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WORKING SMARTER

How Internal Services Productivity helps
business-support teams boost efficiency.





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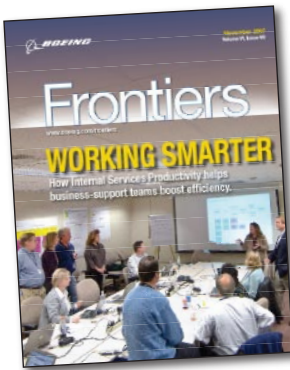
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This image, from the "Epic" recruitment advertising campaign, is part of Boeing's efforts to attract a talented, diverse group of college and experienced professionals, and encourage them to explore a career with Boeing. The skill sets listed demonstrate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



ON THE COVER: Members of the Policies, Procedures and Process Management Project, which has been streamlining Boeing procedural and process writings, meet in Renton, Wash.

Photo by Marian Lockhart

Frontiers



MARIAN LOCKHART PHOTO

**COVER
STORY**

SMART MOVE 10

Cyndy Murphy (right) is on a team that's created a tool kit to be used by Gary Hendrickson and other Commercial Airplanes Finance analysts. This "tool kit" reflects the intent of the Internal Services Productivity initiative—which in part looks to bring Lean concepts to office-based teams.

**GREEN
POWER**

30 Spectrolab, a Boeing subsidiary, is working on miniature solar chips designed for concentrator systems on Earth. These systems convert a greater amount of sunlight into energy—and could help reduce dependence on fossil fuels.

**FEATURE
STORY**

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At the Payloads Studio in Everett, Wash., industrial designer Richard Simms (left) and technical designer Shawn Claflin study the illuminated “connection” board that tracks the team’s many ideas for improving airplane interiors.



GAIL HANUSA PHOTO

Where ideas are born

18 At the Payloads Studio near Everett, Wash., you’ll find people working in a developmental studio where technology is harnessed to create innovative new products and services aimed at improving the flying experience.

Engine of change

22 Propulsion Systems is one of many groups at Boeing that are successfully encouraging and partnering with suppliers to tackle Lean+ improvements in support of the Boeing Production System.

A clean sweep

26 Teams at Commercial Airplanes Fabrication’s Composite Manufacturing Center in Frederickson, Wash., that build the vertical tail for the 777 have taken to heart the lesson of “cleaning as you go.” They recently delivered their 34th consecutive unit free of foreign object debris.

Two for the line of one

27 A Boeing team rose to the challenge of building the EA-18G Growler airborne electronic attack aircraft on the existing F/A-18E/F Super Hornet assembly line in St. Louis. Here’s why this successful effort helps Boeing and its U.S. Navy customer.

Just like you were there

28 Boeing is working with the U.S. Army to upgrade the Longbow Crew Trainer, a high-fidelity simulator that prepares Apache helicopter pilots and crews to fly real missions in battle zones. These improvements will provide even more-realistic training.

Now part of the team

29 Under Boeing’s sponsorship, two Turkish Air Force lieutenants will earn a master’s degree from the University of Houston while modeling solar array electrical systems for the International Space Station.

Lending a hand

34 In another example of efforts to better integrate Boeing’s business units and enterprisewide functions, Houston-based engineers in the Space Exploration business unit have been busy helping Boeing and its suppliers on several Commercial Airplanes and Integrated Defense Systems programs.

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SNAPSHOT

CHECK THAT OIL FOR YOU? U.S. Air Force Senior Airman Lance Sithammalat climbs down a ladder after adding synthetic oil to a Boeing-built C-17 Globemaster III at Ramstein Air Base, Germany. Airman Sithammalat is a crew chief assigned to the 723rd Air Mobility Squadron.

U.S. AIR FORCE PHOTO BY MASTER SGT. SCOTT WAGERS

QUOTABLE

If the Dreamliner performs as advertised ... these delays will be remembered with a shrug and the usual sense of jaded nostalgia.”

—Richard Aboulaflia, an analyst with the Teal Group, on the relative importance of a six-month delay in the planned initial deliveries of the Boeing 787 Dreamliner versus the airplane’s performance, in the Oct. 10 *BusinessWeek Online*

Absolutely, we’re going to have an electronic attack capability we didn’t have before.”

—U.S. Navy Capt. Paul Overstreet, deputy program manager for the Boeing-built EA-18G Growler, about the F/A-18 version that’s designed for airborne electronic-attack missions, in the Oct. 15 issue of *Aviation Week & Space Technology*

It may not look pretty, but it’s an impressive sight. It still astounds me that someone came up with an idea that was so incredible.”

—Joe MacDonald, recently retired chief 747 test pilot for Boeing, about the 747 Dreamlifter, a specially modified 747 that transports large assemblies of the 787 Dreamliner, in the Oct. 9 *Seattle Post-Intelligencer*

IAM PROMOTIONS

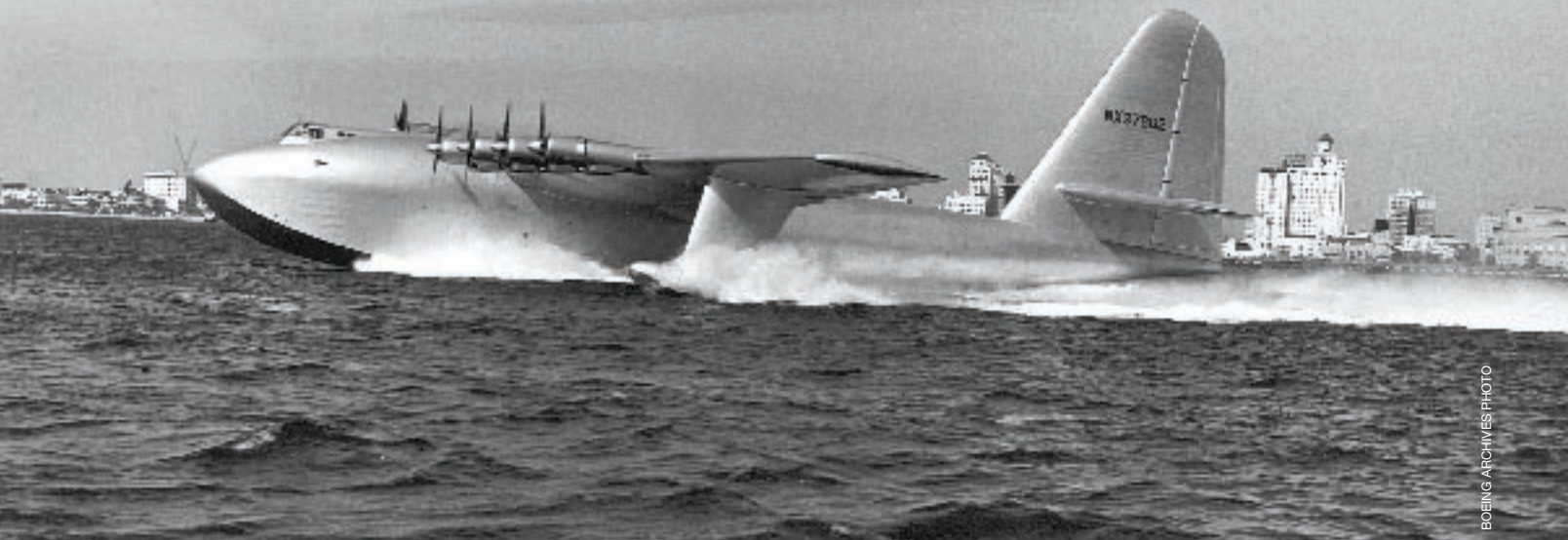
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When the Hercules took to the air

The H-4 Hercules, the world's largest airplane, skims across the water at Long Beach Harbor in California. Sixty years ago this month the airplane made its first and only flight.



BOEING ARCHIVES PHOTO

World's biggest-ever airplane conducted its only flight 60 years ago

By ERIC SIMONSEN

Sixty years ago this month at Long Beach Harbor, Calif., after an arduous journey of development and political controversy, the H-4 Hercules—an airplane that's the world's largest and is still one of its most legendary—made its first and only flight.

The airplane—or perhaps more to the point, the flying boat—reflected the ambition of Howard Hughes, the renowned entrepreneur and the subject of the 2004 movie “The Aviator.” Hughes is connected to Boeing through the products created by Hughes-owned companies that are now part of Boeing, as well as his personal pur-

chase of a Boeing Stratoliner, the first airliner with a pressurized passenger cabin.

The Hercules originally was envisioned as a transport aircraft to support military activity. In 1942, when German U-boats were taking a tremendous toll on U.S. shipping, industrialist and shipbuilder Henry Kaiser conceived the idea of a large fleet of cargo-carrying flying boats. The movement of troops and war supplies

across the Atlantic Ocean to England was critical to the Allied effort in World War II, and perhaps the mission could be accomplished by air.

Kaiser approached aircraft designer Hughes, and together they formed the Hughes Kaiser Corporation. That year, they secured a U.S. government development contract for \$18 million to develop three large flying boats, each ca-

What big wings you have

A comparison of wingspans of several large aircraft, including the Hughes H-4 Hercules.

Hughes H-4 Hercules	320 feet (97.5 meters)
Antonov An-225 Mriya	290 feet (88.4 meters)
Convair B-36 Peacemaker	230 feet (70.1 meters)
Boeing 747-400	211.5 feet (64.5 meters)
Boeing B-52H Stratofortress	185 feet (56.4 meters)

pable of carrying up to 750 troops or two M4 Sherman tanks. However, because of wartime restrictions on strategic materials, the aircraft, designated the HK-1, would have to be made primarily of wood.

Not only was Hughes a perfectionist, but an aircraft of such a size presented design and assembly challenges that caused extensive delays. As a result, throughout the past 60 years a lot of misinformation has emerged about the flying boat. Known by many as the “Spruce Goose,” the airplane was actually made of birch. Hughes disliked the “Spruce Goose” tag and considered it disrespectful to the workers on the HK-1 team.

Despite delays, the assembly process was quite sophisticated and broke new ground. After purchasing the rights to produce the “Duramold” laminating process (first developed by Fairchild Aircraft Company), Hughes perfected it for aerodynamic shaping. The HK-1 team created cross-layered laminations of thin wood strips, injecting glue and then shaping and heating the segments until they solidified. Many aeronautical engineers considered the resulting wood aircraft sections to be stronger and lighter than aluminum. Fabric was used on the elevators and rudder to save additional weight.

Ultimately, the assembly schedule proved too slow for Kaiser. When he pulled out of the contract, Hughes renamed the airplane the H-4 Hercules. Once World War II ended, government funding for the

airplane was canceled, and the U.S. military’s post-war strategy didn’t call for procuring large airborne troop carriers. Yet, the determined Hughes continued injecting his own funding to keep the project alive.

Eventually the world’s largest flying boat was completed, and in June 1946 a team of 2,000 workers moved the aircraft overland in large sections, from the Hughes factory in Culver City, Calif., to a Long Beach Terminal Island dry dock. When finally assembled, the Hercules had an empty weight of more than 300,000 pounds, a wingspan of 320 feet, a length of 218 feet 6 inches, and a height of 79 feet (136,000 kilograms, and 97.5 meters, 66.6 meters and 24 meters, respectively).

Other H-4 innovations included the first “artificial feel system,” which provided more control authority on the control surfaces: The pilot’s yoke would respond as would that of a small aircraft yet multiply the control forces by 200 times to move the extremely large ailerons and rudder.

On the morning of Nov. 2, 1947, the mood was festive at Long Beach Harbor, as invited celebrities and members of the press were gathered to view the H-4 taxi tests. Everyone had expected the first flight the following spring.

After several test runs across the harbor, Hughes called for 15-degree flaps and increased power in the eight engines. Shortly, the behemoth was airborne at an altitude of 70 feet (21 meters) and flew at

80 mph for about a mile (129 kilometers per hour for about 1.6 kilometers). Some detractors later proclaimed that the huge aircraft actually remained in “ground effect,” which is the interaction of the down draft of an aircraft and the surface below it. Delta-winged aircraft commonly encounter this phenomenon during landing and their sink rate is reduced or cancelled out.

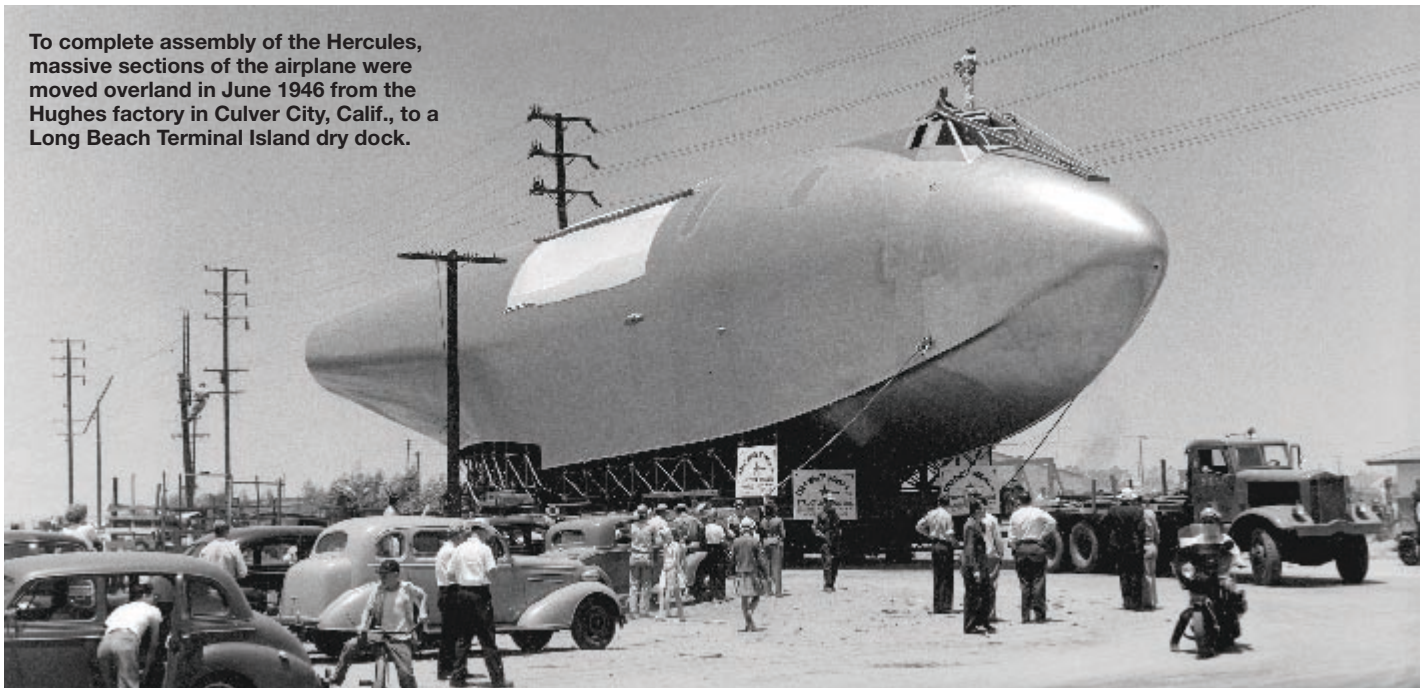
Nevertheless, the H-4 had flown, and Howard Hughes had proven his point. This would be the Hercules’ one and only flight—a flight of determination. ■

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After the flight

After the Hercules’ first flight, Howard Hughes ordered that the H-4 be stored in flying condition. Shortly after Hughes’ death in 1976, Hughes’ Summa Corporation donated the aircraft to the Aero Club of California. The airplane was preserved and displayed under a huge dome in Long Beach, Calif., next to the former ocean liner Queen Mary. In 1988, The Walt Disney Co. acquired both attractions. Disney sold the giant plane to the Evergreen Aviation Museum in 1993—which disassembled the aircraft and moved it to its current home in McMinnville, Ore.

To complete assembly of the Hercules, massive sections of the airplane were moved overland in June 1946 from the Hughes factory in Culver City, Calif., to a Long Beach Terminal Island dry dock.



BOEING ARCHIVES PHOTO

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“Boeing Surplus may not be a cash cow, but return on investment cannot always be measured in dollars.”

—Bob Stevens, Renton, Wash.



Memories stored

I'm writing to the people who can stop the imminent closure of the Boeing Surplus Store in Kent, Wash.

I grew up going there with my father and continue to do so now. I've spent countless hours and dollars there, foraging and dragging home indispensable materials and treasures to feed my addiction of designing and building all manner of useful things. I served eight years with Boeing from 1986 to 1994 as a toolmaker and now work as a toolmaker in the R&D shop of the manufacturing engineering division of a local company—which got its start with tools, machines and materials from Boeing Surplus.

Boeing, in addition to building the world's finest aircraft, has a proud history and long-standing tradition of being a

good corporate citizen by supporting the communities in which it does business. Boeing Surplus may not be the corporation's cash cow, but return on investment cannot always be measured in dollars. Sometimes the greatest rewards come in the form of intangibles, such as community support and goodwill, that foster creative talent and real-world job skills in the community's people. Without Boeing Surplus, I could not have afforded to buy or even had access to the

materials and tools I have purchased from your store over the years. And without these items, I would not have had the opportunity nor the means to discover my talent and develop my skills as a toolmaker and craftsman.

I hope this letter is not a lone plea, but one voice in a swelling chorus of people who have benefited greatly from Boeing Surplus and will sorely miss the Boeing Surplus we came to know and love all these years. You don't have any competition. If it is just a matter of money, raise your prices. We'll pay it (within reason). Please don't let the dream die.

—Bob Stevens
 Renton, Wash.

Editor's note: Ken Botham, Shared Services Group General Services senior manager and the person who leads sur-

plus management and reclamation, provided this response:

"We have long known that the retail store has many loyal customers who find treasures amid the company's surplus. While Boeing has applied innovation and technology to new, Lean production processes, it also has been using Web-based technology to manage surplus materials. Those methods have matured enough that now they are capable of eliminating a significant expenditure of resources required for handling, sorting, transport and storage.

"But the decision also weighed the intangible educational and community roles played by the store. The many intangible benefits you enjoyed at the store are now supported by Boeing in other, more effective ways that were not in place when the store opened in 1972.

"Boeing is a strong supporter of numerous science and engineering educational programs to encourage people of all ages to tinker with technology and explore their talents for innovation. In addition, in the Puget Sound region, Boeing supports the Museum of Flight and the Future of Flight & Boeing Everett Tour as a couple of exceptional 'windows into Boeing.'

"Further, the closure of the retail store does not mean that there is a change in Boeing's commitment to reduce, reuse and recycle. Surplus materials will continue to be processed for sale or reuse, but through large-lot wholesale, online or direct-buy mechanisms.

"Boeing will continue to find buyers who can make productive use of Boeing's unneeded materials and equipment, but it will be done through other, more efficient channels such as online purchasing or direct contracting with resellers."

Letters guidelines

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

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

Right, from the source

Korean-speaking teammates in Calif. and Mesa translate for visiting reporters

BY FELIX SANCHEZ

At home, Andrew Yoo, a senior manager on the C-17 Program, doesn't get much of a chance to speak Korean, his native language: His wife and children speak predominately English. And around other family and friends, Yoo figures maybe he gets a chance to converse in his native tongue about 20 percent of the time.

The same is true for Insoo Shin, a native Korean who moved to the United States when he was age 6. Shin, a C-17 teammate, speaks a minimum amount of Korean with his family. And at their Boeing C-17 offices in Long Beach, Calif., Yoo and Shin together can count on one hand the times they've spoken Korean with fellow workers.

So when the call came out recently for Boeing employees fluent in Korean to volunteer to help the company translate program briefings for a contingent of Korean journalists touring Integrated Defense Systems facilities in California and Arizona, Shin, Yoo and other Korean-descent workers leaped at the chance. It was an opportunity for them to do their part to get Boeing's message across to international customers about the work the company is doing on several important IDS programs—and in their own way give Boeing an incremental edge in building international business.

"I did it to broaden my horizons. It was kind of networking on a personal note and a chance to use my mother tongue," Yoo said. "For the company, it was a chance to make a good selling point. We are in a critical time with the C-17 program trying to find more prospective buyers. I thought it would be good to increase their horizons and understandings about us and the great plane that is our C-17."

Yoo, who's been with Boeing since 1988 and works in strategic support for the C-17 Fuselage Integrated Product Team in Long Beach, volunteered to trans-

late briefings on Global Mobility Systems products for the visiting journalists.

Shin translated during a tour the journalists took of the C-17 final assembly facility, and inside one of the airlifters being prepared for delivery to Canada. He also assisted Yoo and fellow Korean company employees, Yong C. Joo and Myung-Yul Lee, with greeting the visitors, directing them through the C-17 Visitor's Center to get appropriately badged, and then accompanying the reporters to dinner at the end of the Long Beach leg of the tour.

Similarly, Korean-speaking Boeing employees Kap Yoon and Chanhoo Lee in El Segundo, Calif., and Hee M. Moon in Mesa, Ariz., translated for the journalists at Boeing facilities in those cities.

One advantage the volunteer employees offered over professional translators: The Boeing employees were able to provide the journalists valuable insight that only employees can provide about their products, Yoo and Shin said. And who better to convey the technical terms within the verbal

presentations being given journalists than Boeing employees fluent in Korean, said Shin, 30, a 6-year Boeing veteran.

"Even for fluent conversationalists in Korean, some of the terms we had to convey were difficult. Terms such as air-to-air refueling are just hard to translate," said Shin, who works in avionics, design and analysis on the C-17 Program.

Shin said he believes there was an even bigger benefit from using workers as translators. It showed the visitors that Boeing's ranks of employees include "people just like them," he said. "They had somebody they could relate to, another person with the same background as theirs who is working in our company. Using employees who work here, who speak not only the language of Korea, but also conduct the business etiquette and manner—a critical part of a business transaction—gives them the feeling there are people like them who work within the company." ■

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Insoo Shin (holding microphone) of the C-17 Program provides Korean translation to visiting Korean journalists during an October visit to the C-17 Program in Long Beach, Calif. Shin volunteered along with other Boeing employees fluent in Korean to provide translation during the media visit.



GINA VANATTER PHOTO

Smart move

Why Internal Services Productivity matters—and why support functions play a role in boosting competitiveness





The intent of the Internal Services Productivity growth and productivity initiative is to bring Lean tools and concepts into the office environment, said ISP leader Rick Gross.

MICHAEL SLAUGHTER PHOTO

It's been nearly two years since Boeing launched the four companywide growth and productivity initiatives—Lean+, Internal Services Productivity, Global Sourcing and Development Process Excellence. *Boeing Frontiers* recently talked with Rick Gross, leader of Internal Services Productivity, about how Boeing's enterprisewide functions and Shared Services Group are enabling competitiveness, growth and world-class financial performance.

Q: Remind us what Internal Services Productivity is all about.

A: Internal Services Productivity is about bringing Lean into the office environment. That means increasing productivity and output and reducing support/service costs that are centrally managed or embedded in the businesses. This is achieved by eliminating waste, redundancy and “touches,” and by reducing flow times. By doing this, we can provide more timely service that users really need, while improving functional productivity, efficiency and effectiveness.

Our support functions and SSG need to recognize that they can use the same Lean principles that Commercial Airplanes and Integrated Defense Systems use in the factories to become more cost-competitive in an environment of increasing demand and decreasing budgets.

Q: What kinds of activity are we seeing across the businesses? How can we tell whether we're making progress?

A: Generally speaking, we know we're on the right track because the number of projects in the Initiatives Database is increasing monthly, the dollar amount of the projected benefits of the projects is rising, and so is the number of improvements being replicated across the company.

We've certified more than 400 additional Lean + practitioners in the last year and a half, many of whom are dedicated to improving office productivity. Teams from every corner of the company have completed hundreds of Value Stream Mapping exercises and Accel-

Continued on Page 12

Inside

Q&A: Internal Services Productivity leader Rick Gross explains why this growth and productivity initiative is important—and what people can do to support it. **Page 10**

Commercial Airplanes: BCA Finance analysts soon will build their financial outputs with just three Standard Labor Rates—as opposed to the more than 2,000 labor rates available now. **Page 13**

Integrated Defense Systems: The Integrated Control Account Authorization system provides a single source for work authorizations required by all IDS salaried direct-charge employees. **Page 14**

Corporate Offices: The Policies, Procedures and Process Management Project, whose members represent business units and companywide functions, has been consolidating and streamlining Boeing procedural and process writings since August 2006. **Page 15**

Information Technology/Human Resources: Forthcoming changes will make it easier for Boeing employees and their managers to access training information and plan their learning activities and career development. **Page 16**

Shared Services Group: Changes in St. Louis' Site Services processes have led to a more efficient way of collecting refuse—as well as better service to locations. **Page 17**

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erated Improvement Workshops. The challenge now is to implement and close the ideas/actions identified in those efforts to determine if we realize the expected process and performance improvements.

Q: Are any parts of the business showing particular promise?

A: There's a fundamental shift in SSG, Information Technology and many of the support teams when it comes to driving productivity so they become more cost competitive. That's a victory. More broadly, across the company support teams better understand their costs and cost drivers than previously. They know where to go to get information and which focus areas or key levers to apply Lean tools to. Had we not started on this journey 18 months ago, we wouldn't be where we are today, even if we do still have a long way to go to fully optimize Lean into the office environment. We have made good progress.

Q: What's been your focus in 2007? What's ahead for 2008?

A: This year we've tried to get folks to think about the products or services they provide, understand the output, adopt metrics to gauge efficiency and effectiveness, and find ways to boost productivity and yield. We've made some progress but must continue to engage our teams to measure the quality, cycle-time and efficiency (such as units per person, cost per transaction, etc.) of delivering products and services to support the business.

For example, in Finance we've asked every business unit and function that works for Chief Financial Officer James Bell to establish measures of efficiency and use those as a framework to drive process improvement. Shared Services, meanwhile, has spent the last two years benchmarking the competitiveness of its services in terms of cost and quality of service. They're using that information to formulate their plans and implement improvements, to improve the competitiveness of their services. Now it's an integral part of the planning and operating processes.

Q: How's the Initiatives Database coming along?

A: The quantity of improvement projects, the projected benefits and the quantity of replicated improvements are improving each month. We still need to do more in terms of the way projects are described in the database. We need to make sure that projects are input and described in a way that a non-subject matter expert can understand the concept enough to determine possible replication. In some cases, people are still concerned that if they put a dollar value or a quality or cycle-time improvement estimate into the system, they will be held accountable for achieving it down to the last penny or hour. So they're hesitant to provide any estimated benefits. We need to work these issues so good ideas can be more readily replicated.

Q: What's demand management, and why is it important?

A: This is a huge area of opportunity. Working the three "v's"—

visibility, variability and volume—could improve cost performance by as much as 10 to 20 percent.

First, we have to give our partners that use our services better visibility into the cost of those services and specifically what they're using. After that, we need to focus them on reducing the variability of what they're requesting with a goal of driving to a standard process, consumable or deliverable. We won't get to one-size-fits-all across the board, but nonstandard products should be the exception rather than the rule.

“We should think like we're delivering products and services. We need to take up the competitiveness drive around maximizing value for the customer.”

—Rick Gross, leader, Internal Services Productivity

The final step is helping them understand the volume they're consuming and the areas we can cut back. It gives the user accountability for appropriately managing consumption.

For example, if I'm a Finance employee I need to work with my program manager, business partner or site leadership to show them what they're consuming in financial services—things like cost performance reports or integrated scheduling updates. Then I can facilitate a hard conversation around, do you really need that much support at that frequency custom-tailored to meet every need? Or can your needs be met with more standardized services at lower cost and variability? There's a level of managing our internal business partner's expectations regarding requirements and ensuring competitiveness of our support/services.

Our challenge is to provide quality service at more affordable rates year over year. What we're trying to achieve in the office is a fundamentally different way of operating and thinking about what we do. We should think like we're delivering products and services. We need to take up the competitiveness drive around maximizing value for the customer. Then we need to turn that to an internal conversation between support groups and the people they provide their services to, with the fundamental basis of creating value through improving productivity and managing demand. That will become a key competitive discriminator for Boeing.

Q: Our customers make their buying decisions on best quality, best price and best service. Why isn't it instinctive to think that way in the office environment?

A: We have a culture that perhaps hasn't fully focused on thinking like a consumer when it comes to purchasing internal services. We must now think about the services we're providing on a comparatively competitive basis and implement improvements to achieve desired levels of quality and cost.

Q: In a big company like Boeing, I don't know if I (as just one person or part of a small team) have any impact.

A: But you do! We all do. All leaders must create a sense of urgency around this. A lot of our organizations recognize how difficult it's going to be to meet their long-range plans. Applying the Lean+ tools to our ISP focus areas is a key enabler in order for our teams to reach their goals. Productivity enables growth, and these together will ensure our long-term success.

It's our future

Actions cited in this story show how employees are applying concepts of the Boeing Management Model to support the company's business strategies. Here's how.

- **Growth and productivity: Lean+ and Internal Services Productivity, through office-based teams using Lean tools and adopting Lean concepts to streamline their operations, provide better service and improve their cost structures.**

To learn more about the Management Model, visit <http://bmm.web.boeing.com> on the Boeing intranet.

Continued on Page 14



At the Boeing facility in Renton, Wash.—the home of the Boeing 737—Gary Hendrickson, 737 finance analyst, and Cyndy Murphy, Standard Labor Rates project leader, stand with a tool kit typically used by airplane production teams. Thanks to the work of the Standard Labor Rates project team, Commercial Airplanes Finance analysts soon will get their own tool kit of sorts.

MARIAN LOCKHART PHOTO

BCA's tool kit for financial analysts

On the 737 factory floor in Renton, Wash., installation tool kits along the production line await the arrival of technicians. Inside are all the tools and instructions needed to complete an installation.

In the Finance offices overlooking the factory line, analysts will receive a tool kit of another sort at the beginning of 2008. Boeing's Commercial Airplanes Finance team is making it easier for BCA analysts to build reports and develop forecasts by giving them three prepackaged labor rates.

These labor rates do not change the wages Boeing employees are paid. Using Standard Labor Rates will affect only consolidated monthly cost-review reports, as well as the quarterly forecasting of how much projected labor hours will cost in dollars to manufacture a Boeing product.

Today, approximately 200 BCA Finance analysts spend several hours per quarter using multiple systems and various methods to create labor rates; this results in more than 2,000 labor rates. Beginning in January, analysts will build their financial outputs with just three Standard Labor Rates. The three rates will be maintained annually by just a couple of analysts and will be changed only when a variance of 5 percent is exceeded. Saving even eight hours a year becomes significant when multiplied across the BCA analyst community.

"This will free up time, because we don't have to worry about labor rates," said Gary Hendrickson, 737 finance analyst. "The forecasted labor rates will be the same they use to report 'actuals' to us. What's nice is we won't have to spend extra time reviewing variances, because there won't be a variance."

One labor rate will be used for each of three groups: manufacturing, engineering, and administrative. This will eliminate the redundancy of individual Finance analysts being responsible for their own rates within their business unit and give them more time to be business advisors to their customers. In other words, this will allow analysts to analyze rather than collect data.

The outcome of giving analysts more time—also known as creating

capacity—maps directly to the goals of the Internal Services Productivity initiative. Eliminating non-value-added tasks improves analysts' functional efficiency and productivity. Giving customers more timely financial advice ultimately helps decision makers improve their businesses.

"What we're doing is freeing up time to analyze cost drivers they can control, such as expenditure of labor hours and overtime," said Cyndy Murphy, the Standard Labor Rates project leader.

Establishing Standard Labor Rates is one step forward in the Lean+ journey of BCA Finance. The Labor Rates team is one of many projects under way within the Lean Cost Management Implementation team, whose charter is to apply Lean+ thinking and methods to current processes and develop standard processes and tools for use across BCA.

The Lean Cost Management team was formed in May and now involves a large group of Finance employees working to sweep out waste and simplify and standardize BCA Finance processes. The team is also preparing financial foundations to support Value Stream alignment.

Such culture shifts can take years. Murphy has been leading the Standard Labor Rates change for almost two years. The project came out of a January 2006 Accelerated Improvement Workshop and Value Stream Mapping by those looking for ways to reduce rates and factors. Murphy and her team conducted workshops with analysts in St. Louis, Long Beach, Calif., and around the Puget Sound region of Washington state, and leveraged their lessons learned.

"It's been a long road, but one well worth taking," Murphy said.

To learn more about Standard Labor Rates and the Lean Cost Management Implementation team, Boeing employees can visit their portal on the Boeing intranet. Go to my.boeing.com, and in the search field in the upper right, enter the phrase "BCA finance lean cost management." The team's portal should be the first site listed, when sorted by relevance.

—Greg Brown

Continued from Page 12

Q: Is it fair to say in the first 18 months we picked most of the low-hanging fruit, and now the challenge gets tougher?

A: That's how it would appear, looking at support functions individually. We've been able to capitalize on some obvious efficiencies, and now we're really thinking hard about how to make continued improvement a year or two years from now. In many cases, there's a big gap between folks' productivity commitments in the out years and what they know they can do today. And that's going to take a fundamental shift in how we operate. We need to start working more outside our direct teams and focus more on value stream and enterprisewide improvements. That is where the big leverage is—optimizing for the enterprise!

More stories about teams supporting Internal Services Productivity. Pages 16-17

Q: Why all the talk about increasing productivity when our revenues and earnings have been rising?

A: Even though we're growing, we have to work today and every day to position ourselves for the inevitable downturns in our cyclical businesses. Setting stretch targets based on competitive benchmarks is an important way leadership can focus on how we provide support more competitively over time. Our stakeholders' expectations of our performance don't change even if our businesses cycle does. We can become world-class, and operating in this manner will help enable that level of performance.

Q: How do we get people really focused on the need to pursue ISP?

A: Boeing does a great job of executing on what we measure. So if

we measure and integrate into our goals and objectives what we're trying to accomplish through our ISP initiative, our teams will find a way to get it done. They always do. What gets measured gets worked at Boeing, and if we prioritize it and focus on it, it'll get accomplished.

Q: How can we take this to the next level?

A: We need to continue celebrating and rewarding the success of our teams and further sharing of best practices. More communicating, prioritizing and rewarding will enable us to achieve the progress our customers and senior leadership expects. While our leadership understands ISP conceptually, many are still looking for applicability to their work team. It's through sharing successes in the database, using other's improvement ideas and other communication forums—that includes lessons learned, good and bad—that we'll be successful.

Q: Is there additional opportunity to work cross-functionally or across businesses?

A: We are seeing some teams across businesses adopt functional best practices or good ideas, but there's a lot more to do. Taking variability out of how support functions do their work across sites, programs or businesses is still a huge area of opportunity. If we drive to standard work, processes and systems, and if we leverage common infrastructure across the company, we'll see a significant shift in productivity. It will also enable us to move people around the company more effectively and enable the central service functions like SSG and IT to consolidate their infrastructure and lower costs.

Q: Isn't that what functional excellence is all about?

A: Functional excellence includes having productivity metrics and productivity improvement plans in place to enable our businesses to be more competitive. Functions need robust plans working across the company to take out variability, instill more discipline, improve quality and aggressively replicate good ideas to drive business performance. ■

Accounting for common system at IDS

Process improvements and common systems are crucial to improving productivity. That's exactly the focus of an Integrated Defense Systems team that's launching the Integrated Control Account Authorization (ICAA) system, which provides a single source for work authorizations required by all IDS salaried direct-charge employees.

ICAA facilitates the charge line setup process that requires collaboration of many finance functions. Before ICAA, the data elements required in an IDS charge line were collected and communicated using various methods and tools. There also were multiple systems at various sites, with varying ways of generating work authorizations. The disparity of systems and data entry among sites was costly and often required rework.

With this common financial tool, IDS streamlines processes, cuts process times and improves access to information. In turn, the improvements will save time and money.

"IDS did not have a common finance system to provide employees easy access to standard work authorization across all sites," said Dori Scherer of IDS Business Operations. In July 2005, Scherer explained, an IDS-wide workshop was held, allowing each site to present its unique charge line setup and work-authorization processes and systems. Since then, a cross-functional team has worked diligently to find the right solution.

"In selecting the right tool," Scherer said, "it was determined that ICAA was technically advanced, had functionality for requirements and was already interfacing with the Enterprise Accounting System. As a result, it was selected as the IDS common solution."

ICAA will "push and pull" information sourced in multiple IDS common finance systems by interfacing with the Common Contract System, the Enterprise Accounting System and the Cost Schedule Planning and Reporting systems. The tool also will provide comparison reports to identify differences between systems on key data fields. The goal, said Scherer, is for employees to input information into one source system that will be used by other systems to ensure data integrity.

Together ICAA, the Enterprise Accounting System, the Common Contract System, and the Cost, Schedule, Planning and Reporting System provide a complete and integrated set of tools that will help program managers more efficiently transfer and manage work across sites and lead virtual work teams.

"In the past, the focus was on establishing functional systems and processes. This led to functional islands that remained 'siloed', supporting their own internal needs," said Steve Baker IDS Business Operations director. "To be lean, our processes must be integrated so we can minimize touch points, and our data must be shared from system to system—eliminating duplicative entry and error introduction."

—Katherine Sopranos



Jerry Martin (right) of the Commercial Airplanes Program Management Office addresses attendees at a recent Policies, Procedures and Process Management Project leadership team meeting in Renton, Wash. The project's aim: streamline Boeing's procedural and process writings.

MARIAN LOCKHART PHOTO

Streamlining, as a matter of policy

The Policies, Procedures and Process Management (PP&PM) Project—with members representing business units and companywide functions—has been consolidating and streamlining Boeing procedural and process writings since August 2006. This effort, which supports the Internal Services Productivity, Lean+ and Development Process Excellence companywide growth and productivity initiatives, promotes cross-company commonality of requirements, responsibilities and process definition.

The goals of the program:

- Significantly reduce the number of procedural and process writings
- Transition writing ownership to the functions
- Implement a common business, system and documentation strategy and architecture
- Enable commonality and sharing of documentation across the company
- Reduce overall administration and systems cost

“The work of this team is important,” said Rick Stephens, Boeing senior vice president, Human Resources and Administration. “Not only does it save costs, but it supports Boeing’s drive toward enterprisewide commonality and standardization. And, in the end, this will make it easier for all of us to find the important policy and procedure information we need.”

The team’s efforts focus on consolidating existing information technology systems, Web sites and servers used to house and manage procedural and process writings across Boeing. Through the end of September, the team has reduced the number of IT systems, Web sites and servers used by 45 percent. In addition, by mid-2008, more than 60 stand-alone systems will migrate to a target of two. A third system will support process management, including the mapping of procedural and process writings to functional processes used by the businesses and programs. This

will enable the owning functions to view all existing writings mapped to a process so they can focus on achieving the appropriate level of commonality across these process writings.

The ongoing reduction in the number of writings overseen by the PPPM team will result in considerable cost savings. It costs about \$10,000 to create and \$3,000 to maintain each writing. As of Sept. 30, the number of writings has been reduced from over 25,000 to about 18,000. The result is a \$9.1 million recurring savings in 2007 and a projected \$11.7 million recurring savings in 2008. Just as important, greater commonality will result in lower risk, less rework, less retraining, increased efficiency and increased standardization across the company.

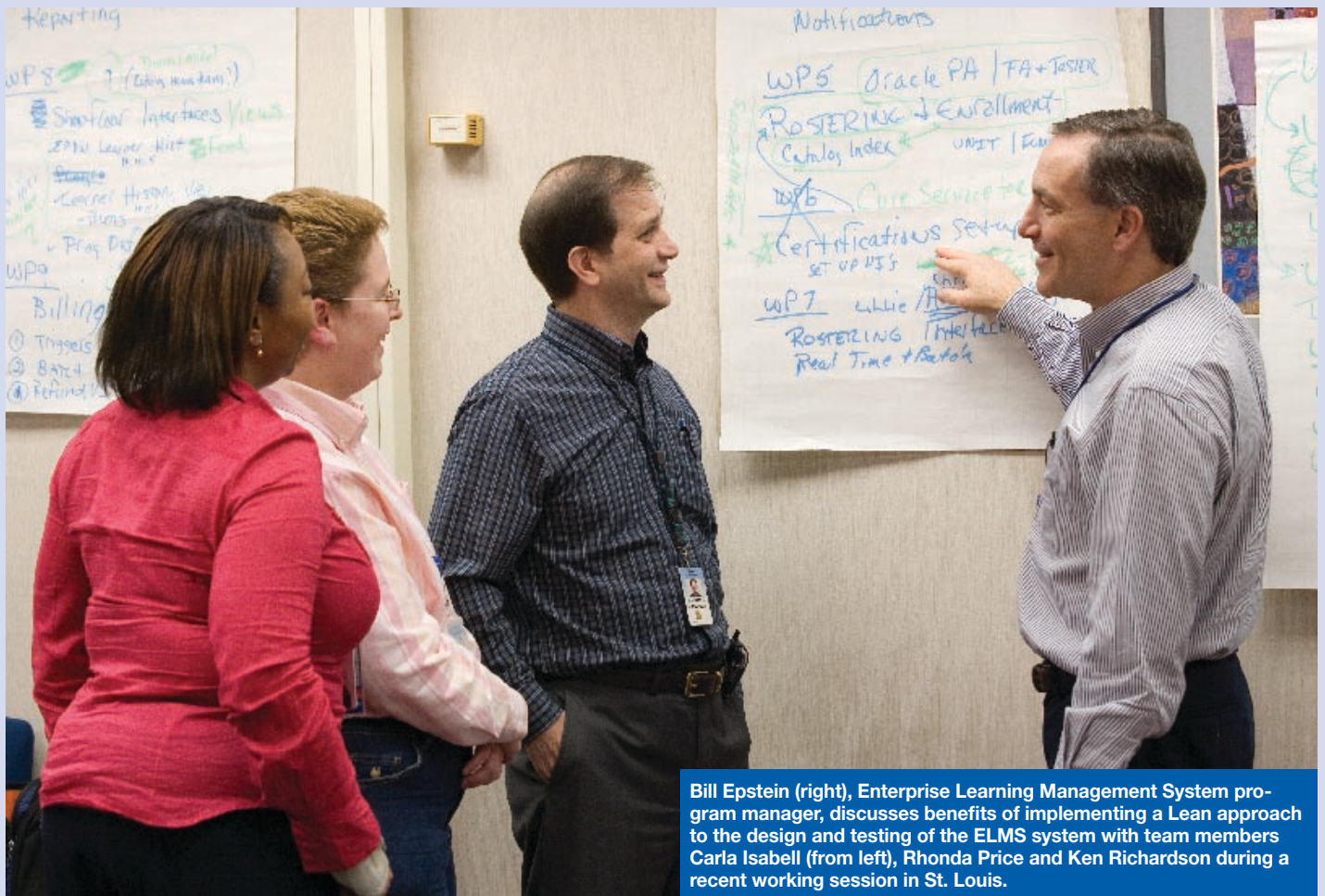
As the functions took ownership of the processes and their associated writings, they set reduction targets to measure and report performance. These targets were exceeded by mid-year, and to support the Lean+ concept of continual improvement, their 2007 targets were raised.

In 2008, the team will continue to reduce the number of writings, to support Boeing’s move to greater procedural and process commonality through functional alignment of processes and their associated writings. The project also will analyze the potential for achieving a single-system solution to meet the company’s integrated policy, procedure and process-management needs.

Future project deliverables include a simplified user interface that will be made available through MyBoeing.com and will serve as a single point of entry to the three systems housing policies, procedures and process information.

“We’ve made significant progress in 2007, and I am sure we all look forward to more progress in 2008,” Stephens said. “We have plans and metrics to ensure we sustain the gains being made, and we look forward to your feedback on how it’s going.”

—Junu Kim



DAVE MARTIN PHOTO

Bill Epstein (right), Enterprise Learning Management System program manager, discusses benefits of implementing a Lean approach to the design and testing of the ELMS system with team members Carla Isabell (from left), Rhonda Price and Ken Richardson during a recent working session in St. Louis.

Lesson learned: Training system streamlined

Forthcoming changes will make it easier for Boeing employees and their managers to access company training information and plan their learning activities and career development. Human Resources' Learning, Training and Development is partnering with Boeing Information Technology and Boeing's business units to develop the Enterprise Learning Management System (ELMS).

As a result of mergers and acquisitions over the past 10 years, the company's learning systems have become inefficient and difficult to navigate. Employees and managers often have difficulty determining and locating the training they need for themselves or their direct reports.

"The new system will give employees and managers better visibility into all their training and certification requirements," said Norma Clayton, Learning, Training and Development vice president. "More importantly, it will encourage managers and employees to have those important conversations around performance and career development."

This new companywide integrated learning management system, which supports the Lean+ and Internal Service Productivity initiatives, will consolidate 27 legacy learning tools and applications into one user-friendly system.

"ELMS is a vital part of our company strategy to drive business results through more simplified common processes and systems," said Cheryl Britton, Human Resources Systems leader for Boeing Information Technology. "In addition to supporting the retirement of legacy systems, ELMS will provide a single-access point for training across the company."

The current maze of training systems includes legacy systems that were pieced into the current configuration. In addition, some antiquated systems are at risk of technical obsolescence. Consolidating into one system will result in significant company cost savings. Boeing projects ELMS to save \$8 million in 2009 and \$6 million per year thereafter.

After a recent thorough review of the ELMS system design, Bill Epstein, ELMS program manager, said the project team is moving forward with the development phase.

"The team is putting together a solution that will provide an efficient and effective system for accessing the right training at the right time and for delivering training and development opportunities to employees," he said.

The first phase of ELMS is scheduled to go live early next year for some Boeing employees, and all employees will have access by the end of 2008. Once it is fully operational, employees will be able to access their training requirements, courses and records through a new Learning Portal on TotalAccess.

—Katherine Sopranos and Tim Deaton

Trash to cash

Demonstrating that benefits from a Lean+ transformation can be found throughout Boeing, the Refuse Collection/Disposition team in St. Louis has streamlined their processes, leading to savings in time and costs as well as service improvements.

“We knew there must be ways we could improve the collection of trash and scrap,” said Bernie Wright, Senior Manager for Service Center 3, Site Services, in St. Louis. “First, we needed to identify tasks that were daily, repetitive, time-consuming and involved everyone.”

To achieve this key step in the Lean+ journey, the team went on inspection walks to identify opportunities for improvement. Soon the walks turned into rides, following the trash container drivers. “Walk or ride, the process found simple, low-cost solutions which enabled our team to design better systems, and also encouraged them to think leaner,” said Wright.

The team identified opportunities to reduce the hours required to haul refuse, increase recyclables awareness and develop standard refuse routes. Through the implementation of these improvements, collection time has been cut by 72 percent, the number of trash containers has been reduced, and the amount of recyclable materials captured has increased.

“We were pleased that not only did we improve our productivity, we created

time for the team to focus on additional process improvements,” said Ken Rowilson, team leader. “We also reduced the amount of scrap going into landfills. That was a plus for the entire team.”

To reduce the amount of recyclable material going to landfill, the team increased the number of blue containers for recyclable plastic, cans and bottles.

Arrows painted on the pavement now indicate trash pickup routes. Bulky, intact cardboard carton throwaways were reduced by promoting use of a cardboard compactor and designing a cart to transport broken-down cardboard flats.

Trash pickups were reduced from three times a day to once a day. To make certain a high level of quality was maintained, a new “hot spot” pickup run, focusing on locations where refuse quickly accumulates, now operates in the afternoon. Combining these routes freed up man-hours, going from 34 to 9.5 daily. “This reduction allows us to accomplish the other work we have in a more timely manner and without overtime,” said Alan Bess, group manager, Shared Services Facilities.

The team continues to monitor and critique the process, ensuring constant improvement. More “hot spot” pickups may be added, including those in other buildings. And, through Wright’s work on the Enterprise Maintenance Council, the team is already sharing its Lean+ expertise with counterparts in Philadelphia.

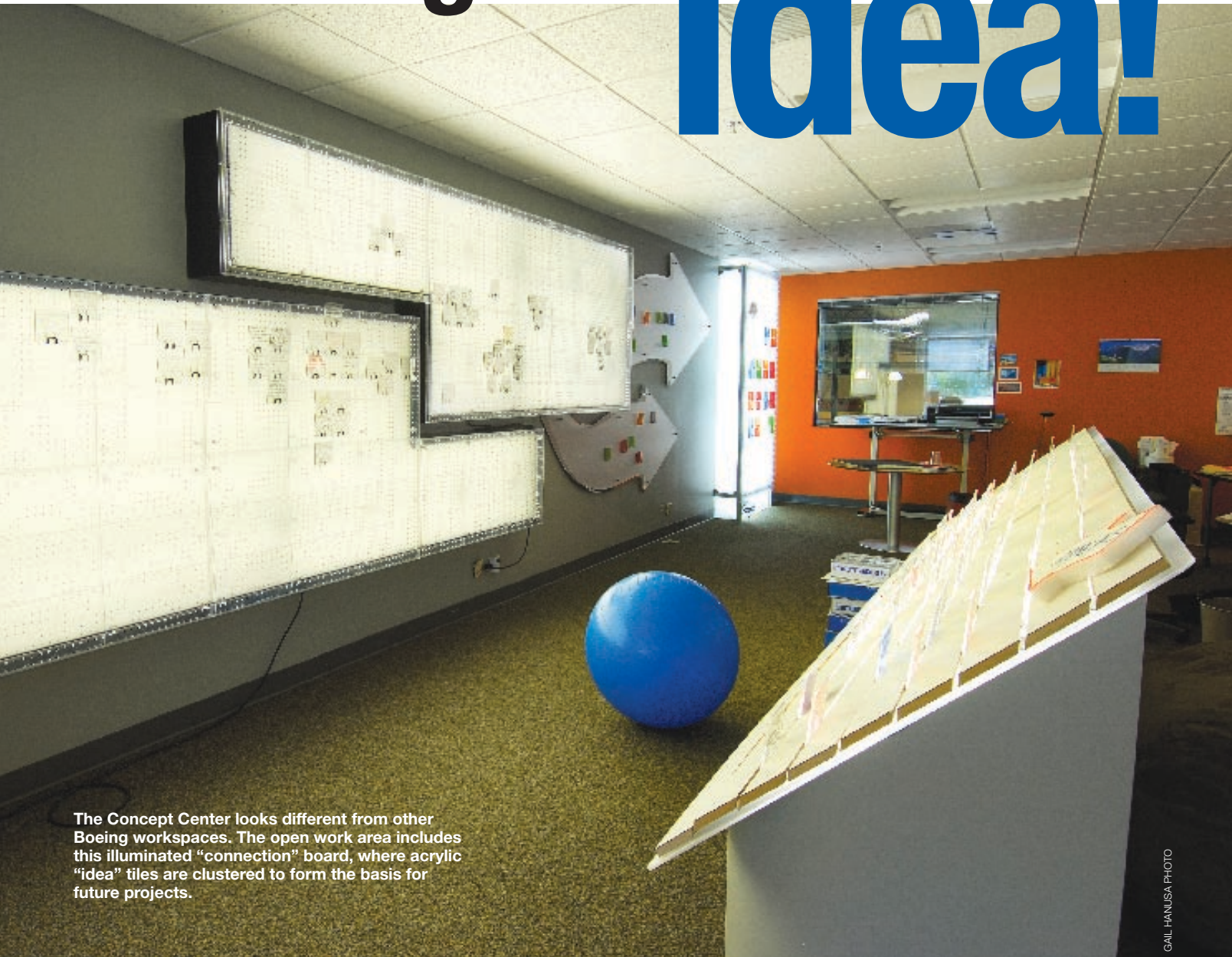
—Christine Frank



RON BOOKOUT PHOTO

Members of the St. Louis Refuse Collection team are shown with the hydraulic trash compactor into which all rolling trash containers in Building 101 are emptied. In the front row, from left, are Tom Kriegemeier, Brad Smith, Kim Sevic, Bernie Wright, Al Kuhn, Joe Haake and Aubrey Ladd. In the back row, from left, are Ken Rowilson, Dewey Shields, Renee Nedeau and Alan Bess.

What a great idea!



The Concept Center looks different from other Boeing workspaces. The open work area includes this illuminated “connection” board, where acrylic “idea” tiles are clustered to form the basis for future projects.

GAIL HANUSA PHOTO

What’s next on board? Payloads Studio has some exciting thoughts

By KATHRINE BECK

You’re flying from Johannesburg to Los Angeles, via a connection in London. You’d like to arrive feel-

ing fresh, so somewhere over the Canadian Rockies you decide to slip into the shower. You enter the airplane’s on-board shower compartment and get out of those clothes you’ve been living in for hours, while the fan warms the compartment air. You enter the shower itself and press a switch to choose the right nozzle height for your own height. A warm mist envelops you. The soothing feeling is enhanced by colored lights. Doesn’t that feel better?

The onboard shower has automated cy-

cles, like a dishwasher. To save water, the mist stops while the soaping cycle is on. A displayed message lets you know your present cycle and how much time you have before the next one starts. Next comes the rinse cycle, followed by the dryer—which gets you as dry as a towel would. After you leave, the unit cycles to clean mode and dispenses a disinfectant solution, then dries itself in readiness for the next passenger.

You won’t find this shower on board a jetliner just yet. But Boeing has the technol-

ogy—technology developed with airplane operational requirements in mind, such as low weight to save fuel burn. Indeed, this shower only uses five cups of water.

The prototype for that onboard shower already exists at the Payloads Studio of the Commercial Airplanes organization known as the Concept Center. The organization's facility near Everett, Wash., is a developmental studio that creates future concepts through research, prototypes, mockups and interactive workshops. It's where technology is harnessed to provide innovative new products and services

aimed at making flying fun for passengers again. And just as important, the facility, which has become a destination for airline-customer visitors, has helped underscore Boeing's reputation as an innovative company.

The shower is one exhibit in what amounts to a futuristic studio of innovative products. It's based on existing technology, but it combines these elements in a new way to help Boeing's airline customers provide their passengers with exciting new flying environments. What's more, the innovations reflect the Payloads Studio's

“airplanes for people” concept. This philosophy recognizes that by analyzing the entire value stream, the studio's staff can create compelling design solutions for everyone who touches the product.

POWERED BINS

There's a lot to see at the facility. Here are some of the ideas on display.

- **Power Automated Stowage Bin System.** In this concept, the overhead bins open and close firmly but gently with the touch of a button. That makes it easier for all passengers, including the elderly and physically challenged, to use the bins. Also, airline personnel can close all bins at once from a central location. And because each bin is powered and operated individually, it's easier for airlines to reconfigure interiors.

- **Super Integrated Passenger Accommodation Space.** This integrated passenger seat concept incorporates the oxygen and mask delivery system, fan and air distribution nozzles, and a reading light that passengers can control to deliver the desired angle and brightness. Sensors in the seat bottom let cabin staff know through wireless links if the passenger is seated, if the tray table is stowed, if the seat is upright, and if the seatbelt is fastened—making it a lot easier to prepare for takeoffs and landings. The integrated seat makes it easier to reconfigure the airplane, because when you move the seat you also move items that have traditionally been part of the overhead architecture. It also significantly reduces the cost of airplane assembly, and provides passengers with more legroom.

- **The Light Lab.** This interior mockup area shows off an innovative LED lighting system that calls on human factors technology and physics to mix a rainbow of colors. The result: changeable lighting that can dramatically alter the mood and feel of the cabin, the way colors look, and the way passengers feel and function.

- **An open area for socializing and collaborating.** This space includes a unique conversation point in the floor. It's an oval glass pane that works like a window on the world and shows the terrain below as captured by a camera mounted on the belly of the airplane—or, in case of cloud cover, a Global Positioning System-based map.

- **Radio frequency identification-based baggage handling and tracking systems.** Industrywide, mishandled baggage is a \$2.5 billion problem, and it costs airlines an average of \$86 to recover and deliver a lost bag to a passenger. In response, Payloads Studio teammates are developing baggage handling and tracking systems based



At the Concept Center, you'll find a prototype for an onboard shower. A refreshing in-flight shower could become a reality for commercial airplane passengers.

CONCEPT CENTER PHOTO

■ COMMERCIAL AIRPLANES

on the same RFID technology that will be used to tag 787 Dreamliner parts.

'CATALYST' FOR IDEAS

The Payloads Studio, like other studios within the Concept Center, is a commercial aircraft interiors engineering and design group, and a place where a diverse group of people from many disciplines come together in an environment designed to remove constraints and encourage risk-taking. Their job is to come up with new concepts that might well become part of the airplane interiors of tomorrow.

"They serve as a catalyst for idea generation, and they collaborate with other members of the product development team," said Todd Zarfos, Commercial Airplanes vice president of product development. "Their role is to spark the idea and create the concept, and then it gets handed off to others who will mature it."

The risk-taking environment was planned that way from the get-go and is the brainchild of Concept Center Director Alan Anderson (see story on Page 21). Anderson, a 40-year Boeing employee who's spent his career in commercial airplane payloads, wanted an organization that could develop innovative concepts for the airplane interior five to 15 years into the future. He also wanted an organization that felt free to pursue "wild ideas" that one day could go on to possible Boeing product development and integration into new airplanes.

The then-named Payloads Concept Center, the first organization of several that would come together as BCA's Concept Center, was officially born in 1999. It's now grown from three to 24 employees, and it's been churning out new ideas at a fast clip.

Its success resulted in the creation of a parallel, colocated organization, The Systems Concept Center, later joined by the Flight Deck Concept Center, all operating under one umbrella and now known collectively as BCA's Concept Center. More studios are planned, said Anderson. "Different studios will be established, working together but each maintaining its own focus and personality."

TOYS IN THE OFFICE

All the studios will be in the idea business. What does it take to keep all those new ideas coming?

It starts with a diverse work force. The people on the Payloads Studio team have a wide variety of backgrounds, disciplines and interests. They have collective experi-



Payloads Studio mechanical design engineer Heidi Kneller views a mosaic of colored acrylic tiles showing current projects and the ideas that spawned them.

GAIL HANUSA PHOTO

ence and expertise in payloads engineering and design, cabin systems management, human factors, interiors configuration, industrial design, mechanical engineering, physics and bioengineering.

The team shares a big open area that facilitates desk-hopping and collaboration. It's full of new materials and strange objects that just might—and do—spark ideas. In fact, at quarterly "inventible" parties, employees go over regular shipments of new materials and

industrial objects that arrive and could come in handy for an exciting new concept.

It's also a hands-on environment where employees are constantly sketching and doodling and building models from real materials in two big studios. And they're having fun doing it. "I have an awesome job. This is the best job at Boeing," said technical designer Shawn Claffin.

He said employees aren't just responsible for innovative thinking. They're also

responsible for developing the processes that keep ideas moving from the idea to a working prototype to practical application. Employees work in an atmosphere of creative freedom, but there's nothing undisciplined about their processes.

Clafin was part of the employee team that designed and built a unique installation to visually track those ideas. Teammates record ideas with a wet erase pen on a clear acrylic tile and display them in a special rack. The ideas are reviewed by others, and placed alongside related ideas in a second location—creating a mosaic of ideas coming together. When they morph into projects, they are color-coded by categories, recorded on colored tiles and moved again to a third section that charts the course of innovation.

And they do their homework. The process begins with learning the right questions to ask—questions based on input from many sources. They include airline requests, benchmark studies of other companies and industries, studies of emerging markets and review of new technologies that could have useful applications for commercial aviation. They also include personal experience of team members. That's how the Payloads Studio de-

cidied, for example, to check into traveling pets and their needs.

To learn more, they embark on projects such as a cultural study of passenger populations in the burgeoning economies of Asia. Their "Experience Aging" project outfitted staff members in gear that gave them the limited mobility, vision and hearing of the elderly, then sent them on commercial flights to learn more about the needs of an aging flying public (see Page 24 of the December 2005 *Boeing Frontiers*).

They also examine whole areas of the passenger experience. Not only are they studying airline food, but they've decided to investigate concepts such as nutritional bars and vitamin drinks formulated for high-altitude conditions.

Nothing's off limits, and that's part of the risk-taking culture the Concept Center nurtures and that its employees prize.

"Where else can you learn and try things you may not necessarily be good at yet," said mechanical design engineer Heidi Kneller. Added Payloads Studio manager Pete Guard: "The environment we've cultivated is at the heart of the future of Boeing." ■

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Innovating for innovation

At Commercial Airplanes' Concept Center, innovation isn't just a hallmark of its work. Innovation plays a major role in shaping this work environment, where creativity is king.

"We'll continue to experiment with work space, innovative conditions, and innovative ways of doing business," said Concept Center Director Alan Anderson. "Many things we do here could be appropriate in any traditional design or engineering office. Not everything is appropriate in every situation, but freedom in the arrangement of space, being more mobile, moving people and office furniture around, are all things that could help any group."

Anderson said the Concept Center approach to work involves having the freedom to move resources and continually prioritize work. "We needed permissions from our bosses to pool the money we wanted to move toward innovative efforts and allow it to be managed more locally. We got that," he said.

"The old way of project management was you had to know a year ahead what you wanted to do to fit the budget cycle," added Pete Guard, Payloads Studio manager. "By the time you got funding, your project might have been out of date."

A successful teammate at the center, said Guard, is confident, collaboration-oriented, highly motivated and achievement-oriented, and has strong communication skills. Also a plus: the ability to deal with ambiguity—which Guard said strongly connects to Finding a Way, one of Boeing's leadership attributes. "The whole element of tenacity and breaking through challenges—that's huge in this environment," he said.

—Kathrine Beck

It's our future

Actions cited in this story show how employees are applying concepts of the Boeing Management Model to support the company's business strategies. Here's how.

- **Leadership attributes: Devising creative solutions supports Finding A Way.**

To learn more about the Management Model, visit <http://bmm.web.boeing.com> on the Boeing intranet.



The Concept Center advanced interiors concept mockup is a showcase for new ideas. The circular viewing pane on the floor gives passengers a camera's-eye view of the terrain below their feet.

GAIL HANUSA PHOTO

Lean power, all around

Propulsion value stream contributors implement Lean improvements

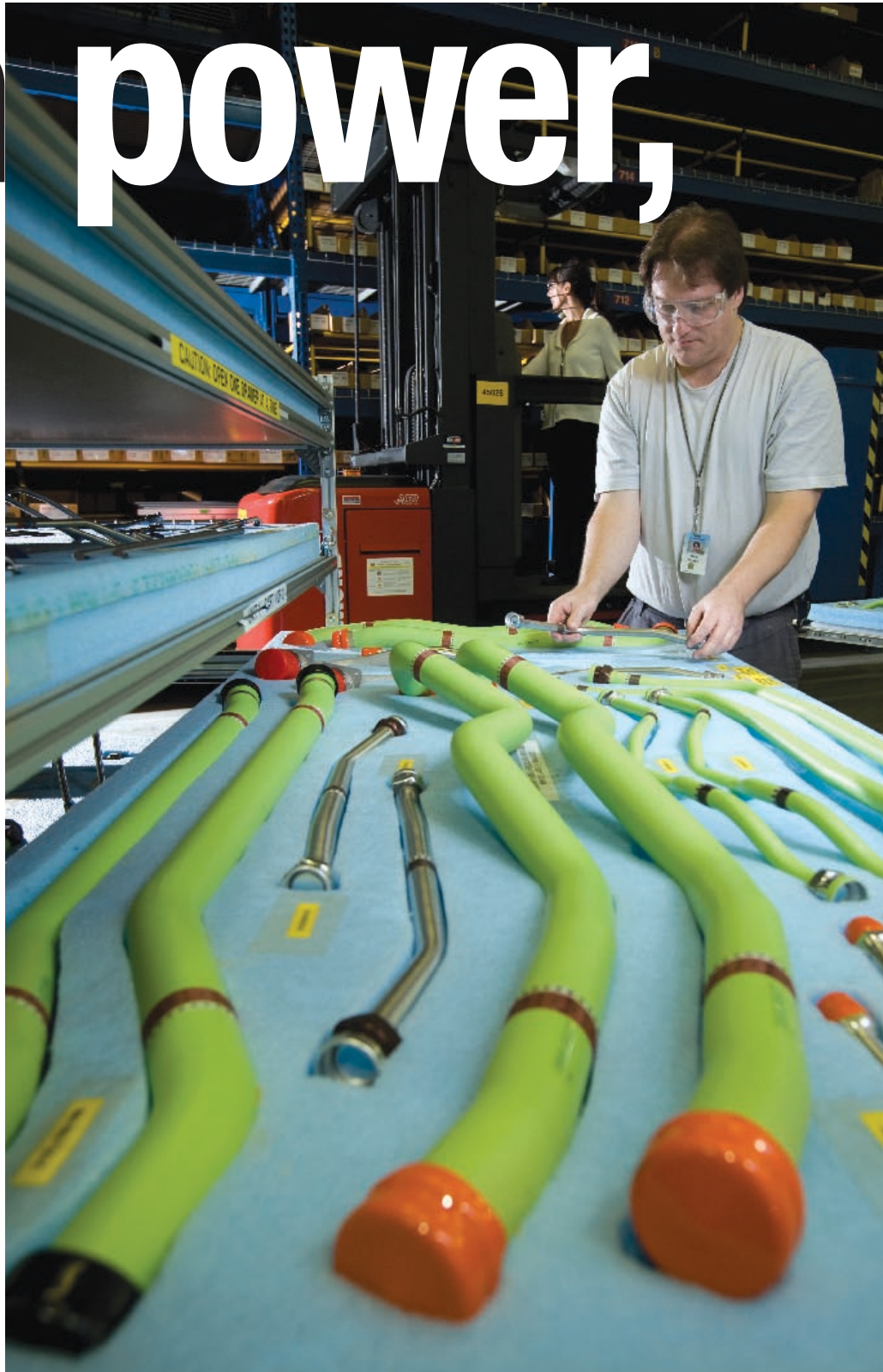
By DEBBY ARKELL

An Engineering team in Seattle uses employee involvement and high performance work team methodologies to create a collaborative, open work environment. A group in Boeing's Tube, Duct and Reservoir Center in Auburn, Wash., creates a parts "supermarket" and begins kitting parts for its customers. And a team in Winnipeg, Manitoba, adopts work cells with moving-line elements into its manufacturing processes.

Propulsion Systems is one of many groups at Boeing that are successfully encouraging and partnering with internal and external suppliers to tackle Lean improvements in support of the Boeing Production System. And suppliers are choosing the methods that work best for them. This activity supports Boeing's Lean+ and Global Sourcing company-wide growth and productivity initiatives.

"Improving performance throughout the value stream and increasing customer satisfaction are at the heart of our activities with Airplane Programs as we transform the Boeing Production System," said Sandy Postel, vice president and general manager, Propulsion Systems. "It's fundamentally important that customers and suppliers work together on continuous improvement."

Indeed, Propulsion Systems has already begun its transformation. Late last year, a Propulsion Systems team moved "shipside" to the Boeing facility in



ED TURNER PHOTO

Dan Rozek (foreground), material process requirements facilitator at Boeing's Tube, Duct and Reservoir Center, finishes assembling a tube kit for 747 strut assembly as Sheila Garcia picks parts from the "supermarket." The TDRC now stores and kits parts for Propulsion Systems as part of a pull-production system.

Renton, Wash., to build up engines alongside the 737s on which the engines will be hung (see Page 24 of the August 2006 *Boeing Frontiers*). Another team is in the midst of moving to Everett, Wash., for similar work on the jetliners assembled there.

“We’ve seen a lot of benefit from our move to Renton, and we’ll see even more once our other crew moves to Everett,” said Ken Balls, Renton Value Stream leader. “By building engines directly in line, we no longer have wait time between shifts, as we’re able to get our engines over to Final Assembly as soon as they’re done.”

This time savings means that having suppliers provide parts only when needed becomes increasingly important. The following stories spotlight a few of the Lean+ improvements in the propulsion value stream—with tremendous results.

SUPPLIER BY DESIGN

Propulsion Systems Engineering has had a Lean plan in place for nearly five years. “We’d begun Lean+ in the factory, but we were grappling with Lean in the

office,” said Vince Robel, Propulsion Engineering Systems leader. “In Operations you can time transactions with a stopwatch click. For Engineering, it’s harder to show that value.”

To apply Lean concepts such as standard work and apply them to engineering processes, the engineering team began focusing on employee involvement and High Performance Work Teams. EI encourages collaboration and innovation in teams; HPWTs develop specific skills for effectiveness in setting, pursuing and achieving common goals.

Robel’s plan included facilitator-led training that teaches his employees to operate as a team. Employees learn how to make decisions, take ownership of the business, and apply Lean+ to accomplishing their specific work statement—and develop a mentality of continuous improvement. Ultimately the teams began using metrics to guide continued improvements, advancing HPWTs through four stages of proficiency. More than 80 percent of Robel’s teams are now in HPWTs.

What’s helped boost Lean+

What’s been helpful in getting teams supporting Propulsion Systems to take Lean to the next level? Here are some insights, from those who witnessed the changes.

“Customer feedback. Following the HPWT [High Performance Work Team] processes, we had to go back and address every issue.”

—Sedrick Chachere, Engineering support organizations manager

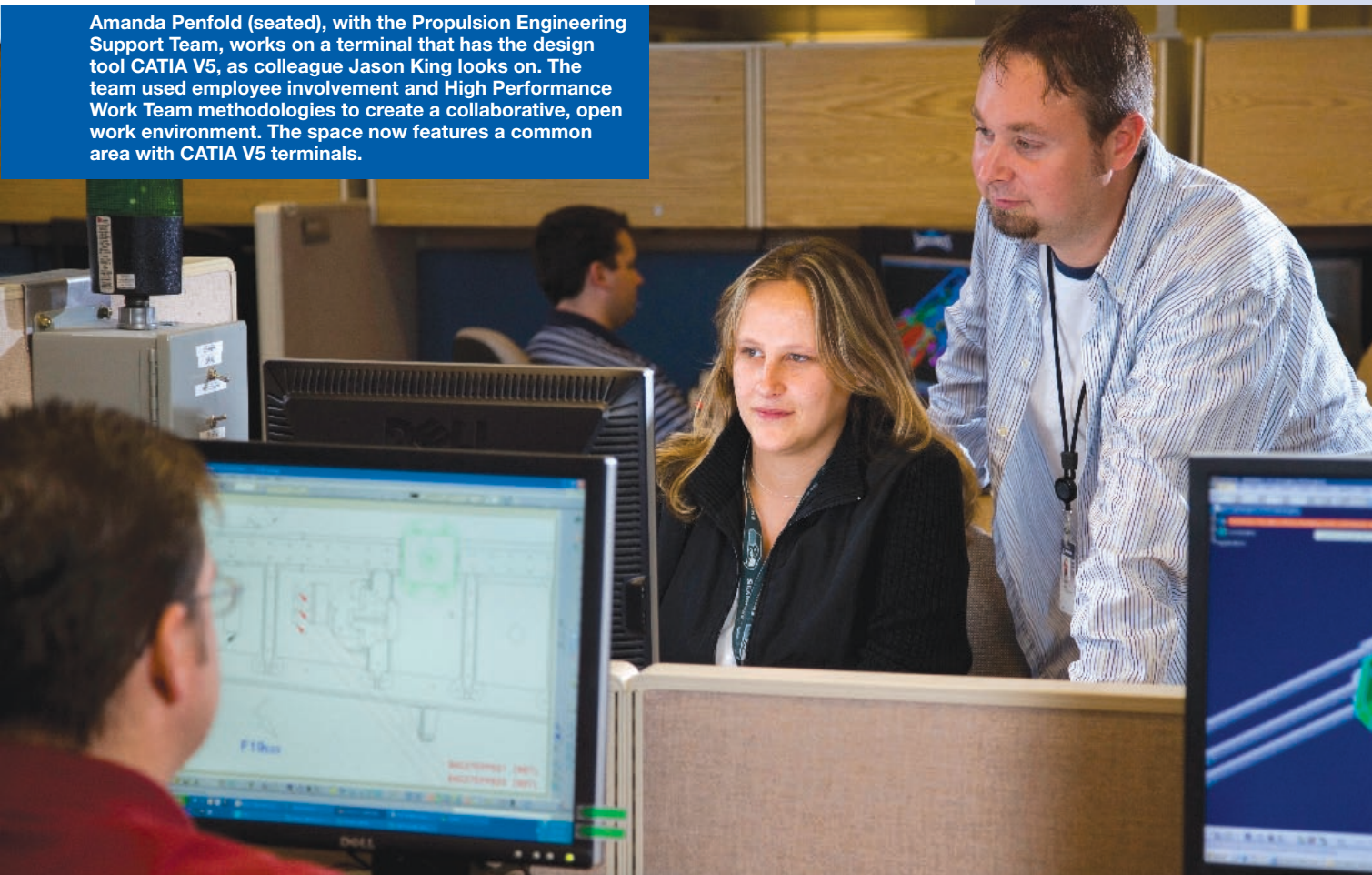
“Connecting our mechanics, materials management and Lean support personnel with theirs [in Propulsion Systems] creates ownership, pride and trust.”

—Tom Rich, Lean manager, Boeing Fabrication Division’s Tube, Duct and Reservoir Center

“We’ve successfully integrated Lean+ [concepts] and manufacturing teams that weren’t cohesive before. Employees see the benefits of Lean and having resources in one place.”

—Steve Mardero, Lean/Boeing Production System manager

Amanda Penfold (seated), with the Propulsion Engineering Support Team, works on a terminal that has the design tool CATIA V5, as colleague Jason King looks on. The team used employee involvement and High Performance Work Team methodologies to create a collaborative, open work environment. The space now features a common area with CATIA V5 terminals.



ED TURNER PHOTO

Boeing Canada Technology in Winnipeg, Manitoba, has rearranged 737 strut assembly processes into work cells, using Lean+ to promote one-piece flow. This has reduced travel, cycle and lead times significantly. Here, Assembly Technician Francisco Arlegue works on a 737 engine strut forward fairing assembly for Propulsion Systems.



MARION FRISDALE PHOTO

Among the productivity improvements attributable to EI and HPWTs: New employees said they feel more comfortable sooner and they feel like their voices are heard. As a result, they quickly become active contributors to the group's work.

"It used to take up to three years for a new employee to feel fully productive in the group," Robel said. "We now see full productivity after just six months."

Employees who come up with their own solutions feel empowered to make a difference—however small, Robel noted: "Small, incremental changes—that's what Lean is all about."

PROCESSES THAT 'FLOW'

Fabrication Division's Tube, Duct and Reservoir Center provides commodities to

Propulsion Systems and other programs. This internal supplier has significantly changed the way it delivers its products, applying techniques such as kitting and point-of-use delivery to establish just-in-time inventory and pull production.

In the past, TDRC's completed parts were shipped in batches to the customer's finished-goods warehouse and stored until Propulsion Systems workers kitted and delivered them to mechanics.

Today, TDRC products are completed and kitted in one location. Customers return empty containers for refilling as needed. This pull-production system replaced the old "push" system of building and shipping parts to the warehouse when completed, regardless of immediate need. Now TDRC can replenish its own

"supermarket" as customers use parts.

"With Propulsion Systems moving line-side [in Everett], it's very important for us to deliver frequently and just when the parts are needed," said Tom Rich, TDRC Lean manager. "Sure, it's extra work for us to organize the parts, but there's a huge benefit to our customers, so the trade-off is worth it."

Another key benefit is a notable reduction in stored inventory along the value stream. Lead time to obtain parts is down as well. Propulsion Systems also sees savings in transaction—or handling—costs, as many of the transactions required from part completion to kit receipt have been eliminated by leaner processes.

"Our delivery and quality performance has become a Lean+ enabler," Rich said.



It's our future

Actions cited in this story show how employees are applying concepts of the Boeing Management Model to support the company's business strategies. Here's how.

- **Growth and productivity: Lean+, through using Lean practices such as streamlining processes and involving teammates in improvements, and through building a culture of continuous improvement; Global Sourcing, through efforts by Boeing to improve supplier performance.**

To learn more about the Management Model, visit <http://bmm.web.boeing.com> on the Boeing intranet.

First was Renton; next comes Everett

Boeing Commercial Airplanes' Propulsion Systems took its first steps to becoming a fully integrated value stream late last year when the team supporting 737 engine buildup collocated with Final Assembly in Renton, Wash. (See Page 24 of the August 2006 *Boeing Frontiers*).

Now the organization has set its sights on Everett, Wash. The Everett Value Stream Team—the team supporting engine, strut and auxiliary power unit buildup for Boeing twin-aisle models—will move to Everett by year-end, with work moving into the nearby 40-54 building.

The plan to create engine buildup feeder lines has led to Lean+ benefits and stronger working-together relationships between the groups—even before the move. Indeed, Propulsion Systems and Everett Manufacturing already are planning to leverage efficiencies from the site's processes for handling hazardous materials and from its just-in-time standards storage and point-of-use delivery processes. Additionally, several Everett airplane programs have decided to move some engine work upstream to Propulsion Systems buildup to minimize disruption and to optimize Final Assembly flow. According to Wayne Kerley, one of the key leaders of the Everett move, the team is “looking forward to receiving earlier and more direct customer feedback and offering a breadth and depth of skills that can help more quickly resolve problems in the factory and field.”

Propulsion Systems' Administrative and Engineering teams will complete the “Move to the Future” in mid-2008, when they move to BCA Engineering's 10-20 office building in Renton. Like their manufacturing counterparts, Propulsion Systems and BCA Engineering teams are expected to benefit mutually from closer proximity.

—Debbly Arkell

“Our customers no longer have a buffer of finished-goods inventory on hand. As a result, we're focusing on our production system even more to ensure we can always meet our customers' needs, understanding that poor quality or missed deliveries will now have even greater impact. There is no room for error.”

STRUTTING THEIR STUFF

Boeing Canada Technology in Winnipeg has been on a Lean journey for nearly a decade. For it, as for other Boeing groups, reducing cost, improving quality and pushing to do better with less is paramount. And like other suppliers, leaders there know that when it comes to whom they work with, customers have choices.

To that end, Boeing Winnipeg is leaning out its strut-build processes by moving to manufacturing work cells, as well as *chaku chaku* and moving lines. (*Chaku chaku*, which is Japanese for “load load,” is an efficient style of production in which all machines needed to make a part are situated in the correct sequence very close together.)

“Trim, fill, cure and layup each used to be its own department with responsibility for mixed product,” said Steve Mardero, Lean/BPS manager. “We've found that right-sized process centers integrated into the manufacturing work cell help us reduce waste and increase productivity.”

Boeing Winnipeg employees began by reorganizing their work into cells focusing on 737 strut-assembly processes. Within each cell, employees perform a clearly defined statement of work that flows in just one direction. With the help of Lean consultants from Shingijutsu, they developed their own right-size equipment. They then located all of the needed machinery and people right next to the product—including management, tech support, schedulers and more.

“Since then, we've seen an approximate 80 percent reduction in travel time and lead time in our 737 processes, and we've gained a 15 to 20 percent improvement in cycle time reduction,” said Mardero.

The 737 work cells are in their final implementation stages. Lessons learned are being applied to 777 strut assembly, and work is progressing well; Boeing Winnipeg also is preparing to support the 747-8.

“Because these changes reduce the amount of work needed, as we ramp up we simply must implement Lean+ from the beginning,” Mardero said. “We're working on the 747-8 value stream now so we can ensure Lean techniques are built into manufacturing processes right from the start.” ■

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A neat achievement

‘Clean as you go’ isn’t just a simple saying; here’s how it became a quality-boosting solution

By CHRISTINE HILL

Cleaning up small messes before they grow is a simple life lesson. The concept is more challenging when it relates to objects that don’t belong in an aircraft but are left behind during manufacturing. Known as foreign object debris, or “FOD,” unintentional leave-behinds can cause damage that mounts with every shake, rattle or roll.

Teams that build the vertical tail for the 777 have learned the “clean as you go” lesson so well that in October they delivered their 34th consecutive FOD-free unit. It wasn’t an easy milestone to reach, but their simple approach and steady commitment to the challenge paid off.

A year ago, nearly every unit the teams delivered to downstream assembly customers included at least one piece of FOD. Ranging from “pigtales” (broken-off fastener pieces) to hammers, undetected FOD can be disastrous. Robust inspection processes keep the worst from happening. But relying on inspections didn’t seem right to tail assembly team leaders at Commercial Airplanes Fabrication’s Composite Manufacturing Center in Frederickson, Wash.

So Bobby Jones, who led the first-shift team, met with Frank Minnick, the second-shift lead, and they set a simple plan in motion: Teach people how to “clean as you go.” Communicate regularly. Recognize incremental improvement in small but meaningful ways. And ensure process consistency between both shifts.

Jones and Minnick began consulting with Quality Assurance inspectors to learn good shakedown techniques.

“We started by showing everyone the ‘Braille’ system—fingers all the way down the stringers and poking into all the cracks the vacuums can’t reach,” Minnick said. With the thickness of the 43-foot-long vertical tail narrowing from 2 feet to about 6 inches at the tip (13.1 meters, 61 centimeters and 15 centimeters, respectively), hands-on checks were the only sure way. Other lessons included clearing the inside of a subassembly after every task and wiping down the outside, undertaking thor-

ough visual checks, and ensuring toolbox accountability.

“We all wanted to get better, so we started talking a lot about doing quality work, keeping it FOD-free, and running our processes correctly,” said Ken Schimon, who recently replaced Jones as the first-shift team lead.

Before long, the teams delivered their first FOD-free unit in a while, and everyone got movie tickets.

“Once we got one, we wanted another one,” Schimon said. He and Minnick began focusing on better communications between the shifts, starting with their own daily ties to make sure any parts or tools missing on one shift were hunted down on the next.

The third FOD-free unit garnered the teams another small reward. The 10th brought a dinner and a growing sense of accomplishment.

The 30th? “It’s about taking pride in our work,” said second-shift mechanic Tom Chubb. “Our unit ships to another control code once it leaves our area. They used to tell us they were finding our FOD. Now our philosophy is, ‘Why should they have to clean up after us?’” ■

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It’s our future

Actions cited in this story show how employees are applying concepts of the Boeing Management Model to support the company’s business strategies. Here’s how.

- **Leadership attributes: Finds a Way, Lives the Boeing Values, Delivers Results.**
- **Growth and productivity: Lean+, by continuous improvement through employee engagement.**

To learn more about the Management Model, visit <http://bmm.web.boeing.com> on the Boeing intranet.

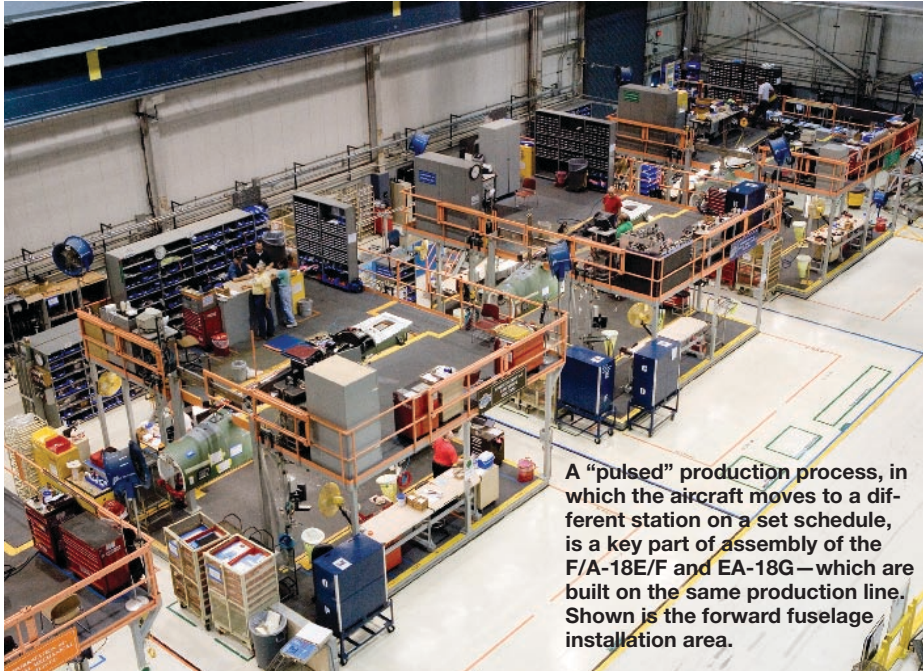


Ken Schimon (left) and Frank Minnick use mirrors and hands to check for foreign object debris inside a 777 vertical tail assembly. The two lead first- and second-shift teams that eliminated FOD from 34 consecutive 777 tail wing assemblies.

DANIEL THOMPSON PHOTO

Two birds, one stone

Building EA-18G, F/A-18 on same line has benefits



A “pulsed” production process, in which the aircraft moves to a different station on a set schedule, is a key part of assembly of the F/A-18E/F and EA-18G—which are built on the same production line. Shown is the forward fuselage installation area.

RICH RAU PHOTO

By KATHY COOK

When Boeing employees were told they’d be building the EA-18G Growler fighter plane on the F/A-18E/F Super Hornet assembly line in St. Louis, they rose to the challenge.

The effort helps extend the Super Hornet line, saves time and money for the U.S. Navy customer, and helped Boeing win the \$1.2 billion EA-18G Growler system development and demonstration contract. In addition, this activity supports Boeing’s Lean+ and Global Sourcing growth and productivity initiatives.

Building the Growler—an electronic warfare version of the F/A-18F fighter/attack aircraft—on the Super Hornet assembly line wouldn’t seem daunting if you looked no further than the planes’ exteriors (see box below). But they are different aircraft with distinct missions. The Super Hornet carries weapons for air-to-air and air-to-ground missions. The Growler has advanced sensor systems for its airborne electronic attack mission—jamming or suppressing enemy radar and communications, to protect friendly assets.

The project team had two key goals,

It’s our future

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- **Growth and productivity: Lean+ and Global Sourcing, through engaged employees generating efficiencies by building multiple products on the same assembly line.**

To learn more about the Management Model, visit <http://bmm.web.boeing.com> on the Boeing intranet.

said Dave Cowell, a Boeing associate technical fellow and a lead on the team: Build the Growler on the existing Super Hornet line and at the same pace, and make the aircraft—F/A-18E, F/A-18F and EA-18G—as common as possible.

For instance, the team worked to make changes to the F/A-18E/F airframe to accommodate extra wiring and new hardware for the EA-18G. The idea: If an airframe change was required for the Growler, the same change would be made, wherever possible, to the Super Hornet.

This helped in two ways. “If you’re building 42 aircraft, and 30 of those are Super Hornets and 12 are Growlers, you can order 42 of the same part, rather than 30 of one and 12 of the other, and you’re going to get a better price,” said Cowell. “But another, less obvious benefit is that fewer unique parts reduce the chance of getting the wrong part.”

Team involvement was a key component in the program’s success, said Cowell and Kim Declue, Assembly general foreman. When the aircraft started down the assembly line, Declue and the production supervision staff made sure they had knowledgeable workers in the right places. Also, the High Performance Work Organizations worked with engineers and planners to figure out where to fit in the extra work. (An HPWO is a group of co-workers who are responsible for a common function or product and exercise self-determination in improving quality and process efficiency.)

“Together, the mechanics and engineers reviewed the models. The mechanics knew what work was coming and could offer suggestions on how to do some things better, explain why some things wouldn’t work, and come up with a plan that made sense for everyone,” Declue said. ■

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A closer look

Both the F/A-18F and the EA-18G are two-seat aircraft that have the same wings and tail hook. But if you look closely, there are some key differences. Here are a few of them.

- **Wingtips:** The F/A-18F has a missile launcher—a thin rail with a pointed front. The EA-18G has ALQ-218 pods, a blunt-end cylindrical attachment with fins; this provides emitter identification and location, among other capabilities.
- **Gun:** The F/A-18F has a gun in the forward fuselage, and the gun’s cover on the top of the fuselage has holes. The EA-18G has no gun (in order to make room for advanced avionics), so the cover has no holes.
- **Visual Identification Lights:** The F/A-18F has a single-flash pattern for daytime landing and a triple-flash pattern at night. The EA-18G has a double-flash pattern for day and night landing.

Pulling Gs ... on the ground

Simulator upgrades offer realistic training for Apache pilots

By STACEY RITTER

Imagine flying the U.S. Army's principal attack helicopter—an Apache AH-64D. You climb into the cockpit of the incredibly complex and powerful weapon system, flip the switches and feel the aircraft come to life. You hear the roar of the engines, see the rotors spin to a blur, feel the anxious vibrations of the aircraft as it prepares for lift, and sense the thrill of the mission at hand.

These realistic sensations are what Boeing engineers had in mind when, in 1999, they developed the Longbow Crew Trainer (LCT)—a high-fidelity simulator that prepares Apache pilots and crews to fly real missions in battle zones. The simulator training is used to sharpen pilots' skills by having them practice combat tactics and critical scenarios they would likely experience during a mission—such as bad weather or radio, engine and power failures—without the accompanying danger.

LCTs—deployed worldwide and used for in-theater training in Afghanistan and Iraq—support battalions by allowing pilots ample opportunities to maintain their training hours and rehearse missions.

With 23 LCTs having been delivered, the goal of providing realistic Apache pilot training hasn't wavered. As weapon systems become more complex, the need for more realistic training increases. Accordingly, Boeing is working in coordination with the Army to provide upgrades to the trainer that will ensure the highest level of combat readiness for pilots and crews. Because Boeing has more than 10 years of LCT design and building expertise, the team can complete major upgrades within a few weeks—and meet customer expectations promptly and efficiently.



Bob Rutkowski, a test engineer for Apache Training Systems, “flies” an Apache Longbow Trainer during a test session in St. Louis.

RICH RAU PHOTO

“Boeing’s Training Systems and Services’ relationship with the ground commander and troops is truly outstanding,” said Randy Nielson, Team Leader, Operator Training Devices, a contractor with the PM Apache Program Management office. “They are not simply a vendor but an active participant with the Army’s Project Management Office. They directly affect ground soldiers’ ability to do their jobs well.”

One of the upgrades that the Boeing–U.S. Army team is implementing is a software change that simulates “pulling g’s”—or experiencing a magnitude of the force of Earth’s gravity (one G is the force of Earth’s gravity) as the aircraft maneuvers.

“The sensation of pulling g’s in a non-moving simulator was just remarkable. ... a situation hugely important in training,” said Lt. Col. Rob Willis, operations officer at the Flight Test Directorate, Aviation Technical Test Center. “The simulator pulled the collective stick (which controls the up and down movement of a helicopter) out of my left hand in response to pulling increased g forces.” This level of sophisticated simulator training can influence real life responses in the battle zone and really improve combat maneuvering flight safety, said Willis.

LCTs are also being substantially redesigned to ensure the units remain relevant to soldiers’ requirements, current in terms of technology advances, and easily maintained. The enhancements will be integrated into new units and retrofitted into many fielded devices.

One element important to the redesign is the Boeing-developed Next Generation Flight Model software. It’s designed to take actual flight-test data and better communicate that data to the trainer, telling it how it should perform and handle. This ensures that if a pilot moves the trainer’s cyclic stick (which controls the direction of the helicopter), the amount of pressure used to move the stick would feel the same as moving the cyclic in the actual aircraft—and, most importantly, that the simulator would then perform like the actual aircraft after such control input. The software is raising the fidelity of the LCTs to a highly sophisticated level, providing the most realistic training possible for pilots and crews, and unquestionably saving lives.

“The teaming of the Army with Boeing,” said Willis, “allows us to dramatically enhance the training value of the LCT, improving safety and mission effectiveness of the warfighter in the real aircraft.” ■

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Space for development

Turkish Air Force lieutenants lend hand to Boeing's ISS effort

By ELLEN WHITFORD

Earlier this year, Eyyup Celik and Mustafa Kaya packed their bags, left friends and family 6,000 miles (10,000 kilometers) behind, enrolled in the University of Houston and joined the engineering team on the largest space venture Boeing has ever undertaken.

Celik and Kaya, lieutenants in the Turkish Air Force, are participants in a new endeavor: the first professional program Boeing has ever made available to the Turkish military. Under Boeing's sponsorship, each of the men will earn a master's degree from the University of Houston

while modeling solar array electrical systems for the International Space Station.

The new program builds on the relationship between Boeing and the Turkish government and is part of the company's industrial participation obligation required by Turkey's purchase of the 737 Airborne Early Warning & Control Peace Eagle.

"We reviewed and discussed nearly a dozen high-level projects before we found one that was a win-win," said Greg Pepin, Boeing Turkey president. "The Turkish aerospace industry and air force are eager to become involved in space exploration in the future, and welcomed the opportunity for two of their pilots to acquire space-based education and training on a prestigious project."

"It's a good model of what international industrial participation is all about," said Gwen Kopsie, director of Industrial Participation and Alliances for Integrated Defense

Systems. "We're adding value for Boeing, improving our customers' products and helping build the aerospace industry of the future."

The space station is the biggest and most complex scientific project in history. When completed in 2010, it will serve as an orbital laboratory for research to foster human exploration of space. As the prime contractor, Boeing built all the major elements of the station, directed an international team that includes almost all major U.S. aerospace companies and hundreds of smaller contractors and integrated the work of participants from 15 countries. Boeing also assists NASA in operating the orbital outpost and provides ongoing engineering support.

Working on such a large and significant project will give Celik and Kaya an opportunity to develop professional relationships with scientists and engineers from around the world, as well as with faculty at the University of Houston.

The ISS engineering team developed activities specially designed to provide the lieutenants with on-the-job training in key space disciplines and exposure to different techniques. Their work includes training in program management, software tool design and systems engineering. As part of the systems engineering team, they are modeling solar power systems.

"This gives us two additional resources for our program that we didn't have before, and it provides the lieutenants with invaluable experience and contacts," said Joy Bryant, ISS program manager. "What they gain from their courses at the University of Houston and from hands-on experience with ISS will give them background and knowledge that will be essential to working with global technology." ■

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ELIZABETH MORRELL PHOTO

As part of their assignment at Boeing, Lt. Mustafa Kaya (seated) and Lt. Eyyup Celik of the Turkish Air Force discuss a problem in modeling solar array electrical systems on the International Space Station.

■ FEATURE STORY

Sun flashes through leaves at Spectrolab in Sylmar, Calif.: This is the company's power source for helping Boeing go "green."

Shedding new light on solar cells

ALL PHOTOS BY BOB FERGUSON

Spectrolab is working on technology that could help cut fossil-fuel use

By WALTER POLT

You thought satellite solar-cell technology was out of this world? “Boeing,” said David Lillington, president of Spectrolab in Sylmar, Calif., “is bringing that space technology down to Earth.” And that technology will be good for the planet.

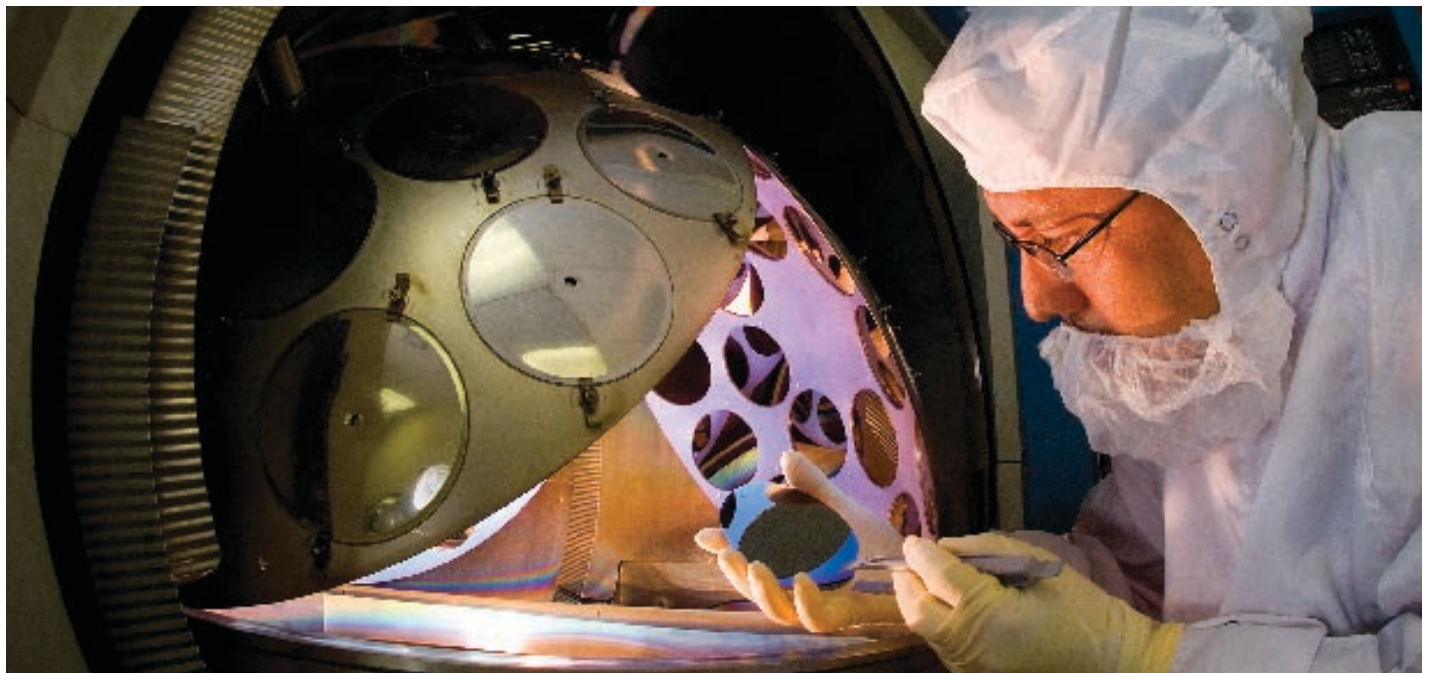
The story, about one of the many things Boeing is doing to improve the environment, starts with translucent, amber chips that turn the sun’s radiant spectrum of energy into electricity. This is the power that Spectrolab, a wholly owned subsidiary of Boeing since 2000, is using to leverage 51 years of expertise with spacecraft solar cells into a new product: miniature solar chips designed for concentrator systems on Earth. And these, if Lillington has his way, may end up on a Boeing rooftop near you, helping reduce dependence on fossil fuels—the use of which is at the heart of the today’s global climate-change challenge.

These multijunction solar cells, like their space counterparts flying on more than 65 satellites, use a core Spectrolab cell technology that captures energy from more colors of the spectrum than ordinary silicon cells. A typical silicon solar cell converts about 15 percent of sunlight to energy. The concentrator cells Spectrolab ships to customers average 35 percent conversion efficiency. The target for future Spectrolab products is 45 percent, and champion cells already demonstrated in a lab setting have converted 40.7 percent of sunlight into electrical energy—a world record confirmed by the U.S. Department of Energy’s National Renewable Energy Laboratory.

Credit goes to the scientists and technologists at Spectrolab, who have received numerous scientific awards for their achieve-



David Lillington, Spectrolab president, holds a semiconductor wafer made by his company. A single one of the 50 terrestrial solar cells to be cut from this many-layered wafer will yield 15 watts of electricity in a concentrator solar system, converting 35 percent of the light spectrum. By comparison, a standard five-inch-square (13-centimeter-square) silicon cell yields 2.5 watts with around 15 percent efficiency.



German Rivera inspects a semiconductor wafer freshly coated with an antireflection surface in a Spectrolab vacuum chamber. The coating will enhance transmission of concentrated sunlight into multijunction photovoltaic cells cut from the wafer.

■ FEATURE STORY

Ana Escobar uses a vacuum wand to place concentrator photovoltaic cells during the process of welding interconnects to them. Robotic welding will soon free her to do other work in the factory.



ments, including R&D Magazine's R&D 100 Award in 2001 and 2007. The company's accomplishments were supported by development funding provided by the Department of Energy, channeled through the National Renewable Energy Laboratory and the U.S. Air Force, which have funded space multijunction cell development for more than a decade. Support also has come from Boeing's White Space organization, which has promoted the application of space technology for terrestrial applications.

INVESTIGATING IN INNOVATION

Boeing is playing a stronger role than ever in stewardship of the environment, because it's a priority for the company's customers, employees, communities and investors. Core to this strategy is to look for ways to reduce emissions of greenhouse gases caused by fossil-fuel use. As a technology leader, Boeing's biggest contribution is to invest aggressively in innovation—to pioneer new products with improved efficiency and environmental performance. Solar technology using Spectrolab's miniature terrestrial concentrator solar cells could be one solution, in a wide spectrum of solutions.

The solar cells illustrate how and where Boeing is examining environmentally progressive technologies. In fact, Lillington revealed larger possibilities: Boeing not just making the world's best solar cells, but taking the lead in benefiting from them. That could

How terrestrial concentrator chips are different

If you let pure sunlight fall on semiconductor materials, its photons ("packets" of energy) start knocking loose unstable electrons. Provide a complete circuit, and the electrons flow as electricity. That's the "photovoltaic effect."

Boeing's photovoltaic (light-to-electricity) cells, both in space and on Earth, are putting to use this power-generating process. They are cut from 4-inch (10-centimeter) germanium wafers that have some 25 layers of additional semiconductor materials "grown" on them in Spectrolab's semiconductor manufacturing facility. Some layers are only a few atoms thick. Arranged in three groups, the layers form a triple-junction cell: It captures the most potent photons available in the color spectrum—variations of red at one junction, of green at the next, and of blue at the next.

The wafers are imprinted with a fine grid, mostly of silver, that establishes the circuit for carrying the electricity. For Earth use, the wafers are cut into cells the right sizes for various concentrator systems—50 or more chips smaller than your fingernail from a single wafer.

And on Earth, concentrator-system makers do something not so feasible in space: they use curved mirrors or different kinds of lenses to concentrate sunlight on the chips. One customer, for example, uses a sheet of Fresnel (pronounced fray-NELL) lenses (flat magnifiers) to focus golf-ball-sized patches of sunlight onto pinhead-sized (1-millimeter-by-1-millimeter) chips.

Concentration puts the chips in, well, a whole new light: In addition to pouring more photons on a spot, it boosts the efficiency of the photovoltaic effect. So it might take 1,000 times as much silicon as concentrator cell material to get the same output. A surprise bonus on Earth: The conversion efficiency of multijunction solar cells on Earth is higher than in space, because our atmosphere obligingly filters out some colors that the solar cells cannot readily convert into electricity.

—Walter Polt

help Boeing sites reduce their reliance on today's major source of electricity—power plants that burn fossil fuels.

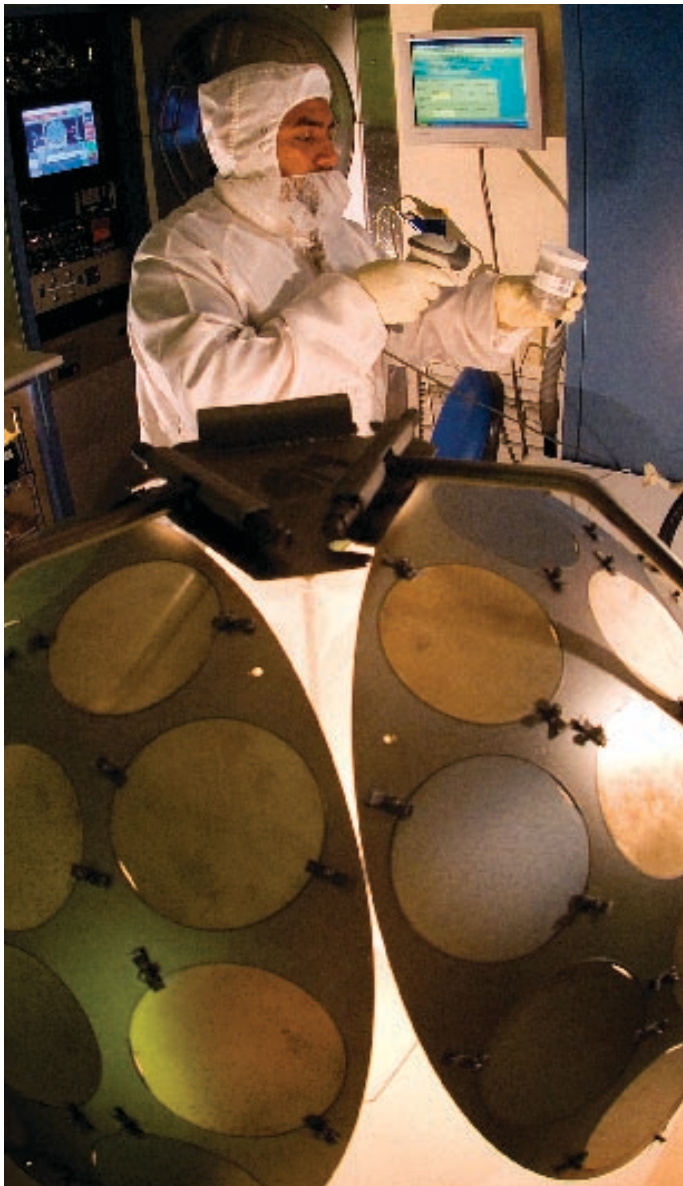
"Many large companies," he said, "are acquiring solar systems to reduce their carbon footprint and dependence on outside energy—so why not Boeing?"

The Spectrolab cells cost a little more. But replacing a standard conventional silicon solar panel system with a concentrator system provides more than twice the electricity over the system's lifetime. With worldwide electricity consumption forecast to double in 20 years, Lillington said these systems would be "an elegant way to get the cost of electricity down in widespread application—and help utility companies grow or supplement their production with affordable green energy."

Sun energy, unlike nonrenewable fossil fuels, keeps flowing—and with a zero carbon footprint. It will last forever—well, 4 billion years, anyway—and it's plentiful.

"If you populated a chunk of California desert just 150 kilometers square (93 miles by 93 miles) with 35-kilowatt solar dishes using Spectrolab's high-efficiency concentrator solar cells," said Jeff Peacock, vice president of Spectrolab Photovoltaic Products, "you'd generate about 4 million gigawatt hours annually." That's almost as much as last year's total U.S. electrical usage, according to the Department of Energy's Web site.

Gabriel Rivas uses a bar-code scanner to keep a record of silver used on a batch of semiconductor wafers (foreground). The wafers—which will be cut into smaller photovoltaic cells—were imprinted with a fine grid composed of silver alloyed with other precious metals. The metal lines collect the electric current generated by light absorbed in the solar cells.



It's our future

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- **Growth and productivity: Lean+, through replicating production efficiencies implemented on the manufacture of a similar product.**
- **Leadership attributes: Finds a Way, Lives the Boeing Values.**

To learn more about the Management Model, visit <http://bmm.web.boeing.com> on the Boeing intranet.

For space use, Spectrolab makes chips and places them in big fan-like arrays to power satellites; for use on Earth, it just makes the chips. "As merchant-supplier to the industry," Lillington said, "we supply chips to about 10 concentrator-system companies. There are about 30 around the world, all looking at our products—plus there's the Boeing team that is working in support of the U.S. Department of Energy's Solar America Initiative." SAI is a push to make solar electricity competitive with conventional sources by 2015.

GETTING COMPETITIVE

In order to slash chip cost, boost production—by orders of magnitude—and satisfy the mounting demand for nonpolluting power, the Sylmar factory is continuing technology and process development, and increasing automation.

"Automation is part of our work under the Solar America Initiative, and it's part of our capitalization plan," said Jim Hanley, director of solar panel operations and chief of staff to Terri Cavicchi, vice president and general manager of operations.

"We're borrowing and adapting ideas from our space-cell production for terrestrial-cell manufacturing; and by expanding our robotics into welding, testing, piece handling, and packaging," he said, "we expect in 2010 to be making 200,000 of these pieces every week. In several years more it could be 2 million. And we'll be reapplying everything we learn about cost reduction to space-solar cell manufacturing." This replication of efficiencies supports Boeing's Lean+ growth and productivity initiative.

Spectrolab is projecting a \$150 million terrestrial-cell business within four years, growing to more than half a billion by 2016—and supplying a conservatively estimated capacity of 1.8 gigawatts of power to concentrating system manufacturers. That's 4 percent of projected worldwide renewable electricity production. Plus, by then some of that clean, multicolored sun energy may be in the electric power that lights your workplace, thanks to Spectrolab. ■

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Green products, green workplace

Making miniature solar chips that will help convert more of the sun's light into energy isn't the only thing Spectrolab is doing to help the environment. The Boeing subsidiary not only works on green products, but it strives to improve environmental practices in its workplace.

Collectively, the crowning "green" contribution as a work force of 400-plus factory workers, engineers and other professionals is the high-technology terrestrial solar chip. Yet "individual Spectrolab employees do things for the environment every day," said Jeff Peacock, vice president of Spectrolab Photovoltaic Products.

For example, some drive hybrid cars. Others have notes on their e-mails indicating: "Please consider the environment before printing this e-mail."

Also, Spectrolab's Sylmar, Calif., facility does more than just use high-efficiency light bulbs and recycle 100 percent of its semiconductor waste material. "We keep strengthening our recycling and reclamation streams," said Holly Baez, Spectrolab's manager for Environment, Health and Safety. "We reengineer our processes."

Terry Cavicchi, vice president and general manager of operations, said those efforts have accomplished a lot: "Today we use half as much electricity processing semiconductor wafers as we did in 1995."

—Walter Polt

Houston, we have a need



Clay Stangle, shown at the Space Station Processing Facility at Kennedy Space Center, Fla., is a design engineer on the International Space Station program. But he's also working on the wire design for general lighting systems for the 787.

INDYNE PHOTO BY KEVIN GILL

Space Exploration engineers pitch in on programs around IDS and BCA

By Ed MEMI

If you know Boeing well, you probably associate work done by Houston employees with space-related programs. Yet Houston-based engineers in the Space Exploration business unit lately have been busy helping Boeing and its suppliers on several Boeing Commercial Airplanes and Integrated Defense Systems programs.

The work, permitted under Interorganizational Work Authorization (IWA) arrangements, allows different business units within the company to help one another and work together as a larger

team. For Houston engineers, this work broadens their experience and skills. And for Boeing, the arrangements do more than help with workload lulls in the International Space Station and Space Shuttle programs: They improve retention of people with important abilities—and they support Boeing's efforts to better integrate the company's business units and enterprisewide functions.

"Just in the last year, BCA and IDS have really started to come together and realize that they have resources that each can share," said Charles (Clay) Stangle, a design engineer on the ISS who now works on the wire design for general lighting systems for the 787. "I feel now that I am well prepared to support the commercial side, and I am able to support the ISS when they need me. It is the best of both worlds for me, since I enjoy both jobs."

Here's a look at some of the work being done by these engineers.

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Mark Santen, manager of Mechanical, Structural, Thermal and Propulsion engineering for Space Exploration, led efforts to get about 45 team members working on the 787 and P-8A Poseidon programs. The P-8A is a U.S. Navy maritime patrol and antisubmarine aircraft based on the Next-Generation 737-800 airframe.

Santen's team is handling instrumentation installation drawings for five P-8A test aircraft. The work consists of creating drawings that ensure that certain sensors, which provide data during flight and ground tests, are installed in the right place on the aircraft. The analyzed data will be used to flight-certify the P-8A for the Navy.

"We had experienced designers available in a Boeing common-mechanical-design software, so we offered up four people initially, which has since grown to about 15," Santen said. The P-8A program, Santen said, decided they wanted their entire design team in Seattle, including the Houston engineers.

One of the achievements on the P-8A program is first-pass quality in Test & Evaluation engineering drawing releases. "We had 34 engineering drawing releases on P-8A with no rejections from BCA," Santen said. "The program has built a drawing quality step into the T&E process that guarantees acceptance, which eliminated cost and schedule delays caused by rework."

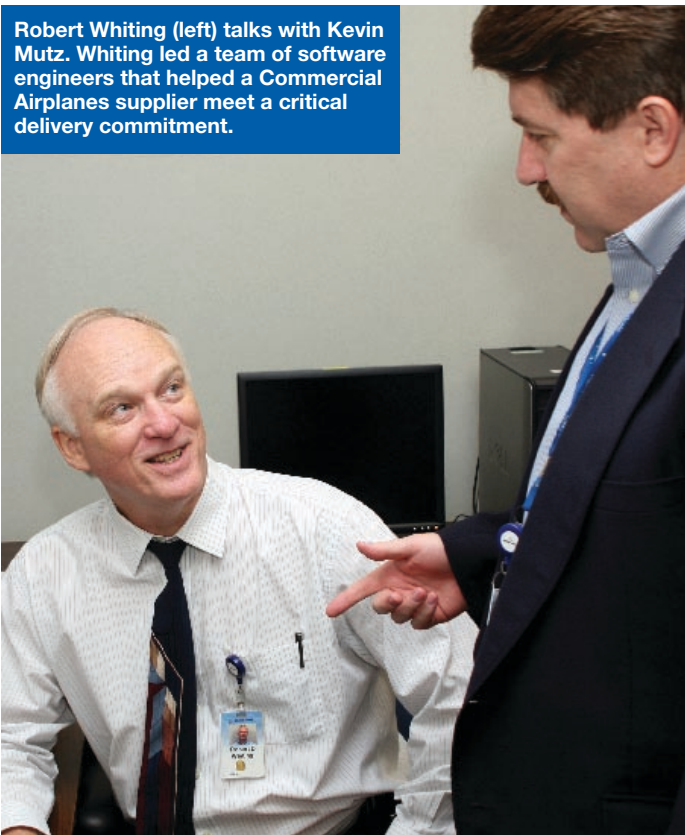
Meanwhile, for the 787 program, Santen's Space Exploration teammates are assisting on mechanical and structural design for interior items. These objects include passenger service units, flight attendant seats, environmental control systems, and general lighting systems. Santen said he expects the 787 work to continue into 2008 and hopes to help out on other BCA programs.

While the work provides the 787 with additional manpow-



Mark Santen, manager of Mechanical, Structural, Thermal and Propulsion engineering for the Space Exploration business unit, has had team members contribute to the 787 and P-8A Poseidon programs.

PATRICK ARMSTRONG PHOTO



Robert Whiting (left) talks with Kevin Mutz. Whiting led a team of software engineers that helped a Commercial Airplanes supplier meet a critical delivery commitment.

er, there's something in it for the engineers. "Our engineers are learning model-based design so that everyone is using the same electronic version of the design. This is the wave of the future in the design world, and BCA is already there," Santen said. Boeing Houston engineers are now gaining that expertise to compete for future NASA business.

In addition to this support of the 787 and P-8A programs, Santen said his team is looking for ways to help the Boeing Space and Intelligence Systems business unit in El Segundo, Calif. "We are helping them on various satellite programs, including thermal analysis and thermal/vacuum testing support, loads and dynamics, and antenna test requirements development," he said.

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The Houston software group has had about five people handling IWA work. The software group helped with testing on a new tire pressure and brake temperature monitoring system on the 777 for Boeing supplier Crane Aerospace & Electronics. This new monitoring system provided additional savings in cost and weight, along with improved reliability, compared with the original system.

When the ISS and Space Shuttle software teams were faced with future downsizing, Kevin Mutz, senior software manager in Houston, contacted Jim Hicks, his former mentor and the chief engineer for 747/767/777 Systems. Within a week, a team of software engineers was at Crane's facility in Lynnwood, Wash.

"The team, led by Robert Whiting, was able to get up to speed quickly and help the Crane team meet their critical delivery commitment," Mutz said. "The key to success was a dedicated, diverse team made up of a core of engineers with past commercial airplane experience and others with diverse software backgrounds.



Houston-based engineers are pitching in on programs around Boeing such as the P-8A Poseidon, a U.S. Navy maritime patrol and antisubmarine aircraft based on the 737-800 airframe.

The team’s work scope and size grew quickly as Crane’s leadership team recognized the talent and capabilities of the team. Not only did this opportunity help our BCA colleagues, it helped us retain valuable ISS and Space Shuttle employees.”

Crane was able to meet the critical dates for delivery of the Tire and Brake Temperature Monitoring System to Boeing.

“None of this would have been possible without the tremendous support from the Boeing team. The team came up to speed in record time and worked extremely hard to achieve some challenging milestones,” said John Edgar, Crane Aerospace & Electronics software director.

In addition to the 777 work, the Houston software team currently has three people helping Crane handle requirements, design, code and test for the 787. “They like the fact that we have a very talented engineering team, past experience on commercial airplanes, reasonable rates, and a proven track record,” Mutz said.

Another plus for the team: Because the software group has the highest Capability Maturity Model Integration rating, the team is very process-oriented (CMMI is an industry-recognized framework that provides insight to the ability of a company to execute on proposed projects). “Our capabilities in terms of CMMI as well as our capabilities to do the whole life cycle from requirements to test to full software quality assurance, safety and config-

uration management is something not all software companies can do,” said Mark A. Ward, manager of Software Engineering and Guidance, Navigation and Control Systems and a software functional for Space Exploration.

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Another Houston team helping on the 787 program is a crew of electromagnetic effects engineers. Kreg L. Rice, ISS specialty engineering manager, said he has two such engineers working on 787 qualification test plans and reports. Electromagnetic Interference testing ensures the electronics do not interfere with one another. Rice said, “Our work helps us gain recognition across the company, and BCA actually extended our period of performance through April 2008. It is interesting work in that we get to work with a lot of different electronic suppliers for Boeing.”

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Although IWA work offers benefits, it’s not without its challenges. Among them: the duration of the work. “A lot of the work is short-term and urgent, making it difficult to predict and a challenge to integrate with the long-term staffing plans,” Mutz said.

Yet those who oversee this work said it helps in a critical area: Retaining people with important skills.

“From the data we have, people leave because they are interested in new work and want career growth,” Santen said. “If they were doing the same work for a long time and it is not expected to change dramatically, they may feel locked in a position that is not growing them. IWA is interesting work where they can grow and learn new things.”

“Everything moves at a much faster pace” with work on the 787, said ISS design engineer Stangle, who’s contributing on the 787 program. “The coolest part of doing the wire designs for the lights is that my designs will be on every 787 that Boeing sells and produces. That’s a neat feeling.” ■

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It’s our future

Actions cited in this story show how employees are applying concepts of the Boeing Management Model to support the company’s business strategies. Here’s how.

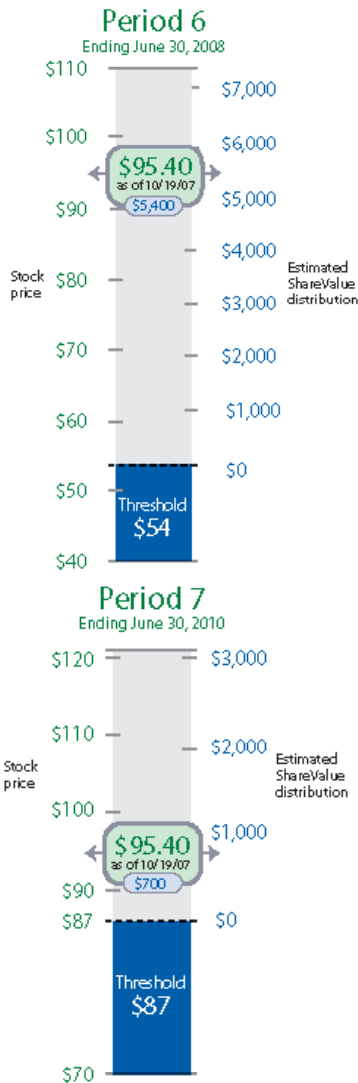
- **Growth and productivity: Lean+, through cross-enterprise integration that also offers career-development opportunities and helps retain employees who have important skills.**

To learn more about the Management Model, visit <http://bmm.web.boeing.com> on the Boeing intranet.

Boeing stock, ShareValue Trust performance

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

The program—which runs for 14 years and ends in 2010—features seven overlapping investment periods. The program is currently in Periods 6 and 7.



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

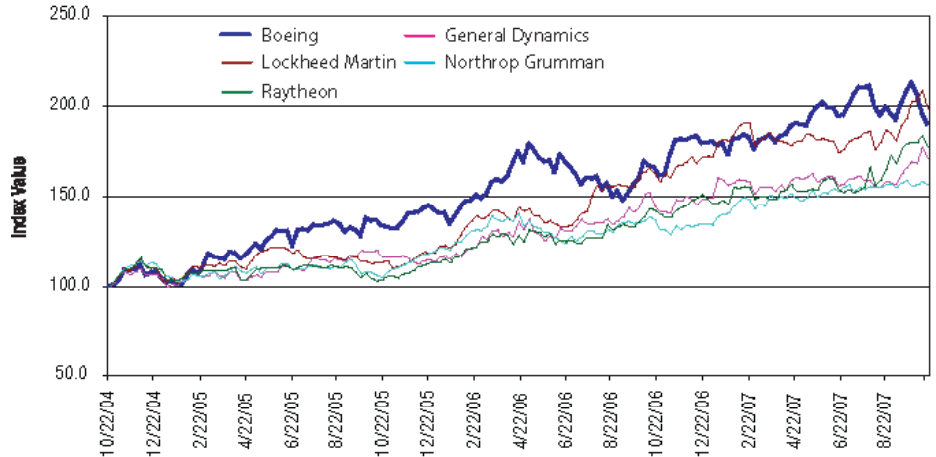
The share price shown is the average of the day’s high and low New York Stock Exchange prices. Updates to participant/employment data will be made periodically.

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

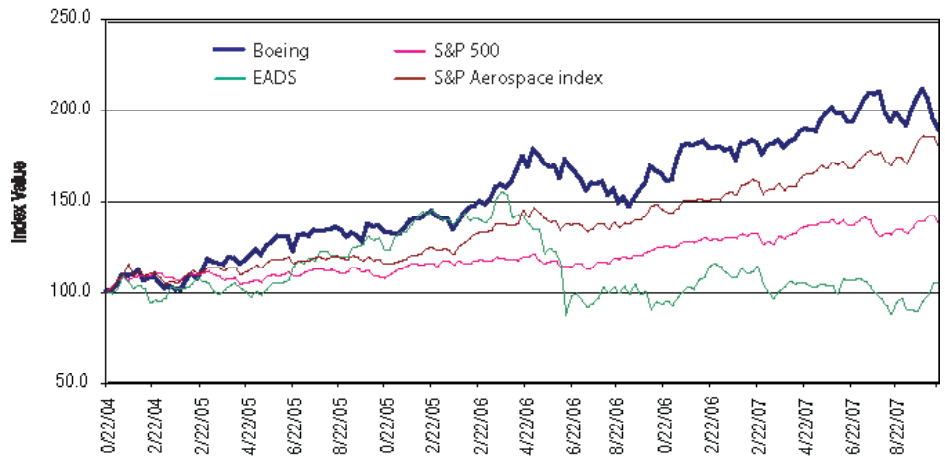
STOCK WATCH

The chart below shows the stock price of Boeing compared to other aerospace companies, the S&P 500 index and the S&P 500 Aerospace and Defense index. Prices/values are plotted as an index number. The base date for these prices/values is Oct. 22, 2004, which generates three years of data. The prices/values on that date equal 100. In other words, an index of 120 represents a 20 percent improvement over the price/value on the base date. Each data point represents the end of a trading week.

Boeing vs. U.S.-based competitors



Boeing vs. stock indexes and international competitors



Comparisons:

4-week, 52-week	Price/value as of 10/19/07	Four-week comparison		52-week comparison	
		Price/value as of 09/21/07	Percent change	Price/value as of 09/22/06	Percent change
BOEING	93.90	102.59	-8.5%	81.74	14.9%
U.S. COMPETITORS					
General Dynamics	85.47	82.96	3.0%	72.17	18.4%
Lockheed Martin	106.16	103.20	2.9%	87.00	22.0%
Northrop Grumman	78.66	79.55	-1.1%	68.80	14.3%
Raytheon	63.03	63.44	-0.6%	50.33	25.2%
INT'L COMPETITORS					
EADS *	23.76	20.28	17.2%	21.11	12.6%
U.S. STOCK INDEXES					
S&P 500	1500.63	1525.75	-1.6%	1368.60	9.6%
S&P 500 Aerospace and Defense Index	443.64	453.64	-2.2%	361.69	22.7%

* Price in Euros

Robert Shafer, 5 Years
 Maryann Shay, 37 Years
 Mary Shelton, 22 Years
 Frank Sikorski, 11 Years
 James Simms, 40 Years
 John Simms, 27 Years
 Jerome Skonieczny, 8 Years
 Larry Smallwood, 25 Years
 Jin Sohn, 21 Years
 Henry Sorensen, 30 Years
 William Springer, 42 Years
 Patrick Staeheli, 30 Years
 Richard Steele, 28 Years
 David Stillings, 27 Years
 Patrice Stockdale, 18 Years
 Frank Swansfeger, 27 Years
 Susan Sweeney, 11 Years
 Masako Takarada, 31 Years
 Raymond Tamaru, 20 Years
 Paul Tebrink, 37 Years
 Patricia Templin, 15 Years
 Roy Tharpe, 10 Years
 Matthew Ting, 22 Years
 James Todd, 40 Years
 Mavis Tugby, 41 Years
 Walter Tushkov, 18 Years
 Gerald Valeske, 39 Years

Edward Vallieres, 48 Years
 Coenraad Vanderschroeff, 10 Years
 Walter Viebrock, 27 Years
 Pantham Vijayakumar, 16 Years
 Alan Walker, 22 Years
 George Walker, 18 Years
 Mun Wang, 18 Years
 Thomas Warner, 39 Years
 Oliver Watson, 46 Years
 James Wells, 18 Years
 William Whelan, 4 Years
 Ian Whittaker, 41 Years
 James Wilkins, 28 Years
 Norma Williams, 40 Years
 John Willis, 36 Years
 Calvin Wilson, 40 Years
 Joyce Wilson, 28 Years
 Shirley Wilson, 38 Years
 George Winchell, 33 Years
 Leroy Winters, 19 Years
 Jane Witte, 22 Years
 Clifford Wood, 28 Years
 Donna Worden, 29 Years
 Lawrence Wu, 28 Years
 Nancy Yee, 20 Years
 John Younger, 24 Years

AROUND BOEING

BOEING NAMES NEW LEADERS FOR KEY INTERNATIONAL, STRATEGY, PROGRAM ROLES

Boeing made a series of leadership changes last month that installed new leaders in critical international, business development, business strategy and program-management roles.

- Shephard Hill was named president of Boeing International. Hill, a 20-year company veteran who was most recently senior vice president, Business Development and Strategy at Boeing Corporate Offices, replaces Laurette Koellner, who is retiring.

- Michael Cave was selected to replace Hill as senior vice president, Business Development and Strategy. Cave moves from Boeing Commercial Airplanes, where he led Business Strategy and Marketing.

- Pat Shanahan was named vice president and general manager of the 787 program. Shanahan previously was vice president, Missile Defense Systems, at Integrated Defense Systems.

- Mike Bair, previously vice president and general manager of the 787 program, was chosen to replace Cave as vice president, Business Strategy and Marketing, for Commercial Airplanes.

- Scott Fancher was chosen to be vice president and general manager, Missile Defense Systems. Fancher most recently was vice president and program director for the Ground-based Midcourse Defense program.

BOEING CHINA REPRESENTATIVE RECEIVES PROMINENT GOVERNMENT AWARD

Kenneth Yata (right), vice president—Business Development, Boeing China, in September received the prestigious 2007 Friendship Award from the Chinese government.

Yata is the first person from the U.S. aerospace industry to receive this award for his cumulative contributions to China's aviation industry. He was nominated by the China Aviation Industry Corporation I.

The Friendship Award was established by the China State Council in 1991 and is awarded annually to international professionals who have made outstanding contributions to China's economic and social progress.

Chinese Premier Wen Jiabao personally extended his congratulations to each of the 50 award winners and expressed his thanks for their contributions to China's modernization drive.



IN MEMORIAM

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

- Robert Allen**, welder/tooler; service date Sept. 15, 1969; died Sept. 27
- Lynda Barnes**, computing process specialist; service date Jan. 5, 1998; died Oct. 9
- Luidel Bernitt**, test and evaluation engineer; service date Jan. 17, 1984; died Oct. 3
- Nancy Bissell**, contract and pricing specialist; service date July 21, 1981; died Sept. 28
- John Bogle**, Print On Demand basic operator; service date April 6, 1998; died Oct. 10
- Marlin Carpenter**, analyst/developer; service date Oct. 23, 1991; died Sept. 29
- Brian Carrillo**, integrated support technical specialist; service date Jan. 30, 1997; died Sept. 22
- James Gibbons**, systems engineer; service date Nov. 15, 1999; died Oct. 1
- James Jay**, wire group assembler; service date April 22, 1988; died Oct. 5
- John Jutte**, materials processing/requisition facilitator; service date Oct. 15, 1979; died Sept. 26
- Margaret Malm**, intern/student engineer; service date May 25, 2007; died Sept. 20
- Thomas Martin**, transportation analyst; service date March 3, 1987; died Oct. 1
- Jose Martinez**, aircraft structure and surface mechanic; service date Feb. 9, 1987; died Oct. 1
- Edward Moore**, structural analysis engineer; service date Nov. 14, 1992; died Sept. 29
- Susan Paisley**, accountant; service date July 5, 1988; died Oct. 7
- Karen Richmond**, business and planning analyst; service date June 29, 1988; died Sept. 11
- Edward Rossman**, Materials & Processes, Physics engineer; service date March 16, 1985; died Oct. 8
- Mike Seeley**, receiving checker reconciler; service date March 24, 1986; died Sept. 25
- Timothy Simpson**, tool maker; service date July 5, 1976; died Sept. 28
- Norman Smith**, estimating and pricing specialist; service date Dec. 27, 1982; died Sept. 26
- Cherryl Taylor**, business operations specialist; service date March 7, 1983; died Sept. 17
- Daniel Thompson**, mechanical systems design and analysis engineer; service date May 9, 2004; died Sept. 26

Aiding the Blue Angels

St. Louis air show gets off the ground with Boeing's help

By LIZ LANE

Thousands of people enjoyed the St. Louis County Fair and Air Show this fall. But probably few considered the monumental effort to produce the event, or the annual support offered by Boeing and its employees.

Putting on a show of this quality is no mean feat, and when the U.S. Navy Blue Angels are involved, the challenge becomes even larger. "Boeing's ongoing support is critical for our squadron, which is always on the go," said U.S. Navy Lt. Commander Garrett Kasper, one of the Blue Angels officers.

This support ranges from providing expert technical advisors who travel with the team throughout the year to speed aircraft repairs, to supplying a logistician who helps locate and get spare parts delivered to show sites across the United States.

Additionally, Boeing provides an air show liaison, Bob Williams, for the St. Louis event. His responsibilities are critical for pulling off a successful show. In addition to these duties, Williams is director of Shared Services Group's Creative Services division. (Creative Services teammates support *Boeing Frontiers* by providing photography, publication design and graphic design, among other services.)

A retired member of the Missouri Air National Guard, Williams has more than 5,000 flight-hours in fighter aircraft and understands the stringent requirements to host a large air show.

"We follow the Blue Angels' 70-page support manual to the letter," Williams said. "It covers everything from security to media rides, FAA requirements, to selecting the team's hotel and workout facilities."

"Williams' job is to ensure that our needs are met, and in most cases he exceeds those needs," Kasper said. "Whenever there is a slight issue, he makes sure it is fixed instantly. That's important when you have 60 people on the road living out of suitcases week after week."

The Blue Angels fly in formation during this year's St. Louis County Fair and Air Show, which is supported by Boeing and its employees.



BRUCE BECKER PHOTO

Williams is familiar with the group's high standards. He has worked closely with the Blue Angels team for 20 years and currently is Boeing's Blue Angel Liaison. He visits the squadron three to four times each year to ensure Boeing is fully supporting the Blue Angels' mission.

"Williams has been a major help to this team," Kasper said.

In addition to providing Blue Angels support, Boeing employees also worked closely with the fair committee. Employees designed ads, volunteer T-shirts and the show's program. They also developed the Boeing on-site exhibit and retail store, which Boeing volunteers staffed over the U.S. Labor Day weekend. Company photographers were also on hand over the holiday to capture the memories.

"We have a tremendous team of talented employees who take great pride in helping put the face of Boeing in front of our community," Williams said. "Our exhibit and store are two of the real highlights of the fair, but it wouldn't be possible without the great work of our talented group of

designers, photographers, videographers, exhibitors, planners, writers, and our business partners from Flight Simulation and Communications."

For years, Boeing has taken a leadership role in sponsoring and supporting the St. Louis fair. Since its inception in 1992, all fair proceeds have been donated to Children's Miracle Network, which supports St. Louis Children's Hospital and SSM Cardinal Glennon Children's Medical Center. To date, the fair has donated \$1.75 million to Children's Miracle Network to provide critical medical care to children.

Additionally, Boeing supports the annual Seattle Seafair festival where the Blue Angels also perform.

Unfortunately, the annual St. Louis fair faces an uncertain future. Land parcels on the show site have been sold to make way for commercial development. Whatever the outcome, Williams said, Boeing's employees are ready to support the next St. Louis County Fair and Air Show, should it continue. ■

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WILLIAM WANTZ PHOTO

Material Management 787 Service Ready Team

Making sure the data, tools and processes are in place to support all facets of the Material Management (spare parts) business—from provisioning inventory lists to customer order, and pick, pack and ship: That’s our work on the Material Management “787 Service Ready” team.

Since the early days of the 787 program, we’ve worked side by side with the airplane Life Cycle Product Teams, the Global Partners organization, the Systems Integration Process and Tools group, partners and suppliers worldwide to ensure that part design and definition supports the timing and methods used by airline customers to operate their aircraft. Our deliverable, the initial Recommended Spare Part List, was the very first deliverable on the 787 program last February.

We’re working on other elements of the business that are critical to ensuring the 787’s smooth entry into service. These aspects include lease parts and ground support equipment located in distribution centers worldwide, essential inventory in place at the customer’s location prior to airplane type certification, and the process for customers to receive “electronic” parts.

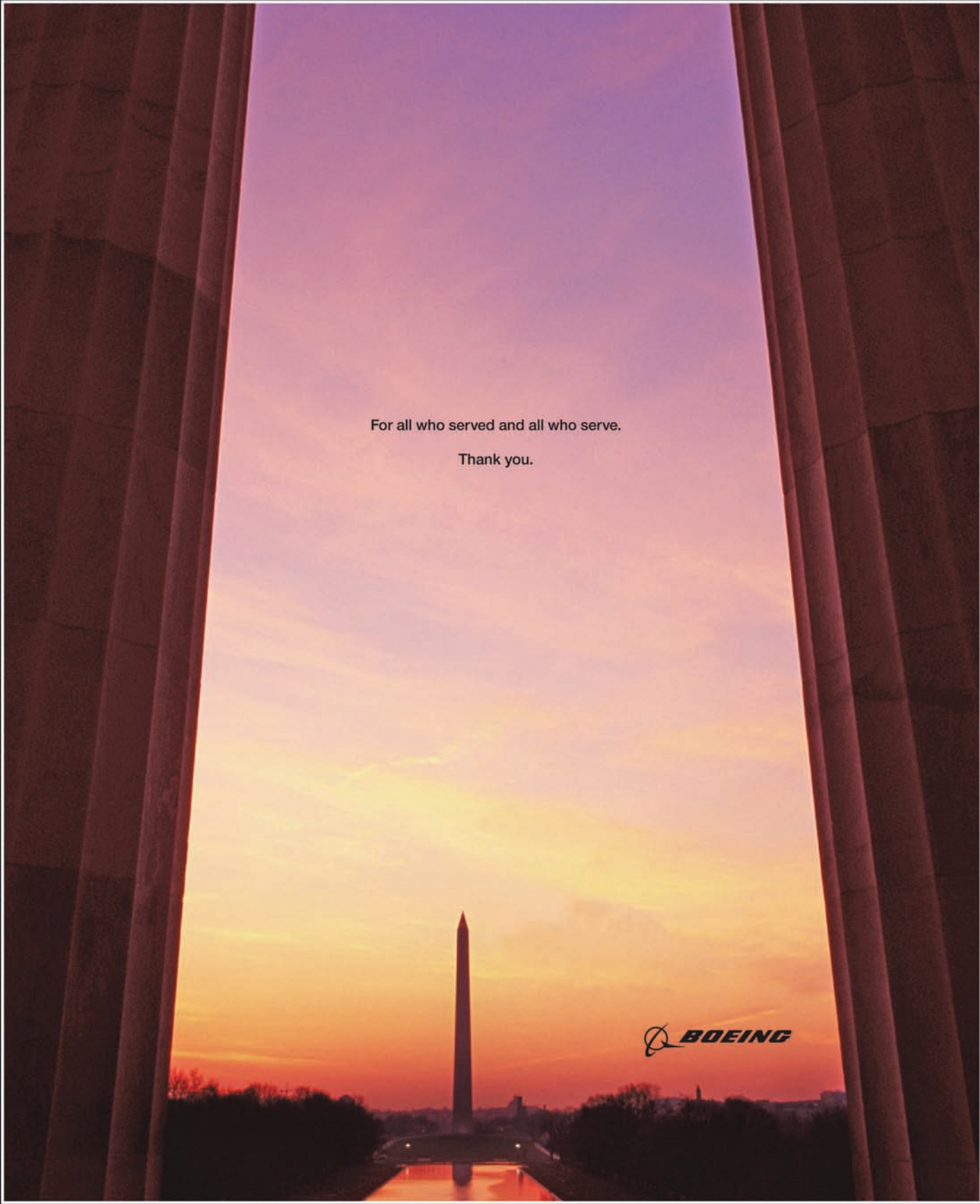
Because so much is new on the 787 Program, we must learn and coordinate activities far beyond the functional roles we brought to the team. The energy and passion around the airplane rollout, the anticipation of first flight and customer delivery make the challenge of developing and streamlining processes all the more exciting.

Front row from left:

Steve Lee, Steve Rowles, Ed Pearson, Susan Linde, Karol Kolcz, Bill Andrews, David Brown, Kurt Courage, Scott Clawson

Back row, from left:

Javier Ortiz-Aponte, Peter Campbell, John Elliott, Danielle Garnich, Michael Fleck, Mark Kastner, Deborah Dabrowski, Greg Pinalto, Cindy Taisey, Dennis Lamb, Mike Flaherty, Amy Chen, Dennis Sanford

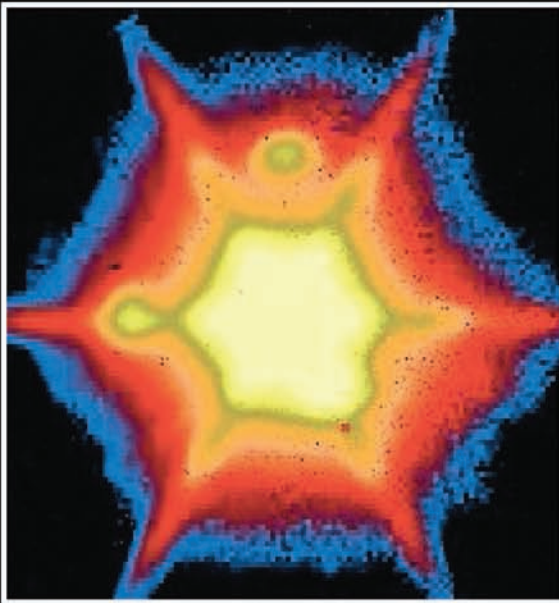


For all who served and all who serve.

Thank you.

 **BOEING**

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



Thermal image of the successful intercept of target warhead.

CAPABILITY: ON TARGET.



Ground-Based Interceptor launches from Vandenberg Air Force Base, 9/28/07.

On September 28, the U.S. Missile Defense Agency and the Boeing-led industry team completed an end-to-end systems test that resulted in the successful intercept of a target warhead. This intercept once again demonstrates the operational capability of the Ground-based Midcourse Defense (GMD) System. It also underscores the critical value of the GMD system as an active defense: protecting our nation, forces, friends and allies from the growing threat of long-range ballistic missiles.



This Integrated Defense Systems ad for the Ground-based Midcourse Defense System (GMD) celebrates the most recent successful target intercept test. It also states that this critical system is at operational capability protecting the United States from the threat of long-range ballistic missiles. The ad will appear in major trade and congressional publications.