronauts of the Space Transportation System-116 mission, to be flown on Space Shuttle *Discovery*, when they head to the International Space Station in December.

Spacewalking astronauts will rewire the Electrical Power System (EPS). Astronauts, along with Boeing engineers and NASA mission controllers, will orchestrate a precise ballet of powering down equipment, transferring it to other power channels, and unplugging and plugging in electrical connectors. The ISS power system will transition from a temporary to its permanent configuration when power is rerouted through electrical components on the Port 1, Starboard 0 and S1 trusses for the first time.

Boeing engineers Mimi Lovato and John Barber, flight leads for EPS, have been preparing for this mission for several years. "It's exciting because it's the next step in prepping for the arrival of all the other power modules" for the ISS, Lovato said. "The flight control team has simulated this mission many times, and we have confidence our hardware will work."

Like a city's central power plant, the station's giant solar arrays generate primary ISS power at levels too high for consumer use, ranging from 137 to 173 volts direct current (Vdc). The power is regulated between

NASA PHOTO



**Astronaut Daniel C. Burbank is shown on the International Space Station's P3/P4 truss during a spacewalk on mission STS-115. During the upcoming STS-116 mission, the power from the photovoltaic module, named P4, will be routed through the permanent ISS electrical power system, which is being activated. Boeing will assist NASA during the activation.**

150 and 160 Vdc and then routed to batteries for storage and to switching units that route it to distribution networks. DC-to-DC converters step down the primary 160 Vdc electricity to a tightly regulated secondary power of 124.5 volts for use on the ISS.

Even though the station spends about one-third of every orbit in Earth's shadow, EPS will continuously provide 84 kilowatts of usable power once all eight solar array wings are on orbit. Boeing, through its Rocketdyne Propulsion and Power division (now part of Pratt & Whitney), built the EPS hardware and provides sustaining engineering support to NASA.

Lovato and the Boeing team of EPS engineers will be supporting NASA during the extensive reconfiguration. "This mission has a lot more configuration changes that make it more complicated than earlier missions," Lovato said.

The power system electronic boxes are cooled by a thermal system that will be activated for the first time during STS-116. In the system, excess heat is removed by liquid

ammonia coolant in tubes that loop through radiator panels, which dissipate the heat into space. Ammonia is used in the external lines that transfer heat to the radiators because of its low freezing point, but an internal water coolant loop in the labs and living modules interfaces with the external loop. Boeing engineers in Huntington Beach, Calif., designed this cooling system, called the External Active Thermal Control System.

"The whole purpose of this cooling loop is to flow ammonia around heat exchangers and cold plates at a controlled temperature," said Matt Jurick, a member of Boeing's Active Thermal Control Systems Team and lead thermal engineer for the flight.

The shuttle mission will also deliver the 4,110-pound (1,860-kilogram) Boeing-built Port 5 truss segment. Port 5 is attached to the Port 4 truss element. P5 connects power and cooling lines, and serves as a spacer between the P4 photovoltaic module and P6 photovoltaic module. P6 will be joined to P5 during a later assembly mission. ■

[edmund.g.memi@boeing.com](mailto:edmund.g.memi@boeing.com)

# Diversity in design

## Boeing offers 2 of 5 development options in rotorcraft program

By MARC SKLAR

Boeing is offering two alternatives for assessment of future rotorcraft needs to support the U.S. Army's Joint Heavy Lift program

Experience in programs like the battle-tested and modernized CH-47 Chinook and the advanced V-22 Osprey give Boeing the ability to present the customer two concept designs: the Advanced Tandem Rotor Helicopter, and the Quad TiltRotor being developed by a Boeing/Bell Helicopter team. The ATRH concept has the outward appearance of the Chinook; the QTR concept looks like a V-22 with four tiltrotor engines—two engines forward and two aft.

"The maturity and knowledge we bring is unmatched," said Pat Donnelly, director of Advanced Rotorcraft Systems with Advanced Systems at Integrated Defense Systems. "They asked contenders to bid within three speed bands (low, medium and high). So Boeing offered up an Advanced Tandem Rotor Helicopter configuration for the low-speed band and, teamed with Bell Helicopter Textron, a Quad TiltRotor for the high-speed band."

The concepts are among five contracts for Conceptual Design and Analysis awarded by the Army's Aviation Applied Technology Directorate at Ft. Eustis, Va., in 2005. The Advanced Rotorcraft Systems team that won the contracts for Boeing was then part of Phantom Works. Now, the team is part of Advanced Systems in IDS.

"The customer gave us the missions in terms of payload and range and said, 'You

tell us what it needs,'" Donnelly said. "We think our concepts, including the variations from baselines we'll present, will offer the capabilities they want."

As the teams prepare for submittals in late 2006, *Boeing Frontiers* looks at these capabilities and how the Boeing teams are drawing on cross-company expertise to greatly enhance their designs.

### Advanced Tandem Rotor Helicopter

A quick glance at the ATRH will remind people of the workhorse CH-47 Chinook. But that would be deceiving. ATRH, in addition to being substantially larger than the Chinook, also will incorporate advances in aerodynamics, avionics, drive systems, rotor technology, materials, weapons systems, communications and networking.

### "The maturity and knowledge we bring is unmatched."

—Pat Donnelly, director of Advanced Rotorcraft Systems, on the two concept designs Boeing is proposing for the U.S. Army's Joint Heavy Lift program

"Overall, the tandem rotor is a very efficient lifter," said Bob Derham, ATRH program manager. "Some of the loads being considered are growing, and we can readily accommodate that. Also, we're incorporating advanced aerodynamic features that make us 40 to 50 percent faster than current helicopters."

The ATRH team also is applying Lean+ techniques to the development of the helicopter concept and to the processes that would be used to build it. "We're using the CATIA V.5 design system, which is a Boeing best-practice design tool," Derham said. "We're also tapping into C-17 team techniques in

Long Beach [Calif.] and getting help from teammates in Huntington Beach [Calif.] for the cargo-handling and operations analysis, and from Seattle engineers for some of their advanced landing gear designs."

To ensure the concept will truly be "joint"—work for more U.S. services than just the Army—the team also took a 1/72 scale model of the ATRH to the Shipboard Suitability Center of Excellence in St. Louis, which has the models of ships in the same scale.

"We proved [it] could move around on a Navy aircraft carrier or the latest, newest class of U.S. Navy amphibious assault ships," Derham said. "We looked at maintenance operations, moving around on deck and elevators, and what a typical flight profile would be like. This is unusual for a conceptual design but was very informative. By electronically shipping its design to a Boeing rapid-configuration facility in Mesa, Ariz., that used stereo lithography to build the models, the team was quickly able to get what it needed for the testing.

"Using great development tools, processes and teams from around Boeing, we've designed a concept we feel is the most affordable to deliver with the capabilities the customer is looking for," Derham added.

### Quad TiltRotor

Like its cousin the V-22, the Bell Boeing Quad TiltRotor can offer customers the best of both worlds.

"Our primary advantage is the capability to carry significant payload at high speed from unprepared fields," said Dave Poling, Boeing QTR program manager. "The payload is in the ballpark of a C-130 transport plane."

The QTR team, too, is drawing on the best of Boeing for its design. "We are looking at Lean+ as we design the airframe, and what we can get in avionics, electron-

## Meet the contenders

Here's a look at the two alternatives for assessment of future rotorcraft needs Boeing is offering the U.S. Army to support its Joint Heavy Lift helicopter program.

### Bell Boeing Quad TiltRotor

- Four-engine tiltrotor with large fuselage and rear loading ramp
- Ability to take off and land vertically and fly with turboprop speed
- Evolution of technology proven on the V-22 Osprey
- Represents Bell Boeing's proposal for the high-speed category of JHL—vehicles flying 250 knots (288 miles per hour or 463 kilometers per hour) or faster



BELL BOEING GRAPHIC

### Advanced Tandem Rotor Helicopter Concept

- Large tandem rotor helicopter with rear loading ramp
- Front and rear rotors spin in opposite direction
- Flies like traditional helicopter
- Proven, affordable capabilities enhanced by advanced avionics, systems and aerodynamics
- Represents Boeing's proposal for the lower-speed category of JHL—vehicles flying between 160 and 200 knots (184 and 230 miles per hour 296 and 370 kilometers per hour)



BELL BOEING GRAPHIC

ics, crew systems and human systems interfacing from within the company,” Poling said. “We’re particularly drawing from areas with leap-ahead technologies. Using Boeing resources, like the C-17 experts in cargo handling, is key to providing the capability and keeping our costs down.”

A Bell Helicopter–funded one-fifth-scale model of a QTR completed wind-tunnel testing at NASA’s Langley Research Center in Virginia this summer. The test objectives were to investigate the aeroelastic effects of the wake of the front rotor on the aft rotor

and wing of the aircraft, as well as how its overall structure responded to flight conditions. These tests, along with tests on individual components of the QTR, are being compared with results of similar V-22 tests to ensure performance is as expected.

“The QTR could speed the deployment, replenishment and removal of troops in ways that give the customer greater capabilities on the battlefield,” Poling said. “When we submit our study, we will show the advanced technologies that make this concept a realistic option.”

The final concept reports will be submitted in early 2007. Next will come a component technology demonstration that could include full-scale component testing and possibly subscale model testing.

“Our concepts are to help the customer make the decision on the value of speed and other capabilities and what they are willing to pay for those,” Donnelly said. “With the ATRH and the QTR, we’ll be in a position to compete whichever speed category they pick.” ■

*marc.a.skлар@boeing.com*

U.S. Air Force 1st Lt. Matt Woodfield “flies” an F-15C trainer at the Boeing-operated Mission Training Center at Langley Air Force Base, Va. Through work such as this, Boeing is a leader in Air Force Distributed Mission Operations initiatives.



BOB FERGUSON PHOTO

# Uniting the forces

## Boeing's work advances training initiatives with coalition partners

By STACEY RITTER

When the U.S. Air Force announced its vision for joint, full-combat-mission training capabilities for the F-15C in the mid-1990s, Boeing leveraged its extensive experience with networked training to deliver a Distributed Mission Operations solution.

DMO is a simulated training environment in which pilots use network-connected, high-fidelity trainers around the world to “fly” a mission. There’s no fuel burned, no ordnance

fired, and no wear and tear on the aircraft—meaning training costs are reduced. Pilots can fly over hostile “territory” without being put in harm’s way and can review their missions in a comprehensive debrief.

As a pacesetter in U.S. Air Force DMO initiatives, Boeing is applying this knowledge to programs for U.S. coalition teammates. Training trials recently began on a U.K. Ministry of Defence program that parallels DMO. This milestone represents Boeing’s latest achievement in defining, developing and deploying distributed, joint and coalition training solutions for military customers—a market where Boeing is a leader (see box on Page 47, bottom right).

### DEFINING REQUIREMENTS

The Ministry of Defence program

is known as the U.K. Mission Training through Distributed Simulation Capability Concept Demonstrator (U.K. MTDS CCD). This program is assisting the United Kingdom in defining its future distributed-mission training requirements. Boeing and QinetiQ, a United Kingdom-based defense-technology and security company, are leading Team ACTIVE, a group of contractors under a three-year contract to the MoD to provide the U.K. MTDS CCD.

To better understand these requirements, Team ACTIVE opened a demonstration facility in July within the Air Battlespace Training Center at RAF Waddington in the United Kingdom. The facility provides an extensive exercise-management center with computer-generated military forces, a role-playing capability, situational awareness and VIP viewing area; team-perfor-

## Inside Exercise Battle Buzzard

Exercise Battle Buzzard was the first training trial under the U.K. Mission Training through Distributed Simulation Capability Concept Demonstrator program. Trials began in October. The five-day event involved U.K.- and U.S.-based crews using simulators in their respective countries and “flying” in a common, simulated airspace against a common opposing force.

**Day 1:** System familiarization. Pilots became acclimated to their respective simulators and planning, briefing and debriefing facilities.

**Day 2:** Trial began in earnest. The mission: Provide air support for coalition ground forces. Coordination among the forward air controllers and U.S. and U.K. forces in adjacent geographic areas were key close-air-support training issues.

**Days 3 and 4:** F-16 and Tornado GR4 pilots flew close air support. The pilots rotated to a new geographic region each day, dealing with new targets and unanticipated threats.

**Day 5:** Additional complexity was added by increasing ground or air elements. Clearly, close coordination among ad hoc coalition teams was necessary for success.

The five days of training provided significant challenges for even the most experienced pilots and crucial practice in coordination of coalition forces.

mance assessment; forward-air controllers; distributed planning, briefing and debriefing; and Tornado aircraft air-to-ground mission training simulators.

Trials using front line aircrew began in October. The first, known as Exercise Battle Buzzard, was a five-day exercise involving U.K. trainees at RAF Waddington and U.S.-based crews at the Mesa, Ariz., Air Force Research Lab. Participants manned simulations in their respective countries but “flew” in a common, simulated airspace against a common opposing force (see box above).

“This trial was the first of seven events that will help define the requirements for any future U.K. MTDS program,” said Steve Monson, Boeing manager of MTDS CCD. “The trials will assist us in defining the training value for the participants, determining the right level of fidelity for the equipment used in team and collective training, and establishing a roadmap for persistent U.S. and U.K. coalition training.”

## MANY TRAINING OBJECTIVES

The trials linked four Tornado GR4 aircraft and two forward air controller training simulators at RAF Waddington with training simulators at the Mesa research lab for



At the F-15C Mission Training Center at Langley Air Force Base, Va., U.S. Air Force 1st Lt. Matt Woodfield (left) and Bob Johnson, an instructor for Boeing Aerospace Operations, sit at a brief/debrief station to review a training mission Woodfield conducted in a simulator.

four F-16s, two A-10s, an Airborne Warning and Control System aircraft and a Joint Tactical Air Controller. The mission: provide air support for coalition ground forces while maintaining air superiority and demonstrating the ability to respond to time-sensitive targets. Target designation was provided by both air and ground controllers. Training objectives included enhancing coordination among forward air controllers and between U.S. and U.K. forces.

“What our joint and coalition training and engineering research is doing is helping to identify what to train, how best to train, and how often various players need to connect in a DMO environment to prepare for actual operations,” said Winston “Wink” Bennett, senior scientist for Training Systems and Performance Assessment for the Warfighter Readiness Research Division at the Air Force Research Lab.

Not only is Boeing supporting training research initiatives through U.K. MTDS CCD, it also plays a significant role in the U.S., Canada, Australia and U.K. coalition mission training research being conducted at the U.S. Air Force Research Lab. In this role, Boeing, with other contractors, works in partnership with AFRL to provide coalition mission training support.

“As contractors, we support both the engineering work of connecting the simulators together and the behavioral research that measures the potential training effects of exercises where the participants are separated by such large distances,” said Sara Elizabeth Gehr, a Boeing Human Factors Design specialist on the Mesa team. “The knowledge gained from this research will help our warfighters to train as they fight—as a part of an international coalition team.” ■

*stacey.l.ritter@boeing.com*

## A track record in training

Boeing has leveraged its extensive experience with networked training to support the U.S. Air Force's expansion of its Distributed Mission Operations initiatives. The company also has worked with military customers worldwide to support similar programs. Here are some of the DMO programs Boeing supports.

- Boeing has delivered and currently operates F-15C DMO Mission Training Centers (MTCs) for the U.S. Air Force at Eglin, Langley and Elmendorf Air Force bases, Kadena Air Base in Japan and at the air base Royal Air Force Lakenheath in the United Kingdom.
- Boeing is the prime contractor for the Air Force's F-15E MTC contract. The company is responsible for the design, development, construction and integration of MTCs at Mountain Home, Elmendorf and Seymour Johnson Air Force bases, and at RAF Lakenheath. First deliveries are expected in early 2007.
- As a provider of major components for the Air Force's F-16 MTCs, Boeing delivers DMO-capable systems for the Royal Saudi Air Force and the Finnish Air Force. It also builds similar DMO components for Apache Longbow aircrew trainers for the United Kingdom.



# Keep the fuel flowing

RON BOOKOUT PHOTO

## IDS' Support Systems keeps tankers in service for generations to come

By KATHERINE SOPRANOS

**D**oyle Somers personally can attest that a Boeing tanker is built for longevity.

"The last person to fly the KC-135 hasn't even been born yet," said Somers, who has more than 30 years' experience with the KC-135 Stratotanker, including 22 years in the U.S. Air Force.

Somers is among the many Support Systems employees in Integrated Defense Systems who are proud to be a part of Boeing's tanker program, which includes the KC-135, KC-10 and the KC-767. Recent program milestones, including the KC-135's

50th anniversary and the KC-10's 25th anniversary, reinforce Boeing's unrivaled position in the tanker market, as well as the critical role Support Systems plays in keeping tanker aircraft flying and relevant.

**"I get emotional when I see this airplane."**

—Doyle Somers of KC-135 Support Systems

"Boeing is the tanker company. We're very proud that our predecessors were responsible for developing the KC-135 and KC-10 and turning them into the potent force-extension capabilities that they are today," said Tony Robertson, vice president of Support Systems Maintenance, Modifications and Upgrades. "Our focus is on

**The world's military forces mainly use Boeing's KC-135 (foreground) and KC-10 tankers. Boeing offers tanker customers a full spectrum of cost-effective support services for mission readiness and aircraft sustainment.**

moving forward with the advanced technologies required to make tomorrow's tankers even more relevant and ready for the network-centric integrated military environment. This reduces risk for the customer and gives them significantly increased air-power advantage."

Tanker aircraft require maintenance, repairs, upgrades and testing for mission readiness and aircraft sustainment. Amid shrinking defense budgets, air force customers worldwide are seeking more economical ways to keep their tankers performing missions successfully and safely.

Support Systems, one of IDS' three





During a recent flight test, a Boeing KC-767 Tanker extends its fifth-generation, fly-by-wire boom telescoping tube as an F-15 follows in near-receiver position.

BUZZ SHADY PHOTO

business centers, supplies those solutions. Boeing offers a full spectrum of cost-effective services that help drive down support and maintenance costs while extending a fleet's life span and delivering higher performance reliability. These range from maintenance, emergency repairs, upgrades and avionics modifications to integrated performance-based logistics, supply-chain management and air-crew training.

### KC-10: SUPPORTING A NETWORK-CENTRIC FUTURE

The world's military air forces mainly use Boeing's KC-135 and KC-10 tankers, with Boeing responsible for nearly 2,000 new tankers or tanker conversions over the years. Boeing has delivered more than 99 percent of the boom-equipped tankers ever made.

The KC-10 Extender continues to be a key component to militaries' operations.

"It's a testament to the design of our original KC-10s that 25 years later these aircraft are still supporting our warfighters in the field today," said Mike Wright, Boeing's KC-10 program manager.

Boeing's KC-10 support services include depot maintenance, modifications, air crew training and inventory management. Boeing provides contractor-operated main base supply support for McGuire Air Force Base, N.J., and Travis Air Force Base, Calif. This includes issuing parts to the users and depot facilities and maintaining all ground support equipment. Another customer is the Royal Netherlands Air Force, for the KDC-10. Boeing also maintains supply locations in

Germany, Japan and the Netherlands.

Ongoing modifications include communications, navigation and surveillance equipment to meet future civil air-traffic-control needs. The next major upgrade will be the KC-10A Aircraft Modernization Program, with initial production slated to begin in 2011. Updates will position the KC-10A Extender for global network-centric operations and enhanced survivability.

### KC-135: FUELING THE FUTURE

Although it turned 50 in August, the KC-135 still has its eye on the future. A total of 820 KC-135s and its variants were produced between 1956 and 1966. Of the 530 in service today, many are expected to be flying for another 35 years through modernization and upgrades.

"Boeing employees can be proud of their accomplishments in keeping this aircraft ready, sustainable and modern," said Ben Robinson, KC-135 program director. "We're evaluating challenges and developing solutions on how to keep this aircraft healthy for another 35-plus years."

After five decades, the KC-135 fleet still supports most of the U.S. Air Force's and U.S. Navy's air-refueling needs. The Air Force today has KC-135 tankers assigned to

**Doyle Somers (left) of KC-135 Support Systems works with Pat Donahay, Functional Systems Integrity Program co-chair of the U.S. Air Force—135 Program Office, at Tinker Air Force Base, Okla.**



PHOTO COURTESY OF U.S. AIR FORCE. PHOTOGRAPHER RON MULLAN



BOB FERGUSON PHOTO

## KC-10 support gets Lean

Mike Wright, KC-10 program director, explains to *Boeing Frontiers* recent and planned Support Systems improvements on the KC-10 and how they benefit the customer.

### Q: What are some Lean practices and achievements on the KC-10?

**A:** We have begun our Lean journey on the KC-10. Our first success was on the KC-10 Thrust Reverser modification, which garnered \$3.4 million in additional savings to the program while sustaining a 100 percent on-time delivery rate and zero customer-reported major defects. We also increased the annual aircraft modification rate from nine aircraft per year to the customer's request of 39 per year. Through employee involvement and Lean initiatives, the modification team accomplished this monumental task.

### Q: What's the next goal?

**A:** Our next goal is to apply Lean to our "C" check program—the depot maintenance work on the KC-10—which will cut flow days by 25 percent and provide the customer with a lower cost and increased aircraft availability. Our plan is to reduce the cycle time still further through additional Lean manufacturing improvements. We're also deploying Lean across the program to become more paperless, reduce cost and customer price, improve customer fleet-performance visibility and increase customer aircraft availability.

### Q: How do you address the challenge of rising maintenance costs on an aging tanker fleet?

**A:** We have product support specialists who focus on key cost and mission capability drivers and then work across Boeing and the supplier base to provide innovative solutions. In addition, we are applying Lean+ [one of four Boeing companywide growth and productivity initiatives] to eliminate waste and reduce costs while increasing quality and aircraft availability. We also are deploying a common information system across the program to more quickly identify opportunities for improvement.

—Katherine Sopranos

## KC-767: UNMATCHED TANKER EXPERIENCE

Boeing, along with its supplier-partners, is revolutionizing aerial refueling with the KC-767, the world's most advanced tanker. Built on proven technologies from the KC-10, the KC-767 will transform aerial refueling operations from manual to fly-by-wire with new, state-of-the-art capabilities, upgraded capabilities and network-centric operations. Boeing currently is under contract for four KC-767s for the Italian Air Force and four tankers for the Japan Air Self Defense Force. The first tanker for Italy currently is in flight test in Wichita.

"Our focus is to achieve the optimal blend of mission readiness and affordability," said Jeff Homsher, head of IDS Life Cycle Customer Support. "We achieve this goal by leveraging the experience and tools of our Boeing Commercial Airplanes teammates and airline partners as well as the vast experience supporting U.S. Air Force mobility aircraft for more than 50 years."

How will Boeing's deep history in the tanker business translate to world-class support for the KC-767?

"We have the benefit of building upon our KC-135 and KC-10 support experience, as well as our experience in supporting commercial 767 airplanes," said Mark Fruits, deputy for 767 Tanker Integrated Support Systems. Currently, Boeing's airline partners achieve a dispatch rate exceeding 98 percent on more than 900 commercial 767 airplanes, he said.

"When combined with our commitment and experience in depot partnering, Boeing is truly uniquely qualified to provide the optimal support solution," Fruits said.

Across all Boeing tanker programs, Support Systems collaborates with one primary focus in mind—mission readiness for the customer. For Somers, it's not only about work, it's also personal. "The KC-135 is a national asset," he said. "I get emotional when I see this airplane." Built to last, the airplane may evoke this feeling from people for decades to come. ■

*katherine.sopranos@boeing.com*

Boeing will use an Airborne Warning and Control System aircraft to measure and quantify the effectiveness of network-centric capabilities in battle management and command control functions.



BOEING PHOTO

### What's network-centric warfare?

Network-centric warfare is an emerging theory of war—pioneered by the U.S. Department of Defense—that seeks to translate an information advantage into a competitive warfighting advantage through the robust networking of well-informed, geographically dispersed forces.

This networking combines information technology with a robust network for increased information sharing, collaboration and shared situational awareness. This theoretically allows greater self-synchronization, speed of command and mission effectiveness. The theory has four basic tenets:

- A robustly networked force improves information sharing.
- Information sharing enhances the quality of information and shared situational awareness.
- Shared situational awareness enables collaboration and self-synchronization, and enhances sustainability and speed of command.
- These, in turn, dramatically increase mission effectiveness.

# 'We'll have the data'

## Boeing to analyze network-centric ops mission effectiveness for U.S. Air Force

By DAVE SLOAN

The U.S. Defense Department says network-centric warfare will become the backbone for future military operations. But if you're a potential customer for these high-tech capabilities, which ones do you choose? And in a tight budget environment, which ones give you the most bang for your buck?

Boeing will help the U.S. Air Force answer those questions. The company has signed a two-year Cooperative Research And Development Agreement with Electronic Systems Center, Hanscom Air Force Base, Mass., and the Air Force Research Lab Information Directorate. The CRADA will measure and quantify the military effectiveness of network-centric capabili-

ties in performing battle management and command control functions, utilizing an Airborne Warning and Control System (AWACS) platform.

"We're saying to the Air Force, 'you can spend your money here instead of there and be more effective, and we'll have the data to back it up,'" said Kevin Jones, manager of new capabilities development, Boeing Airborne Warning Systems.

Modeling and simulation tools will be used to evaluate the application of these capabilities while executing a variety of missions involving multiple platforms. The goal is to determine which mix of systems and capabilities improves a specific mission and how much improvement is possible.

Paul Metcalf, AWACS systems engineer, said Boeing will be looking at time-critical targets such as a mobile rocket launcher or an enemy on the run: "Mission effectiveness will be determined by measuring whether the number of successful target engagements increases during a given time period or whether the time to successfully engage a given number of targets decreases."

The Air Force and the Pentagon will continue to expand the use of applications that

enhance net-centric operations, Jones said. There's a stated goal that all Air Force systems be net-centric-capable by 2013.

"One of the challenges, for example, is what information will be sent from an AWACS to a fighter jet or to a ground station? Who is going to use that information, and how does the use of that information benefit the mission you're trying to accomplish?" said Jones, noting he hasn't seen any focused effort to address that problem until now.

The Air Force is working closely with Boeing in providing the architecture for the networks and the types of assets in the network. Boeing also is talking to the operators who actually fly the missions.

This cooperative research approach could be expanded to other programs on the Pentagon's modernization roadmap, including the Airborne Maritime Fixed Joint Tactical Radio System.

Boeing hopes this effort will show the U.S. government where to concentrate funding for upgrades most effectively and at the same time guide the company's independent research and development toward optimal solutions. ■

*david.a.sloan@boeing.com*

# Spelling success with ‘EI’

## Getting employees involved pays off in San Antonio

By JARROD BARTLETT

For the first time in his career, Eddie Soto goes to work each day feeling like an important member of a team. Soto works at Boeing’s Support Systems facility in San Antonio on the KC-135 program depot maintenance line. Employee Involvement gives him a stake in his team’s success, he said.

“This is the first place I’ve worked where management gets involved with the workers, and we’re pretty much on a first-name basis,” Soto said.

Soto, apparently, is not alone in feeling empowered to make a difference. Employee Involvement has helped the Boeing San Antonio facility dramatically improve performance.

Almost all workers in San Antonio—96 percent—are on EI teams. Moreover, they are making their mark. For instance, three of the four EI teams in the Support Systems organization of Integrated Defense Systems that have reached the highest level of maturity, stage four, are in San Antonio.

Those numbers are producing remarkable results. EI is credited with helping get programs at San Antonio back on track: the KC-135 Global Air Traffic Management program, the KC-10 thrust reverser modification, and the KC-135 program depot maintenance line.

Since EI teams were formed, the Global Air Traffic Management line has experienced a 45 percent reduction in hours to complete an aircraft; on the KC-10 TR, modification deliveries have tripled; and on the KC-135 program depot maintenance line, aircraft once delivered in 400 days can now be done in 153 days.

“It starts with (site) leadership,” said Mark Haupt, San Antonio’s EI manager. “They have to buy into it. They’ve got to encourage it. They can’t pay attention to it

one day a week, one hour a day. It’s a continual culture shift.”

In the old culture, management completely controlled processes and the implementation of new ideas. The EI culture has teams of employees, who know their processes best, suggesting and implementing changes that directly benefit their work flow. Loren Bedore, manager of Lean, Employee Involvement and Operations support in San Antonio, credited leadership with creating the culture of change.

“Our key to success in San Antonio is we have the right leadership in place and the right culture for change; and we have set up an infrastructure to deploy the training to the employees,” Bedore said.

San Antonio leaders believe in the EI culture. “My role is to aggressively support EI from a leadership perspective and to coach site leadership to follow my lead,” said Tim Coyle, vice president and general manager of Operations, Supplier Management and Procurement, and Quality.

“I have to be the biggest cheerleader I can possibly be for Employee Involvement success,” said Dennis Stuart, San Antonio site general manager

Stuart attends daily “boardwalks” in the office and on aircraft, where teams present job status. Site leaders also host a monthly business review where three to four selected teams report their latest breakthroughs and accomplishments to leadership. Soto’s team recently presented to the business review; he said the event is a perfect way to bridge the gap between the flight line and executive office.

“Us being on the ramp and management being in the office puts a natural barrier between us,” Soto said. “Presenting to leadership brings us together in one room. We’re all on the same level. It feels great to talk to our program managers, call them by name, and that they remember our names as well.” ■

[jarrod.s.bartlett@boeing.com](mailto:jarrod.s.bartlett@boeing.com)



RON BOOKOUT PHOTO

**C-17 Employee Involvement team leader David Soriano (pink shirt) briefs San Antonio site leader Dennis Stuart (white shirt) and others during a recent EI team “boardwalk.”**



Combat Survivor Evader Locator program teammates Steve Lew (clockwise from left), Mike Bates and Mike Alexander discuss a matter relating to the CSEL radio. Boeing recently delivered the 10,000th CSEL radio to the U.S. Air Force.

CSEL is the first military end-to-end system that provides multisatellite, over-the-horizon communications and the latest-generation military GPS module in a small, lightweight hand-held unit. The system provides line-of-sight recovery forces and over-the-horizon joint search-and-rescue centers with two-way, secure data communications capability. That allows rescue forces to authenticate and communicate with isolated personnel in near real time, anywhere in the world. “CSEL literally takes the search out of a search-and-rescue mission,” Bates said.

Demand for CSEL—which is performing very well in the field—remains strong, with the Joint Services having ordered 16,272 units as of September. Demand was fueled even more when U.S. Central Command, which oversees military operations in the Persian Gulf region, authorized CSEL for use in Afghanistan and Operation Iraqi Freedom. Total orders could eventually exceed 40,000 radios.

Boeing developed CSEL in response to the U.S. Air Force’s request in 1995 for the industry to develop technology that would decrease the amount of time it took to safely locate and rescue personnel in hostile territory (see Page 42 of the September 2005 *Boeing Frontiers*). Six members of the team that started on the Boeing CSEL contract in 1996 are still working for the program—including Steve Lew, a software engineer and Team Lead for the Ground Segment. “CSEL is designed to save the lives of pilots, and that’s very rewarding. I’m proud that we got it into the field and it’s being used on a daily basis,” Lew said.

Mike Alexander, a Lead Systems Engineer, was also a member of the original contract team. “CSEL makes a big difference to the rescue forces,” he said. “They know exactly where to go to rescue people. And they can also communicate that they’re coming at a certain time, so the downed pilot is ready.”

With Boeing’s CSEL team currently working on its second full-rate-production order, there will be more of the hand-held radios in the field. But, in the eyes of many warfighters, there still aren’t enough to meet their needs. “Demand for CSEL is huge,” Alexander said. “And they want it out there as fast as they can get it.” ■

*jerry.a.drelling@boeing.com*

# No search, all rescue

Boeing delivers 10,000th CSEL communications radio to U.S. Air Force

By JERRY DRELLING

For many U.S. warfighters serving in Iraq and Afghanistan, being lost or isolated in hostile regions is less of a concern—if they’re carrying Boeing’s Combat Survivor Evader Locator, a sophis-

ticated combat search-and-rescue communications system developed by employees in Anaheim, Calif.

Boeing in October delivered the 10,000th CSEL radio to the U.S. Air Force customer. Col. Leslie A. Blackham, commander of the Air Force’s 753rd Electronics Systems Group, accepted the milestone radio at a ceremony in Palmdale, Calif., where the CSEL units are assembled and tested.

“We know what CSEL means to the warfighters who depend on it,” said CSEL program manager Michael Bates.

# Building the future today

The Geostationary Operational Environmental Satellite-P spacecraft being built by Space and Intelligence Systems is the third in a series of Geostationary Operational Environmental Satellites. The GOES satellites are advanced multimission weather and Earth-observation satellites for the National Oceanic and Atmospheric Administration and NASA. GOES-P is scheduled to launch in 2008.

BOB FERGUSON PHOTO

# Network and Space Systems, an IDS business, is working to create a network-enabled information age

By DAVID SIDMAN

There's no road map to designing and building the future. But that is precisely the task ahead for IDS' Network and Space Systems business.

"We see ourselves at the beginning of a new network-enabled information age, just as almost 100 years ago we were at the beginning of this aerospace age," said Roger Krone, N&SS president. "It's a road of discovery for all of us."

N&SS has a broad portfolio of developmental programs, including space exploration, complex communications programs, missile defense, and satellite and intelligence programs. They may take years to develop, but their value might only be measured, for example, in the seconds it takes for an encrypted message to be delivered or a missile to be intercepted.

N&SS programs are "game changers" for just about everyone: the warfighter, the astronaut, the intelligence community, the average citizen—and Boeing employees. With important needs emerging quickly in these areas, Boeing has the opportunity to define the future of this industry segment—just as it has done in others—by working to create solutions that generate the most value for the company's customers. "One of the exciting things about this business," Krone said, "is that the chapter hasn't been written yet. We're writing that chapter and creating that future."

Here's a snapshot of the Network and Space Systems business.

## Reliable, secure communication: Command, Control and Communications Networks

The word "radio" brings to mind an image of an AM/FM receiver in the car or maybe what the military uses to communicate—listening to music and talking to a person being the extent of radio's capabilities.

Now imagine a radio that can do more: It can carry voice, but can also transmit data and video. It has Internet-like capabilities. It's secure, it's wireless, and it can adapt to the environment it's transmitting in, hostile or friendly. That's the combat radio of the future, and it's being developed by Command, Control and Communications Networks. C3 Networks is home to transformational communications and command and control development, including the Joint Tactical Radio System Ground Mobile Radios program.

JTRS GMR is one of C3 Networks' key programs, and it solves an important problem for the U.S. Army: how to connect its warfighters who use different legacy radios. "Right now, we have a soldier out in the field with one type of radio and he can't talk to someone who has a different type of radio because they're different frequencies," said Henry Gomez, a system integration engineer for JTRS GMR.

JTRS GMR solves that problem because it's a software-based radio; the software enables the radio to understand different radio signals. Using JTRS GMR, warfighters will be able to transmit and receive communications with multiple legacy radios used at the other end of the transmission link.

The JTRS GMR system involves complex software integration with millions of lines of code, much like the system it's going to be a part of: the Future Combat Systems program.

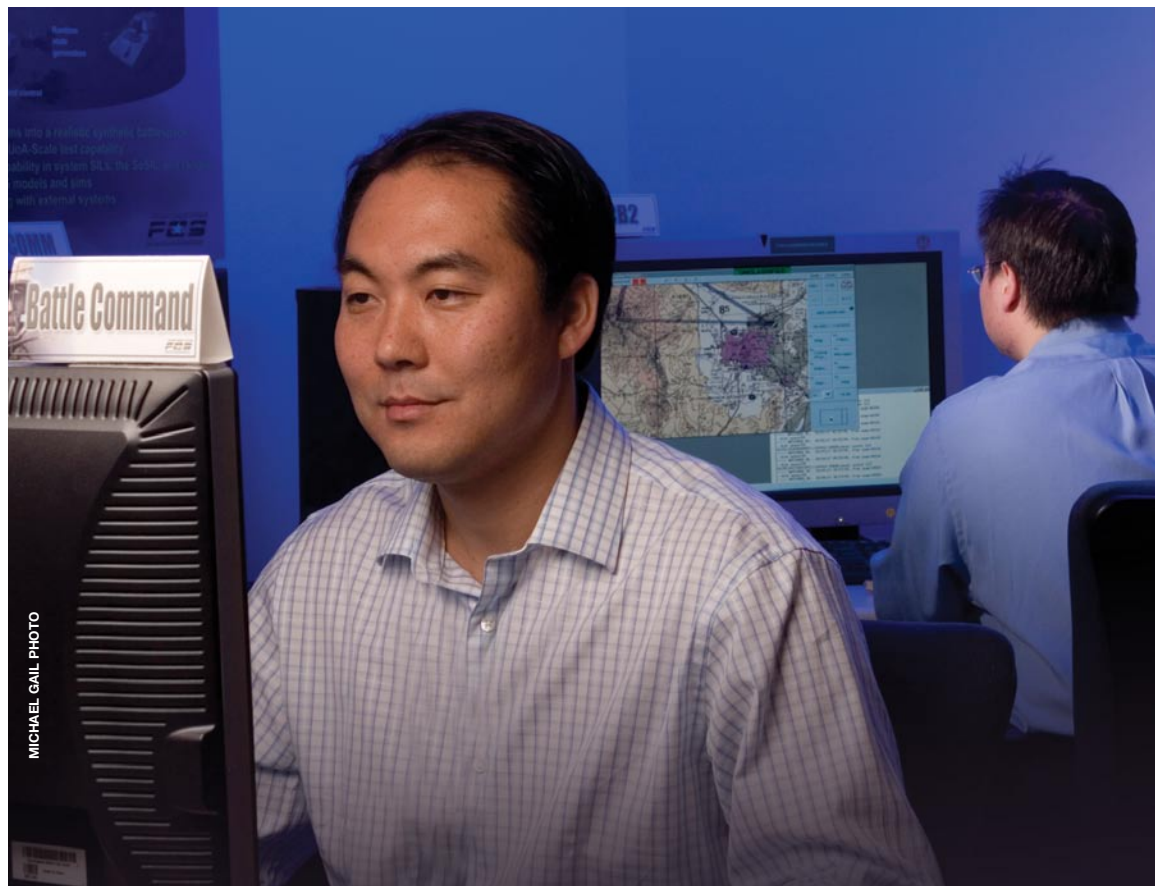
## Increased lethality and survivability: Combat Systems

The Combat Systems division of N&SS is home to the U.S. Army's key modernization program, Future Combat Systems. This networked fighting force of the future will give each soldier access to unparalleled situational awareness—as well as new technology to defeat the enemy faster.

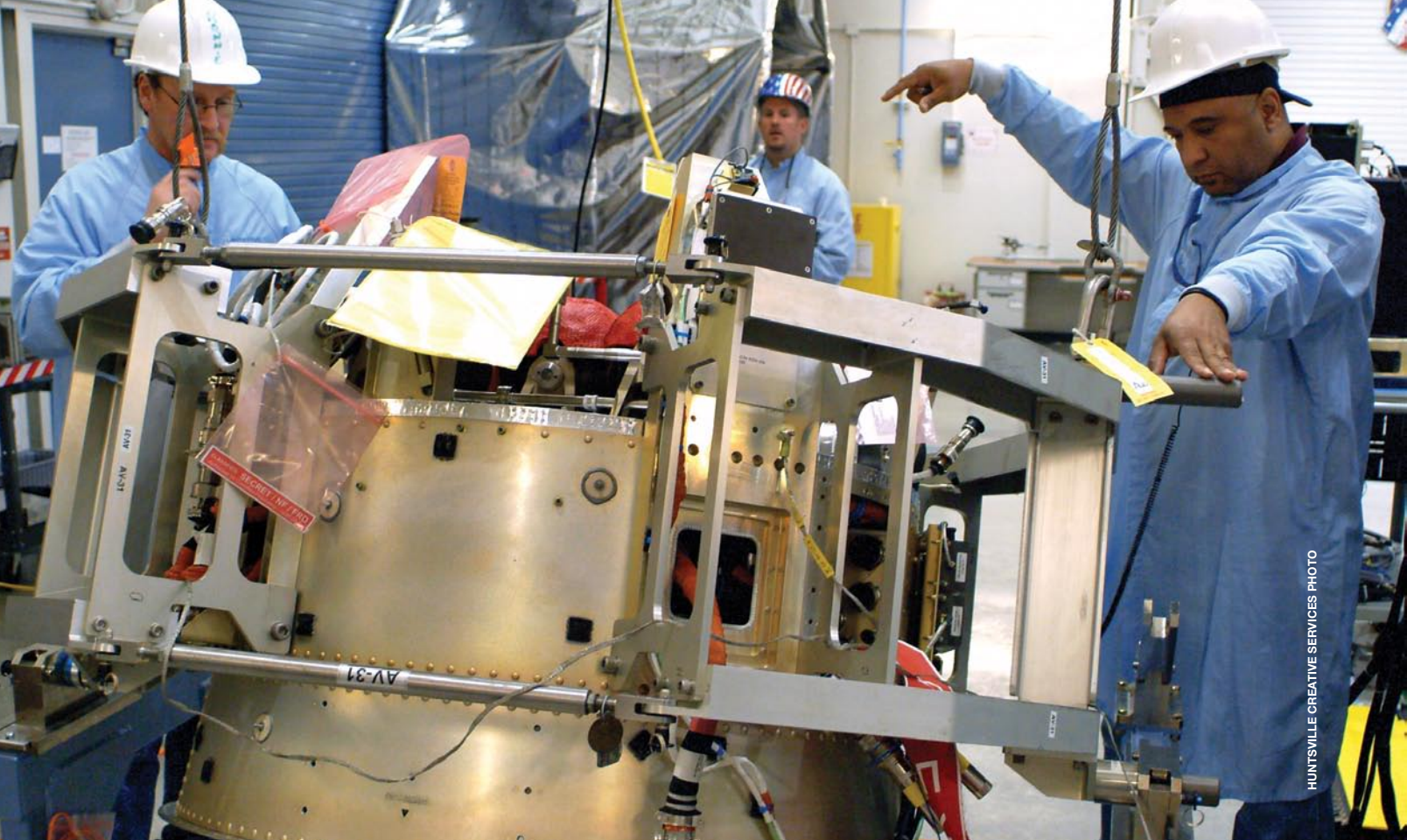
Boeing, as lead systems integrator for FCS, is working alongside Army experts and more than 600 partners and suppliers across the United States. Together, the FCS "One Team" is build-

---

Sun Kim (foreground) and Jimmy Liu, software engineers on Future Combat Systems, work at the Software Integration & Test lab in the Systems Integration Lab at Huntington Beach, Calif. "I'm very excited and proud I'm working on a system that will help save soldiers' lives," Kim said.



MICHAEL GAIL PHOTO



HUNTSVILLE CREATIVE SERVICES PHOTO

In Huntsville, Ala., Ronnie Hornsby (left) and Nick Antoine (right) install the Booster Avionics Module into a stand as Johnny McCutcheon controls the crane. Their work supports the Ground-based Midcourse Defense system.

# The people behind the network

It takes a network of people to create a network-enabled information age. Below and on Pages 57 and 59 are profiles of some teammates.



KEVIN GILLINDYNE PHOTO

**Name:** Elizabeth Boyd  
**Title:** Systems engineer  
**Worksite:** Kennedy Space Center, Fla.  
**Years with Boeing:** 8  
**Role at work:** Mechanical engineering, Payload Canister/Transporter Operations  
**Why are you excited about the work you do?** "Processing flight hardware is not an ordinary job. Every day is different and challenging. And it's exciting meeting these challenges and seeing how it applies to the big picture: space exploration!"

ing and integrating a system of systems that includes unmanned air platforms and both manned and unmanned ground maneuver, maneuver support and sustainment systems. Each piece of the system—sensors, munitions, unmanned air vehicles, ground vehicles, robotics, and a battle command system, to name just a few—are all tied together by a common software system with one goal in mind: to support the soldier. "Sometimes you have to wait for your computer to respond, or you have to reboot when you're having problems," said Mike Ernst, chief engineer, FCS Spin Out. "We're doing more so that FCS runs real-time all the time. When that soldier presses a screen, there can't be a delay. Our systems can't ever fail."

FCS networked technology will save lives when deployed—much like the networked technology of Boeing's missile-defense programs.

## Detect, track and destroy: Missile Defense Systems

There are no second chances when trying to intercept an incoming ballistic missile. That's the reality for employees at Boeing Missile Defense Systems. Their mission is to develop and deploy defensive solutions to protect the United States, its military and its allies against ballistic missile threats—and to ensure that those defenses work perfectly when they're needed.

Building a layered missile defense system that protects against the three phases of missile threat—boost, midcourse and terminal—is no easy feat, given the speed of missiles and the vast distance they travel. The level of precision involved requires "smart"



missile interceptors or lasers whose guidance systems are tied into a network that's continually receiving and transmitting information about possible threats.

The Airborne Laser, Ground-based Midcourse Defense system and Patriot Advanced Capability-3 Missile seeker are three MDS programs designed to provide that layered defense. The ABL will protect against missiles in the boost, or launch, phase. GMD protects against missiles in midcourse, the longest phase of missile flight. And PAC-3 protects against missiles that are terminal, or falling towards their target.

"There's a lot of space out there that we have to analyze for targets, and then react to a target versus a decoy," said Anthony Lanting, an electronics technician who works on the Ground-based Midcourse Defense program. "It requires an absolute degree of accuracy."

**A ride into space: Government and commercial launches**

Because space is critical to the success of the network, *assured* access to space is required. That is what United Launch Alliance will provide. A 50-50 joint venture between Boeing and Lockheed Martin, ULA combines Boeing's Delta II and Delta IV launch vehicles with Lockheed Martin's Atlas launch vehicle in order to provide the U.S. government with superior mission assurance at an affordable cost. The ULA transaction was completed on Dec. 1.

The majority of employees in the former N&SS division of Launch Systems are now employees of ULA. Boeing will still have commercial launch capabilities, however, which will be part of the C3 Networks division. Whether the launch is for ULA or a commercial customer of Boeing's, the Delta family of rockets has a proven track record dating back to 1960 of boosting government, commercial and civil payloads into orbit.

**Pushing the boundaries of space: Space Exploration**

Astronaut Michael Collins once said, "It's human nature to stretch, to go, to see, to understand. Exploration is not a choice, really; it's an imperative." Collins bravely lived his words as an astronaut aboard Gemini X and Apollo 11 during the 1960s. That was the beginning of the Space Age, and Boeing has continued to support NASA since then. "One of Boeing's key competitive advantages is knowing firsthand the requirements for safe human space flight," said Cheryl Britt, program manager for Space Exploration's Transformation and Integration organization.

Space Exploration is in a state of transformation as it continues to support the legacy programs of Space Shuttle and the International Space Station—while gearing up for the Vision for Space Exploration, which calls for manned spaceflight back to the moon, Mars and beyond. NASA's Constellation program, which will accomplish that mission, includes Orion (Crew Exploration Vehicle), Ares 1 (launch vehicle), robotic space systems, and lunar landers and habitat infrastructure.

"Our legacy programs are all about sustaining low-Earth orbit. The Vision for Space Exploration is really about pushing out beyond and extending humanity's presence," said John McCann, a Space Exploration systems engineer working Constellation pursuits.

Extending humanity's presence also extends the network in space, where spacecraft built by Space and Intelligence Systems provide a crucial cornerstone for the Network and Space Systems business.

**Communicating and understanding information: Space and Intelligence Systems**

Television. Navigation systems in cars. Weather forecasts. They all depend on satellites that orbit the Earth. Instead of just relaying information from space, though, Space and Intelligence Systems



THOM GOEBTEL PHOTO

**Name:** Andy Murphy

**Title:** Project engineer

**Worksite:** Springfield, Va.

**Years at Boeing:** 21

**Role at work:** Geospatial project engineer for Space & Intelligence Systems' Mission Systems

**Best part of the job:** "There are no cookbooks here. We work from scratch, creating tools that make a difference and support men and women in the field. Never in my wildest dreams did I ever imagine I would be working in intelligence."



SALVADOR SANCHEZ PHOTO

**Name:** Brian Wismer

**Title:** Senior systems engineer

**Worksite:** Anaheim, Calif.

**Years with Boeing:** 25

**Role at work:** Family of Advanced Beyond line-of-sight Terminals System Requirements & Analysis Lead Engineer

**Why are you excited about the work you do?** "I have been involved on the FAB-T Program since its inception. To see something be developed from an initial concept to working hardware and software has been very exciting for me."

**Most memorable work experience at Boeing:** "I was part of the capture team working long hours for months in an attempt to beat the incumbent contractor for [FAB-T]. We finally arrived at the day the announcement would be made and sat with anticipation in one of the conference rooms waiting for the result. When it was announced we won, the joy (and high fives that followed) was one of the most memorable moments of my career at Boeing."



TOMI RULLE PHOTO

**Name:** Nancy Millman

**Title:** International contracts and pricing, Combat Systems

**Worksite:** St. Louis

**Years at Boeing:** 16

**Role at work:** Participate in capturing new international business for Combat Systems

**Most memorable work experience at Boeing:** "While in IDS International Contracts and Pricing, I was a member of the UK Chinook Through Life Customer Support capture team that recently won

the Atlas Achievement Award. I was a part of the team for about half of the five years of negotiation. The award recognizes teams with exemplary performance based on several criteria."

**Daily philosophy:** "Be thankful for family and friends—including the four-legged kind. Be open and honest in all aspects of life and enjoy the work you do."

## N&SS: What's in it for us?

Network and Space Systems is about combining the physical network—things you can see, such as a radio, a satellite or even a soldier—with anytime-anywhere communications. The result of the combination is to turn raw information into actionable intelligence. Here are a few of the network-centric programs of N&SS which, ultimately, help everyone.

**For the warfighter:** Enhanced capabilities for conducting urban warfare. Fighting enemy forces and gathering surveillance information in a hostile urban environment present many challenges. When Future Combat Systems introduces its first round of technology to the current force in 2008, part of that rollout will include new unattended ground sensors that will enhance the soldier's situational awareness and improve perimeter defense, surveillance and target-acquisition capabilities.



**For the cell phone user:** Uninterrupted mobile phone transmission. As you move, cell phone signals hop between cell phone towers, when they're nearby. The Mobile Satellite Ventures program's satellites and ground systems will create the world's first commercial mobile satellite service that will use both space and terrestrial elements. Combining the best of satellite and cellular technology, MSV will deliver reliable voice and data coverage across North America starting in 2010.



**For weather forecasters:** Accurate prediction and tracking of severe weather. Thanks to this year's successful launch of the Boeing-built Geostationary Operational Environmental Satellite—N aboard a Delta IV rocket, scientists will be able to more accurately monitor conditions that trigger dangerous weather. The satellite will not only serve the United States by continuously observing and measuring meteorological phenomena in real time across the Americas and their surrounding oceans, but also will serve the world by transmitting vast amounts of observational data.

lite will not only serve the United States by continuously observing and measuring meteorological phenomena in real time across the Americas and their surrounding oceans, but also will serve the world by transmitting vast amounts of observational data.



**For the intelligence analyst:** Data and imagery collection and exploitation. Information is critical for the intelligence community, and that's what Space and Intelligence Systems' Mission Systems specializes in. With the U.S. National Geospatial-Intelligence Agency and

the National Security Agency as its largest customers, Mission Systems specializes in imagery production and manipulation. Combined with its data production, analysis and dissemination expertise, Mission Systems provides end-to-end IT solutions for this important customer base.

**For the U.S. homeland:** Missile defense. The Airborne Laser and the Ground-based Midcourse Defense system are two key components of U.S. defense. ABL is a modified Boeing 747-400F aircraft that will be equipped with a precise, high-energy laser capable of destroying ballistic missiles in the boost phase of flight. GMD is the first missile defense program deployed operationally to defend against ballistic missile attacks.

**For humanity:** Manned and unmanned space exploration. Spirit and Opportunity, the two rovers rambling across Mars, have transmitted amazing pictures and significant amounts of data to Earth. Launched aboard separate Delta II rockets in 2003, each rover is powered by solar cells built by Boeing subsidiary Spectrolab. Their success is the foundation for human missions to Mars and Boeing's Constellation program efforts. The Constellation program supports NASA's implementation of a sustained and affordable human and robotic exploration program as part of the U.S. Vision for Space Exploration.



NASA PHOTO

**Space Shuttle *Discovery* launches from Kennedy Space Center, Fla., in July at the start of mission STS-121. *Discovery's* next mission, STS-116, is slated for December and marks the 20th mission to the International Space Station.**

combines those space-based communications assets with the capability to analyze large amounts of data. S&IS builds commercial and military satellites, which deliver data to Earth, and then uses data collection and analysis capabilities to provide services for the intelligence community.

Looking forward, S&IS will continue to blend its satellite and information businesses. For a look at that future, consider a successful S&IS simulation that highlighted the Global War on Terror's key dilemma: how to find and track people considered a threat to security.

For the first time, signal intelligence receivers proved they could automatically identify the target—a mock terrorist—and trigger airborne surveillance assets to track the target on the ground, while capturing full-motion imagery and broadcasting it instantly to analysts several hundred miles away. Boeing used a mobile mesh-net satellite communications network to broadcast live video and command and control information from two different unmanned aircraft systems simultaneously to the East and West coasts.

Dan Jones, director of the Advanced Information Systems unit of Boeing Space and Intelligence Systems, said: "Our ability to creatively integrate technology from Boeing, our customers and our valued partners provides near-term focused capabilities that make the promise of network-centric operations real." ■

*david.sidman@boeing.com*

# N&SS at a glance

**President:** Roger Krone

**Employees:** 23,600

**Headquarters:** Crystal City, Va.

**U.S. states with major locations:** California, Missouri, Alabama, Texas, Florida, Virginia



BOEING PHOTO

## Missile Defense Systems

Vice president and general manager: Pat Shanahan

**Key programs:** Ground-based Midcourse Defense; Airborne Laser (left); Arrow; Advanced Tactical Laser; Avenger; Patriot Advanced Capability-3 Missile seeker



BOB FERGLUSON PHOTO

## Command, Control and Communications Networks

Vice president and general manager: Rick Bailly

**Key programs:** Joint Tactical Radio System Ground Mobile Radios (left); Airborne and Maritime/Fixed Station Joint Tactical Radio System; Boeing Launch Services; Family of Advanced Beyond line-of-sight Terminals; ICBM Systems; Combat Survivor Evader Locator; Integrated Shipboard Systems; Integrated Command & Control; Vigilare and High Frequency Modernisation Project (Boeing Australia Ltd.)



NASA PHOTO

## Space Exploration

Vice president and general manager: Brewster Shaw

**Key programs:** Space Shuttle; International Space Station; Checkout, Assembly and Payload Processing Services; Constellation program



BOEING GRAPHIC

## Combat Systems

Vice president and general manager: Dennis Muilenburg

**Key programs:** Future Combat Systems, British Army's Future Rapid Effects System



BOEING PHOTO

## Space and Intelligence Systems

Vice president and general manager: Howard Chambers

**Key programs:** Commercial/civil satellites including Geostationary Operational Environmental Satellites N, O, and P, Mobile Satellite Ventures, DIRECTV, Thuraya; military satellites including Wideband Gapfiller Satellite system and Global Positioning System; proprietary programs



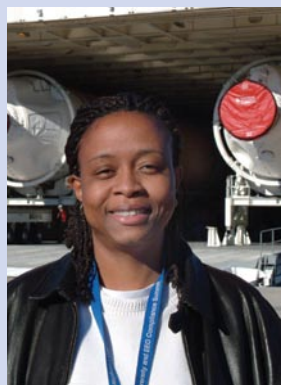
HUNTSVILLE CREATIVE SERVICES PHOTO

**Name:** Kyle Metchnik  
**Title:** Integration Specialist  
**Worksite:** Huntsville, Ala.  
**Years with Boeing:** 12

**Role at work:** Member of a team that assembles, integrates and tests the electromechanical assemblies used in the seeker on the Patriot Advanced Capability-3 missile.

**Most memorable work experience at Boeing:** "I worked 10 years on the International Space Station program as a mechanical technician, where I integrated

equipment racks for the lab module. Once I accompanied Space Station hardware on its trip to Kennedy Space Center, Fla., aboard a C-5 cargo jet."



HUNTSVILLE CREATIVE SERVICES PHOTO

**Name:** Tinesha Ross  
**Title:** Test and Evaluation engineer  
**Work site:** Decatur, Ala.  
**Years with Boeing:** 7

**Role at work:** System administrator and Ground Support Equipment for the Delta IV Cryogenic Second Stage

**Most memorable work experience at Boeing:** The Delta IV rocket's first flight, in November 2002. "It's an incredible feeling when we see evidence of our hard work paying off."

**Best work-related advice ever heard:**

"At this year's Diversity Summit, Joyce Tucker [Boeing vice president of Global Diversity & Employee Rights], said, 'The only limits we have are the ones we set for ourselves.' Her words stayed with me and are one of the main reasons I continue to work hard and strive to be the best at everything that I do."

# 'An incredible gift'

## Process-management tools help state agency better support families

By KEVAN GOFF-PARKER

When Cheryl Stephani was named assistant secretary of the Children's Administration for the Washington State Department of Social and Health Services in May 2005, she knew major challenges were on the horizon. The administration had a projected multimillion-dollar overspend. Workers had no capacity to fully deliver on an overpromised agenda, and field employees didn't trust internal policies or central office leaders.

To find a more proactive approach to running her administration, Stephani reached out to state and civic leaders—including Bob Watt, Commercial Airplanes' vice president of Government Relations and Global Corporate Citizenship. As a result, Boeing is contributing its process-management expertise to help the organization improve its operations. Sharing this ability with the Children's Administration represents another of the many instances of how Boeing is helping improve the communities where its people work and live.

"What an incredible gift Boeing is giving to the children and families in the state of Washington," Stephani said. "Our ability to figure out strategies that are sustainable and lay the right foundation so we can make these improvements over time is an incredible gift. We are very appreciative of it."

To help identify and implement improvements at the administration, Watt's team turned to Jerry Martin, BCA director of Process Management. Not only is Martin a foster father, he's on the board of trustees of the Ryther Child Center, a children's residential treatment center in Seattle. Martin and his team's past work with various non-

profits and school districts had already impressed Watt and his staff.

For Martin—who with his wife, Judy, has been a foster parent for more than 11 years—the opportunity to help streamline and standardize the Children's Administration's work aligns perfectly with his volunteer work at Ryther. As he became involved on the strategic planning team at the center, Martin said, he began to ponder how the life of a child could be improved by using process-management principles.

"My work at Boeing is about process improvement—the end-to-end flow," he said. "I started thinking about the lifetime of a child and how if we could do the right assessment and diagnostics early, while performing well-thought-out interventions, then maybe the child could get on a successful path."

Martin said the opportunity for his team to work with the administration has meant the chance to influence systemic changes in how the administration operates. Steve Bolton and Mike Milholland, two of Martin's business process analysts in Process Management, now split a three-quarter equivalent budget as they assist DSHS, while Watt's Government Relations and Global Corporate Citizenship organization funds the work, labor, travel and incidentals.

"On my own time, I've personally combined my need to fulfill an ongoing education requirement for my foster-parent license with meetings with Cheryl and her staff," Martin said. "As it has gone on, more work has gravitated toward Mike and Steve. I continue to work with Cheryl on what they need, but they're the focals. We're helping the state government to make major changes in a holistic way."

Bolton said his work involves aligning processes with an organization's strategies while he looks for opportunities to eliminate waste and to document and standardize processes. Among the efforts he and Milholland have undertaken: assisting the Children's Administration with mapping out and exploring their processes, and working on standardizing how foster homes are licensed.

Stephani said Boeing's work with her agency's core leadership team during offsites and in regular meetings is improving overall communication within the administration.

"We found we needed to fix some foundational issues rather than put the fix at the end," she said. "We're working more now on leadership development and where there are opportunities to do foundational work. Fundamentally, it is all about people and relationships, whether you're building foundations for airplanes or for children."

For more information about Boeing volunteer opportunities in the Pacific Northwest, visit [http://community.web.boeing.com/nwregion/ei\\_vol\\_eventlist.cfm](http://community.web.boeing.com/nwregion/ei_vol_eventlist.cfm) on the Boeing intranet. For more on opportunities in other regions, visit <http://community.web.boeing.com/howto.cfm> on the Boeing intranet, select a region in the dropdown bars near the bottom, and click on the appropriate local site link. ■

*kevan.m.goff-parker@boeing.com*



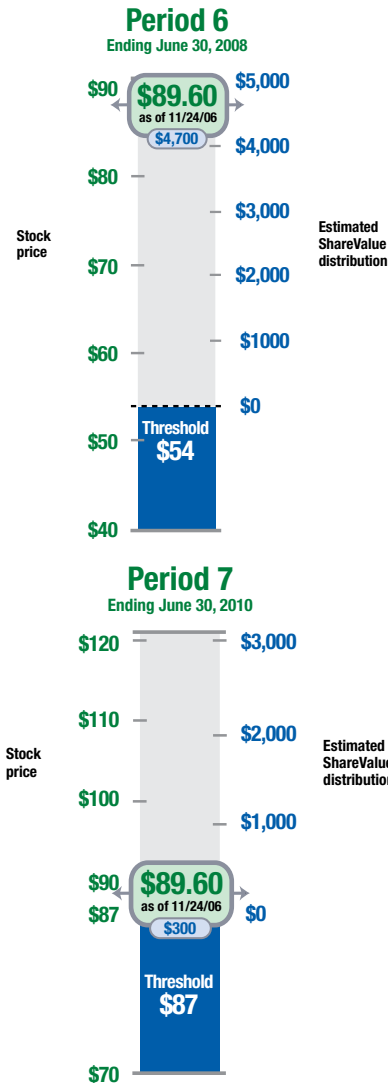
ED TURNER PHOTO

**From left: Steve Bolton and Mike Milholland, business process analysts in Process Management for Commercial Airplanes, are working closely with Cheryl Stephani of the Children's Administration for the Washington State Department of Social and Health Services and using process-management tools to help improve her organization's operations.**

## 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 Periods 6 and 7.



The above graphs show an estimate of what a “full 4-year participant” ShareValue Trust distribution (pretax) would be for Periods 6 and 7 if the end-of-period average share prices were the same as the recent price shown.

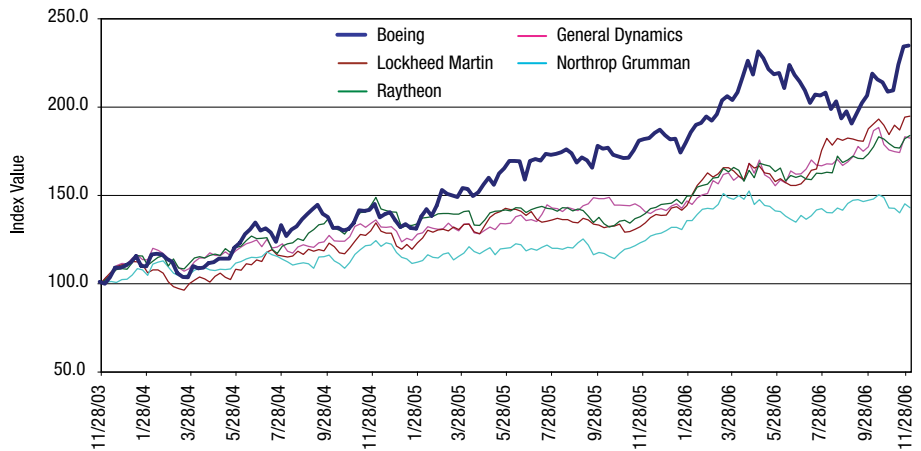
The share price shown is the average of the day’s high and low New York Stock Exchange prices. Updates to participant/employment data will be made periodically.

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

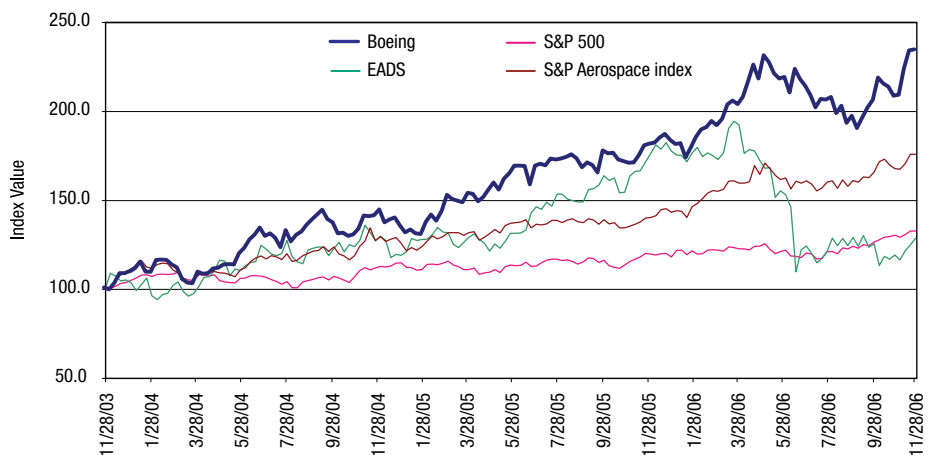
## STOCK WATCH

The chart below shows the stock price of Boeing compared to other aerospace companies, the S&P 500 index and the S&P 500 Aerospace and Defense index. Prices/values are plotted as an index number. The base date for these prices/values is Nov. 28, 2003, which generates three years of data. The prices/values on that date equal 100. In other words, an index of 120 represents a 20 percent improvement over the price/value on the base date. Each data point represents the end of a trading week.

### Boeing vs. U.S.-based competitors (3-year)



### Boeing vs. stock indexes and foreign competitors (3-year)



### Comparisons:

4-week, 52-week	Price/value as of 11/24/06	Four-week comparison		52-week comparison	
		Price/value as of 10/27/06	Percent change	Price/value as of 11/25/05	Percent change
<b>BOEING</b>	<b>89.77</b>	<b>79.74</b>	<b>12.6%</b>	<b>69.06</b>	<b>30.0%</b>
<b>U.S. COMPETITORS</b>					
General Dynamics	73.65	70.91	3.9%	57.95	27.1%
Lockheed Martin	89.33	84.61	5.6%	60.65	47.3%
Northrop Grumman	66.05	66.01	0.1%	56.89	16.1%
Raytheon	50.87	49.62	2.5%	38.12	33.4%
<b>FOREIGN COMPETITORS</b>					
EADS *	23.25	21.54	7.9%	30.98	-25.0%
<b>U.S. STOCK INDEXES</b>					
S&P 500	1400.95	1377.34	1.7%	1268.25	10.5%
S&P 500 Aerospace and Defense Index	374.15	357.29	4.7%	297.72	25.7%

\* Price in Euros

## SERVICE AWARDS:

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

### 60 Years

Shirley Haines

### 50 Years

Robert Ellis  
Frederic Heath  
Harold Mitchell  
Robert Phelps

### 45 Years

Joseph Banuelos  
Glen Barker  
Gary Bjarnason  
Nicholas Damico  
Herman Demik  
Clarence Huff  
Maynard Jones  
Thomas Ludden  
John Mansini  
Wayne Swan  
Douglas Thorne

### 40 Years

Walter Abbott  
Farrell Aslin  
Gerald Bertagni  
Michael Bland  
James Bogenpohl  
Brian Boyer  
James Clark  
Richard Dierst  
Aaron Duckworth  
Roland Freeman  
David Futhey  
Jerry Hartzell  
James Hutchins  
Wilbert Johnson  
Steve Kassa  
Robert Keiser  
Lavern Kerner  
Joyce Larson  
Edward Marcyan  
Peter Meekins  
Walter Merrick  
Jonathan Oppenheimer  
Richard Parker  
David Reed  
Stanley Robinson  
Jacob Schemnitzer  
Norman Shell  
Glenn Stieg  
Janice Stinebaugh  
Albert Strain  
Michael Teague  
Joseph Troyan  
Patricia Willett  
Norma Williams  
Rachel Wood

### 35 Years

Raul Alvarado

Robert Arne  
Betty Benjey  
David Blanding  
Sandra Botelho  
John Carroll  
Lawrence Craig  
Byron Gion  
Clare Hamilton  
Charles Hardy  
Gerald Joromat  
Maria Kalina  
Harold Keibel  
Darvin Lord  
Wilfred Otaguro  
Judy Saltmarsh  
Gerald Stonebraker  
Betty Stroter  
William Stuart  
Dennis Sullivan  
Bonnie Todd  
David Woehrl

### 30 Years

Dean Anderson  
William Anderson  
Francis Ankelmann  
Barbara Boteler  
Charles Burden  
Lareine Callahan  
Kathleen Christianson  
Richard Colella  
Anthony Colello  
Kenneth Copenhaver  
Teresa Del Rio  
Charlie Dixon  
Sally Dubuque  
Michael Dunican  
Michael Dunn  
Ron Edlund  
Douglas Eller  
Dennis Freeman  
Robert Fulkerson  
Paul Funke  
Robert Gabriel  
Deirdre Gallagher  
Patrick Gibson  
David Gould  
Robert Green  
Bradley Grubb  
Colleen Haberlach  
Brad Hancock  
Raymond Harrison  
Melissa Heath  
Susan Huber  
Edward Ito  
Donna Jackson  
Judy Jones  
Michael King  
James Kirkland  
Rochelle Kletke  
Martin Kordonowy

Louise Lennon  
Richard McClelland  
Orie McLemore  
Richard Miles  
Stanley Mitchell  
Richard Morgan  
Steven Morphis  
Peggy Nugent  
Louis Petty  
Dennis Reed  
Diane Revell  
Mark Robinson  
Gary Sandell  
Ramona Sepulveda  
Randal Sherrer  
Henry Sorensen  
Radford Sprague  
Keith Stanley  
John Stuart  
Christopher Sykes  
Dwight VanInwegen  
William Walton  
Brandt Willson  
Jeffery Worley  
Ronald Zitzer

### 25 Years

Laurie Adams  
Jerry Allen  
Twila Allen  
Lorraine Amabile-Weible  
Richard Anderson  
Hirotaka Ando  
James Aube  
Robin Baley  
Daniel Baroh  
Vincent Beck  
Patricia Bennett  
Carl Bevis  
George Bichsel  
Ricky Blackston  
Donald Blanchet  
Jeffrey Bleakley  
Lee Borkan  
Debra Box  
Jerry Brigman  
David Brock  
Pamela Brooks  
Lawrence Brown  
Joanne Burns  
Marie Cammer  
Dennis Capovilla  
Lorrel Carpenter  
David Casey  
Michael Cassel  
Kirk Chandler  
Leroy Chavez  
Pinchung Chen  
Charles Childress  
Barbara Childs  
Michael Cizek

Michael Clark  
William Clark  
Alan Cloyd  
Michael Conrad  
John Cowin  
Keith Croak  
Ralph Cruz  
Stanley Daffern  
Louis Damey  
Anita Delang  
Jolene Derusha  
Aaron Dickson  
Dennis Dobbs  
Frank Drummond  
Douglas Dubois  
John Dugo  
Sherry Durham  
Keith Elitzer  
Carole Elko  
Timothy Eriksen  
Keith Erleben  
Duane Esperum  
Michael Farmer  
Kurt Farrow  
Cindy Fierro  
Pamela Fife  
Jerry Fisher  
Anton Flecklin  
Michael Flynn  
Mary Foley  
James Gaal  
Larry Galenski  
Bernard Gamache  
William George  
Angelo Giacone  
Gary Givens Jr.  
Thomas Goff  
Donald Goodman  
Richard Graham  
Gary Graybeal  
David Gualtieri  
Amin Haider  
Ian Halley  
Michael Hansen  
Scott Hayden  
James Heighton  
Floyd Heller  
Maria Hernandez  
Nam Hinh  
Steve Hoffman  
Mark Hogan  
Elizabeth Huffine  
Cheryl Irby  
Richard Jay  
David Johnson  
Donald Johnson  
Mark Johnson  
Richard Johnson  
Kurt Kassebaum  
Jeffrey Kawana  
Dubong Kim

Kevin King  
Ann Kirtley  
Scott Knibb  
Curtis Knott  
Roberta Koller  
Kathy Krauss  
Mark Kriskovic  
Joseph Kurley  
Robert Laird  
Carl Latchaw  
William Lawson  
Thomas Leavitt  
Paul Leenknecht  
Nadine Lewis  
Regan Lewis  
Michael Limpel  
Anthony Luca  
Dennis Lytton  
Tse-Wayne Mah  
Sheryl Mancuso  
Patricia Marruffo  
Charlotte Marsh  
Donald May  
Glenn May  
Murray McIntyre  
Suzanne McMullin  
John Melton  
William Meredith  
Douglas Miller  
Earl Miller  
Rodney Minson  
John Mitchell  
Fred Moore  
Barbara Mullis  
Daniel Murakami  
Tony Muro  
Michael Murphy  
Michael Murphy  
Catherine Nadal  
Helen Nelson  
Jeffrey Nelson  
Leonard Niedbalski  
Robert Nordin  
Kenton Norton  
David Novak  
Michael O'Donnell  
Wilmer Olsen  
Dean Oquist  
Stephen Pallardy  
Alan Parker  
Joseph Parkhill  
Rosalynda Parkhurst  
Darren Perez  
Lucinda Perlick  
David Perry  
Andrew Petro  
Dianne Philippon  
Jerry Phillips  
Philip Pisanelli  
Julia Plank  
Ralph Plummer  
Joseph Porter  
William Porter  
Steven Przybelinski

Charlene Randall  
Tobi Rich  
Donald Rodgers  
Carolyn Rougeaux  
Richard Ruiz  
Dorothy Rush  
Gary Rushing  
Kimberly Ryans  
Diana Sadowsky  
Gail Sailer  
David Sanford  
Vito Savala  
Robert Schaffnit  
Gordon Schott  
Steven Schrader  
Martin Schuster  
Erik Schutten  
Connie Sharp  
Marti Sheldon  
Lee Sherman  
Barbara Smith  
Kim Smith  
Michael Smith  
Patrick Smith  
Debra Snapp  
Stephen Sockey  
Martin Spotanske  
Martin Stephenson  
Karen Steverson  
Kevin Steyer  
Kenneth Strickland  
Frank Suffoletta  
William Swift  
Jayme Sy  
William Tabing  
Conard Testerman  
Theodore Tieken  
John Todd  
Geoffrey Trowbridge  
Renee Tucker  
Ronald Tucker  
Erling Ulstein  
Canio Vaccaro  
Vincent Vaccaro  
Mark Vanlandingham  
Michael VanOverloop  
Patti Varnado  
Michelle Waldo  
Lee Warner  
Wade Webster  
John White  
Gregory Willging  
Denise Williams  
Scott Williams  
Gregory Wilson  
Richard Wilson  
Aaron Wood  
Brian Worthley  
Caroline Young  
Tomas Zaldivar

## SERVICE AWARDS:

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

### 55 Years

John Rockhold

### 50 Years

William Body

Carl Mellenthin  
David Williamson

### 45 Years

Robert Aardal

James Brownrigg  
Gilbert Cresswell  
Dixie Delgado  
Gary Dreyer  
Arthur Iwaki

Melvin King  
Leroy Paridy  
William Sapiens  
Albert Sather  
David Sellers

Gary Smith  
Robert Townsend  
Warren Wall  
Robert Welby  
David West  
James Wilkins

### 40 Years

Larry Amidan  
Fredrick Behringer  
James Beymer  
Charles Brickey  
Wayne Brooks  
Robert Brunelle  
Norman Buchert

Karl Carlson  
Douglas Carrie  
James Carter  
Bennie Collins  
Thomas Crosse  
Alfred Davis  
John Good  
David Gough  
Robert Grasso  
Richard Greifzu  
Stephen Harris  
Stanley Hunter  
Jimmy Johnson  
Ray Jones  
Robert Jones  
Charles Korba  
Richard Labeau  
James Lewis  
Valentine Lugo  
James Martin  
Jimmy Mojher  
Rocky Nelson  
Michael Powell  
Robert Reed  
Larry Rettig  
Michael Robinson  
Carol Rundberg  
John Salery  
Paul Schmid  
Gerald Sheehan  
Thomas Smith  
Ralph Thompson  
Grant Trumbo  
Wen-Hung Tseng  
Anthony Venezia  
Carl Vorst  
James Walter  
Charles White  
Jerry Whitney

### 35 Years

Sheri Banda  
Norman Black  
Henry Chin  
David Copley  
Helen Craig  
Janice Davis  
Antoinette Derrickson  
Edward Eng  
Keith Felderman  
David Ferrando  
William Flowers  
Michael Hagene  
Lorin Hawkins  
Charles Haynes  
John Headrick  
Theresa Hebert  
Herbert Ho  
Margaret Kent  
Delmar Langton  
Oliver Leslie  
George Lincoln  
Freddie Lowe  
Darlene Masters  
Edgar McKenney  
Richard McKinney  
Douglas Meyer  
Dianne Mills  
Tommy Montgomery  
Dennis Patrick  
Bernd Pesler  
Alan Petre  
Janet Powell  
Joan Quintana  
Robert Reynolds  
James Riggins

Joseph Rodriguez  
Edgar Sanchez  
Dean Schaefer  
Andrew Sible  
Sandra Sperry  
Norman Varnen  
Randall Waibel  
Noel Wedin  
Thomas White  
William Whitley  
Benjamin Yu

### 30 Years

Melody Adams-Forsstrom  
Curtis Anderson  
Thomas Anderson  
Martin Anzaldo  
John Aragon  
Michael Araiza  
Linda Bagley  
Kathryn Bailey  
Sayoko Baker  
Douglas Ball  
Fred Barker  
Paul Bishop  
Ivan Bislow  
Thomas Black  
Ivar Blomquist  
Johnny Borowitz  
Andrew Bostick  
Scott Broughton  
Philip Bumgardner  
Charles Burmeister  
Bobby Cason  
Mark Cheever  
Susan Clark  
Stephen Clegg  
Fredrick Clement  
Patsy Collins  
Michele Cooke  
Lawrence Cornelius  
James Creager  
Duane Criswell  
Christopher Cummings  
Patsy Dean  
Randall Dean  
Guy Ding  
Bruce Drugg  
Gregory Ducey  
Nicholas Dziuba  
Gay Eibey  
Richard Emmett  
Daniel Endres  
Steven Euting  
James Federico  
Lawrence Fink  
Steve Finlay  
Robert Frederick  
Thomas Freet  
Craig Fujimoto  
Samuel Furfaro  
Jimmie Gardner  
Doris Gash  
Thomas Goldade  
Henry Gratrix  
Joseph Grau  
Christopher Griffin  
Robert Grossman  
Heyward Haddock  
Wanda Hanby  
John Hart  
Martha Hartsell  
Cordell Hauglie  
Raymond Hautala  
Margaret Hernandez  
Mark Hinkley

Edward Hubel  
Charles Hudson  
Charles Hughes  
Philip Irvine  
Patricia Jackson  
Barbara Jaramillo  
Jane Johnson  
Jay Johnston  
Clint Jones  
Robert Jordan  
Norbert Jordan  
Marie Kimm  
Jay King  
Donald Kirby  
Kenneth Kittelson  
Edward Kivitz  
Brenda Konersmann  
Ronald Kopp  
Glenn Kosai  
Darell Krause  
Mitchell Lagasca  
Darell Larson  
Richard Lebens  
Joseph Levorsen  
Patricia Lim  
Linda Lin  
Elise Lindseth  
Gary Longland  
Roy Lothringer  
Robert Luecking  
Matthew Lum  
Georgeena Lysons  
Gary MacDonald  
Eddie Madera  
James Martin  
Robert Matthewman  
Mark Maulden  
Richard Mayer  
Frankie McComb  
Philip McCutcheon  
Robert McDonough  
Kevin McGillis  
Terry McMeekin  
Sanford McMurray  
William Messer  
James Mick  
William Moeckli  
Jon Moen  
Leroy Moore  
Lloyd Nakano  
Nadine Nakasaki  
Paul Nelson  
Clyde Newman  
Carl Niedermeyer  
Robert Nix  
Paul Nordstrom  
Ignacio Norman  
Thomas O'Keeffe  
Richard O'Neill  
Joseph Pagano  
James Pagenkopf  
Ernest Palmer  
John Patton  
Pete Perez  
Delaine Peterson  
Edward Peterson  
Sharon Peterson  
Janet Pettibone  
Owen Peyton  
Richard Ponce  
Steven Porthen  
John Roger Powell  
Lauren Power  
Ronald Pozzo  
George Price  
Leroy Race

Martha Ramirez  
Loretta Randolph  
Thomas Reidy  
Deanna Reynolds  
Susan Robbins  
Mark Rosenthal  
Joseph Saldin  
Gary Samuelson  
George Sanderson  
Dean Schaeffer  
Dale Schuk  
Christina Schulenberg  
Daniel Shaddock  
Dale Sherwood  
Deryl Shields  
Gerald Shields  
Edward Shroyer  
Paul Simonoff  
Stephen Slye  
Deborah Smith  
Kenneth Smith  
Paul Southerland  
Terry Spence  
Elizabeth Stanfill  
James Steer  
Daniel Stetler  
Pamela Strandberg  
Robert Strawser  
Steven Suzaka  
Gary Tamura  
Ann Thomas  
Gary Vassallo  
Danny Walker  
Samuel Wallick  
Terence Walls  
Howard Wanke  
Leland Wehland  
Glen Weichert  
Bernard White  
Eric White  
Richard White  
Charles Widger  
Gil Williams  
Johnny Williams  
William Wittenauer  
Dean Wright  
Alice Yelle  
Michael Yochum

### 25 Years

Anwar Ahmed  
Richard Aldridge  
Robert Alter  
Peter Anast  
John Arensberg  
Charles Armstrong  
Richard Armstrong  
Michael Asbury  
Leland Austel  
Roy Bailey  
Allen Bakalyar  
Cary Barnes  
Cynthia Barth  
David Beeney  
Glen Begley  
John Behr  
Victor Beibide  
David Bergeson  
Jesse Bergmann  
Sharon Blair  
Merrill Blaser  
Mark Boda  
Candace Bouma  
Deborah Bowen  
Stephen Brophy  
Howard Brown

Roy Brown  
Wilton Brown  
Brian Brt  
Sandra Brunk  
Paul Brunks  
Mark Brunson  
Jack Buchheit  
Gerald Burmeister  
Fred Burnette  
Raymond Burrell  
Dan Buschelman  
Susan Butler  
David Byers  
Rita Cain  
Michael Carlson  
Tony Carnicello  
Melvin Carpenter  
Jerry Caruso  
Victor Cassella  
Dawn Cassidy  
Gloria Chaffin  
Charlotte Chamberlin  
Dean Christiansen  
Jeffrey Claybrooks  
Marilyn Cohen  
Darrell Conrad  
Geraldine Conrad  
Connie Cooper  
Lisa Cordas  
James Cotherman  
Jon Courtright  
Roger Cramer  
Michael Crawford  
Carol Crayne  
William Crealock  
Sean Crosby  
Dominic Custodio  
Mark Davidson  
Robert Dawes  
George De Haas  
Diane De Moulin  
Matthew Delong  
Denis Denardo  
Steven Desante  
David Dickens  
Robert Ditch  
Brian Ditsworth  
Thomas Dooling  
Dennis Dudgeon  
Trent Duff  
Roberto Duffy  
Maryjane Duke  
Michael Dunham  
Dilma Duprey-Booker  
Steven Eckley  
Gerald Edgar  
Michael Ehrhard  
Theodore Eigle  
Mitchell Elder  
Ronald Ellerbeck  
Steven Emmi  
John Enberg  
Steven Epp  
Johnnie Fain  
John Farra  
Fredrick Flowers  
Camille Foote  
Christine Forster  
Edward Frawley  
David Gaines  
William Gaynor  
Robert Geraci  
Kenneth Gochenour  
Samuel Goms  
William Grace  
Gary Graham

Janice Grammer  
Marlene Gravemann  
Jeffery Gray  
Eric Grieve  
Gary Griffith  
Paula Grimes  
Kenneth Groah  
Doug Gruver  
Donald Guempel  
Karis Hackmann  
Walter Hadlock  
James Hall  
Stephen Hall  
Larry Hammond  
Richard Harank  
Kris Hardie  
Joyce Harrison  
Michael Hartman  
Robert Hauge  
Carl Hawkins  
Lois Hayes  
Steven Haynie  
Linda Heather  
Lynn Heckel  
Daniel Hendrickson  
Steven Hendrickson  
Alfred Hernandez  
Monico Hernandez  
Dale Hilt  
Charlie Hinojosa  
Alexander Hironaga  
John Hobson  
Fred Hoffhines  
Peter Holden  
Kenneth Holland  
Clarence Hopkins  
Joseph Hopwood  
David Horning  
Robert Horton  
Robert Hovanec  
Kimberlee Hughes  
John Iannicola  
Robin Iwanylo  
Donald Jack  
Cynthia James  
Dennis Jenkins  
Michael Jimenez  
Theresa Jimenez  
Margaret Kaelin  
Jeffrey Kalama  
Kimberly Kearns  
Melvin Kelch  
Paul Keller  
Calvin Kennebrew  
Henry Knapp  
Steven Kness  
Michelle Knowlden  
Kirk Kohnen  
David Kosmach  
Susan Kramer  
Andrew Kwan  
David Kwolek  
Pamalu Langford  
Gregory Langmann  
Dave Larsen  
Lonn Lattanzio  
Jeffrey Lawrence  
William Lawrence  
William Lawton  
Robert Leblond  
Ronald Lehman  
Susan Lemmon  
Kevin Lewis  
Richard Lewis  
Larry Lewiston  
Robin Lloyd

## ■ MILESTONES

Joseph Lo  
Barbara Lockett  
Debra Loe  
Gregory London  
Terilee Loseth  
Michael Lough  
Rosalba Luna  
Ronald Lyter  
Jerry MacFarlane  
Jesse Madrigal  
Joseph Malawey  
Linda Mallas  
John Mar  
Bruce Martin  
Delwin Martin  
Ernest Martin  
Douglas Masterson  
Steve McCoy  
Tommy McCullah  
Karen McCusker  
Jon McDonald  
Jeri McGinty  
Susan McIlvain  
John McKean  
David McKenzie  
Charles Mealy  
Davin Mehring  
Thomas Melocoton  
Annette Meyer  
Jerry Millage  
Carla Milligan

Roger Million  
Clark Mills  
Keith Mills  
Jorge Mina  
Gary Minard  
Ali Mirdamadi  
Richard Morales  
Samuel Morgan  
Raymond Morrison  
Michael Muller  
Bradley Mulvaney  
Frederick Munch  
Kevin Murphy  
Timothy Murphy  
Elizabeth Nadeau  
Douglas Nardelli  
Ronald Neal  
Dominic Ngan  
Randall Nishioku  
Douglas Nordyke  
Stephen Norkus  
Karl Nymon  
Ben Oakley  
Judy Oelkers  
Susan Oelrich-Benish  
Dale Ogle  
Linda Okazaki  
Ricky Oliver  
Craig Olsen  
Travis Oney  
Daniel Orr

Stephne Orrell  
John Orzel  
William Owens  
Mike Palmerino  
David Parfitt  
Donald Peck  
Carlos Pelayo  
Theresa Pennington  
Marc Perdue  
Edward Perlick  
John Peterson  
Lennie Peterson  
Ronald Peterson  
Marilyn Pfrimmer  
John Pham  
Michael Phillips  
Donald Picetti  
James Pidgeon  
David Pinkleton  
David Pollock  
Carlos Porras  
Gloria Porter  
James Posenjak  
Christine Prior-Dunn  
Patricia Pumphrey  
Karl Pyl  
Lourdes Quaintance  
David Reaux  
Steven Recker  
Robert Reeb  
Alexander Retana

Allan Revel  
Daniel Richardson  
Linda Richter  
Neil Roberts  
Christopher Rose  
Wally Rose  
Jack Routhier  
Richard Rusness  
Matthew Salcius  
Neil Sammon  
Janice Sandberg  
Ross Scalise  
Russell Schexnayder  
Wenford Schurman  
James Seaman  
Harold Seiden  
Mark Severson  
Steven Sharp  
Kenneth Sherer  
Eric Shinaver  
Julie Shinn  
James Sickert  
Constantine Sismanidis  
Nancy Slezinger  
Valerie Sloboden  
Larry Smallwood  
James Smith  
James Smith  
Scott Smith  
Timothy Smith  
David Solter

Rene Soto  
Charles Spanski  
Jeffery Speak  
Nancy Spraggins  
Edward Stein  
Charles Stonebraker  
Brian Stutzman  
Dogan Subaykan  
Diane Swanson  
Kausar Talat  
Ernest Tamayo  
James Taylor  
Ryan Telkamp  
Richard Terney  
Duane Theilen  
Janice Thompson  
Lawrence Thone  
Brad Thornton  
Cheryl Tollan  
Helen Tom  
Russell Tom  
Hoi Tran  
Oanh Tran  
Dennis Trujillo  
Kathi Tsunemoto  
Arthur Tucek  
Gerrie Tumia  
Steven Turner  
Alicia Valenzuela  
Patricia Valles  
Robert Vandygriff

Robert Varner  
Soledad Venegas  
Robert Wagner  
Harry Wallace  
Linda Walters  
Mitchell Waters  
Gene Weaver  
Fred Webber  
Ritchie Werre  
Randy Wessels  
Betsy Wianecki  
Kim Wiley  
Roger Williams  
Ronald Wilson  
Kerry Winston  
Jeffrey Wong  
Michael Wood  
Stephen Wood  
Gregory Woodard  
Edward Wooldridge  
Jerry Woudenberg  
Anna Wu  
Yeong-Wei Wu  
Brad Young  
Lyman Young  
Sally Young  
Stanley Yu  
Susan Zanger  
Van Zeitz  
Tony Zurcher

## RETIREMENTS: The following employees retired in October from The Boeing Company.

Kathleen Anderson, 36 Years  
Willie Barnes, 21 Years  
Andre Beauchesne, 27 Years  
Stephen Behnen, 28 Years  
Kieran Bergin, 16 Years  
Sandra Bernhardt, 11 Years  
Ronald Black, 27 Years  
Michael Bourbina, 18 Years  
Calvin Boykin, 25 Years  
William Bright, 16 Years  
Jesse Burns, 20 Years  
Judy Burns, 18 Years  
Michael Burton, 23 Years  
Brian Byrne, 17 Years  
Jesse Caddell, 27 Years  
Conrad Caswick, 41 Years  
Steven Charles, 23 Years  
Leslie Crenshaw, 18 Years  
Thomas Cundiff, 25 Years  
Gregory Darnell, 19 Years  
Harry Dawson, 11 Years  
Diane Dodd, 18 Years  
Henry Dominguez, 28 Years  
Angelo Drammissi, 23 Years

David Eck, 14 Years  
Kenneth Edgell, 26 Years  
Dale Einwalter, 32 Years  
Harlan Etling, 28 Years  
James Felicita, 26 Years  
Joseph Fortin, 26 Years  
Katherine Freeman, 20 Years  
Mark Gabler, 34 Years  
Robert Garcia, 20 Years  
Maedine Gardiol, 15 Years  
William Garland, 18 Years  
Tony Giammasi, 34 Years  
Michael Gianelli, 37 Years  
David Glaubach, 20 Years  
Peter Glienes, 22 Years  
Irene Gomez, 28 Years  
Gerald Greer, 26 Years  
Jerry Gutridge, 12 Years  
Linda Halbrook, 30 Years  
William Hammond, 5 Years  
Stuart Hann, 37 Years  
Ronald Hanson, 32 Years  
Sylvia Hawkins, 26 Years  
Janis Helle, 20 Years

Joseph Hesse, 22 Years  
Charles Hinson, 40 Years  
Roy Johnson, 24 Years  
Maureen Jones, 4 Years  
Sandra Keane, 7 Years  
Henry Kelley, 34 Years  
Patrick Kelley, 41 Years  
Richard Kimmons, 29 Years  
Renee Kirby, 23 Years  
Virginia Klaus, 26 Years  
Nicholas Kuntz, 40 Years  
Patricia Lashley, 9 Years  
Patrick Leong, 33 Years  
Kenneth Lin, 10 Years  
Eric Linfield, 36 Years  
Kenneth Lobejko, 23 Years  
Mark Lucas, 27 Years  
Duncan MacKinnon, 28 Years  
John Malson, 31 Years  
Bonnie Marlow, 22 Years  
Robert Marquez, 28 Years  
Michael Martling, 18 Years  
Wayne Massing, 25 Years  
Victoria Maynard, 26 Years

David McGinnis, 24 Years  
Gregory Meyer, 32 Years  
Michael Miller, 35 Years  
RLee Moody, 27 Years  
Joe Moreno, 32 Years  
Kenneth Mraz, 34 Years  
Robert Mullans, 42 Years  
James Newland, 22 Years  
Leslie Newland, 19 Years  
James O'Neil, 41 Years  
Nola Orth, 20 Years  
Kelli Peckman, 0 Years  
Veronica Peterson, 27 Years  
Craig Post, 22 Years  
Norman Prins, 5 Years  
Joel Ramirez, 41 Years  
Matthew Rawlins, 16 Years  
Linda Razo, 34 Years  
Alan Reasoner, 19 Years  
Lawrence Reuben, 22 Years  
Rita Richard, 24 Years  
William Ridgeway, 28 Years  
Bobby Rodgers, 25 Years  
Lawrence Rossiter, 21 Years  
Barbara Roth, 32 Years  
Evelyn Russell, 30 Years  
Loren Salmonson, 5 Years

Raymond Scheerer, 19 Years  
John Schweiger, 36 Years  
Sandra Sell-Lee, 19 Years  
Ida Shriver, 15 Years  
Charles Sisson, 25 Years  
Fredrick Speckmeyer, 40 Years  
Ben Sperry, 4 Years  
Timothy Stahl, 43 Years  
James Stecker, 26 Years  
John Stevens, 10 Years  
Bonita Stoufer, 2 Years  
Larry Stuart, 40 Years  
Joseph Surina, 22 Years  
Theodore Takemura, 24 Years  
Robin Thompson, 20 Years  
Michael Valliere, 18 Years  
Michael Varon, 33 Years  
Sharon Vlchek, 37 Years  
Richard Walker, 33 Years  
Timothy Walsh, 20 Years  
Robert Wassmuth, 19 Years  
Thomas Whiston, 22 Years  
Lee Wilson, 10 Years  
Chris Woods, 14 Years  
William Yokel, 26 Years

## IN MEMORIAM

The Boeing Company offers condolences to the families and friends of the following employees, whose deaths recently have been reported.

**James Harrison**, mechanic; service date May 22, 1978; died Nov. 8.  
**Mark Hudgins**, test & evaluation engineer; service date July 7, 1986; died Oct. 24.  
**John Lepage**, supply chain data specialist; service date Nov. 12, 1962; died Nov. 1.

**Keith Marshall**, seal test & paint coordinator; service date Oct. 17, 1977; died Oct. 26.  
**John Palmer**, procurement agent; service date June 9, 1997; died Nov. 10.  
**Jane Pavina**, maintenance pipefitter & plumber; service date Oct. 2, 1989; died Nov. 5.  
**Irvin Pettigrew**, supply chain specialist; service date Aug. 6, 1979; died Nov. 14.  
**Steven Pomeroy**, maintenance plumber; service date Oct. 6, 1972; died Oct. 28.  
**James Schindler**, test & evaluation engineer; service date Aug. 25, 1991; died Nov. 7.  
**Georgia Scott**, technical data specialist; service date Nov. 11, 1980; died Nov. 9.  
**Robert Sirko**, project engineer; service date May 23, 1978; died Nov. 13.  
**David Tegerdine**, test & evaluation engineer; service date Jan. 18, 1985; died Nov. 7.



# AROUND BOEING



Employees in Mesa, Ariz., participate in a game that helps them learn basic Lean principles. From left are Lavon Towe, Boeing Enterprise Data Management; Matiel Payton, with the Quality organization in Long Beach, Calif.; Pam Williams, Systems Engineering; and Vern Young, Production Engineering.

from Boeing. And office administrator Joni Morris said the class will help her eliminate elements of her job that are non-value-added. "I want to apply the analysis tools to routine tasks and ask myself: Does this task ultimately support the customer? Am I doing it right the first time?" Morris said. ■

*lisa.j.dunbar@boeing.com*

## ALSO AROUND BOEING

- Boeing in November took a major step in transforming the 777 line into a leaner and more efficient production system by implementing a moving assembly line to build this jetliner.

For now, the moving assembly line is used only during final assembly positions for the airplane, moving it at a steady pace of 1.6 inches (4.1 centimeters) per minute during production.

"A moving line drives efficiency throughout the system because it makes problems visible and creates a sense of urgency to fix the root causes of those problems," said Elizabeth Lund, director of manufacturing for the 777 Program.

- Boeing in November received a \$299.8-million U.S. Air Force contract to produce the fourth Wideband Gapfiller Satellite. This is the first option to be exercised on the WGS Block II contract, which was finalized in October. The Block II contract is valued at \$1.067 billion, if all options are exercised.

- Boeing in November unveiled a new Lean Enterprise site on the Boeing Web that serves as a single resource for companywide Lean+ information. The site pulls together Lean education, online training and organizational contacts and provides examples of Lean transformation across Boeing. The site, at <http://leo.web.boeing.com>, was redesigned in support of Boeing's Lean+ and Internal Services Productivity initiatives to increase productivity and growth. ■

## Learning Lean

What would you do with \$300 million? A class figures it out

BY LISA DUNBAR

For a brief time in October, a group of Boeing employees in Mesa, Ariz., were the owners of \$300 million. They could spend the "pretend" money however they saw fit—as long it was to improve a business process using Lean principles.

The employees were students in a day-long Lean office principles class in support of Lean+, Boeing's growth and productivity initiative to apply Lean not only on shop floors, but also in the office environment. The class revolves around an exercise in which teams identify and implement improvements to reduce cycle time within simulated business processes.

In the class, participants were allowed to spend \$300 million over three rounds

to make improvements. After each round, teams explained what they intended to improve and what process changes they implemented, and then reflected on whether their improvements worked.

The exercise revolves around a game created for the MIT Lean Aerospace Initiative. Both the game and the class lecture emphasize that to maximize value for the customer, processes must be improved as a system—as opposed to individual functions being improved independent of one another.

"Besides learning basic Lean concepts, students learn about the flow and complexity of business processes—and why sometimes the results of improvements may not be realized immediately," said Lean Office focal Todd Burow.

Participants said they'd put to use the lessons they learned.

Megan Prine, Employees Community Fund administrator at Mesa, said she'll apply what she has learned to her job by eliminating redundant steps in the process non-profit organizations use to apply for grants



PETER GEORGE PHOTO

## The Globe 23 High Performance Work Organization team

What are the keys to achieving success in the High Performance Work Organization process? For us on the Globe 23 HPWO team in St. Louis making the C-17 Ramp Forward and Aft bulkheads, it took four years, innovative ideas and excellent communication flow between engineers, planners and employees on the shop floor to achieve Stage 4 status, the highest level of improvement.

We gathered a ton of great ideas and made a lot of changes to improve the cost, quality and schedule of the assemblies we build. Among the changes we made:

- To prevent fasteners from backing out when we shoot them in, we developed a new shop tool that reduced assembly time and improved quality.
- We changed out the bulkhead drill, which originally required us to drill upward. Now we drill downward, which makes the task ergonomically sound.
- When we worked on striker plates, the bulkhead used to be at a height requiring us to use work stands. Now, the bulkhead is closer to the floor. That allows us do this job quicker and better, and makes this process less taxing.

We know Lean is a continuous journey, and we'll work to make our processes even better. That helps us support our program—and the warfighter.

It took time for us to get where we are, but we're proud of our accomplishments and the improvement initiatives we are currently working on. In fact, we were nominated for and will be participating in Integrated Defense Systems' Employee Involvement team day on Dec. 12, which will recognize the top 50 EI teams at IDS.

**Clockwise, from far left**

**Tom Stancy**  
Liaison  
Engineer

**Dale Key**  
Foreman

**Leon Smith**  
Sheet Metal  
Assembler Riveter  
(SMAR)

**Charlie Albiez**  
Industrial  
Engineer

**Mike Moran**  
Team Leader/  
SMAR

**Van Cochran**  
SMAR

**Arnold Cordray**  
SMAR

**Barb Davis**  
SMAR

**Not pictured**

**Tim Knight**  
Methods Engineer

**Richard Scobbie**  
SMAR



# The driving force of Joint Force communications.

## AMF JTRS

The Airborne and  
Maritime/Fixed Station  
Joint Tactical Radio  
System will create a new

era of interoperability for joint and coalition forces. By networking air, ground and at-sea communication systems across platforms and services, warfighters will have a new level of capability and strength. The Boeing team is bringing its unmatched expertise to making the vision of AMF JTRS a reality.

**BBN**  
TECHNOLOGIES

**L3**  
communications

**MILCOM**  
Systems Corporation

**HARRIS**

**NORTHROP GRUMMAN**

**Rockwell  
Collins**

**BOEING**

*This new Integrated Defense Systems ad supporting the Airborne and Maritime/Fixed Station Joint Tactical Radio System (AMF JTRS) is designed to advocate the customer's vision of a radio system that is interoperable across the three domains: in the air, on the ground and at sea. It also positions the Boeing team as best qualified to deliver on the requirement. The ad will appear in targeted publications including Air Force Magazine, Defense News and key base papers.*



## **A POWERFUL COMMITMENT TO OUR WARFIGHTERS.**

The U.S. Air Force combat search and rescue program, CSAR-X, is an unwavering commitment to the safety of our forces. Sharing that vision, we're proud that the USAF has selected the Boeing-led HH-47 team for this vital mission.

**Honeywell**

**Rockwell  
Collins**

**BOEING**

*This Integrated Defense Systems ad celebrates the recent U.S. Air Force combat search and rescue contract award. The ad salutes this vital Air Force mission and Boeing's commitment to the safety of U.S. forces. The ad will run in key trade publications in December and January.*