

Frontiers

www.boeing.com/frontiers

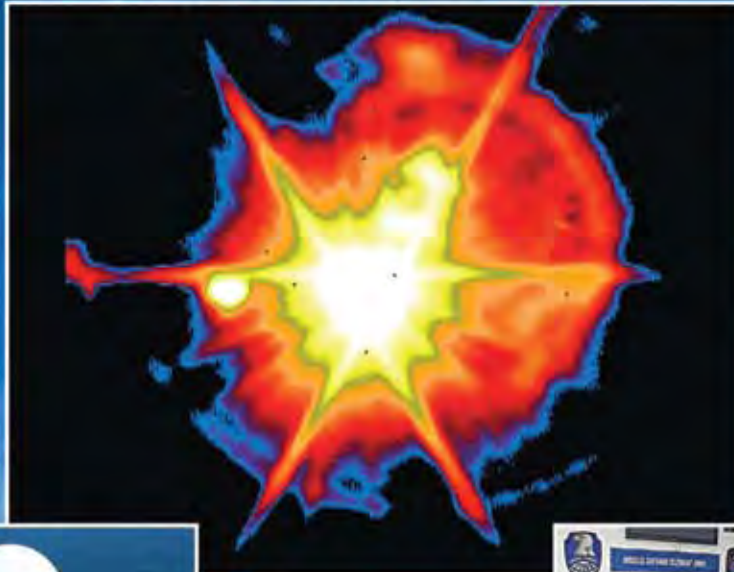
FEBRUARY 2009 / Volume VII, Issue IX



Charting the course

Boeing faces challenging market conditions in 2009. The heads of Integrated Defense Systems and Commercial Airplanes explain their business unit's priorities for the year.

Thermal image of the successful intercept of target warhead.



AMERICA'S DEFENSE: REAL, TESTED, READY.

On December 5, 2008, the U.S. Missile Defense Agency and the Boeing-led Ground-based Midcourse Defense (GMD) team successfully completed the most complex end-to-end test of America's only defense against the threat of long-range ballistic missiles. The system intercepted and destroyed a target warhead, proving the effectiveness of this vital defense capability. Boeing is proud to work with our nation's armed forces and will continue to bring the best of American industry to the task of protecting the homeland.

 **BOEING**

This new Integrated Defense Systems print ad highlights the recent successful flight test of the Ground-based Midcourse Defense System. The ad communicates that the Boeing-led team is meeting the challenge of developing and deploying this critical system. The ad is scheduled to run in congressional and military trade publications.



ON THE COVER

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WHAT LIES AHEAD: Boeing this year faces a daunting set of business challenges in its major markets. Scott Carson, president and CEO of Commercial Airplanes, and Jim Albaugh, president and CEO of Integrated Defense Systems, offer their views on the 2009 outlook for their business units and markets. Among their insights: IDS sees notable business opportunities internationally, as exemplified by the recent sale of the P-8 anti-submarine and surveillance aircraft to India. COVER IMAGE: SKY PHOTO FROM GETTY IMAGES / COVER ILLUSTRATION USING PILOT'S HEAD-UP DISPLAY SYMBOLLOGY BY BRANDON LUONG. ABOVE: BOEING

36 THE LOOK OF ONE

A companywide team worked to ensure that the Boeing brand stays current, represents Boeing as one company—and properly supports the work employees are doing to make Boeing the world's best and best-integrated aerospace company.



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In this June 2008 photo, a CV-22 Osprey assigned to the 71st Special Operations Squadron, 58th Special Operations Wing, Kirtland Air Force Base, N.M., prepares to land during a training mission in northern New Mexico. The U.S. Air Force has tapped the CV-22 as a prime transformational resource in its Special Operations efforts. **U.S. AIR FORCE**

20 A focus on providing value

In this economic climate, competitiveness is more important than ever. John Lockard, chief operating officer for Integrated Defense Systems, is overseeing initiatives to boost productivity and cut costs. Here he shares his thoughts on what IDS must do to maintain leadership in the defense industry.

22 Fast fixes

Engineers from Commercial Airplanes' Material and Process Technology organization are using agile development methods to design and implement solutions to local challenges. Here's an explanation of how agile development works—and why it's helping Boeing employees perform work faster and more efficiently than ever before.

28 A flying lab, on the ground

Meet ZA000, the 787 Dreamliner's virtual understudy. ZA000 doesn't look like an airplane; instead, it's a network of labs at the Integrated Aircraft System Laboratory in south Seattle. This setup lets the Test & Evaluation team more quickly and efficiently validate its work integrating the 787's systems and components.

30 When history was made

Forty years ago this month, the 747 made its first flight. Since then, Boeing has delivered more than 1,400 of the iconic jetliner to customers worldwide. Up next for the team: the 747-8 Freighter and 747-8 Intercontinental passenger airplane.

INSIDE

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31 Tops for Special Ops

By melding the best features of a conventional helicopter and a turboprop aircraft, the V-22 Osprey will change the way the U.S. Air Force accomplishes Special Operations missions. That's a major task, since inserting and extracting special operators into sensitive areas remains one of the most dangerous aviation missions.

32 A sign of approval

Employees on the Chinook team have worked to significantly modernize the aircraft with new mission equipment, enhanced capabilities and improved safety features. The U.S. Army validated these efforts last year by agreeing to a multiyear contract for about 200 more of these helicopters.

34 They aim to serve

Commercial Aviation Services (CAS) and Global Services & Support (GS&S)—the support businesses for Commercial Airplanes and Integrated Defense Systems, respectively—have made strides in working together more effectively and efficiently. Their collective goal: Achieve at least \$120 million per year in earnings synergies by 2013.

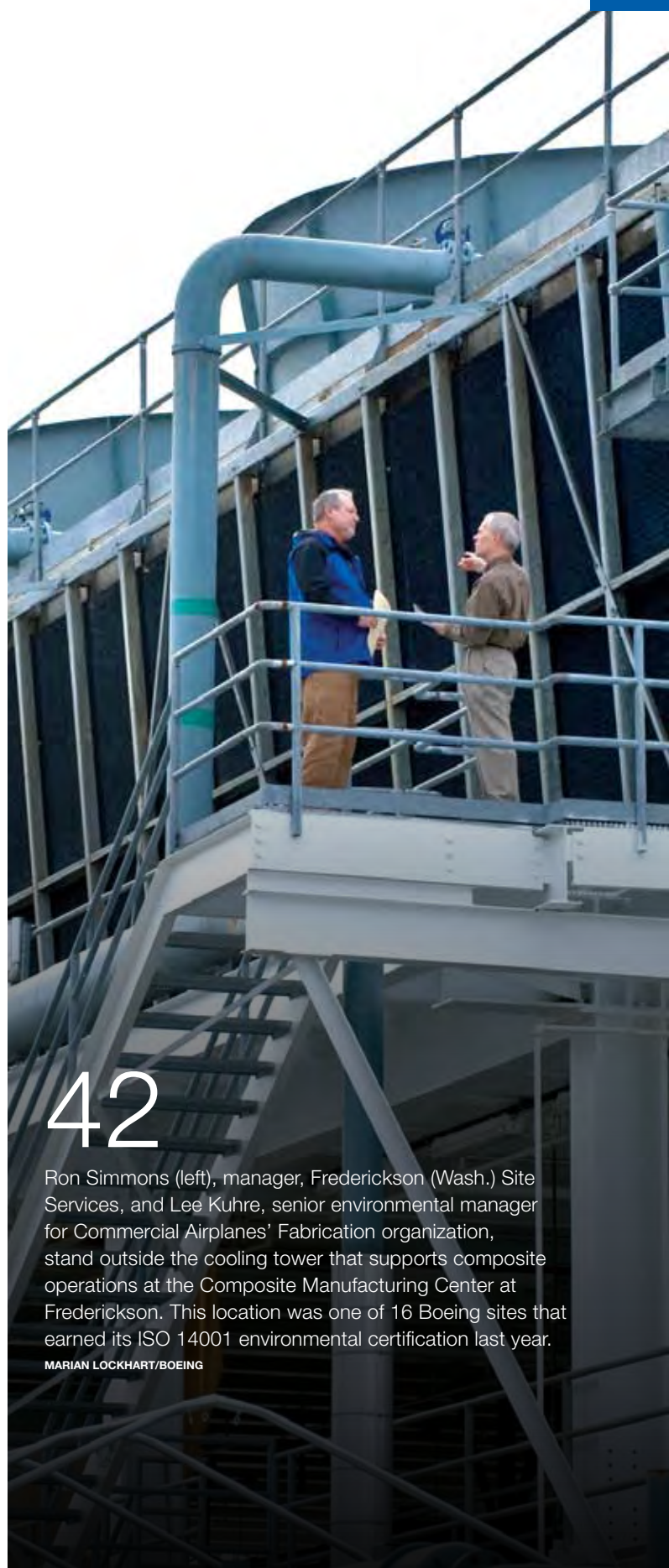
42 Green scene

Last year, 16 Boeing production facilities earned their ISO 14001 certification. This certification, a major milestone in Boeing's continuing effort to improve its environmental performance, came about through the coordinated efforts of many people at these sites—and shows how the integrated efforts of an engaged population across Boeing can create a broad benefit.

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Ron Simmons (left), manager, Frederickson (Wash.) Site Services, and Lee Kuhre, senior environmental manager for Commercial Airplanes' Fabrication organization, stand outside the cooling tower that supports composite operations at the Composite Manufacturing Center at Frederickson. This location was one of 16 Boeing sites that earned its ISO 14001 environmental certification last year.

MARIAN LOCKHART/BOEING



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LETTERS /

“Would it be possible to enhance colors rather than minimize them?” —Linda Frazier, St. Louis

JUST NOT MY TYPE

My husband retired almost 10 years ago and reads Boeing Frontiers religiously every month. Last night he was looking at the Service Awards pages and could not figure out why they started over with different names under the same number of years. I looked at it and told him that one was January and one was December. I thought he just missed it. Turns out he couldn't see that pale yellow type. I know he is color blind and maybe that had something to do with it, but a lot of men are color blind. He reads the paper front to back every day and points out things to me that I miss. He just got new glasses and doesn't have anything extraordinarily

wrong with his eyes. My only conclusion is that some older folks are not able to see that really light print. Would it be possible to enhance colors rather than minimize them?

—Linda Frazier
 St. Louis

Editor's note: Thank you for your comments. We have adjusted the type color on our Service Awards pages.

Clarification:

- Balcony viewpoints for tours of the Everett, Wash., factory will be outfitted sometime in 2009 with new see-through barriers (December 2008/January 2009, Page 24).

CALENDAR /

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

Feb. 22–26: IDEX 2009. This marks the ninth occurrence of the biennial Middle East defense conference and exhibition. Abu Dhabi, United Arab Emirates. See www.idex2009.com

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

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

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

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

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

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

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

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

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

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

LETTER GUIDELINES

Boeing Frontiers provides its letters page for readers to state their opinions. The page is intended to encourage an exchange of ideas and information that stimulates dialogue on issues or events in the company or the aerospace industry.

The opinions may not necessarily reflect those of The Boeing Company. Letters must include name, organization and a telephone number for verification purposes. Letters may be edited for grammar, syntax and size.

SNAPSHOT / OH, THE WEATHER OUTSIDE IS FRIGHTFUL ...

In late December, the Seattle area was socked with record snowfall. Boeing teams around the region worked to keep operations running. Above, flight line activities continue at Boeing Field—even as the snow piled up.

JIM ANDERSON/BOEING



QUOTABLES /

“It has the range and space of a three-engine plane, but with two-engine economics.”

—Doug Runte, an analyst at Piper Jaffray & Co. in New York, about the Boeing 777 Freighter, in a Jan. 13 Bloomberg News report about FedEx Corp. announcing its decision to exercise options on purchasing 15 additional 777 Freighters

“We express our strong support for the continued procurement of Super Hornets to address the (U.S.) Navy’s strike fighter shortfall.”

—A section of a Dec. 11 letter signed by 12 U.S. senators, including both senators from Missouri, where the Super Hornet is built, to Defense Secretary Robert Gates, in support of procuring more Super Hornets, in the Jan. 13 *Defense News*

“Continuing the process of improving and reforming the export control system should be a key part of your ... agenda.”

—Jim McNerney, Boeing president, chairman and CEO, in an open letter to U.S. President Barack Obama about the link between export control reforms and aerospace’s fortunes, in the Jan. 19 *Aviation Week & Space Technology*. McNerney was among seven leaders who contributed to the magazine’s “Viewpoints” column on policy matters affecting the industry

IAM PROMOTIONS

No promotions listed for periods ending Dec. 5, 12, 19 and 26, and Jan. 2, 9, 16 and 23.

ETHICS QUESTIONS?

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



A crowd gathers around the mural “Black Americans in Flight” at its 1990 unveiling at Lambert–St. Louis International Airport. The mural, created by two McDonnell Douglas employees, memorializes and celebrates the contributions of African-American aviators.

BOEING ARCHIVES

Linking the past to the future

A look at the connection between African Americans’ contributions to aviation, the Tuskegee Institute, a mural in St. Louis—and Boeing

By Henry T. Brownlee Jr.

If you’ve flown into Lambert–St. Louis International Airport and walked from the main terminal to the baggage claim and ground transportation area, you’ve probably seen a mural titled “Black Americans in Flight.” The mural, created in 1990 by McDonnell Douglas employees Spencer Taylor and Solomon Thurman and measuring 8 feet tall and 51 feet long (2.4-by-15.5 meters), memorializes and celebrates the historical significance and enduring value of African-American aviators and their contributions to aviation since 1917.

“Black Americans in Flight” also depicts 18 aircraft, several of which were developed and built by Boeing predecessor companies. African-American pilots and astronauts used these aircraft to accomplish various missions while simultaneously breaking race and gender barriers in the U.S. military and the defense industry.

The creation of this mural, an effort supported by Boeing heritage company McDonnell Douglas, reflects the importance of Tuskegee University, previously known as the Tuskegee Institute, to the contributions of African Americans to aviation. As a sign of this facility’s prominence, it’s one of 13 Historically Black Colleges and Universities (HBCU) in the

United States that Boeing supports today. As the United States observes African American History Month in February, here’s a look at what this mural portrays—and how it conveys the importance of the Tuskegee Institute and the Tuskegee Airmen, the popular name of a group of African-American pilots who trained at the college and flew with distinction during World War II.

MCDONNELL DOUGLAS BACKS MURAL

Taylor, a senior industrial artist, and Thurman, a senior re-production equipment technician, worked on their own time to create the mural. Among the organizations supporting their efforts was the McDonnell Douglas Foundation, which donated \$65,000 in 1989 to the organization financing the mural. “[McDonnell Douglas feels] that the role of black aviation history should be brought out,” said Jim Ramsey, a McDonnell Douglas spokesman, at the time. “We’re strongly involved in the community and in improving education, and we feel that these black aviators will serve as symbols that young people can follow and copy.”

And that it does, as “Black Americans in Flight” traced the history of African Americans in aviation.

The first panel shows figures of pre-Tuskegee African-American aviators. Among them: Eugene Bullard, a combat aviator who fought in World War I with the French Lafayette Flying Corps; Bessie Coleman, the first licensed African-American pilot in the United States; and Willa Brown, who organized the National Airmen's Association of America, the first black aviation association.

In this panel, Taylor and Thurman also included former First Lady Eleanor Roosevelt and President Harry S. Truman. To show her support for African-American combat aviators, Roosevelt went for a flight with Charles Alfred "Chief" Anderson, chief instructor at Tuskegee. While he was a senator, Truman encouraged Congress to fund the Tuskegee Experience, the unit at Tuskegee Army Air Field. As president, Truman in July 1948 issued Executive Order 9981, which required the integration of the U.S. armed services.

The second section of the mural, titled "Tuskegee Pilots 1940-1945," must be considered the quintessence of the full mural. Both the pre-Tuskegee section and the following three portions make sense only when considered in reference to this section.

Here, Taylor and Thurman focused their attention on the first graduating class of Tuskegee Airmen, or Red Tails as they preferred to be called, in March 1942. Taylor and Thurman included 17 pilots and one anonymous crew chief. Now-famous Tuskegee Airmen in this section include Benjamin O. Davis Jr., the first African American officer to fly alone for the Army Air Corps; Clarence "Lucky" Lester, famous for downing three enemy aircraft in five minutes; and Joseph Ellesberry, the first

Tuskegee Airmen to down three enemy aircraft in a single sortie.

The third, fourth, and fifth panels present a "who's who" of African-American aviators and astronauts.

The third section contains images of African-American pilots from 1950 until 1990 including Gen. Daniel "Chappie" James, the first African-American four-star general in the U.S. Air Force; and U.S. Army helicopter pilots Capt. Ronald Radliff, a pilot in Vietnam, and Capt. Marcella Hayes, the first African American female to fly Army helicopters.

Taylor rounded out his mural with images of some of the first African Americans in the space program. Among them: Ronald McNair, who died in the *Challenger* explosion in 1986; and Guion Bluford, who in 1983 became the first African American in space.

At the 20th anniversary event commemorating his historic Space Shuttle flight, Bluford attributed his ability to become an astronaut to the success of the Tuskegee Experience and the Tuskegee Airmen. His reflection on the importance of the Tuskegee Airmen and those committed to inclusion of African Americans as equals into every part of U.S. military service and the defense industry is not an overstatement. The Tuskegee Experience and the efforts of civil rights groups and politicians to make integration and desegregation real in the U.S. armed services produced several new laws. They included Executive Order 8802, a 1941 decree that prohibited discrimination in defense industries and federal bureaus.

BOEING AND TUSKEGEE TODAY

Boeing maintains a relationship with Tuskegee University. The college, in Tuskegee, Ala., is one of 13 HBCUs with which Boeing has developed a long-term strategic partnership. Boeing is actively recruiting young business and engineering talent at the college, increasing interaction with students participating in the Boeing Scholars Program, and increasing the number of visits by company executives to the campus, said Barbara Wilson, director and program manager, T-45 Training System Program, and the Boeing Executive Focal to Tuskegee University. There are currently 54 Tuskegee University Boeing Scholar graduates working at Boeing in various engineering and business fields.

In 1998, U.S. President Bill Clinton signed a law establishing the Tuskegee Airmen National Historic Site to commemorate and interpret the heroic actions of the Tuskegee Airmen during World War II. At last October's site dedication ceremony, Boeing was a major sponsor of the event, at which Boeing was represented by a cadre of executives, managers and employees. ■

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"We're strongly involved in the community and in improving education, and we feel that these black aviators will serve as symbols that young people can follow and copy."

— Jim Ramsey, McDonnell Douglas spokesman



Spencer Taylor, a senior industrial artist, was one of two McDonnell Douglas employees who created the mural "Black Americans in Flight." He's shown here at the unveiling of this work. BOEING ARCHIVES

In Philadelphia, Bryan Dunn (from left), DeLandria Gilmore and Lorrie Smith were among the employees who volunteered to experience a physical disability in the “In Someone Else’s Shoes” event.

FRED TROILO/BOEING



Getting to know *you*

Philadelphia employees find fresh and often surprising ways to reach out to others

By Geoff Potter

Isolating.” “Stressful.” “Eye-opening.” That’s how several Boeing employees described their experience with temporary physical disabilities last fall, in one of many initiatives at Rotorcraft Systems in Philadelphia to foster greater understanding of, and better communication with, their colleagues.

The event was led by the Philadelphia Diversity Council—which will be recognized for helping to provide a more diverse work environment as one of 12 award winners honored at Boeing’s 7th Annual Diversity Summit, which takes place this month. The council was selected for launching innovative and inclusive activities, serving as an advocate and catalyst for workplace change, and providing opportunities for teammates to learn about each other—and themselves.

In October, the council hosted “In Someone Else’s Shoes,” an event in which employees volunteered to experience a physical disability. For four hours, six people began to appreciate what it’s like to negotiate the workplace in a wheelchair or have impaired hearing or vision or limited upper mobility. They shared their in-

sights in a newsletter and video with their colleagues across the site.

“I found the experience to be isolating,” said Kathleen Brown, manager, Supply Chain Management, who spent four hours as hearing impaired. “I couldn’t use the phone to perform simple routine tasks; sending e-mails and waiting for responses was my only option. No music, no laughter, no background sounds that let you know other people are close by.”

“I did not anticipate the very emotional and stressful day I encountered,” remembered Andrea Allen, project manager, H-47 Operations, who was not allowed to use her legs and struggled to perform her job from a wheelchair. “It made me realize that we need to focus on being the employer of choice for all employees, not just the ‘physically able’ ones.”

“I learned two valuable lessons,” said Bryan Dunn, V-22 Finance manager, who was challenged to operate “normally” after losing his hearing and ability to speak. “First, that it’s harder to interpret meaning without hearing the tone of someone’s voice. Second, I use my sense of hearing to navigate around campus

“It made me realize that we need to focus on being the employer of choice for all employees, not just the ‘physically able’ ones.”

— Andrea Allen, project manager,
H-47 Operations

more than I realized. I found that I walked around constantly turning my head from side to side, frantically trying to regain my usual sense of awareness. I felt foolish and paranoid. It was an eye-opening experience.”

Recognizing the need to better communicate with co-workers who are deaf or hard-of-hearing, the council set up an American Sign Language class in 2008. Sixteen students completed the training, consisting of 16 sessions over an eight-week period. The class, having helped increase awareness about deaf culture and bridge communication gaps between employees, now will be offered annually.

The “In Someone Else’s Shoes” event was one of many initiatives created last year by the council, led by Anthony DiCello and made up of 28 volunteers representing functional areas throughout the site.

Other Philadelphia activities included:

- During Multicultural Awareness Month in August, the “Getting to Know Me” event paired up 22 employees from different backgrounds at lunchtime to exchange knowledge about their cultures, families, and ethnicities. Today, months later, many partners continue to meet regularly and learn new things about each other.

- The council also hosted the first Diversity Town Hall Forum, and later used the discussion of issues and concerns to help fuel the site’s 2009 diversity plan.

- In early 2008, people from across the site came together to create the Civil Rights Movement quilt. Asked to consider how the movement affected their lives and the lives of others they know, employees wrote their thoughts on patches that were

Dawn Stanfield-Scott (left) and Rosemary McLaughlin, members of the Philadelphia Diversity Council, brought together 170 colleagues from across the Rotorcraft Systems site to create a Civil Rights Movement quilt.

FRED TROILO/BOEING



later sewn together into a quilt. The artwork now hangs in the main cafeteria and continues to offer insights to all who visit.

At Boeing’s 2009 Diversity Summit, taking place Feb. 18–19 in Anaheim, Calif., 10 other individual employees and teams will receive Change Agent Awards for their success in advancing the principles of diversity, equality, fairness and inclusion in the workplace. Another team will be presented with the Global Diversity Process Improvement Award.

“Boeing people are doing amazing things to advance diversity, compliance and inclusion, and the Diversity Awards help to showcase their accomplishments and share best practices,” said Joyce Tucker, vice president of Global Diversity & Employee Rights, which hosts the summit.

The awards and annual and regional

summits are valuable tools for the enterprise, according to Rick Stephens, senior vice president of Human Resources and Administration.

“Diversity is a business imperative today,” he said. “Like the global marketplace we serve, the pool of talent available to us is becoming more diverse, and for Boeing to meet our customers’ needs we need to tap into the perspectives, skills and insights of all our people.

“While we’ve made great progress—thanks to Diversity summits, Heritage commemorations, training opportunities, and outstanding work by key leaders—we still have a long way to go.” ■

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Ideas that *fill the bill*

'Road Warriors' share tips on expensing

By Stephen Davis

On a given day, Boeing employees are hoisting bags into crowded overhead bins, wedging into well-used seats and travelling to distant locations rapidly and efficiently thanks to the marvel of heavier-than-air flight. These road warriors responded to a recent *Boeing Frontiers* piece on travel tips (Page 11, December 2008/January 2009) with their ideas on how to comply with policy and lower cost to Boeing. Here are few more of their tips—and favorite road memories.

Ron Sterzik, Shared Services Group

Trips in the past six months: 4

Expensing advice: "At the end of the day, put receipts in a file folder. I label each folder with the date and travel authorization number."

Travel tale: "One trip home to Seattle, we had to make a medical emergency landing in Billings, Mont. I never realized until then that the ground crews do so much before a flight. It took over an hour for the crew to service the airplane, even though it was a routine landing."

Ryan King, Commercial Airplanes

Trips in the past six months: 4

Expensing advice: "If you use the EBC list of credit charges to pull in your hotel bill, you then can easily further itemize the costs in your expense report down to the appropriate categories."

Travel tale: "A few of us on the same trip compared our final hotel invoices at checkout. One showed every charge had been multiplied by 100!"

Don Frueh, Boeing Capital Corp.

Trips in the past six months: 4

Expensing advice: "Record expenses as you go. Travelers in my group often have long trips with many different destinations. We use a common spreadsheet to record expenses on the road."

Travel tale: "One of my expense reports was held up because the taxi receipt was in Japanese and the auditors couldn't read it. Now I annotate receipts in English to clarify the expense."

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

stephen.m.davis@boeing.com

PHOTO: Following a business trip to California from Seattle, Ryan King, with Commercial Airplanes' Finance team, checks the receipts he saved for his travel expense report. MARIAN LOCKHART/BOEING

TIP OF THE MONTH: EASIER TRAVEL EXPENSING

Shared Services Travel & Expense Services processes nearly 1 million expense documents each year. The team has been working to make it easier for employees to submit receipts Boeing is required to collect by the U.S. Internal Revenue Service. Expense reports must be submitted within 12 calendar days upon the completion of travel or incurrence of the business expense. That means the receipts also must be submitted within that time.

“We recognize that expensing policies and requirements can have a huge effect on employees,” said Yvette Winn, director of Travel and Expense Services, “and we are committed to making improvements to our tools and processes.”

To make the receipt requirement easier, Winn suggests:

- Use Travel’s new Travel Receipts Organizer. The organizer is a simple way to collect receipts and record expenses as you travel. It’s a paper envelope that has categories printed on the front so people can jot down an expense for later reference—then stow the receipt inside. It’s available from Travel’s Web site at <http://tes.web.boeing.com/travel.htm> on the Boeing intranet or by ordering through the Shared Services Procurement/Payables Network.
- Scan required receipts directly to Travel Accounting to save time and reduce errors. Printer/copiers at most U.S. sites now have this new feature to save you time and improve accu-



Printer/copiers at most Boeing U.S. sites now allow users to scan required receipts directly to Travel Accounting. Look for the symbol in the lower right of the printer/copier’s status monitor (lower right), and follow the Scan-to-Travel icon’s prompts.

DANA REIMER/BOEING

racy of receipt submittal. Just follow the Scan-to-Travel icon prompts. By the time you return to your desk, you’ll see an e-mail from Travel with an image of the scan, allowing you quickly to verify that the transmission was correct. If you do not have access to an updated printer/copier, use Travel Accounting’s new fax number, 314-545-0000.

—Stephen Davis

BOEING REPLACING APACHES, CHINOOKS LOST IN BATTLE

Boeing Rotorcraft Systems in Philadelphia and Mesa, Ariz., is replacing 52 AH-64 Apache helicopters and 11 CH-47 Chinooks lost or extensively damaged during operations over the past decade in Afghanistan, Iraq, Kuwait and Kosovo.

The U.S. Army awarded an initial Wartime Replacement Aircraft (WRA) contract in 2005 for 13 Apaches. These aircraft represent the first U.S. Army new-build D-model procurements. Additional contract plus-up modifications were awarded in 2006, 2007 and 2008, bringing the total to 52 aircraft with a total contract value of \$755 million.

The first helicopter was delivered in May 2007. Since then, 16 aircraft have been handed over, all on or ahead of schedule. The last Apache is scheduled to be delivered in late 2010.

The 11 replacement Chinooks are built into the Army’s \$14 billion contract to deliver 452 CH-47 new builds and conversions from D to F model aircraft over the next 10 years. In 2008, funds were provided to add 10 more Chinooks to the fleet (see Page 32).

“It is vital that we get more aircraft out there,” said Mark Ballew, senior manager for Marketing, Tandem Rotor aircraft. “The success of the Chinook and its ability to move cargo and troops in high altitudes and high winds has made the aircraft incredibly valuable in all theaters of operation. And with the way the Army is restructuring, the Chinook is becoming more prominent in all operations and the Army is requiring more aircraft.”



Boeing employees in Mesa, Ariz., home of the Apache helicopter, are replacing 52 AH-64 Apaches lost or extensively damaged during the past decade in theaters of combat. BOB FERGUSON/BOEING

“This effort returns new-build Apaches to the warfighter for the next fight, which is vital to the Army’s objective of maintaining overall force structure,” said Apache WRA Program Manager Travis Williams. “Pilots are eager to fly the brand-new version of this mission-proven helicopter.”

—Lisa Dunbar

A year like none other

Boeing faces profound challenges in 2009. What must employees do to make the year a success? The leaders of Commercial Airplanes and Integrated Defense Systems offer their views.

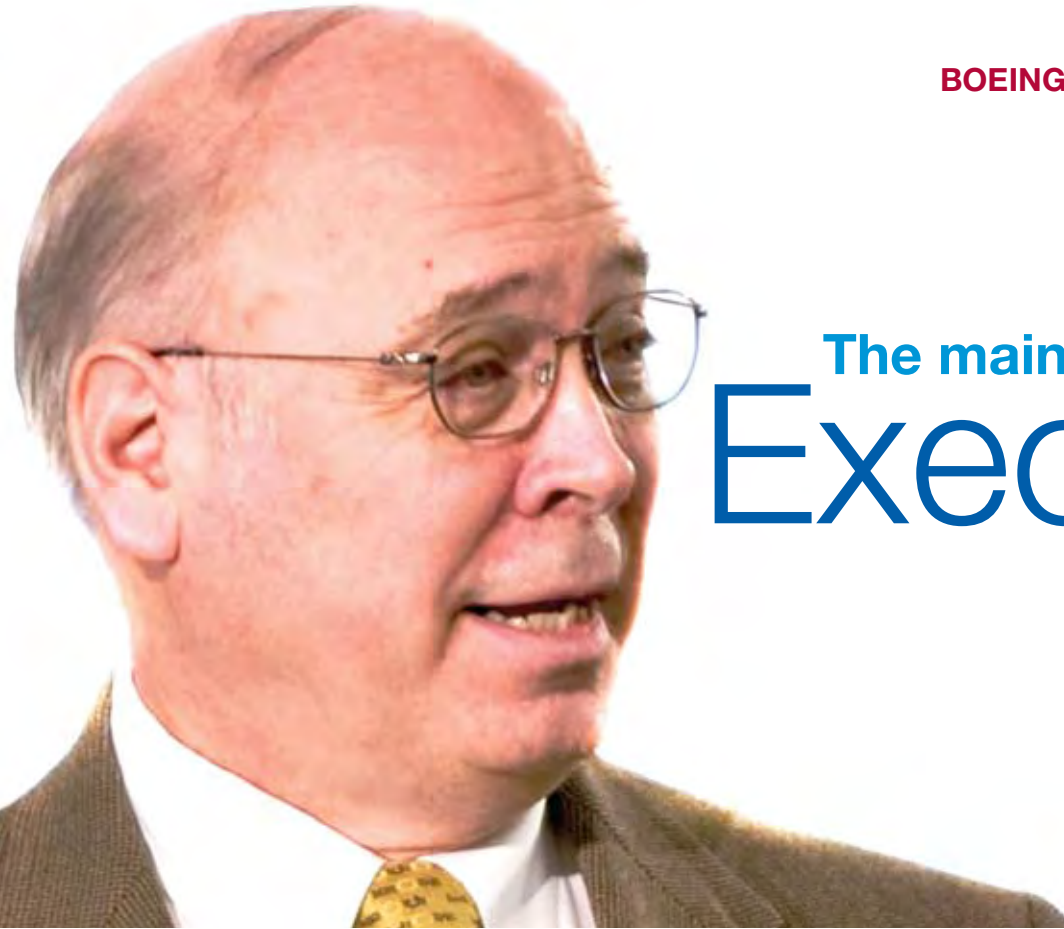
For Boeing and its employees, 2009, perhaps more so than any recent year, brings with it a startling set of contradictory and challenging circumstances.

On the one hand, Boeing's major business units, Commercial Airplanes and Integrated Defense Systems, have compiled extensive backlogs worth a combined \$352 billion. In addition, international customers play a stronger role in each business unit's plans: Not only does Commercial Airplanes' backlog feature more orders from international customers than has traditionally been the case (see Page 35 of the July 2008 *Boeing Frontiers*), but IDS envisions international markets as a major source of business growth. These factors illustrate how important international markets are to both business units.

Yet on the other hand, the conditions in Boeing's major business markets arguably constitute the most difficult set of challenges the company has seen recently. The world is dealing with a recession and an ailing financial industry. Commercial and defense customers are having to adjust to these economic realities—and so is Boeing.

That backdrop raises the question: What's next for Boeing?

To provide insight on this question, *Boeing Frontiers* spoke with the leaders of the company's two major business units—Scott Carson, president and CEO of Commercial Airplanes, and Jim Albaugh, president and CEO of Integrated Defense Systems. In separate discussions, each leader offers his respective takes on the 2009 outlook for his business unit and its markets—and discusses the priorities each organization needs to focus on to make the year a success.



The main focus: Execution

Scott Carson, Commercial Airplanes

With the first decade of the 21st century ending on an economic down note, Commercial Airplanes and its customers and suppliers face some tough challenges. Scott Carson, Commercial Airplanes president and CEO, recently put the current business environment in perspective for *Boeing Frontiers* and reviewed the top priorities for the year ahead. Following are highlights of the discussion.

Q: What big issues does Commercial Airplanes face?

A: There are a number of challenges facing our business. There's no question that one of the biggest issues arises from the delays in the 787 and 747-8 programs. Our execution on those two development programs has not been satisfactory. This affects near-term opportunities for us to grow, and it affects how our customers think about us. It directly affects—today and tomorrow—our financial results.

Certainly we delivered fewer airplanes than we expected last year, and that had a big impact on us. And none of us suspected that the world around us would be threatened by the economic cycle we are now a part of. This has a lot of implications for us.

Thirdly is an issue that relates to the first two: Our recent announcement concerning a reduction in our work force. This was a very, very difficult decision. It is in response to the totality of the environment we are facing. It is an effort to help us to prepare for an uncertain future and to manage our cash flow, which is so important to our business for funding key development programs and ensuring our competitiveness through this difficult period.

Recently we restructured our organization to help put more focus and better execution in the airplane programs and our global supply chain. One of the key results of this effort is to integrate the 787 program with the rest of the production family to drive the improvements that are necessary to make that program a

long-term success, and a profit engine, for the company. Overall, the organization change will benefit our entire production system, put more emphasis on quality, boost our competitiveness and put us in a position to address the challenges of 2009.

Q: How severe is the impact of the global recession?

A: The short-term market outlook is tied to the economic environment we're facing. We are indeed in a global recession. We have never been through a set of circumstances like we're going through today. Having said that, we're as well-positioned as any company in the world to get through this if we stay focused on execution.

Still, the economic situation is really dicey right now. We're seeing gross domestic product (GDP) deterioration in every part of the world. Just a year or 18 months ago, some major nations were enjoying double-digit GDP growth, but now those rates have dropped in a dramatic way.

Oil prices continue to be highly volatile. The good news is that where prices are today, airlines could be profitable, so there is an opportunity if the traffic is there for them to actually make money. The bad news is that we're seeing the impact of the recession on air travel.

Nonetheless, our 20-year forecast still suggests this is a very robust and very reliable market. But we are clearly going through a hiatus right now in terms of traffic, and the data can be hard to read. Our Sales team is watching this carefully to be sure that every airplane coming out of a fleet has a potential home so that we don't adversely affect the total business here at Boeing. All in all, most of the customers flying Boeing airplanes are holding on OK. So, based on where we are right now, we see relatively steady production over the next 18 months as we deliver on our backlog.

Q: How solid is the Commercial Airplanes backlog?

A: You may have seen some media reports indicating that our orders were off by a substantial amount last year. True, but we still took orders for 662 airplanes, and that was after coming from a couple of record years that had been well over 1,000. The fact is 662 orders still ranks as the eighth highest year in our history. So it isn't like we dropped through the floor. In other times it would have been considered outstanding business volume.

Also on the positive side, I like our model mix and the geographic dispersion of our backlog. All in all, this works well for us. I think we are as well-positioned in our backlog as we could hope to be. (See charts below.)

Q: What about the services side of the business?

A: The services market remains good. Of course, the airplanes that have come out of the fleet—mostly MD-80s and 737 Classics—are no longer consuming spares. So, the spares side of Commercial Aviation Services has been adversely impacted. But the technical services side of the business and the Jeppesen and Aviall subsidiaries are doing well. So even with pressure on revenues, the CAS organization has been able to meet its performance plan. Also, opportunities continue to open up for us around the globe in the services business.

Q: Should Commercial Airplanes be working more closely with suppliers?

A: Part of our restructuring effort deals specifically with supplier issues. Whether suppliers are outside the Boeing walls or inside the Boeing walls, we need a singular focus on that aspect separate from final assembly. Airplane programs and services

are how we make our money, but we need to focus on the quality, cost, productivity and schedule effectiveness of our supplier partners.

Our new Supply Chain Management and Operations organization will put a concentrated effort on driving first-time quality improvement from our supplier partners as a continuation of our productivity journey. We need to maintain the partnerships that we worked so hard to build while driving long-term productivity that benefits both of us.

Q: How would you sum up the key focus areas for 2009?

A: Clearly the first one is to finish our developmental programs. We must get them into the marketplace so they're generating revenue for our customers and for ourselves.

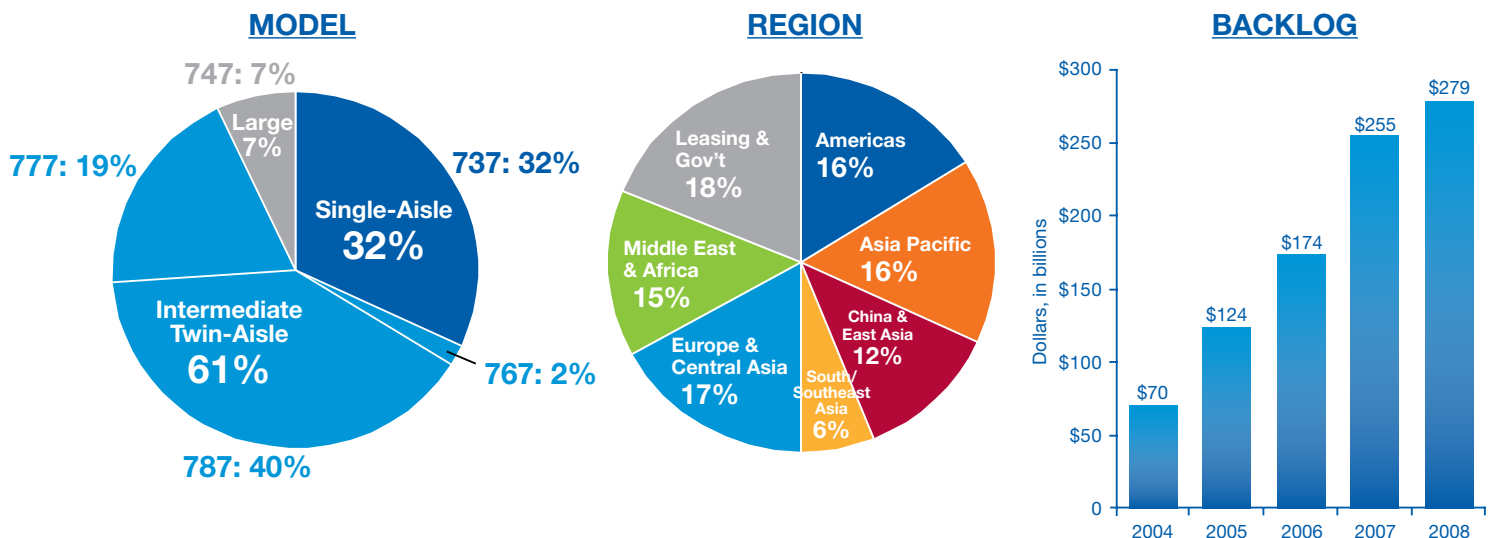
Second is keeping the backlog sold. That means being agile in terms of how we understand what's happening in the marketplace and being agile in terms of how we move our model mix around to keep production rates steady.

Third is quality. Our customers are not going to tolerate a production system—whether it's ours or our suppliers'—that is not delivering a high-quality product. We can differentiate ourselves in this market by making quality the most important thing we deliver to our customers.

And finally, the business plan. As I mentioned recently to my leadership team, the Commercial Airplanes plan approved by the company is, in my view, only the floor—the minimum goal. We have to work significantly throughout the year to exceed the plan. If we deliver a high-quality product to our customer with every delivery, if we delight the customer every time, we can beat the plan—and that will put us in a whole different place in the market. ■

A SNAPSHOT OF A BACKLOG

Commercial Airplanes' backlog reflects the market's interest in intermediate twin-aisle airplanes such as the 787 Dreamliner. It also shows how the great majority of airplanes are destined for customers outside the Americas—and that the value of this total backlog has mushroomed in the last few years.





Know our customers' needs

Jim Albaugh, Integrated Defense Systems

The New Year brings challenges and opportunities for Integrated Defense Systems. Clearly the financial meltdown and global recession weigh on everyone's mind and will affect business in 2009. At the same time, IDS has built a near-record backlog and enters the year with its fundamental financial strength and competitiveness intact. Equally encouraging, there are plenty of new business opportunities in the United States and internationally. Jim Albaugh, IDS president and CEO, sat down with *Boeing Frontiers* to discuss the way forward in 2009.

Q: We began the New Year with a big positive—the first international sale of the P-8 anti-submarine and surveillance aircraft, to India. What does that say about our fundamental strategy amid the uncertainties of 2009?

A: The P-8 sale represents something unique and powerful about Boeing: that we have certain strengths and capabilities that no other defense and aerospace company can match. It says further that if we continue to leverage this “One Boeing” strength, then we could see some more positive outcomes that set us apart from the rest of the industry. It also shows that we have the right strategies, people and technology to succeed over the long term—not only in platform businesses but for all of our IDS business units.

Q: We're in a recession, the United States has a new president and U.S. defense spending is likely going to be cut. How does IDS manage through this?

A: We need to keep our programs healthy, and here I'm talking about executing on our programs, making sure that they are relevant to the warfighter and their needs near-term, and keeping them politically viable. And that means working with the Washington, D.C., office on Capitol Hill.

At some point the budget will moderate. It will moderate as the U.S. gets out of Iraq, it will moderate because of the competition for government funding with the other social programs that exist, and I think that we need to be prepared for that time. And there are things that we can do to make sure we remain competitive.

Q: Why do you feel IDS is well-positioned to remain competitive during leaner times?

A: It's impossible to predict with perfect clarity which programs will survive and which ones won't. But we do understand the enduring needs of our customers. And if we focus on these needs—mobility, integrated command and control, global situational awareness, logistics support, force projection—and on developing technologies that support those enduring needs, as programs come and go we will be very well-positioned to win new opportunities.

At the same time I think price and cost will be much more of a determining factor, and we need to make sure our cost structure is one that offers us a competitive advantage now and in the future. Our strategy of enhancing existing platforms with new capabilities—including network-centric features—also helps our customers by providing lower-cost, low-risk and high-value solutions.

Q: How do you think U.S. defense acquisition will change under an Obama administration?

A: There certainly have been acquisition issues, there have been protests that have been sustained, there have been cost overruns, there have been programs that don't necessarily match the needs of the warfighter. I think it's time for both the Depart-

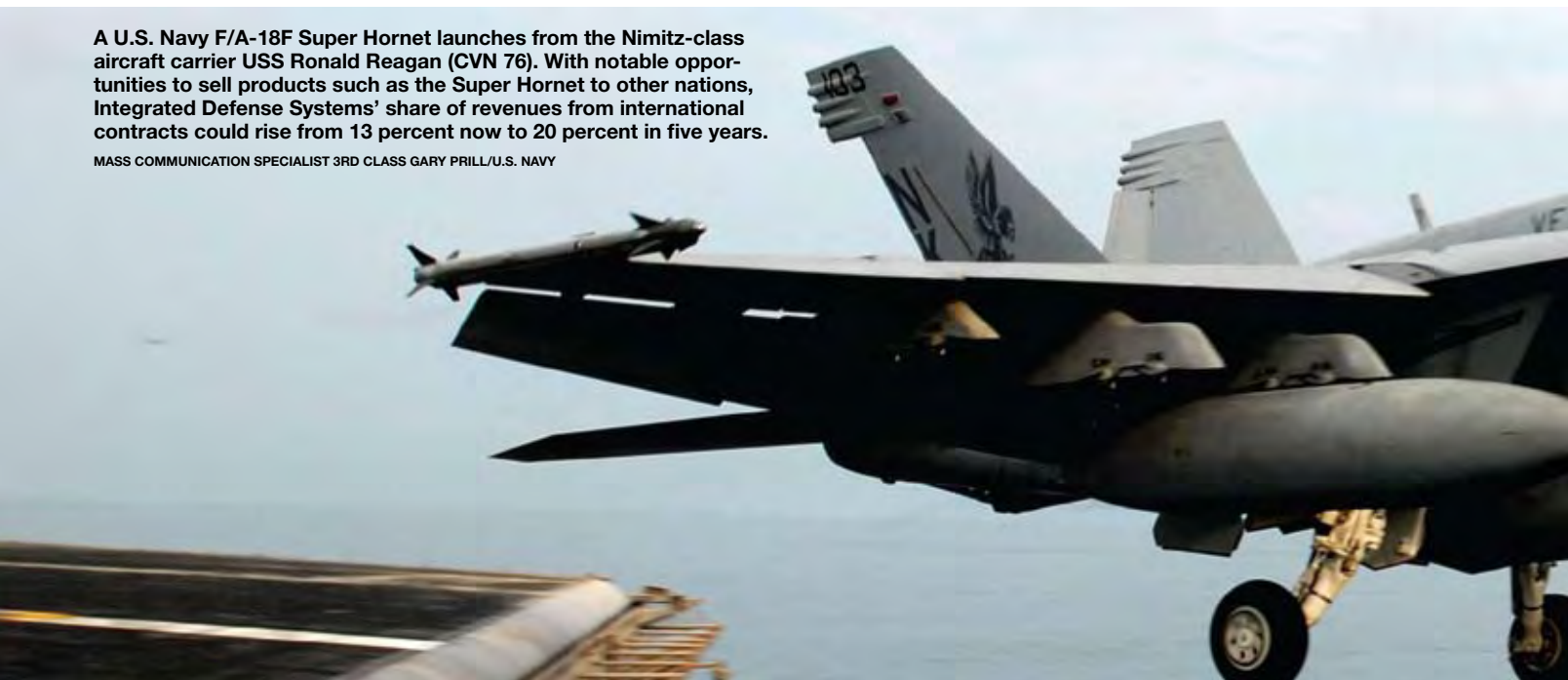
Q: Where do you see business opportunities for IDS in the near term?

A: Clearly an opportunity that we can all work on is our cost structure, making sure that the things that we are doing add value to our customer and that we're doing them as efficiently as we can. At the same time, there are many international opportunities we need to address aggressively. Some of the biggest sales potential will be in key international markets that are seeking a variety of aircraft. There are also adjacencies, such as Homeland Security, the intelligence market and other government services, that we need to address in a much more aggressive fashion than we have in the past.

The other opportunity has to do with the whole area of sup-

A U.S. Navy F/A-18F Super Hornet launches from the Nimitz-class aircraft carrier USS Ronald Reagan (CVN 76). With notable opportunities to sell products such as the Super Hornet to other nations, Integrated Defense Systems' share of revenues from international contracts could rise from 13 percent now to 20 percent in five years.

MASS COMMUNICATION SPECIALIST 3RD CLASS GARY PRILL/U.S. NAVY



ment of Defense and Congress and the defense companies to really sit down and address some of the issues that are driving these problems.

Relative to protests, having clear requirements, having good communications with all the competitors up front in the competition phase of the program and then carefully following the requirements of the Request For Proposals, all need to be done.

Q: Do you anticipate a gradual or sharp decline in defense spending over the next five years?

A: I don't anticipate a sharp decline. I think the environment we're in today is very different than in the '80s when there was a marked reduction in the defense budget. In those days, all the equipment was new and budget cutters could take cost out of the Defense Department by reducing personnel. The threats were well-understood. Today, there is a full spectrum of threats that need to be addressed. The equipment is old and needs to be reset, and we're adding 92,000 troops to the Army and the Marines.

port. As the airplanes that are out there continue to age and are not replaced, there will be more opportunities for our Global Services & Support business to provide the necessary upgrades, maintenance and training.

Q: Tell us more about the international market.

A: Right now I see more international opportunities than I have seen in my career with Boeing. These opportunities are driven by the fact that the threat environment has changed around the world, but it's also a result of globalization. Many countries that didn't have the ability to buy defense products now have the means to purchase them.

We see opportunities for fighter aircraft, rotorcraft, network systems, airborne early warning and control airplanes, and the C-17. Today, about 13 percent of our revenues are driven by international contracts. Within five years that number can reach 20 percent.

Q: How critical is it to make cost a competitive advantage?

A: In the present environment there are two overriding factors that will likely dominate our customer's decisions. One, do they get the capability that they need? And two, do they get it at a price that they can afford? We are a company that can always put together a great technical answer, but sometimes our solutions are so elegant that they become costly. And sometimes our solutions lack mature technologies that should be included—and that drives costs up. But our customer is going to have to make trades between cost and capability, where they have accepted a solution that provides them not the optimal capability, but the required capability. In fact, we've already seen them do that in

Q: Another part of the IDS strategy calls for shaping new markets and agencies by leveraging the network. Can you describe some of the most promising of these opportunities?

A: We've said for many years that using existing programs and capabilities and by linking those programs and systems together ensuring data and capabilities, you can provide a capability that didn't exist before. We've done that with Missile Defense, we are doing that with Future Combat Systems, and we are doing that with the Secure Border Initiative. There are more opportunities to make existing platforms more capable, more survivable through networks. There is potential internationally, too, where networking has not been done to the same extent as here.



places. And that means all of us need to understand the requirements of the customer, meet the requirements and make sure we put them into our programs.

Q: How does IDS drive out cost from complicated and highly technical programs?

A: The first thing we have to do is to make sure that we understand the requirements, and that means a lot of face-to-face communications with our customers. Second, we need to make sure our solutions use mature technologies. Third, we need to make sure that we've done good systems engineering and we've put together a very complete and integrated master plan. Then, we must be disciplined in how we do the work to make sure that as issues come up they are readily addressed by the program teams.

Another big part is making sure that, as we flow down requirements to our suppliers, we flow down the correct requirements. We have to spend time with them so they understand the requirements—just as we need to understand the requirements of our customers.

Q: We face some challenging times in the short term, and Boeing has encountered tough times in the past. Why do you feel IDS is in such a solid position today and is well-prepared to grow in the future?

A: I think it starts with the people that we have. This team has demonstrated time and time again they can handle adversity, they can solve difficult problems and they understand how important their work is to the customer. I'm sure that as we better understand the challenges we face in the coming years that once again this team is going to step up. And the leadership team is going to do everything we can to make sure that the team has all the information we have about issues, about budgets, about programs and about challenges. ■

John Lockard, IDS chief operating officer, explains the link between productivity and cost containment—and leadership of the defense industry. Page 20

Emerging **better** and **stronger**

IDS' John Lockard explains why productivity and cost containment are linked to Boeing maintaining leadership of the defense industry



PHOTO: John Lockard, chief operating officer of Integrated Defense Systems, says that providing more value to the customer, through reduced price or more capability for the amount spent, puts IDS in a "more favorable environment." BOB FERGUSON/BOEING

John Lockard, Integrated Defense Systems chief operating officer, is overseeing initiatives to vastly improve productivity and reduce cost to remain competitive in a changing defense climate. Lockard, a retired U.S. Navy admiral, has a unique perspective on what it will take for IDS to maintain its leadership of the defense industry. He shared his thoughts with *Boeing Frontiers*.

ON IDS PRODUCTIVITY IMPROVEMENTS AND LEAN+ INITIATIVES:

"Some of the best examples of success we are seeing can be found in the factory. We have wonderful examples of where employees engaged in performance improvement have yielded results that frankly people never expected in such programs as the F/A-18, C-17 and rotorcraft.

"Some of our smallest programs are doing fantastic things and doing it in different ways because of their smaller size. JDAM and Small Diameter Bomb are perfect examples. They use innovative production systems with lean principles in everything they do.

"Lean+ involves every aspect of the business. It's not just about the manufacturing anymore, it's about the engineering that supports the new design concepts, it's about the financial planning that supports the new design and production concepts. It's a totally integrated program team approach. And we need to take those results and apply the learning across the entire enterprise so we can take Lean+ to the next level."

ON THE IMPORTANCE OF MAKING COST REDUCTION A COMPETITIVE ADVANTAGE:

"There's going to be a lot of pressure on the customer to control expense, particularly in procurement, and I believe that the customer is going to have to face the reality of buying less if we don't figure out a way to produce our products at less cost.

"So every opportunity we can take to help the customer in their very difficult decisions puts us in that trusted supplier category. That means seriously examining ways to cut costs and improve productivity. If we are considered to be a preferred supplier, then they are going to turn to us for advice and they are going to turn to us for more product. So the more we focus on providing value to our customer—whether it is through reduced price or more



capability for every dollar—it puts us in a more favorable environment, and it puts us in a very competitive position that I think the climate is going to require.”

ON OVERALL 7 PERCENT COST REDUCTION TARGETS FOR IDS:

“It looks like we need to get and can achieve about a 7 percent performance improvement across the board to improve our competitiveness. Is that something that is chiseled in stone? Absolutely not, but it is clearly within reach. What we need to do is to work to get better than that if possible. It is laid out as a guideline—something that we can measure. In some areas it will be difficult to get to 7 percent and in other areas you can exceed it by a considerable margin. So let’s attack it everywhere, and if we are doing the best that we can do, our view is we will exceed 7 percent across the board. We will be competitive in this harsh environment.”

ON THE CHANGING DEFENSE ENVIRONMENT AND CUSTOMER RELATIONS:

“I think while every moment in history is unique, there are always comparative points that can be made. This is not the first time we’ve had an economic turndown. This is not the first time that we’ve had pressure on the funding for defense. It probably is, from my memory anyway, the first time we’ve had as many factors that are as diversified as they are, that appear to be emerging at a point in time that is coupled with an administration change. So the way I try to think through these things is to

PHOTO: In this 2006 photo, a U.S. Air Force captain inspects a weapon carriage with GBU-39/B small diameter bombs. The Small Diameter Bomb program is among the Integrated Defense Systems teams that are using innovative, Lean-based production systems.

U.S. AIR FORCE

deal with data and not emotion. That means we can never have enough information.

“We really need to improve our engagement with our customer across the board. What are the things that worry them, what are the things that are pressuring them, and if we really listen to what they say, and go and try to help them—engage with them in a way that we somehow relieve some of that pressure, then we are going to come out of this with better business and a stronger company. It is that straightforward.” ■

Where Lean+ and



Al Hardy (left), factory floor machining manager; Martin Manning (center), manufacturing engineering manager; and John Woodward, layout specialist, check the status of jobs in work at the Emergent Operations Center at the Boeing Fabrication facility in Auburn, Wash. MARIAN LOCKHART/BOEING



Ray Robinson Jr. checks a parts kit's "pinwheel"—a sheet listing the kit's pertinent information such as its destination. Parts employees worked with M&PT engineers to develop a system that lets them deliver completed kits to their point of use within 20 minutes after receiving orders from mechanics. GAIL HANUSA/BOEING

Commercial Airplanes Material and Process Technology engineers use agile development methodology to drive out waste

By Dan Ivanis

Although spread among 34 machines and over 70,000 square feet (6,503 square meters) in Emergent Operations at the Boeing Fabrication facility in Auburn, Wash., machinists, team leaders and managers now can monitor all jobs in real time and see what's coming next in the group's ever-changing queue of critical work.

At the systems installation area on the 777 moving line in Boeing's huge factory in Everett, Wash., parts room employees now can deliver completed parts kits to their point of use in 20 minutes or less after receiving orders online from mechanics on the airplane.

Employees at Commercial Aviation Services' Material Management organization in SeaTac, Wash., can with a glance view large plasma screens and individual andon lights in their work area to see whether teammates need support or are available to help on urgent matters.

At all three of these points along the Commercial Airplanes value stream, engineers from Material and Process Technology (M&PT) used agile development methods to design and implement solutions to local challenges so Boeing employees can per-

form work faster and more efficiently than ever before.

Agile development is a methodology that promotes rapid turnaround, iterations, teamwork, collaboration and process adaptability throughout the life cycle of a project. It works especially well in rapidly changing environments or where requirements are not well-defined, said Larry Hazlehurst, an M&PT engineer and Associate Technical Fellow.

"The people who ask for our help generally know what they want, and the next question is how long it will take to get it done," said Sidney Ly, who often partners with Hazlehurst and also is an Associate Technical Fellow. "The idea is there, but they don't know whether it will work or not. They want to be able to try it out the next day. That's what agile is all about."

For example, the outcome of a Lean+ workshop sometimes is a collection of participants' ideas. However, those ideas often require a new tool or a technological advance to become a reality. That's where agile development comes into play.

"My main focus area has been on where Lean+ and technology meet," Hazlehurst said. "The agile development environment works really well with Lean. For instance, we worked with participants in a Lean workshop recently. Their workshop let out on Friday and we had the first pass at a solution for them on Monday."

technology meet



Sidney Ly (left), Bruce Howard (center) and Larry Hazlehurst, engineers in Commercial Airplanes' M&PT organization, discuss a potential modification to one of the many systems they developed using agile development techniques.

JIM ANDERSON/BOEING

DIFFERENT FROM 'WATERFALL'

The agile method—which M&PT employees have used to do everything from design a special hand tool to simulate twin-aisle airplane production in the factory—differs greatly from the traditional “waterfall” method. In that method, which often is used in software development, detailed specifications are determined up front and handed over to a development team, which is expected to come back at a specified date with a finished product.

“With agile, we get our first iteration done quickly and then keep improving it with the customer’s input,” Hazlehurst explained. “Agile doesn’t work for everything and in some cases the waterfall method is best. But in certain situations, agile development is the best answer.”

One cornerstone of agile development is the re-use of available systems or the adaptation of off-the-shelf systems to the specific needs of the customer. For Hazlehurst and Ly, this often includes the Universal Data Collection System and the Intelligent Information Dashboard, both invented by Ly. When these are used together, real-time data can be collected from a number of existing systems and displayed in ways that can be customized to maximize usefulness for the user.

“When the 777 was transitioning to the moving line, we knew our old method of delivering parts to the airplane would no longer work,” said Jesse Quigley, a manager who at the time was a team leader for the largest parts control area for the 777 pro-

gram. “I kind of knew what we needed, but didn’t know what was possible.”

Quigley investigated and discovered the Pacer system, which was in use in 777 final assembly and on the 737 moving line in Renton, Wash. Developed by M&PT, Pacer collects data from an expandable collection of existing systems and displays it according to the customer’s needs.

“We asked Larry to come talk with us and we started with a very rudimentary tool,” Quigley said. “Every time we hit a snag, we’d call back and ask if we could change this or add that. He would come back to me within the next day and say, ‘Try it now.’”

With the Pacer system, employees have dramatically improved Systems Installation parts-room processes. Workers can see precisely where kitted parts are stored once they have been put together. And mechanics on the airplane can order part kits for their jobs online and know that the correct kits will be delivered at the point of use within 20 minutes.

“It is a long way from where we were,” Quigley acknowledged. “It used to be that most of everyone’s time was spent looking for stuff. Now, the system does all that for us.”

GOODBYE, INDEX CARDS

Agile development methodology emphasizes the importance of leveraging the knowledge and unique talents of everyone involved in the process—the development team, customers, sup-

Dawn McDonald (left), a supply chain analyst, explains an issue to manager Jerry Davis at Commercial Aviation Services' Material Management offices in SeaTac, Wash. Plasma screens and andon lights (foreground) give Material Management employees highly visible, real-time information about the health of their production system. **MARIAN LOCKHART/BOEING**



Jesse Quigley (right), a manager who formerly served as team leader in the 777 systems installation parts control area, checks the status of a parts kit with Jodi Groves. **GAIL HANUSA/BOEING**



pliers and subject matter experts.

"The agile method allowed everyone on our team to get involved," said Martin Manning, a manufacturing engineering manager in Fabrication's Auburn Machining and Emergent Operations facility. "There was some skepticism to begin with, but once people saw their ideas were being taken seriously they started really getting involved."

Manning moved to Auburn in mid-2007 and discovered that group's operations revolved around a labor-intensive system where index cards were used to indicate work priorities. Because of the emergent nature of the work, the cards had to be rearranged constantly. "We had no way of seeing the big picture and no way of collecting meaningful data," Manning said.

Using agile development, M&PT designed a system that tracks and automatically updates the list of pending jobs, and at the same time, tracks work in progress on each of the 34 machines. The information is displayed on a large plasma screen in the work area, and individual operators can call up the data at their PCs so they can prepare for what's next in their queue.

"The old system was like writing everything out longhand," said Bill Taylor, a manufacturing team leader. "I spent most of my time moving index cards around. Now everyone has visibility of what is coming next, and I spend my time doing valuable work."

"The strategy was to make sure we had a good eye on the customer requirements for all the items that [they considered to be] critical," said Mike LeClair, a senior manager in Emergent Operations at the time. "This kind of factory floor visibility helps achieve a sense of urgency and involvement for the entire Emergent Operations team. It has been a great team effort."

Manning said the two factors in his success working with M&PT have been his close association with the developers and

the speed in which things are developed.

"They talked to me, they talked to the team leaders and the machinists and they helped us develop an understanding of what we needed, and not necessarily what we wanted ... Those were two different things," Manning said. "Then they delivered it in about a month."

In addition to the real-time data, the system also automatically compiles historical data, which managers can use to more efficiently run the department.

"Instead of basing decisions on anecdotal information from a collection of sources, we can use hard data collected from our entire operation," Manning said. "That has helped us engage the whole team. They give me ideas on how we can improve [the system] to help them do their jobs, and we work with M&PT to do that."

WATCH FOR THE RED LIGHT

When Commercial Aviation Services' Material Management organization established a Lean vision to dramatically reduce response times and improve customer service, Lean manager Gary Rucshner turned to M&PT to help develop the tools necessary to measure the health of the Lean system.

First, the organization implemented response cells and then process cells. Each cell was given specific responsibilities within the organization's overall mission, which is to receive orders and deliver airplane parts to customers and distribution centers throughout the world.

"We knew our customers were not totally satisfied with the service they were receiving," Rucshner recalled. "We established these groups of people—cells—to perform specific functions, and then we needed to figure out a way to measure the health of our



Glenn Richards (right), a supply chain analyst, explains an issue to manager Peter Kim at Commercial Aviation Services' Material Management offices in SeaTac, Wash. Real-time information about their production system comes from plasma screens and andon lights.

MARIAN LOCKHART/BOEING

processes and our productivity.”

After the teams developed processes for each cell and established points within the processes where time lapse should be measured, Rucshner contacted M&PT for help.

“We started out with a concept on paper and then we met with Sidney,” Rucshner said. “He created a working model very quickly and we refined it over the next several months.”

The finished product is a system that provides overall visibility of everything going on in a particular cell. Leadership team members also can use the system to get a higher level view of the organization’s productivity.

Employees within a cell can access the information from their computer screens or from large plasma screens situated within the cell. The screens display which cell members are signed on, the issues they are working and the status of each. Everything on the screens is color-coded—green, yellow or red—to indicate whether a task is on track to meet the time target.

In addition, each cell member has a three-color andon light plugged directly into the computer that lights up based on the same information.

“Managers can just glance around the room and see immediately the health of the production system,” Rucshner said. “They can come in here and say, ‘We’re not meeting our targets for today. What can we do? Shift resources?’ And so on.”

For Hazlehurst and Ly, who have been partnering for about three years, the agile development process has taken on a familiar rhythm. Hazlehurst, a Lean expert with extensive experience in assembly technology, is in charge of meeting with potential customers, investigating each problem and summarizing everything on a single sheet of paper that he hands off to Ly.

“Then Sidney puts his technology expertise to work and be-

fore you know it, we have a prototype,” Hazlehurst said.

“Larry’s role is extremely important because he has the experience with the processes out in the factory and can break down the issues and relay that information to me,” Ly said. “Without that input, we’d develop some great stuff that wouldn’t have any customers.”

“One of the greatest things about agile development is how it leverages knowledge,” Hazlehurst said. “We leverage it all—my knowledge, Sidney’s knowledge, the collective knowledge of our customers and the knowledge of the people doing the work. It’s a very powerful thing.” ■

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‘Material’ information

Commercial Airplanes’ Material & Process Technology (M&PT) is dedicated to the continuous improvement of design, fabrication, testing, maintenance and quality of material and processes in Commercial Airplanes and across the enterprise.

For more information about M&PT products and services or to contact the organization, visit <http://mpt.web.boeing.com> on the Boeing intranet.

A blue and white Boeing 737 aircraft is shown from a low-angle perspective, flying over a body of water. The aircraft's wings, engines, and tail are visible. The sky is a light blue, and there are large, stylized, circular eye-like graphics in the upper portion of the image. The text "IT'S JUST WHAT THE WORLD ORDERED." is centered in the middle of the image.

IT'S JUST WHAT THE WORLD ORDERED.

The Next-Generation 737 logged 5,000 orders faster than any other commercial airplane in history. This accomplishment underscores the value this airplane delivers to its 118 airline customers around the world, who rely on the jetliner for its performance, reliability, durability and economics. This advertisement celebrates the achievement and salutes the customers, employees and suppliers vital to the airplane program's success.



From the beginning, the Next-Generation 737 has been a remarkable airplane, offering airlines around the world superior performance, reliability and value. The proof is in the numbers, as we recently logged its 5,000th order. No other airplane has ever captured so many orders so fast, making it the most popular airplane of all time. To our Next-Generation 737 customers and suppliers around the world and to our own Boeing employees who made this unique milestone possible, we express our extreme gratitude.

 **BOEING**



Mike Bryan (second from right), 787 project pilot, conducts a flight test in the ZA000's flight deck simulator while test engineers and analysts monitor performance. From left: Cameron Ghahreman, Tyler Finn, Matt Lassen, Christopher Caps, Bryan and Tim Cassady. When the first 787 takes flight, ZA000 will takeoff in the lab and shadow the initial flight. JIM ANDERSON/BOEING

Simulating flight

Test & Evaluation 'flies' virtual 787 Dreamliner to ensure safety, efficiency

By Sandy Angers

Consider it a dress rehearsal: ZA000, the 787 Dreamliner's virtual understudy, has already made its first flight. In fact, this virtual airplane will have "flown" about 1,000 flight test hours by the time the real 787, designated ZA001, takes to the skies for the first time.

ZA000 doesn't look like an airplane, but for all intents and purposes it behaves like one. It's essentially an airplane spread out among networked labs at the Integrated Aircraft System Laboratory in south Seattle. This setup allows the Test & Evaluation team to more quickly and efficiently validate its work integrating the 787's systems and components—and also lets them reduce risk for the airplane's forthcoming flight test program.

"We treat ZA000 like a real airplane," said Mike Bryan, 787 project pilot and the lead test pilot for ZA000. "We release it for flight like an airplane. We fly it, and flight test analysts collect data and write 'squawks' if there's an issue. We even hold a debriefing after each flight."

MANY INTERCONNECTED SYSTEMS

The virtual airplane consists of several independent 787 airplane systems labs that are interconnected to test interaction

among airplane systems. Interconnected systems include electrical power, flight control electronics, avionics, electric brakes, propulsion engine controls, hydraulics, flight deck and environmental control systems, and flight control surfaces including flaps, ailerons, spoilers, elevators, stabilizers and rudder.

In addition, 787 program pilots use flight deck simulators to fly virtual missions that assess airplane performance, flying qualities and system effects. As the pilots perform simulated flight maneuvers, systems in the labs respond accordingly, depending on the test conditions.

All the systems were thoroughly bench-tested in the labs before "joining" ZA000, meaning that each was tested as a stand-alone system to ensure it functioned as designed. Integrating the systems and components so that they communicate and function seamlessly has been the work of Boeing Test & Evaluation and the 787 program teams for the past two years.

"We've spent years testing the 787's individual parts, but ZA000 was the first time for many of those components to 'talk' to each other. In the process, we've made some discoveries that, ordinarily, we would have had to wait and learn on the actual airplane," said Bryan.



Rachel Soderberg (left), an Airplane Systems Lab Integrated Product Team leader, discusses the flight test simulation with Ryan Younkin, ZA000 test director, in the Satellite Test Analysis Room. In the background, engineers monitor test conditions and data during a simulated flight test in ZA000. JIM ANDERSON/BOEING

FLIGHT TEST SUPPORT

Running the integrated systems through the rigors of flight test conditions allows employees to test the robustness of the 787's systems in ways that were unavailable to them before ZA000.

During actual flight tests, employees insert failures into in-flight scenarios to confirm how the airplane will perform. For example, a flight test may call for hydraulic and electrical failures or single-engine landing approaches.

ZA000 will go beyond these conditions. For example, test simulations with ZA000 will call for both engines to shut down and restart during flight. Another test will require the airplane to take off without flaps deployed and with one engine off. Although extreme test conditions such as these will not be flown on a real airplane, the systems knowledge gained from these tests is critical to support other in-flight test scenarios that will be conducted during the 787 test program.

The testing of ZA000 also has helped the team look at the entire airplane for cross-disciplinary issues before flight test. That ability enables the flight test team to ensure more predictable outcomes in actual flight test conditions.

"We're reducing risk for flight testing with ZA000," said Rachel Soderberg, an Airplane Systems Laboratory Integrated Product Team leader. "The ZA000 testing is the only time we look at some of those test conditions before we try them on the airplane. We run the test conditions here and find the problems now so we can fix them before we ever get to flight test."

ZA000 has allowed for the smooth integration of processes and teams, as well. The virtual flight tests have brought together all the people who would be involved in actual flight tests—the

test pilots, test directors, flight test analysts—and allowed them to run through flight test processes.

"Working across the fence between Flight Test and the engineers who design the tests and analyze the data, we've determined that we don't always do the best job of communicating when describing flight test issues or providing data to help solve them. So we're fixing that now," said Ryan Younkin, ZA000 test director.

Executing flight test processes in a simulation mode allows Test & Evaluation employees to improve the efficiency of processes ahead of time, something that will be difficult to do once the actual flight test program begins.

"Sometimes our flight plan looks good on paper, but then we fly it in ZA000 and uncover some places where we could be more efficient," Younkin explained. "We also discovered that we needed [to involve] some other people whom we originally didn't think needed to be involved."

Process improvement isn't the only benefit derived from ZA000. Younkin said the virtual airplane also allows Test & Evaluation employees to get hands-on experience before the real 787s transfer into their hands.

"By the time the actual airplanes arrive at Flight Test, we'll be able to do the real testing safely, efficiently and with more experience under our belts," he added.

Bryan agreed: "We test in the lab to be safe. We also test here to be efficient, which means we'll be smarter. It's a lot of work, but it's an investment in accuracy, efficiency and safety." ■

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A big anniversary



Forty years ago, the first Boeing 747 made its initial flight. Since then, Boeing has delivered more than 1,400 747s to 95 unique customers.

BOEING ARCHIVES

Forty years ago this month, the 747 made its initial flight

By Tim Bader

Feb. 9, 1969—a day 40 years ago this month—was a banner day in the annals of Boeing history, and for that matter aviation history. On that cold morning at Everett, Wash.'s Paine Field, Boeing prepared to fly the new 747 for the first time.

Onlookers watched as Pilot Jack Waddell, Co-pilot Brien Wygle and Flight Engineer Jess Wallick eased RA001 into the sky at 11:34 a.m. The 75-minute flight tested the airplane's low-speed characteristics. It also proved the 747 flew well and was stable, despite the windy conditions.

The test flight ended up being cut short due to a minor structural failure in one of the flaps. Joe Sutter, commonly referred to as the "Father of the 747," watched anxiously as RA001 made its final approach. "Many critics questioned whether an airplane as big as a 747 could safely land," said Sutter. "This was on my mind as RA001 descended to the runway."

After the airplane gracefully descended for a smooth landing, Boeing celebrated its newest airplane. The successful flight validated the enormous gamble that Boeing took to design, build and fly the 747. "Boeing was told that the 747 would never fly, both literally and financially. What the naysayers did not figure on were the Boeing employees who designed and built the 747," said Mike Lombardi, Boeing historian.

When the 747 Program was launched, it was an unprecedented undertaking. It would be by far the world's largest commercial airplane. Few airport runways could accommodate it. For that matter, neither could Boeing factories.

Further complicating matters were the limited resources available at the time. According to Lombardi, in the late 1960s when Boeing began development of the 747, the company was involved in a tremendous number of programs and "the only option to free up the needed engineering resources was to cancel one of the company's other successful programs." That led to Boeing's decision to end its turbine engine business, he added.

Despite the risks and challenges, Sutter and his team, referred to as the "Incredibles," successfully designed, built and flew what would be the world's largest commercial airplane for the next several decades. Since the program's beginning, Boeing has secured more than 1,500 orders for models of the 747 family and delivered more than 1,400 to 95 unique customers. The 747 family has conducted roughly 17 million flights taking passengers and cargo approximately 42 billion nautical miles (about 78 billion kilometers)—about the distance of flying to the moon and back 101,500 times. The 747 also has established itself as the leader in the air cargo market by carrying more than half the world's air freight.

The 747 family's accomplishments are sure to grow as Boeing prepares to write a new chapter in the 747 story with the 747-8 Freighter and 747-8 Intercontinental passenger airplane. The first 747-8 Freighter will make its first flight later this year. With the 747-8, Boeing will continue to build on the 747's legacy and ensure the "Queen of the Sky" will remain airborne for years to come. ■

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BY THE NUMBERS: 747-400'S 20 YEARS OF SERVICE

On Feb. 9, 1989, the first Boeing 747-400 entered service with launch customer Northwest Airlines. In time, the 747-400 series would become the most successful model of the 747 family. Here's a look at what the 747-400 has accomplished in its 20 years of service:

694

Total orders for all 747-400s, more than for any other 747 model

5.5 million

Number of 747-400 flights

17 billion

Nautical miles flown by 747-400 models (31 billion kilometers)—the equivalent of flying around the world 221,061 times

35 million

Flight hours logged to date (about 4,000 years of flight time)



A bird with bite

Senegalese soldiers exit a U.S. Air Force Special Operations Command CV-22 Osprey during mission rehearsals in late 2008 as part of Exercise Flintlock in Bamako, Mali. This marks the CV-22's first deployment abroad. U.S. AIR FORCE PHOTO

Osprey transforming how U.S. Air Force performs Special Ops missions

By Jeff Barnett

The ability to rapidly change between helicopter and fixed-wing modes of flight makes the Bell Boeing V-22 Osprey aircraft one of the most unique in the air today. More importantly, these capabilities place it at the forefront of transforming how the U.S. Air Force completes Special Operations missions.

The V-22 Osprey is a multimission, military tiltrotor aircraft with both a vertical takeoff and landing and a short takeoff and landing capability. It's designed to perform missions like a conventional helicopter but provides the long-range, high-speed cruise performance of a turboprop aircraft. By combining the best options into a single platform, the Osprey will change the way the Air Force accomplishes these missions, program executives said. "Working to support the warfighter, to help our special operators carry out their work and come home safely, is a great effort to be a part of," said Gene Cunningham, vice president, Bell Boeing V-22 program.

The Air Force has tapped the CV-22 version of the V-22 as a prime transformational resource in its Special Operations efforts. The CV-22 offers a unique solution to getting Special Ops forces quickly to the right locations so they can accomplish their mission and return safely. That's a big job, since inserting and extracting special operators into sensitive areas or opponent-controlled zones remains one of the most dangerous aviation missions.

Fixed-wing aircraft offer the range and speed to penetrate deep into adversarial areas, getting larger numbers of troops into action faster. However, to get troops and equipment on the ground, they require either a runway—or parachute drops.

For Special Ops missions, secure, viable runway space is hard to find. And landings take time, which could place crew, aircraft and special operators in the sights of opposing combatants. Fixed-wing aircraft also are easily picked up on radar. Parachute drops are inherently risky and limit the numbers of troops and the types of equipment that can be successfully deployed.

Helicopters are much more adept at pinpoint insertions and landing without prepared landing strips. They are also much stealthier, thanks to their smaller radar cross-section and ability to

fly "nap of the Earth"—flying just above the ground using the surrounding terrain to block radar. But they're also much slower and more vulnerable to ground fire. They also provide less range and carry smaller loads than fixed-wing aircraft.

The CV-22 provides the combination of range, speed and payload to allow Special Operators to penetrate deep into enemy territory, faster and farther than conventional rotorcraft, and still land in rugged, unprepared landing zones like a helicopter. It can also carry a larger load than most helicopters. In addition, the CV-22 also includes technologies that let the aircraft support missions at night, which provides a sizeable advantage in covert operations. And when flying at night and at low altitudes, the Osprey will rely on terrain-following radar and the aircraft's Suite of Integrated Radio Frequency Countermeasures defensive system for effective low-light, low-flight operations. These systems let the CV-22 use the terrain to remain hidden from radar and visual identification.

AFRICAN TOUR OF DUTY

Last year, the U.S. Air Force Special Operations Command sent the CV-22 on its first deployment abroad. It's participating in exercises to support Special Operations in the Horn of Africa through 2009. Called Flintlock 09, these exercises in the trans-Saharan region of Africa are designed to help train African military personnel in developing the skills vital for patrolling and defending their nations. The trans-Saharan area is known for its lack of infrastructure and rugged terrain—which makes travel, let alone military operations, challenging. With capabilities for flying at night and at low altitudes, the Osprey's tour of duty in Africa will put many of its systems to the test. ■

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At the Boeing facility in Philadelphia, Ken Drummond, Flight Test crew chief, inspects a CH-47F Chinook helicopter. Under a contract awarded last summer, Boeing will provide the U.S. Army with more than 190 Chinooks over five years.

JEFF CORWIN



More brawn and brain

CH-47F team proud of helicopter's capabilities—and pact for more aircraft

By Jeff Barnett

Last year was full of successes for Boeing Rotorcraft Systems, including the Block III Apache helicopter's first flight, the MV-22 tiltrotor's high grades in combat deployments, and the A-160 unmanned aerial vehicle's endurance demonstration.

But one of the most notable achievements has been the continued rise of the CH-47F Chinook, considered the workhorse of U.S. Army aviation. Since 2001, the Chinook team has worked to significantly modernize the aircraft with new mission equipment, enhanced capabilities and improved safety features. As a result, the Army has equipped and trained three complete units, deployed the first CH-47F unit to Iraq in support of Operation Iraqi Freedom—and, in a decision that validates the hard work of Boeing employees on the Chinook team, agreed to a multiyear contract to stabilize and reduce costs for the program.

"We knew from the outset that we faced some rigorous challenges," said Tommy Filler, CH-47F program manager. "We needed to give our warfighters the best helicopter we could and make sure the contract and schedule gave them what they needed on time and within their budget."

To help focus the team's efforts, Filler and his F-model team adopted one of the Army program manager's own slogans, "Soldiers First."

"We repeated this mantra early and often," Filler said. "We constantly focused on the needs of soldiers and their mission."

Their efforts resulted in a \$4.3 billion, five-year contract awarded late last summer that provides for 181 CH-47F Chinooks plus 10 additional Chinooks under fiscal year 2008 supplemental funding. It also includes options for an additional 24 aircraft.

BATTLEFIELD IMPACT

The contract is "a phenomenal achievement," said Tammie Gregg, proposal manager and Contracts and Pricing representative. But the aircraft itself also represents a major milestone in the Chinook's history. Its enhanced safety and situational awareness, on top of its improved performance, mean the CH-47F has a major battlefield impact. All in all, it's a stronger, faster helicopter.

The CH-47F is built around a newly designed, improved monolithic-machined airframe. It's powered by twin Honeywell engines, each generating 4,733 horsepower. These engines and tandem rotor design allow the Chinook to operate at speeds of more than 175 mph (280 kilometers per hour) and give it the ability to transport more than 21,000 pounds (9,525 kilograms) of material and soldiers.

Along with more brawn, the F-model features new brains. A new Rockwell Collins Common Avionics Architecture System (CAAS) and a BAE-designed Digital Advanced Flight Control System give the crew vastly improved situational awareness and substantially better flight-control capabilities. That translates into improved performance and safety in the harshest operating envi-

ronments. CAAS also incorporates an advanced digital map display and a data transfer system to allow for mission management and mission changes in flight.

Fitted with a new Extended Range Fuel System, the Chinook can operate at ranges of over 400 nautical miles (460 statute miles or 740 kilometers) and offers a combination of lift and "legs" for nearly any mission.

The CH-47F also offers the warfighter improved survivability thanks to the Common Missile Warning and Improved Countermeasure Dispenser systems. These systems work in tandem to help protect aircraft and crew from anti-aircraft missiles by detecting incoming warheads and dispensing a mix of chaff and flares to help avoid them.

FIELD-PROVEN

Although the Chinook team is extremely proud of its new contract, teammates see their biggest success as being the capabilities they provide to warfighters.

"Successful deployments are the final grade in customer satisfaction," said Filler. "The proof of the team's hard work is in the field, where the soldiers are depending on the Chinook everyday to get the job done and get home in one piece."

The Army appears to agree. Currently, two Army units are equipped with F-model Chinooks in combat zones, and a third has completed training and will be entering combat soon.

"The CH-47F is a surprising piece of equipment, a quantum leap forward," said Chief Warrant Officer 4 Neal Lorenson, Bravo Company, 7th Battalion, 101st Aviation Regiment. "The engine instruments, systems displays, the low-speed hover regimes ... we'll be able to safely execute missions that were probably more dangerous than we would have liked to entertain in the past. It's a marvelous aircraft." ■

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Know your CH-47F

Here's a short list of some of the many things the CH-47F Chinook can do—and what it's already done in service.

- The only military rotorcraft capable of operations above 10,000 feet (3,050 meters)
- Capable of detecting incoming missiles and deploying countermeasures
- Flies at more than 175 mph (280 kilometers per hour) and transports more than 21,000 pounds (9,525 kilograms)
- Has a mission radius of more than 400 nautical miles (460 statute miles or 740 kilometers)
- Deployed to Iraq, Afghanistan and Liberia
- Performs air assault, combat re-supply, humanitarian relief, transport, and search and rescue missions

Good, better, best

Aircraft support businesses work together to tackle a noteworthy market opportunity

By Marguerite Ozburn

In November 2007, Boeing Chairman, President and CEO Jim McNerney challenged the company's two support businesses to achieve between them at least \$120 million per year in earnings synergies, or ways the organizations can work together more efficiently and effectively, by 2013.

Commercial Aviation Services (CAS) and Global Services & Support (GS&S)—the support businesses for Commercial Airplanes and Integrated Defense Systems, respectively—are working to tackle that challenge. They've set the stage for forthcoming success by creating a team to guide synergy activities and record collaborative achievements.

"We are one company, and the activity we've started in CAS and GS&S is the future for the entire Boeing enterprise in its goal to be the best integrated aerospace company in the world," said Jim Brunke, vice president, Global Maintenance, Repair and Overhaul, CAS. Brunke and Phil Schwab, vice president, Business Development, GS&S, are leading the synergy team.

The CAS/GS&S synergy team members quickly realized that although their customers and markets are different, how they do what they do is the same. Both organizations provide maintenance, repairs, upgrades and testing for customers across the globe to ensure aircraft are mission-ready around the clock and to extend the life span of these aircraft. They also provide aircraft health management and sustainment while proactively preparing customers for future needs.

"Airplanes are airplanes," said Brunke, "so it's logical for the two businesses that service those airplanes to weave synergies into the way they do business."

The enthusiasm Brunke and Schwab feel for meeting their challenge is palpable but tempered with a healthy dose of realism. "We can't chase all the good ideas, but we've made good progress, and the effort is ongoing," Schwab said.

The CAS/GS&S team has identified five categories with strong, near-term potential for synergistic gains:

- Supply chain management
- Technology
- e-enabled military platforms
- Modifications
- Integration/people. This includes executive exchange, succession plans, a joint rotation program, program management and joint recognition.



“It’s logical for the two businesses that service airplanes to weave synergies into the way they do business.”

– Jim Brunke, vice president, Global Maintenance, Repair and Overhaul, Commercial Aviation Services

Mechanic John Mora works on a KC-10 Extender at the Boeing facility in San Antonio. KC-10 support is among the many tasks handled by the Global Services & Support business of Integrated Defense Systems—which is working with its commercial counterpart at Boeing to develop synergies.

LANCE CHEUNG/BOEING

To date, the team has recorded major successes in the areas of Airplane Health Management (AHM) and succession planning.

AHM is a diagnostic and prognostic service designed to increase commercial airplane availability. When AHM identifies upcoming problems, airlines can prepare to fix them as soon as an airplane arrives at the gate. This advance awareness reduces the number and length of airplane dispatch delays and converts many tasks from unscheduled to scheduled maintenance periods. AHM also identifies recurring faults and trends, supporting long-term fleet reliability programs. The result is a single source of information from which airlines can make maintenance decisions.

“Commercial Aviation Services is well-established in the Integrated Vehicle Health Management arena with 29 customers and 800 aircraft,” said Dave Kinney, CAS AHM product manager. “Now we’re working with GS&S and Phantom Works (Boeing’s research and development arm) to leverage the technology.”

AHM also is being applied to military aircraft. The C-17 Globemaster III is the first noncommercial-based aircraft platform being considered for development of an AHM application. CAS has also conducted AHM work to support the P-8A Poseidon and the KC-767 Tanker proposal.

Another promising application of AHM is the use of Virtual Maintenance & Engineering Services (vME), in which Boeing becomes an airline’s virtual maintenance and engineering departments. “Our team of engineers can sit anywhere in the world and provide analysis and recommendations via the Internet,” said Al Stender, senior manager, Maintenance and Engineering Services, Aviation Information Systems, CAS.

Stender said it is likely just a matter of time before military aircraft are maintained via vME. “Republic of Korea Air Force officers are coming to Seattle to learn how to maintain their military aircraft using commercial practices,” he said. “Part of our plan is to expose them to the possibilities of virtual maintenance and engineering services.”

Human Resources teams from CAS and GS&S also have caught the synergy bug in the area of succession planning. Positions best suited to integrated succession planning are identified and potential candidates are interviewed; then, senior leaders from both businesses evaluate the skills, knowledge, experience and development needs of candidates.

“When senior leaders from both businesses evaluate candidates, the awareness of talent is broadened and the pipeline of potential leaders is lengthened,” said Cyndee Evans, CAS HR director. ■

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One, for all

A companywide team has developed a fresh approach to visual identity that capitalizes on the power of the iconic Boeing brand

By Carrie Howard

A brand is more than a logo, a name or an ad campaign. It's a promise that a company makes to the marketplace and the reputation a company earns for keeping that promise.

The best brands can hold a distinctive and powerful place in the market that allows them to introduce new products more successfully, defend their markets against competitors more easily, and command premium prices for goods and services. Leading companies manage what they do, what they say and how they present themselves to ensure that their promise is reinforced in everything that a customer, investor or influencer experiences. Boeing is one of those leading companies.

Thanks to the products and services Boeing employees produce and provide—and to the company's unmatched history in aerospace—the Boeing brand is one of the most well-known brands in the world, routinely landing on lists of the world's most respected brands compiled by publications such as *Barron's* and *Business Week*. The Boeing brand is an irreplaceable asset that marketing research firms estimate to be worth billions of dollars.

But even a great brand needs maintenance to stay fresh and to support the changing needs of a growing business. That's why an enterprisewide team has worked to ensure that the brand stays current, represents Boeing as one company, and properly supports the work Boeing employees are doing to fulfill promises and work toward being the world's best and best-integrated aerospace company.

"A few years ago, we began to take the next steps in the brand's evolution," said Fritz Johnston, director of Brand Strategy and Advertising. "Driving a 'one brand' culture is more important now than ever before. We didn't become one of the world's iconic brands because of any one product or service. Our reputation comes from the breadth and depth of our capabilities. And that has to do with much more than how we look; it is also how we act. Every contact we have with stakeholders, from the quality of our products and services to the tone of our business communications to the appearance of our business cards, building signs and presentations, is an opportunity to strengthen the brand."

Johnston noted that about 20 years ago, Boeing had more 200 different styles of business cards and letterhead. "None of our exterior signage matched, and our vehicle colors and markings were all over the map. Our exhibits and collateral literature looked different," he said. "Today that has changed, and we have strengthened our brand presence and reduced costs by millions of dollars. Now we need to take the next big step of ensuring that we present a unified, compelling and distinctive face to the world."



“We have strengthened our brand presence and reduced costs by millions of dollars.”

– Fritz Johnston, director of Brand Strategy and Advertising



A communication package created by the visual identity team includes a brochure, tip cards and a wall poster that explain the Boeing Brand Visualizer in an easy-to-use format.



This Commercial Airplanes display of model jetliners, shown at an exhibit at the Singapore Airshow 2008, was one of the first projects to reflect concepts that are now part of the Boeing Brand Visualizer. **ED TURNER/BOEING**

AUDITS REVEAL WEAKNESSES, OPPORTUNITIES

The current brand refresh effort began in 2006, when a team headed by Jim Newcomb, director of Brand Management and Promotion, conducted an audit of communication materials throughout the company. The audit showed a distinct lack of unity. Business-unit exhibits at international air shows, for example, appeared to come from completely different companies. Many of the materials appeared dated compared with communications produced by Boeing competitors, and that difference contradicted Boeing's positioning as an innovative technology leader. A second audit in 2007 confirmed the impression of visual clutter and disconnectedness.

In late 2007, Tom Downey, senior vice president of Communications, announced the functional alignment of the Brand Management & Advertising organization and Creative Services, the organization responsible for creating communication materials for the company. (Creative Services supports *Boeing Frontiers* by providing services such as design, photography, writing and editing.) The companywide Procedure PRO-42, "Corporate Identity Program," was updated to give Creative Services governance authority over corporate identity. "This formally gave Creative Services responsibility and authority for the protection of the brand for the first time and helped to solidify the informal relationship we had with corporate branding," said Bob Williams, director of Creative Services.

With roles and responsibilities defined, it was time to take a fresh look at the Boeing graphic standards.

In February 2008, a one-company team representing Communications, Creative Services, Customer Relations and business-unit Marketing Communications organizations met to discuss how to bring harmony to the Boeing visual identity. The team was assisted by Chicago-based Drafftcb, Boeing's advertising agency; Paul Haverly, Commercial Airplanes design consultant; and corporate design consultant Methodologie of Seattle. The task that lay before the team was daunting; team members were forced to re-examine their roles and their assumptions about the Boeing brand.

The team's mission was to take the Boeing visual identity to the next step by meeting three goals:

- Create a more unified, compelling, fresh and modern representation of the Boeing brand.
- Make it easier for audiences to find information about Boeing by reducing clutter in communications.
- Reduce costs and waste by driving consistency and promoting Lean design principles.

Team members reached across organizations and businesses to build working relationships based on a common goal. "We always said that it wasn't a cross-company team, but a one-company team, with everyone working to do the best for the company," Newcomb said.

“We’ve been more successful in getting the word out about our brand standards and processes than in the past.”

– Bob Williams, director of Creative Services

Applying the Brand Visualizer and visual identity tools to communications leads to consistent, contemporary, uncluttered communications that express the dynamic Boeing brand.

Creative Services produced more than 19,000 projects requiring application of Boeing brand standards in 2008. The examples shown below represent a small sampling. Streamlining processes and simplifying standards will result in significant cost and time savings.



TOOLS OF THE TRADE

One of the biggest challenges facing the team was visual clutter. The sheer amount of communication materials sent to stakeholders was overwhelming, and individual pieces were visually dense and unorganized. “It’s important to not put the audience in a position where they have to hunt to find you. If we can portray ourselves with a powerful, consistent look, we will stand out from the clutter,” Downey said.

Another challenge: Making all the materials look as if they came from one company. Boeing boasts diverse products and services, but at times the company appeared to be a conglomerate of smaller companies, which weakened the overall impact of communications. “It’s important for everyone who works under the brand to recognize that to the outside world, there’s only one name over the door, and that’s ‘Boeing,’” Downey said.

The team realized that it also needed to reduce clutter in the graphic standards, which users reported were difficult to access and understand. To focus their efforts, the team devised a tool called the Brand Visualizer, which Newcomb described as “a simple, clear graphic presentation of the company’s visual identity standards.”

Based on the corporate vision, strategies and values, the Brand Visualizer ensures that company communications give a true picture of Boeing’s character and capabilities. The “brand DNA”—the why, how and what of the Boeing brand—guides design decisions and provides a yardstick against which to measure the success of communication materials (see box on Page 41).

Using the brand DNA as a guide, the Enterprise Brand Visualizer Team, as it came to be known, simplified standards for the Boeing name, voice (written communications) and face (visual identity). The team reduced the multitude of typefaces used to just one family, Helvetica; streamlined color palettes; and curtailed variations on the Boeing logo. The team determined that imagery is a particularly powerful way of portraying Boeing’s strengths, and emphasized use of high-quality imagery optimally placed in clean, open layouts.

The contrast between the new design materials and materials previously collected for the audits was striking. The team and its business partners agreed the new materials more aptly represented the Boeing brand.

The team also recognized that simplicity is not just good communication strategy; it’s good stewardship of resources. “We’re strengthening the brand through powerful common visual expressions, and we’re applying Lean+ for the office by coming up with a common look and feel, processes and templates,” Downey said. “We think we’ve found a great way to achieve several objectives at once.”



OWNERSHIP IS THE KEY TO SUCCESS

Developing standards is only half the battle. The brand team now is moving into the implementation phase of the brand-refresh project. “The Brand Visualizer is not just a tool; it also is a process for ownership,” said Newcomb. “Anybody can do standards, but keeping people focused is another step.”

Training for Creative Services and Communications staff will be conducted throughout 2009. Later in the year, staff will attend specialized workshops in branding and design, and there are plans to formally recognize “best of Boeing” design efforts.

“We have to make sure Creative Services employees are trained in and attuned to the brand, because you can’t govern something you don’t understand,” said Williams. “Having a more formalized relationship with corporate branding has helped tremendously in enabling us to put processes in place to make sure our people have the training and resources they need to oversee the brand.”

A companywide brand network helps ensure that design activities are coordinated. The newly streamlined Brand Center (<http://brandcenter.web.boeing.com> on the Boeing intranet) will be rolled out this month to provide easy access to brand standards via the Boeing Web. Regional Creative Services branding focals with in-depth knowledge of the brand standards have been given the responsibility to support Creative Services staff and answer questions from business partners.

“We work hand-in-glove with our business partners, and many were involved in helping us develop the standards, so the transition has been smooth,” said Williams. “We’ve been more successful in getting the word out about our brand standards and processes than in the past. And if someone comes in who wants something done that doesn’t reflect the Boeing brand, we have the authority to recommend alternatives and work with them on an appropriate approach.”

The brand team is quick to point out that an employee does not have to be directly involved in design to have an impact on the Boeing brand. “The actions of every employee inside this company, no matter where they are in the organization, no matter who they touch inside and outside, reflect on the brand,” Downey said. “In Communications, that plays out in the consistency of our messaging, spoken and written, in how we present the company visually. It also plays out in the materials that we use, both in print and electronic media, to help win business and communicate the Boeing story.” ■

These photos of Boeing employees are based on concepts stated in the Boeing Brand Visualizer. **Bob Ferguson/Boeing**

“The actions of every employee inside this company, no matter where they are in the organization, no matter who they touch inside and outside, reflect on the brand.”

– Tom Downey, senior vice president of Communications

Boeing Brand DNA

The Boeing brand approach supports the company's corporate goal: To be the best and best-integrated aerospace company in the world. The Boeing Brand DNA, below, details the "why, how and what" that make and keep this goal a reality.

ENTERPRISING SPIRIT

Why We Do It

We share a passion to take the next great leap in the business of aerospace.

PRECISION PERFORMANCE

How We Do It

We hold ourselves to the highest standards of performance, ethics and accountability.

DEFINING THE FUTURE

What We Achieve

We work as a global team to shape the future of aerospace.

Global brand assets



Boeing's global brand assets are the tools the company and its employees use to project a consistent presence for the company. These assets are:

Our voice.

The tone the company and its people use when speaking to stakeholders.

Our name.

How the company is known the world over.

Our face.

The way the company visually represents itself. The distinctive visual elements of the brand include the Boeing logo, typography, color palettes, layout grid and imagery.

Earning together program

Companywide effort helps 16 Boeing sites secure important environmental certification

By Junu Kim

All it took for Mike Dwyer to realize that Boeing employees in St. Louis were extremely engaged with the site's efforts to earn its ISO 14001 certification, an internationally recognized environmental standard, was a feedback page on an internal Web site.

A St. Louis-specific site with information about ISO 14001 offered employees the chance to send comments to the team running the certification effort. Dwyer, the director of Environment, Health and Safety in St. Louis, knew from past experience that although employees cared about the environment, they showed varying levels of engagement. Yet after this site went live last June, the volume of comments and environmental suggestions it received made Dwyer realize that St. Louis employees were significantly engaged with certification efforts. The feedback included ideas on recycling opportunities, energy usage and greener ways of transport and commuting.

"Before the feedback mechanism was up, people hadn't expressed themselves as openly or as often as they did afterward," Dwyer said. "We have many skilled people here who are passionate about the ideas they believe in, like taking care of the environment. When they see the chance to express themselves, they'll do so."

St. Louis was one of 16 Boeing production facilities in 2008 to earn its ISO 14001 certification, a standard for organizations wanting to implement or improve an environmental management system (EMS)—a set of processes, systems and practices an organization uses to reduce its environmental impact and to operate more effectively. The certification of these Boeing sites marks a major milestone in Boeing's continuing effort to improve its environmental performance. Yet it's an achievement that required the coordinated efforts of many people at these sites—and demonstrates how the collective, integrated efforts of an engaged population across Boeing's major business units and several nations can create a broad benefit.

"Getting all of our major manufacturing sites ISO 14001 certified by the end of 2008 was one of our primary environmental focus areas," said Aileen Yankowski, Compliance and Services director for EHS. "Employees throughout the company showed tremendous environ-



mental commitment in helping us meet this challenging goal.”

ISO 14001 doesn't prescribe performance targets such as cutting greenhouse gas emissions by a certain percentage. Instead, it strengthens an organization's ability to set its own specific environmental objectives and targets, and to monitor and continually improve its environmental performance.

Why undergo certification? Among the reasons: Earning it represents third-party validation of Boeing's environmental management system. “We've maintained that we had a comprehensive and responsible environmental management program. An ISO certification program proves it to others,” said Tom Deem, director, EHS and Chemical Process Management in the Fabrication organization of Commercial Airplanes.

For Boeing, the certification drive also brought the company together. The effort, introduced in July 2007, was tackled as an enterprisewide activity, instead of something to be done separately by business units. “We had an aggressive plan to expand ISO 14001 certification to all our major manufacturing sites by the end of 2008, and we saw more opportunities for alignment and integration in doing this,” said Michael Hoff, the current enterprise ISO 14001 program manager at EHS Compliance and Services in Renton, Wash.

After the July 2007 kickoff, the enterprisewide team defined action items, created subteams and conducted regular coordination meetings to ensure integration. Among the deliverables that emerged: Standardized templates and tools that sites could use to prepare for certification audits. These common tools were “very, very helpful,” said Kris Stutko, an environmental engineer/scientist in St. Louis who worked with the IDS sites that earned their ISO 14001 certification last year. “Whenever a new site came on board, we provided these templates and guidance. They help people pick up on what needs to be done much more easily.”

“Employees throughout the company showed tremendous environmental commitment in helping us meet this challenging goal.”

— Aileen Yankowski, Compliance and Services director
for Environment, Health and Safety

To support each facility's quest for certification, team members worked with sites to help them undertake the 43 actions needed to achieve certification. This support included tasks such as:

- Helping sites form and train their implementation teams and conduct an important Aspect/Impact analysis, which identifies all of a site's major impacts upon the environment. Although conducting this analysis can be difficult, it lets facilities prioritize environmental activities and helps site employees focus on the high-ranking activities. “I've seen other companies write their environmental management system without doing an Aspect/Impact analysis, and they'll build their EMS around the wrong things,” said Lee Kuhre, senior environmental manager for Commercial Airplanes' Fabrication organization.
- Helping sites effectively use common tools, templates and resources. As part of making the certification drive an all-Boeing effort, the team developed and honed tools such as common awareness training, common communications templates and a single database to report significant environmental effects and the site's plans and targets to reduce the impact. Team members also worked with sites to help their people properly use these tools.
- Conducting readiness reviews (mock audits by Boeing employees at the facilities to be certified). To ensure readiness for the actual audit, “we tried to be twice as aggressive as DNV [the third-party auditor] would be, to prepare sites for the worst,” Kuhre said.

These collective actions helped Boeing facilities in the United States—along with Bankstown and Fishermans Bend, Australia, and Winnipeg, Canada—earn their certification before the goal of the end of 2008.

Lee Kuhre (left), senior environmental manager for Commercial Airplanes' Fabrication organization, and Ron Simmons, manager, Frederickson (Wash.) Site Services, visit the cooling tower that supports composite operations at the Composite Manufacturing Center at Frederickson. This location was one of 16 Boeing sites that earned its ISO 14001 environmental certification last year.

MARIAN LOCKHART/BOEING



“This was a huge effort and a terrific example of why functional management is so important,” said Mary Armstrong, Environment, Health and Safety vice president. “Ensuring we were common and aligned across the whole company was key to meeting our aggressive commitment.”

The teams’ efforts also drew praise from the team of experienced auditors, with over 80 positive noteworthy items and no major nonconformances.

“DNV auditors recognized many areas of environmental excellence at Boeing, from employee involvement programs to recycling efforts, in one of the most aggressive ISO 14001 certification efforts we’ve seen,” said Sidney Vianna, DNV’s director of Aviation, Space & Defense Services. “Congratulations to Boeing on this significant accomplishment, and we look forward to our ongoing partnership in continual environmental improvement.”

Yet the certifications don’t mark the end of this activity. Not only are additional Boeing facilities working toward earning their certifications this year, but the certified locations must do what’s needed to maintain theirs. Among the team’s next set of to-dos: better integrating environmental management systems into the business, and maintaining the engagement of employees. “We’ve generated a lot of grass-roots excitement,” Hoff said.

Indeed, leaders of the certification effort said the endeavor would not have been as successful if it wasn’t for the enthusiasm and dedication of Boeing employees at the certified sites.

“This effort has been very successful at Boeing thanks to the efforts of many people,” Kuhre said. “It’s clear to me that Boeing employees are going to keep the environment high on the agenda.” ■

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Standard bearers

These Boeing facilities received their ISO 14001 certification in 2008. They join Everett, Wash., Portland, Ore., and Exmouth, Australia, as ISO 14001-certified sites (see Page 20 of the March 2008 *Boeing Frontiers*).

U.S. LOCATIONS

Alabama: Huntsville

Arizona: Mesa

California: El Segundo, Long Beach, Seal Beach, Sylmar, Taft, Torrance

Florida: Kennedy Space Center

Missouri: St. Louis, St. Charles

Pennsylvania: Philadelphia

Texas: San Antonio

Utah: Salt Lake City

Washington: Auburn, Frederickson, Kent, Renton and North Boeing Field Developmental Center and Military Flight Center (Seattle/Tukwila), Boeing Electronics Center and Triton Towers (Renton)

INTERNATIONAL LOCATIONS

Australia: Bankstown, Fishermans Bend

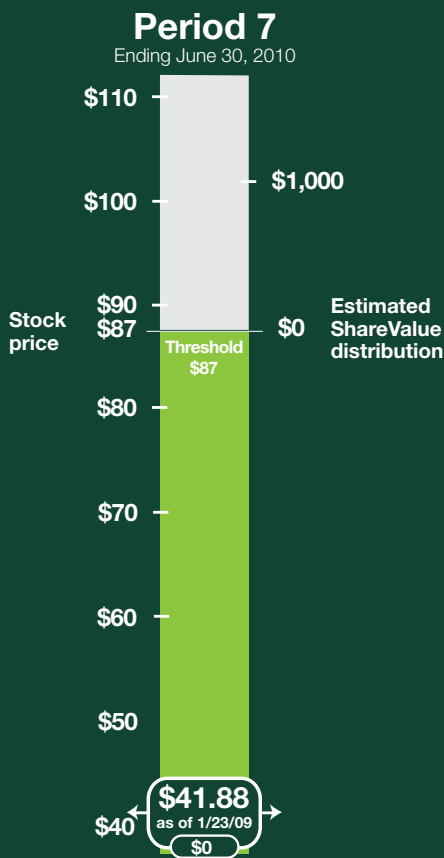
Canada: Winnipeg

PHOTO: Kris Stutko, an environmental engineer/scientist in St. Louis who supported multiple Integrated Defense Systems locations in the ISO 14001 certification effort, said that having common tools helped new sites get up to speed quickly. RON BOOKOUT/BOEING

Boeing stock, ShareValue Trust performance

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

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



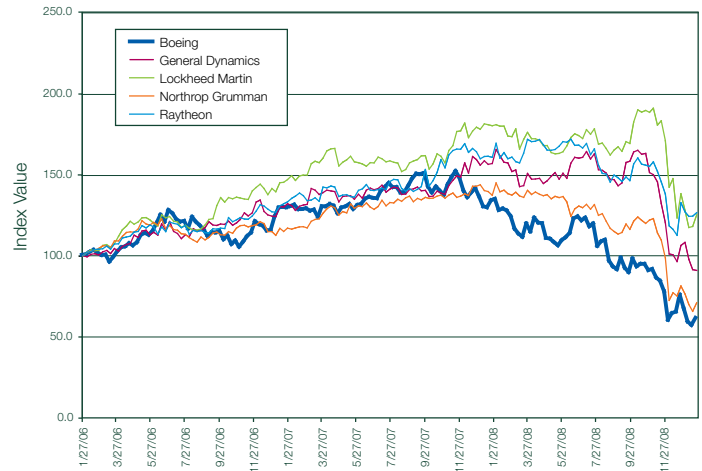
The above graphs show an estimate of what a “full 4-year participant” ShareValue Trust distribution (pretax) would be for Period 7 if the end-of-period average share prices were the same as the recent price shown.

The share price shown is the average of the day’s high and low New York Stock Exchange prices. Updates to participant/employment data will be made periodically. For more information on the ShareValue Trust, visit <http://www.boeing.com/share>.

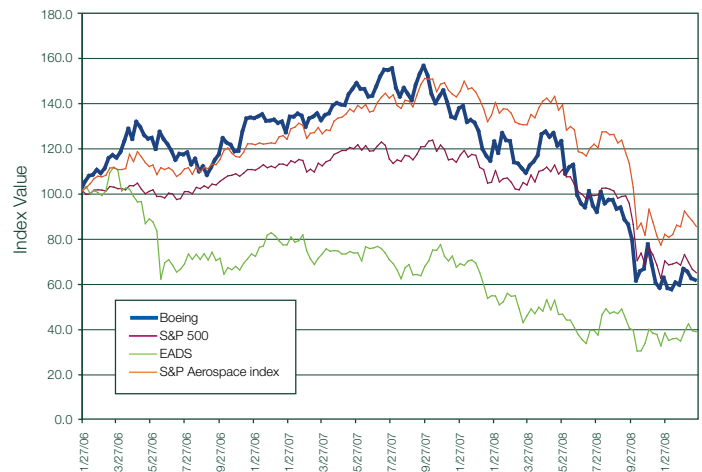
STOCK WATCH

The chart below shows the stock price of Boeing compared to other aerospace companies, the S&P 500 index and the S&P 500 Aerospace and Defense index. Prices/values are plotted as an index number. The base date for these prices/values is Jan. 27, 2006, which generates three years of data. The prices/values on that date equal 100. In other words, an index of 120 represents a 20 percent improvement over the price/value on the base date. Each data point represents the end of a trading week.

Boeing vs. U.S.-based competitors



Boeing vs. stock indexes and international competitors



Comparisons: 4-week, 52-week	Price/value as of 1/23/09	Four-week comparison		52-week comparison	
		Price/value as of 12/26/08	Percent change	Price/value as of 1/25/08	Percent change
BOEING	41.98	40.53	3.6%	77.03	-45.5%
U.S. COMPETITORS					
General Dynamics	53.32	55.91	-4.6%	81.13	-34.3%
Lockheed Martin	80.98	81.11	-0.2%	105.49	-23.2%
Northrop Grumman	47.11	43.24	9.0%	78.07	-39.7%
Raytheon	50.38	49.31	2.2%	62.82	-19.8%
INT'L COMPETITORS					
EADS*	12.60	11.30	11.5%	17.51	-28.0%
U.S. STOCK INDEXES					
S&P 500	831.95	872.80	-4.7%	1330.61	-37.5%
S&P 500 Aerospace and Defense Index	263.78	263.50	0.1%	412.80	-36.1%

* Price in Euros

John Foy, machine repair mechanic; service date May 17, 1978; died Dec. 25

Broderick Gibson, aviation maintenance technician and field inspector; service date Jan. 18, 1996; died Jan. 1

Josephine Gilley, design and analysis engineer; service date March 25, 2002; died Nov. 29

Steven Hanger, graphic designer; service date Aug. 3, 1989; died Dec. 18

Donald Henry, crane operator; service date March 30, 1989; died Dec. 7

Jose Honrado, aircraft test technician; service date May 2, 1989; died Nov. 26

John Irvine, information technology engineer; service date Jan. 12, 1975; died Dec. 4

Robert Johnson, aircraft assembly technician; service date Feb. 23, 1980; died Dec. 19

Sung-Soon Kim, systems engineer; service date Feb. 20, 1989; died Jan. 1

Patricia Knape, accountant; service date May 18, 1995; died Dec. 21

Felicia Martin-Parham, supplier diversity specialist; service date Aug. 31, 2001; died Dec. 7

Zanetta Montgomery, technical publications delivery specialist; service date Nov. 6, 2002; died Dec. 20

Mohammad Nowelati, design and analysis engineer; service date Aug. 19, 1981; died Dec. 8

Pamela Noyes-Boles, manufacturing planner; service date Nov. 19, 2006; died Dec. 30

Wan-shin O'Young, programmer analyst; service date Sept. 14, 1978; died Dec. 21

John Portlock, software engineer; service date April 9, 2004; died Dec. 25

Ron Rhoades, general machinist; service date April 16, 1979; died Dec. 30

Phillip Salyers, instrumentation technician; service date Feb. 11, 1980; died Dec. 22

Samuel Shields, systems engineer; service date Sept. 4, 1962; died Dec. 15

Lester Staton, assembly and installation inspector; service date Aug. 25, 1987; died Dec. 16

Ronald Terry, government property management specialist; service date Nov. 13, 1987; died Dec. 18

Roy Thorson, estimating and pricing specialist; service date April 6, 1987; died Dec. 10

John Wilsey, product life cycle engineering manager; service date May 9, 1986; died Dec. 3

AROUND BOEING



The Boeing 777 Freighter, shown above in a July 2008 photo, successfully completed flight testing in last month. TIM STAKE/BOEING

747, 777 AND 767 SWEEP TOP SPOTS IN MAGAZINE'S 'BEST AIRCRAFT' POLL

Boeing widebodies swept the top three spots in *Global Traveler* magazine's fifth-annual GT Tested Awards survey. The Boeing 747 captured the "Best Aircraft Type" for the second consecutive year. The 777 and 767 placed second and third, respectively. In addition to the 747, 777 and 767, the 737 ranked sixth and the 757 ranked ninth. No other airplane manufacturer had as many airplanes in the rankings. More than 30,000 *Global Traveler* readers participated in the survey of the best in business and luxury travel.

777 FREIGHTER COMPLETES FLIGHT TEST; FIRST DELIVERY NEARS

The Boeing 777 Freighter successfully completed flight testing in January, after more than 600 hours of ground testing and 300 hours of flight testing. Launch customer Air France is scheduled to take delivery of the first 777 Freighter this quarter. The 777 Freighter, launched in May 2005, is capable of flying 4,880 nauti-

cal miles (9,038 kilometers) with a full payload at general cargo market densities, making it the world's longest-range twin-engine freighter. The 777 Freighter currently has 73 firm orders from 12 customers.

PASSENGER EXPERIENCE RESEARCH CENTER WINS TECHNOLOGY LEADERSHIP AWARD

The Commercial Airplanes team that helped inspire innovations in the 787 Dreamliner recently won the 2008 Frost & Sullivan Technology Leadership Award in commercial aircraft design.

The center, which opened in 2002 in Mukilteo, Wash., was built to study passenger reactions to various airplane interior ideas. Results from extensive surveys in the center led to the innovative design features in the 787 such as a sky-like ceiling treatment, bigger windows and larger overhead bins.

"This kind of research allows Boeing to find out what passengers prefer, rather than designing interiors according to what they believe passengers might want," competition judges wrote.

SSG Site Services Maintenance at Boeing Field



Our Shared Services Group team, led by Pat Dennehy, supports operations at the Seattle flight line with routine and reactive maintenance for electrical and heat, ventilation and air conditioning systems, along with plumbing, mechanical and environmental issues. Pat's role is to keep us in lock-step with Commercial Airplanes' needs at the site. We work closely with our building and grounds teammates, led by Terry Henslee, to take the initiative needed to be the service provider of choice for the paint hangar and North Boeing Field operations.

We know that down time is lost time, and that our work has an impact on airplane deliveries. Our supervisor, Al Kier, often challenges us by asking, "If this was your company, how would it operate safely, with cost efficiency and productivity?" These have become our focus and priority.

One of the things we've done is set up a place where we can share ideas and keep an eye on improvement activities. We have a visibility board in our area where we post ideas on how to make things work better around here. Coming up with ideas keeps our jobs interesting—and it saves a lot of labor hours and money.

In 2008 we proposed 19 improvement activities, six of which we've completed. One of our bigger improvements came from a reduction in fuel back-flow devices on the flight line. We used to have 46 devices that required annual maintenance and inspection. By establishing a single above-ground device instead of those below ground, we've reduced maintenance and inspection costs by \$160,000 annually.

Using moonshine methodology we also regularly perform jobs using in-house materials—for a fraction of the cost in a fraction of the time it otherwise might take.

Back row, from left: Tom Mitchell, Scott Brewster, Chuck Haley, Terry Henslee, Doug Green, Andy Svendsen.

Front row, from left: Steve Johnson, Frank Young, Dallas Radford, Pat Dennehy, Don Anderson, Rob Micek, Duane Eddy, Tom Higgins, Cuong Nguyen, Scott Headland, Lee Burnstein.

MARIAN LOCKHART/BOEING



ASTRONAUT. TEACHER. SUPERHERO.

The beginning of life brings the hope of great things to come.

Boeing proudly supports those dedicated to awakening young minds.



Global corporate citizenship refers to the work Boeing does—both as a company and through its employees—to improve the world. This ad reflects Boeing's commitment to early learning, promoting the development of social, emotional and cognitive skills in children at very young ages.



OUR DIFFERENCE IS OUR STRENGTH.

Boeing proudly supports those who understand that by celebrating
our differences, we are truly able to come together as one.

 **BOEING**

*Global corporate citizenship refers to the work Boeing does—both as a company and through its employees—to improve the world.
This ad emphasizes Boeing's commitment to organizations that promote diversity and understanding in communities worldwide.*