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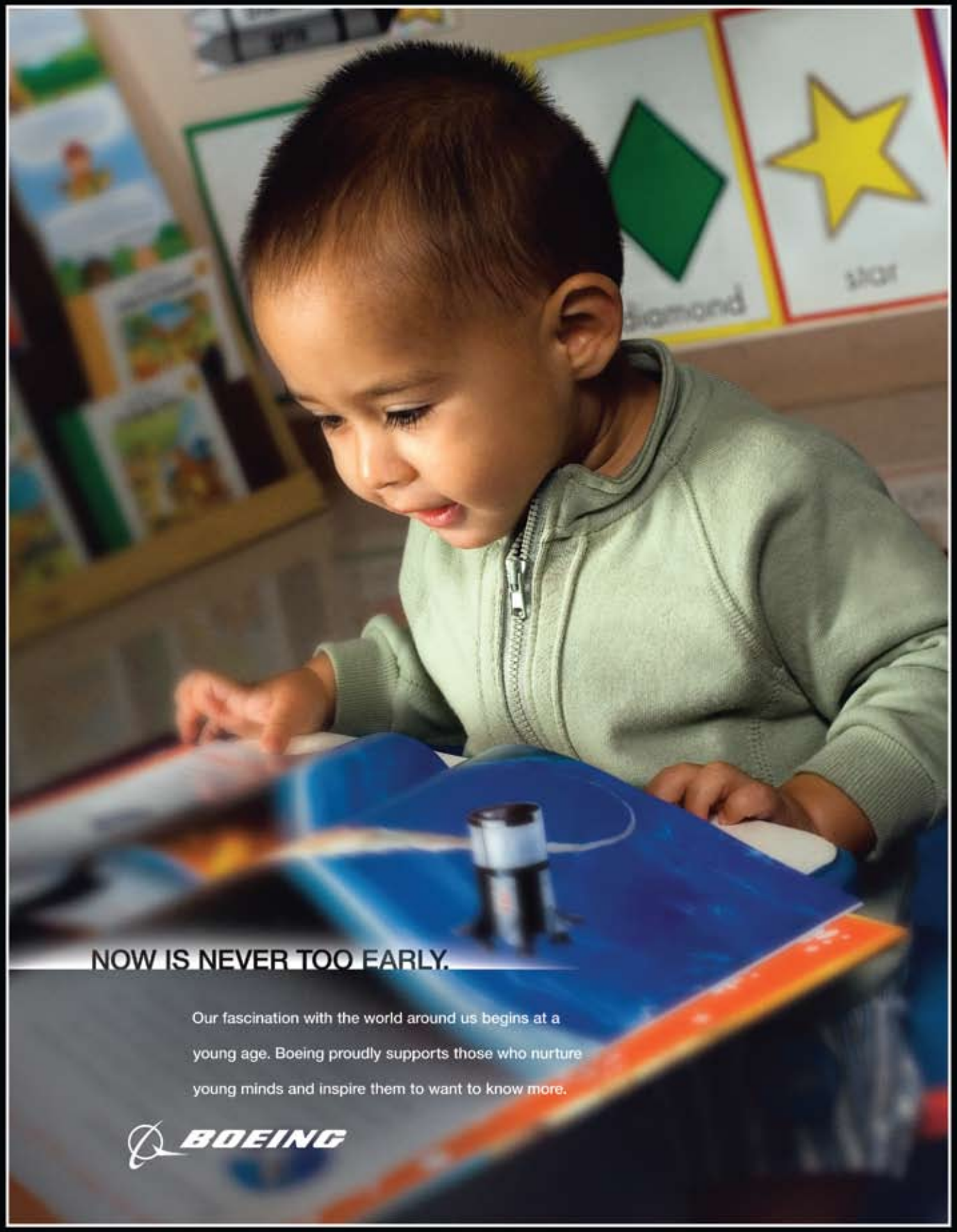
波音

Boeing in China

Partnership for growth in a key market



Global corporate citizenship refers to the work Boeing does—both as a company and through its employees—to improve the world. These efforts, combined across the enterprise, can yield sustainable improvement in the communities where Boeing employees live, work and support. This ad illustrates Boeing's commitment to early learning, which promotes the development of social, emotional and cognitive skills in children.

11 A potent partnership

China, with one of the fastest-growing economies in the world, represents the largest commercial airplane market outside the United States. China's airlines have ordered 850 Boeing jetliners, and Boeing jets make up more than half its fleet. The relationship also presents significant opportunities for China, which has had supplier contracts with Boeing since the 1970s. China currently supplies parts for all of Boeing's commercial jets, including the 787 Dreamliner. But there is increasing competition for Boeing in China, and the company must continue to grow China's role as both customer and supplier.

COVER IMAGE: A NEXT-GENERATION 737 RECENTLY DELIVERED TO XIAMEN AIRLINES, ONE OF CHINA'S MOST PROFITABLE AIRLINES AND AN ALL-BOEING OPERATOR, IS SHOWN AGAINST A TRADITIONAL BACKDROP OF THE GREAT WALL OF CHINA. THE TWO CHINESE CHARACTERS ON THE COVER, "BO" AND "YIN," REPRESENT "BOEING" IN CHINESE AND WERE DRAWN BY XIAO WANQING, 70, A WELL-KNOWN CALLIGRAPHER AND PAINTER IN BEIJING. PHOTO ILLUSTRATION BY BRANDON LUONG/ BOEING; AIRPLANE PHOTO BY XIAMEN AIRLINES; PHOTO BY SHUTTERSTOCK.COM

PHOTO: TWO 737-800S AND A 747-400F, ALL DESTINED FOR CHINESE AIRLINES, ARE SHOWN ON DISPLAY DURING A VISIT BY HU JINTAO, PRESIDENT OF CHINA, TO BOEING'S EVERETT, WASH., FACTORY IN 2006. MARIAN LOCKHART/BOEING

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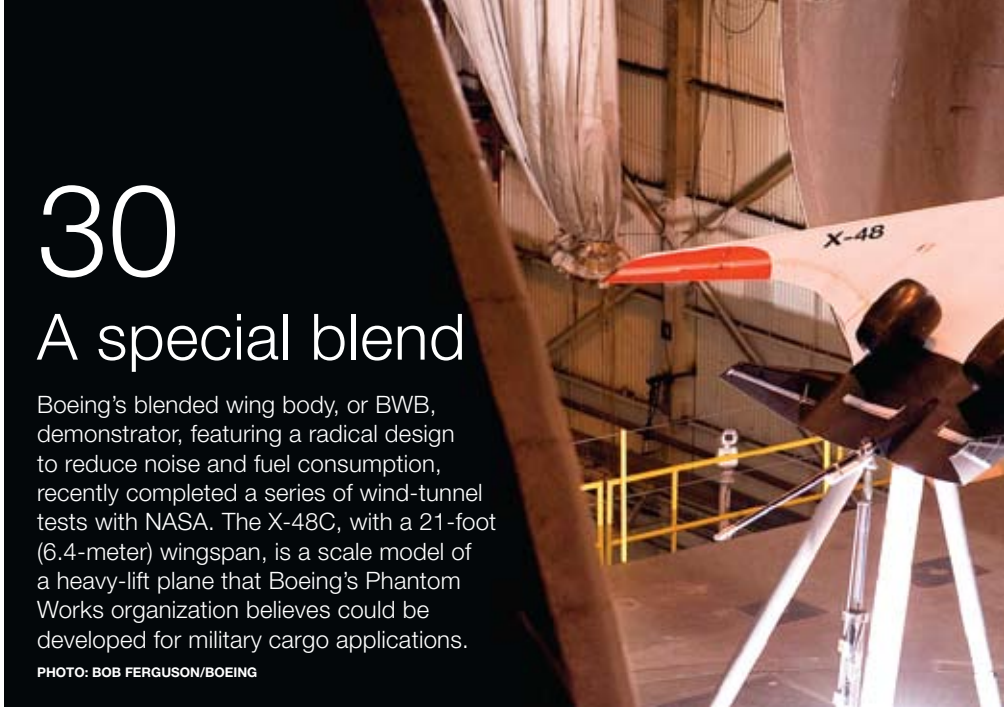

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A special blend

Boeing's blended wing body, or BWB, demonstrator, featuring a radical design to reduce noise and fuel consumption, recently completed a series of wind-tunnel tests with NASA. The X-48C, with a 21-foot (6.4-meter) wingspan, is a scale model of a heavy-lift plane that Boeing's Phantom Works organization believes could be developed for military cargo applications.

PHOTO: BOB FERGUSON/BOEING

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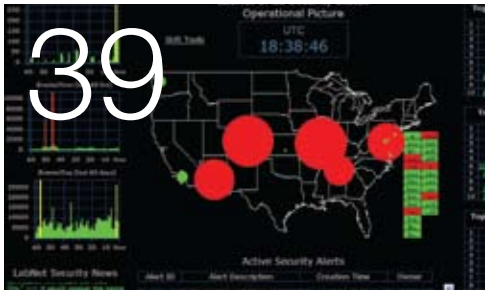
ontents

Simply terrific

A surprisingly simple concept of prioritizing work-related tasks is paying huge dividends on the P-8A Poseidon and Airborne Early Warning and Control system planes. Known as Lean+ 10X, the idea is to speed up the work flow by actually slowing down, so that tasks can be completed without interruption. PHOTO: MARIAN LOCKHART/BOEING



Cyber threats

It's not just the stuff of movies such as *Hackers*. The threat to vital national security information from cyber attacks is real, and Boeing is responding to the call from government and military customers by developing solutions that protect these vast information networks, including its own.

PHOTO: FRED TROILO/BOEING

Hungary for C-17s

In a first-of-a-kind multinational joint venture, Pápa Air Force Base in western Hungary, a former Warsaw Pact fighter base, is now home to Boeing C-17s. The transport planes are set to be used to support various missions, including those in Afghanistan, by a 12-nation consortium. For Boeing personnel at the base it's a unique assignment. They serve as the primary maintenance, material management and support team for the C-17s.

PHOTO: JERRY DRELLING/BOEING

INSIDE

A world of opportunities

Bringing the best of 'One Boeing' to global markets can help us thrive in uncertain times

Shep Hill
President, Boeing International

PHOTO: BOB FERGUSON/BOEING

A recent analysis of the global financial crisis by financial services company Citi concluded, "The crisis is more than the world's first synchronized recession. It is an historic turning point, prompting a re-calibration of economic, political and market dynamics and public expectations."

Frankly, it is hard to overstate the unprecedented changes that have occurred to the world economy over the past 24 months other than to say they will have lasting and fundamental impact.

This global recession has affected all of Boeing's markets, and no country or region has been immune. The depth and breadth of the economic downturn has challenged business theory, business practice and our expectations of the future.

Nowhere is this more obvious than in our customer base. On the commercial side, airlines are confronting reduced passenger and cargo demand and trends affecting premium travel business models. On the government side, limited resources and changing priorities are affecting how and where our customers invest.

Because of the scope and fundamental nature of change occurring, it is important that Boeing emerge stronger, leaner and more competitive. To echo what Boeing Chairman, President and CEO Jim McNerney recently said, "Our goal through these challenging times is not merely to withstand them but to use them as an impetus to accelerate our pace of change to better compete and grow as we move ahead."

An area of continued and growing emphasis will be our engagement in the global marketplace. The international market presents Boeing an opportunity worth more than $1.1 trillion over the next 10 years. Future growth will depend on our ability to access and competitively address this market. Access will depend on our ability to develop partnerships within and between companies and countries.

Fortunately, the fact that we are the world's largest aerospace company and an integrated global enterprise represents a significant competitive advantage. Countries and companies around the world want to partner with Boeing to create mutual success.

The Boeing International team reflects and leverages the integrated nature of the Boeing enterprise. BI is committed to creating a competitive advantage for the company through established business partnerships in key markets and to improving efficiencies internally and externally with our partners. BI has been established in 19 countries, with regional leaders and cross-functional teams of employees spanning nearly every business group. These enterprisewide teams help establish local presence in key markets by demonstrating a vested interest in local communities and economies.

"The international market presents Boeing an opportunity worth more than $1.1 trillion over the next 10 years. Future growth will depend on our ability to access and competitively address this market."

This month's issue of *Frontiers* features China, a crucial market for Boeing and an integral part of our long-term business strategy. The business potential is huge. We forecast that China will need more than 3,770 commercial airplanes, worth approximately $400 billion, over the next 20 years. It's a market where the competition is fierce and the business environment is changing rapidly. Our continued success is dependent on anticipating these changes and swiftly adapting to them.

China is just one example of where Boeing has developed a deep and meaningful business partnership with our customers over decades. Building on this foundation and bringing the best of "One Boeing" to China will ensure our market leadership position for years to come. ■

Snapshot

IN QATAR'S COLORS
Qatar's second C-17 Globemaster III, registered as a military aircraft but bearing the same gray, maroon and white livery seen on government-owned Qatar Airways commercial jetliners, departs Long Beach, Calif., en route to its new home in the Middle East. This unique C-17 paint scheme—the first of its kind—is intended to build awareness of Qatar's participation in humanitarian, disaster-relief and peacekeeping operations around the world. MICHAEL GAIL/BOEING

Quotables

"We made huge progress regarding the design. The 747-8 Intercontinental will become a great airplane for our customers."

– Mohammad "Mo" Yahyavi, 747 program vice president and general manager, talking to media about the passenger version of the new 747-8. The freighter version is scheduled to enter flight test before the end of this year. Lufthansa is the launch customer for the Intercontinental, which will follow the freighter.

"We see the Osprey contributing in a manner that no other aircraft can."

– Lt. Gen. George Trautman, deputy commandant for U.S. Marine Corps aviation, on the Marines' pending deployment of the Bell Boeing MV-22 Osprey tiltrotor aircraft to Afghanistan, as reported in Aviation Week *on Sept. 8.*

"Twenty years from now, more than 40 percent of the world's airline traffic will begin, end or take place within the Asia Pacific region."

– Randy Tinseth, Boeing Commercial Airplanes vice president, Marketing, referring to the company's latest jetliner market outlook. It forecasts the Asia Pacific region will be the world's largest aviation market over the next 20 years, requiring 8,960 new commercial jets valued at approximately $1.1 trillion.

IAM PROMOTIONS

No promotions listed for periods ending Aug. 28 and Sept. 4, 11 and 18.

ETHICS QUESTIONS?

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Dawn of the spaceplane

Though it never flew, X-20 Dyna-Soar helped pioneer the way for the Space Shuttle

Story and graphics by Erik Simonsen

Ironically, it was only two months after the surprise Oct. 4, 1957, launch of Russia's Sputnik into Earth orbit that the concept of a U.S. manned spaceplane was born.

In December of that year, the U.S. Air Force invited proposals from the aerospace industry to design a reusable military spaceplane. At the time, many in the United States believed the country trailed far behind the Russians in science and technology. Yet by the mid-1960s, a U.S. shuttle-type spacecraft could have been a reality.

On June 16, 1958, Boeing and the Martin Co. were selected to compete for the spaceplane, now designated the Dyna-Soar, for Dynamic-Soaring. Boeing would build the manned space glider and Martin would provide the booster rocket. The winners were chosen from proposals submitted by competing Bell, Convair, Douglas, Lockheed, McDonnell and Republic.

Initially, the goal of the Dyna-Soar program was to fly a sub-orbital vehicle. After review by then–Secretary of the Air Force Eugene Zuckert, the program was revamped, and on Nov. 9, 1959, a new contract was signed to develop Dyna-Soar for orbital missions. As a result, the booster would be upgraded from a Titan I rocket to the newly developed Titan III, which was capable of placing 20,000 pounds (9,000 kilograms) into low earth orbit (150 miles, or 240 kilometers), or approximately 13,900 pounds (6,300 kilograms) into a 1,000-mile (1,600-kilometer) orbit.

As envisioned, the first manned flight was to take place in August 1965 once a series of unmanned orbital flight tests were successfully completed. Dyna-Soar would be launched into orbit from Cape Canaveral, Fla., re-enter, and would glide to a landing on the dry lakebed at Edwards Air Force Base, Calif. The Air Force Dyna-Soar development budget for fiscal year 1960 was allocated at $16.2 million.

"The choice of flight paths available to the Dyna-Soar pilot will be almost infinite," George Stoner, Boeing Dyna-Soar program manager, said in a statement on Sept. 22, 1960. "By combining

the high speed and extreme altitude of his craft with his ability to maneuver, he will be able to pick any airfield between Point Barrow, Alaska, and San Diego, Calif., with equal ease."

The single-crewmember space glider was to be constructed of several new exotic alloys, including Rene 41 "super alloy," molybdenum and columbium. The blunt delta-wing vehicle would have a length of 35.4 feet (10.8 meters), a span of 20.8 feet (6.3 meters), vertical fin height of 8.6 feet (2.6 meters), and an empty weight of approximately 10,400 pounds (4,700 kilograms). Landing gear consisted of three skids similar to the North American Aviation X-15 high-speed research vehicle's rear skids.

Air Force Chief of Staff Gen. Curtis LeMay stated on Oct. 26, 1961, "Since space systems are extremely expensive, one of the first tasks of a manned space vehicle would be to repair equipment operating in our unmanned satellites." This far-reaching statement occurred more than 20 years before the Space Shuttle began satellite repair/recovery missions. And it was only three years ago that Boeing developed Orbital Express, an unmanned autonomous satellite that demonstrated on-orbit refurbishing missions.

Dyna-Soar's advantage was to insert flexibility into manned spaceflight, so the pilot could determine the point of initial re-entry into the atmosphere. The wings would provide aerodynamic maneuvering capability (unlike a space capsule), plus a cross-range of approximately 1,200 miles (1,900 kilometers) from the initial direction of flight. In addition, the ability to land at a conventional air base rather than being recovered at sea, such as the Mercury and Gemini space capsules, along with any collected payload, was a priority. Possible military missions included reconnaissance, space weapons, space rescue, satellite maintenance and monitoring of enemy satellites.

On March 15, 1962, four U.S. Air Force test pilots and two NASA pilots were assigned to the Dyna-Soar program. One of the NASA pilots was Neil Armstrong, who later returned to the space agency and would become the first person to walk on the moon.

The Dyna-Soar glider received its official X-20 designation from the U.S. Department of Defense on May 26, 1962. "The Dyna-Soar may be regarded as a logical follow-on to the North American X-15 in the exploration of aerospace," said then–Undersecretary of the Air Force Joseph Chanyk. "This military test system has the capability for manned, maneuverable, hypersonic reentry from orbital altitudes and velocities with a normal landing at conventional airfields."

Boeing built a full-scale engineering mock-up and established the initial tooling for a production line of 10 X-20s at the Missile Production Center in Seattle. Despite excellent government reviews of the program, however, and the military's expressed need for such a system, Defense Secretary Robert McNamara announced on Dec. 10, 1962, that the X-20 Dyna-Soar program was canceled. His rationale was that Dyna-Soar had no viable military mission and, citing the $400 million that had been spent on the project from 1958 through 1963, was too expensive.

At the time of the X-20 cancellation Boeing had 6,475 employees involved in the program and had completed about 40 percent of its program tasks. Subcontractors Honeywell and Radio Corp. of America had completed almost 60 percent of their work. The partially completed X-20 prototype and the full-scale engineering mock-up were scrapped, as well as the production line.

Although the cancellation was unfortunate, what Boeing engineers had accomplished on the X-20 Dyna-Soar program was an impressive technical achievement. It helped chart the course for the more than 120 manned orbital Space Shuttle flights that have taken place since 1981, launching satellites, performing space science experiments and performing more than 30 International Space Station construction flights. ■

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GRAPHICS: (LEFT) This artist's concept shows the X-20 with its orbital insertion stage (trans-stage) attached. **(RIGHT)** An X-20 Dyna-Soar rides into space aboard a modified 98-foot-high (30-meter-high) Titan I rocket. Dyna-Soar originally was to conduct suborbital flights, but that changed to orbital missions using a more powerful Titan III.

Tale of the tape

- Crew: One pilot
- Length: 35 feet 4 inches (10.8 meters)
- Wingspan: 20 feet 10 inches (6.4 meters)
- Height: 8 feet 6 inches (2.6 meters)
- Empty weight: 10,395 pounds (4,715 kilograms)
- Max takeoff weight: 11,387 pounds (5,165 kilograms)
- Powerplant: Orbital insertion rocket engine, 72,000 pounds (320 kilonewtons) of thrust

Performance

- Maximum speed: 17,500 miles per hour (28,000 kilometers per hour)
- Altitude: Low earth orbit 150–300 miles (240–480 kilometers)

Swapping
spanners for sponges on C-17 wash

Buckets, sponges and detergent aren't the usual tools used by the Boeing Defence Australia team at Royal Australian Air Force Base Amberley. Each month, team members from across the site sign up to help wash the RAAF's fleet of four C-17 aircraft, supporting Boeing's C-17 Globemaster III Sustainment Partnership.

The wash team, wearing gumboots and wet-weather clothes, spends eight hours and uses approximately 6,600 gallons (24,980 liters) of collected rainwater cleaning each aircraft every 180 days, or after operational deployment as required. More than just a cosmetic requirement, the washes help maintain the aircraft's correct weight and balance and prevent corrosion.

– Karinne N. Cilento

PHOTO: Boeing Defence Australia employees including Bruce Madsen (left of aircraft, in white overalls), Howard Bell (foreground left), Paul Woodward, Dave Clarke (on elevated platform with brush) and Al Hutcheson help keep the Royal Australian Air Force's C-17 fleet clean with regular washes. JOHN DIEFENBACH/BOEING

Loud and clear

Boeing Defence Australia's Vigilare program recently marked two milestones, conducting the system's first secure live voice transmission to an offshore location at the Northern Region Operations Center at Royal Australian Air Force Base Tindal, in Northern Australia, and successfully receiving the first radar and flight plan data from defense and civilian systems around Australia. The successful tests demonstrate the configuration of the installed Vigilare system on site is robust and working correctly, said Lee Davis, deputy program manager, Vigilare.

As one of the most advanced ground-based air defense systems in the world, Vigilare will enable the Australian Defence Force to conduct surveillance and battlespace management over continental Australia and its coastline by fusing data from a number of sensors and sources. These include Boeing products such as the Wedgetail Airborne Early Warning and Control aircraft, F/A-18A/B+ Hornets and Super Hornets.

– Emily Scarfe

PHOTO: Ready to make the Vigilare system's first secure voice call to an offshore location from the Northern Region Operations Center at Royal Australian Air Force Base Tindal are (front, from left) Tony Burt and Paul Mula; (back, from left) Chris Kolokas, Phil Johnson, Jerome Hediger, Sidesh Ranchhod, Neil Staines and Anthony Ranieri. ALARIC WILLI/BOEING

Partners in flight

Fast-growing China aviation market presents opportunities for both Boeing and China

By Eric Fetters-Walp

People in China have sought ways to soar in the skies for millennia, beginning with the world's first known kites more than 2,000 years ago. By the 13th century, Chinese military leaders were using rockets.

And when the age of flight dawned in the early 20th century, Chinese-born Feng Ru gained nationwide attention in the United States by testing a powered airplane in 1909, just a year after the Wright Brothers' first powered flight. When Bill Boeing sought the first aeronautical engineer for his company in 1916, he hired Wong Tsoo, who helped to design the Model C seaplane, Boeing's very first production airplane.

From that storied history, China's aerospace industry and airlines are propelling fast into the future, with Boeing poised to provide airplanes, manufacturing capability and quality and aviation services. President Hu Jintao of China has called Boeing a household name in that country, and it needs to remain such as competition grows, said Shep Hill, president of Boeing International.

"We have to make sure that even though China is familiar with Boeing and recognizes a legacy of cooperation, that we continue to look forward together."

– Shep Hill, president of Boeing International

PHOTO: Symbolic of the close partnership between Boeing and China, an Air China Next-Generation 737 flies over China's Great Wall.

PHOTO ILLUSTRATION: BRANDON LUONG/BOEING; AIRPLANE PHOTO: JIM COLEY/BOEING; GREAT WALL PHOTO: SHUTTERSTOCK.COM

"We [Boeing] need to work hard to be not just a household brand, but to be known as the superior brand in China."

– David Wang, president of Boeing China

"We have to make sure that even though China is familiar with Boeing and recognizes a legacy of cooperation, that we continue to look forward together," Hill said.

China's potential importance to Boeing is difficult to overstate. "The numbers speak for themselves," Hill said. "It has more people than any other country in the world. The economy in the last 20 years has grown faster than any other developed or emerging nation in the world. Even in this time of global recession, its economy has grown about 9 percent this year."

"It's the largest market outside the U.S. for commercial airplanes, period," added John Bruns, Boeing Commercial Airplanes vice president of China Operations. "The potential growth in demand for air travel as China's economy grows is staggering—it's huge."

Consider that of the 850 airplanes Chinese airlines have ordered from Boeing since President Richard M. Nixon's historic visit to China in 1972, more than 60 percent of those orders have come since 2000. In the past nine years, the commercial airline fleet in China has more than doubled, to more than 1,300 airplanes. The number of commercial airline passengers soared from 83 million to 202 million during that same period, according to the International Civil Aviation Organization.

But the future need for airplanes presents even greater potential for Boeing and competitors. Chinese airlines are expected to need 3,770 airplanes between now and 2028—with a market value of $400 billion—according to Boeing's latest Commercial Market Outlook. Randy Tinseth, Commercial Airplanes vice president of Marketing, calls it the "most dynamic aviation market in the world." About 53 percent of the commercial jetliners flying in China are Boeing models; 36 percent are from Airbus.

Because of China's huge demand for airplanes, it's easy to focus on China as the next big market. But Bruns said that's a one-dimensional approach. "We don't view China just as a market," he said.

中国

China at a glance

Formal name: People's Republic of China

Location: Eastern Asia, bordering Russia, Mongolia, North Korea, Vietnam, Laos, Myanmar, India, Bhutan, Nepal, Pakistan, Afghanistan, Tajikistan, Kyrgyzstan and Kazakhstan

Area: More than 3,700,000 square miles (9,600,000 square kilometers), similar in size to the United States

Population, 2008: 1.32 billion people; ranked first in the world

Capital: Beijing

Other major cities: Shanghai, Tianjin, Chongqing, Guangzhou and Hong Kong

Gross domestic product, 2008: RMB 30,067 billion (U.S. $4.4 trillion); ranked fourth worldwide

GDP growth rate, 2008: 9 percent

Largest export partners in 2008: European Union, United States and Japan

Sources: Chinese government Web sites, World Bank

PHOTO: (BELOW) China's Beijing National Stadium was built for the 2008 Summer Olympics. It was nicknamed the Bird's Nest because of the structure of steel beams.
SHUTTERSTOCK.COM

"It's a lot more than that. We're looking to broaden and deepen our relationship with China."

Boeing and China already have long-standing ties on several fronts, with supplier contracts dating back to the mid-1970s. All of Boeing's commercial airplane lines, from the 737 to the 787 Dreamliner, now incorporate parts made in China. Since the 1980s, Boeing has purchased Chinese aviation hardware and services worth $1.5 billion, and that procurement total is expected to double in the coming years. Boeing remains the largest single customer of China's aviation industry.

China also is home to the first conversion facility for the 747-400 Boeing Converted Freighter. Additionally, Boeing is involved in several Chinese joint ventures providing airplane parts and services.

Overall, there are 150 Boeing employees in China, with more than 6,100 employed in joint ventures and subsidiaries. And those numbers are growing, said David Wang, president of Boeing China. In recent years, the company's office in Beijing has added its own Human Resources staff and programs to address ethics, university relations and technology. Its communications and Global Corporate Citizenship programs also have expanded, Wang said.

"Not only in the number of people but also in the number of functions, we have grown significantly," Wang said. "The most important thing is, we've grown local employees much more than expatriots. So we have some good local leadership here."

Developing talented local employees, Wang said, will assist Boeing as competition between airplane makers heats up in China. In May, the first Airbus A320 assembled in a new joint venture plant in Tianjin took to the air. Airbus has been as active as Boeing in courting orders from Chinese airlines. Additionally, China's aerospace industry is preparing to produce its own commercial airplanes, starting with a 737-size model, in the next half-decade.

"That's going to happen. We have to find a way in China to both partner and compete," Tinseth said. "I'm confident we can find a way through that."

Wang said Boeing can benefit by talking more to the Chinese public about how Boeing's presence and programs across the nation have real value.

"Boeing still is very much a household

PHOTO: An employee of Shanghai Aviation Manufacturing Corp. installs a fastener on a 737 horizontal stabilizer.
YONG HE

name," he said. "But we need to work hard to be not just a household brand, but to be known as the superior brand in China."

To accomplish that, Wang said, the marketing efforts in China are focused on what sets Boeing apart from its competitors. That includes the company's biofuels initiative, which has garnered attention among media, government and industry officials there.

Boeing's services also can differentiate the company from competitors. In addition to providing airplanes to China, Boeing has played a large role in modernizing the country's commercial aviation infrastructure, Tinseth said. Since 1993, Boeing and its subsidiary, Boeing Training & Flight Services, formerly Alteon, have trained more than 37,000 aviation professionals in the country as part of an initiative undertaken with the Civil Aviation Administration of China. The two also have worked on improving air traffic systems as the nation's airline routes grow quickly, especially in the eastern half of China. With Boeing's assistance in training and safety, the country's commercial airline system today boasts a safety record rivaling that of the United States and Europe.

As China's airlines grow and change with the market, Boeing has worked to keep strong customer relationships with them. Xiamen Airlines, one of China's most profitable airlines, has succeeded with an all-Boeing fleet, and five Chinese airlines are on the 787 launch team. Tinseth said Chinese airlines remain strong Boeing customers, despite the Dreamliner program's setbacks.

"With the 787 delays, it's challenged our relationship. The only thing we can do to repair that is to deliver. I'm confident we can build back our credibility, but we have to perform," Tinseth said.

In the meantime, Boeing has distinguished itself by supporting China's emerging aircraft financing and leasing community. As the country looks to turn its considerable intellectual and capital resources into profit opportunities in jetliner financing, Boeing Capital Corp. has shared its expertise for mutual benefit.

BCC's Asia-based financing team has worked to draw Chinese bankers to regional financiers' events. With China's support, it brings executives to Seattle to learn the intricacies of airline planning and aircraft leasing. During the past year, Boeing actively began introducing non-Chinese airlines to local bankers seeking foreign investments. Additionally, BCC President Walt Skowronski signed cooperative agreements with China's four leading banks working in aviation.

"In Asia, you need to demonstrate that you are part of the community," said Foster Arata, BCC vice president and managing director for Asia Pacific and Greater China. "Unless you demonstrate that you're willing to establish yourself and participate in the community, you won't become a trusted, reliable partner. And people in China communicate how appreciative they are for what Boeing is doing."

Those running Boeing's businesses in China say it's hard to convey, to those who have not witnessed it, how fast China has changed in one generation. And doing business there requires an ever-changing knowledge of how industry and the government interact.

"But Chinese culture doesn't change, and in order to work in China, you need to have an understanding of the history and culture," Bruns added.

The company's history with China and expanding links with Chinese airlines, manufacturing partners and financial institutions give Boeing a solid platform from which to build. But increasing competition in China means Boeing can't depend solely on its past successes, Wang said. Instead, Boeing must continue to grow China's role as both a customer and supplier.

"We must be successful in China. There's no alternative," Wang said. "It's so important to our future." ■

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"We don't view China just as a market. It's a lot more than that. We're looking to broaden and deepen our relationship with China."

– John Bruns, Boeing Commercial Airplanes vice president of China Operations

PHOTO: (RIGHT) The blue and white livery of Xiamen Airlines matches the sky overhead as a Next-Generation Boeing 737 awaits delivery ceremonies in Seattle.
JIM ANDERSON/BOEING

Flying high 飞

With an all-Boeing fleet, Xiamen Airlines charts a course for success

Xiamen Airlines is a prime example both of the vibrant, forward-thinking Chinese aerospace industry and the potential for Boeing in the dynamic Asian aviation marketplace.

With its strategy of operating an all-Boeing fleet—including 54 Next-Generation 737s, with another 60 on order—Xiamen Airlines has earned a profit for 22 consecutive years, one of the most consistently successful financial performances in the Chinese aviation industry. Xiamen is a domestic carrier, operating more than 150 routes in the regional markets of Fujian and East China. It also flies a select number of regional international routes and recently opened an office in Taipei to support the cross-straits traffic.

"The capacity of the Next-Generation 737 perfectly matches Xiamen Airlines' operations, market position and route network," said Xiamen Airlines President Che Shanglun. "The aircraft's high reliability and low operations and maintenance costs are crucial factors in our market advantage."

"Xiamen Airlines is a key Boeing partner in China," noted Rob Laird, vice president, China/East Asia Sales, Boeing Commercial Airplanes. "We are very proud of its decision to build an all-Boeing fleet based on the Next-Generation 737."

Xiamen executives describe the company as a "high-quality," rather than a "low-cost," airline, targeting mainly mid- and high-level business travelers. The carrier's business model is designed to optimize revenue by retaining adaptability to a wide range of markets, including leisure and family travelers. Customer service is at the heart of its market approach, with special emphasis on punctuality and convenience, and of course safety.

In June 2009, the International Air Transport Association, one of the airline industry's leading international trade groups, recognized Xiamen Airlines with an award for its safety record.

Its domestic focus has helped Xiamen Airlines weather the global financial downturn. The domestic Chinese airline market has been less affected by the financial crisis than other sectors of the global industry, helping Xiamen to remain profitable.

The airline also credits Boeing products, services and support for helping build its marketplace success. "Boeing has provided real vision and comprehensive services through the years," Che said.

With a solid track record of marketplace success, Xiamen Airlines is looking to become "the airline with the best investment value in China" by 2020. The carrier plans to add routes to its East China–based network, connecting the Chinese mainland with Hong Kong, Macao and Southeast Asia. Airline executives point out that more routes mean the need for more Boeing airplanes.

Airline executives also look forward to a continued successful partnership with Boeing. "For more than two decades, we have worked together with mutual trust and shared knowledge and skills," Che pointed out. "It is a model that is exemplary in the aviation industry and the world."

– Patrick Summers

飞机 China's airplanes

Air China Group
Headquarters: Beijing
Fleet: 237 airplanes, including 108 737s and Next-Generation 737s, 20 747s, 13 757s, 10 777s, and seven 767s, as well as BAe and Airbus airplanes. It also is a launch-team customer for the 787 Dreamliner. Air China Cargo flies nine 747 freighters.

China Eastern Airlines Group
Headquarters: Shanghai
Fleet: 229 airplanes, including 58 737s and Next-Generation 737s, three 767s, and nine MD-90s, as well as Airbus and smaller regional models. It also is a 787 customer.

China Southern Airlines Group
Headquarters: Guangzhou
Fleet: A customer on the 787 launch team, this airline's fleet of nearly 300 airplanes includes 98 737s and Next-Generation 737s, two 747s, 18 757s, and a dozen 777s, in addition to two DC-9s and 13 MD-90s. The airline also flies Airbus and Embraer airplanes.

Hainan Airlines
Headquarters: Haikou
Fleet: As the largest privately owned airline in China, Hainan's fleet of 95 jetliners includes 80 737s and Next-Generation 737s, three 767s, and several Airbus models. Hainan also is a 787 customer.

PHOTO: Xiamen Airlines Boeing 737s and 757s await early morning departures. XIAMEN AIRLINES

major airlines

Shanghai Airlines
Headquarters: Shanghai
Fleet: 55 airplanes, including 32 Next Generation 737s, 10 757s, seven 767s, one Hawker 800 and five CRJ-200s. Shanghai Airlines is also a 787 launch-team customer.

Shenzhen Airlines
Headquarters: Shenzhen
Fleet: 81 airplanes, including 43 Next-Generation 737s and nine 737s, as well as Airbus models.

Shandong Airlines
Headquarters: Jinan
Fleet: 38 airplanes, including 31 737s and Next-Generation 737s and regional jets.

Sichuan Airlines
Headquarters: Chengdu
Fleet: 43 airplanes, all Airbus and Embraer models.

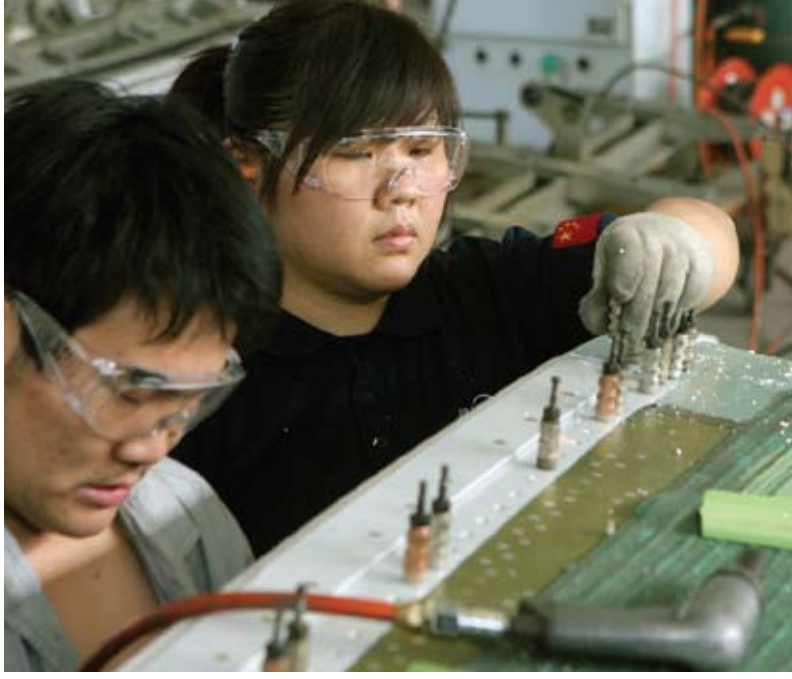
Xiamen Airlines
Headquarters: Xiamen
Fleet: All-Boeing fleet of airplanes consists of 737s, Next-Generation 737s and 757s.

Other Chinese passenger and cargo airlines include China Cargo Airlines, China Postal Airlines, China United Airlines, Chongqing Airlines, Deer Jet, Donghai Airlines, East Star Airlines, Grandstar Cargo, Great Wall Airlines, Jade Cargo International, Juneyao Airlines, Kunpeng Airlines, Lucky Air, OK Air, Spring Airlines, Tianjin Airlines, United Eagle Airlines and Yangtze River Express.

Sources: All airlines listed above and Boeing

Part of the 团队 team

Chinese suppliers are a vital link in Boeing aircraft production



Chinese aerospace firms are producing parts for Boeing's newest airplanes, the 787 Dreamliner and 747-8, but China's role as a supplier is not new.

Since shortly after Boeing sold its first airplanes to China in the early 1970s, the nation has grown as a vital supplier for all of the company's airplanes. Additionally, Boeing now has a stake in several joint ventures, such as Boeing Tianjin Composites Co. (BTC), that produce aircraft components.

"Boeing partnerships in China are strategically chosen for long-term benefits to all," said Kenneth Yata, vice president, Business Development, Boeing China. "The company works on projects that help Chinese partners gain technical and manufacturing experience, which enables the delivery of aviation products with superior quality and value."

As of today, 5,700 Boeing jetliners—about 60 percent operating around the globe—include parts from Chinese manufacturers. Major parts and assemblies made by partners and suppliers in China include:

- For the Next-Generation 737, Shanghai Aviation Manufacturing Corp. makes horizontal stabilizers; vertical fins come from Xi'an Aircraft International Corp.; 737 tail section modules are produced by Shenyang Commercial Aircraft Co.; and 737 doors come from Chengdu Commercial Aircraft Co.
- For the 787, Chengdu is building composite rudders; the leading edge for the 787 vertical fin comes from Shenyang; and Hafei Aviation Corp. is making various composite panels and components.
- For the 747-8, Chengdu is producing ailerons and spoilers; Xi'an is building wing parts, including the 747-8's inboard flaps, the single largest piece of aircraft structure that Boeing purchases from China.

Boeing Tianjin Composites is undergoing a $21 million factory expansion and has a long roster of customers in addition to Boeing. Other joint ventures include TAECO in Xiamen, which plays the largest role in converting 747s into the new 747-400 Boeing Converted Freighter. This fall, Boeing Shanghai Aviation Services plans to open its new modification, maintenance, repair and overhaul service hangar at Shanghai's Pudong International Airport.

Additionally, key Boeing partners such as General Electric, Pratt & Whitney, Goodrich, Rolls-Royce and Vought all buy components from China or have aerospace manufacturing facilities there. Boeing and its supplier partners have active contracts with the Chinese aviation industry valued at more than $2.5 billion.

David Wang, president of Boeing China, said these supplier and manufacturer relationships demonstrate to the Chinese government, industry and people that Boeing wants to be a big part of the nation's aerospace sector, providing training and jobs for the long term. That, in turn, helps to maintain Boeing's competitiveness in selling airplanes to China's airlines.

– Eric Fetters-Walp

"Boeing partnerships in China are strategically chosen for long-term benefits to all."

– Kenneth Yata, vice president, Business Development, Boeing China

PHOTO: (ABOVE) Workers at Shanghai Aviation Manufacturing Corp. assemble a 737 horizontal stabilizer. YONG HE

桥 Bridge to better business

Local hire brings cultural expertise to Boeing's China Support Organization

Steven Jiang's value as an employee of Boeing China goes well beyond his many years of experience in aerospace. He is one of his group's most knowledgeable people on Chinese culture, language and business practices.

He's a local hire, the first Chinese citizen hired by the company's China Support Organization. Born Jiang Guoquan, he uses the name Steven on the job for the convenience of his English-speaking colleagues.

"In 2000, the China Support Organization included seven or eight expats [expatriates]—no local people," Jiang said. "They needed a bridge, someone to help them discuss technical information with Chinese aerospace people and regulators. Now we have seven local hires—three working in maintenance, three working in flight operations and an office administrator."

As a senior technical specialist, Jiang, 48, is an important link in providing technical support to Chinese airline personnel and the Civil Aviation Administration of China (CAAC). He also assists Commercial Aviation Services colleagues in conducting seminars, workshops and other activities. This includes handling logistics, schedules, liaison activities and the translation of technical information.

"My background is in maintenance and engineering, and part of my job is conducting evaluations of airlines' maintenance processes," he said. "The evaluation itself takes about two weeks and involves four to six people. After that, we write a report and hold a debrief session for the airline's senior management."

For example, Jiang led the Boeing team that evaluated how Chinese air carriers maintain mature airplanes, contributing to the recent completion of the mature airplane support project for CAAC. Another task involved assisting Air China in adapting Airplane Health Maintenance systems it recently purchased from Boeing.

Before joining Boeing, Jiang worked at the CAAC's Aviation and Technical Center as deputy director of airworthiness engineering and information services. His primary responsibility was Boeing fleet airworthiness management for all Chinese airlines.

Boeing and its airplanes have long been part of Jiang's career. In addition to his Boeing fleet responsibilities for the CAAC, he began his career as an airplane mechanic, working on Boeing 707, 747, 737 and 767 airplanes. He believes his years as a mechanic were essential in preparing him for later career opportunities, including his work at Boeing China.

> "They needed a bridge, someone to help them discuss technical information with Chinese aerospace people and regulators."
>
> *– Steven Jiang, Boeing senior technical specialist, China Support Organization*

A program co-sponsored by Boeing and the CAAC in 1985 made Jiang one of the first Chinese aerospace professionals to receive a U.S. Federal Aviation Administration Airframe and Powerplant mechanic's license. He was one of four students selected to go to the United States to take the final examination in San Jose, Calif.

Although he spoke some English in 1985, Jiang's two years with the program greatly improved his knowledge and use of the language.

After becoming the first student to enroll in the Civil Aviation University of China (CAUC), Jiang graduated with a degree in aviation mechanical engineering. He also holds a master's degree in business administration from Rutgers University in New Jersey. In addition to working for Boeing, Jiang is also an honorary professor at CAUC, where he conducts classes for professors and advanced students on airline maintenance and engineering processes.

– Bill Seil

Working together 携手

Boeing liaison engineer keeps production, communications lines flowing

In 1989, a young Boeing engineer working in Washington state applied for a long-term assignment in Japan. He thought the experience would be an excellent opportunity to improve his interview skills.

When an interviewer asked Steve Morse if he'd ever been outside the country, he said that a month earlier he had visited Victoria, British Columbia, just north of Seattle.

To his surprise, Morse got the job, and it turned out to be a life-changing event.

Over the past 20 years he has held Boeing positions in Japan, Spain, Indonesia (where he also was responsible for Singapore, India and Pakistan) and twice near Xi'an, China.

"I grew up around airplanes," said Morse, 48. "My dad was a Marine Corps fighter pilot. I knew before I got my engineering degree that I wanted to work for Boeing, but I never dreamed I'd be leaving Seattle, let alone living overseas."

Morse is the Boeing site leader and liaison engineer at Xi'an Aircraft International Corp. (XAIC), located just outside Xi'an. The Chinese aerospace company currently manufactures 737 vertical fins, 747-8 fixed trailing edge ribs and floor beams for converted 747 freighters.

As a liaison engineer, Morse offers technical and manufacturing support, and helps to resolve problems.

A sign posted prominently in Morse's office states, "Focus on the solution, not the problem." He works closely with his XAIC colleagues and believes their work ethic embraces this principle.

"I meet with the general manager once a week and we candidly share any issues we may have," Morse said. "Some of these issues can be resolved in five minutes, while others may take days or even weeks. But there's always open communication. I also let him know when I see someone doing a particularly good job and [who] is deserving of recognition."

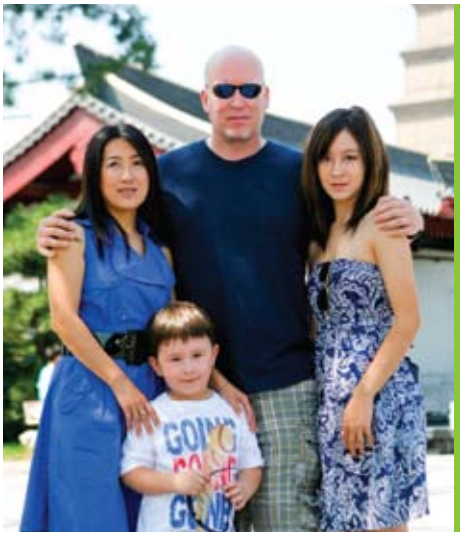
Morse said he is proud of the advancements XAIC has made, particularly in Lean manufacturing. Over the years the company has produced nearly 2,000 737 vertical tail fins.

Morse met Grace, his wife, in 1993, in downtown Xi'an. Two months later he moved on to an assignment in Indonesia, but they kept in touch. They were married in 1996 and moved back to Xi'an in 1997. They now have a daughter, Marlin, 12, and a son, Samuel, 4.

In Xi'an, they have frequent opportunities to visit Grace's family. They recently returned to the Seattle area on home leave and spent time in Morse's hometown outside of Seattle.

"I want my kids to understand and appreciate their unique American-Chinese heritage and hopefully become ambassadors for these two important countries in the future," he said.

– Bill Seil



"I want my kids to understand and appreciate their unique American-Chinese heritage and hopefully become ambassadors for these two important countries in the future."

– Steve Morse, Boeing site leader and liaison engineer, Xi'an Aircraft International Corp.

PHOTOS: (ABOVE) Steve Morse, Boeing's engineering liaison and site leader at the Xi'an Aircraft International Corp. plant, inspects a part in the 737 vertical fin assembly area. **(LEFT)** Morse (center) with his wife, Grace (left), daughter Marlin (right) and son Samuel. YANG BOWEN

Helping communities soar 飞翔

Boeing education projects excite students about math and science

To be successful in China, Boeing needs to see the nation not just as a promising market but also as a place to develop suppliers and invest in the country's people and their communities, according to David Wang, president of Boeing China.

Boeing Global Corporate Citizenship has stepped up its effort to demonstrate that, most notably with "Soaring with your dream," a technology and engineering-oriented school program launched in China a year ago.

Boeing worked with Chinese educational agencies to design a new aviation science curriculum to be used in 100 Beijing elementary schools this year, Wang said. The project could be expanded beyond Beijing in the coming years to other major cities in China.

Cao Yan, a science teacher at Dongguantou Primary School in Fengtai District of Beijing, is one of those teachers who went through the training course. A tutor to that school's model airplane club for the past eight years, Yan said the training has further advanced his aviation knowledge.

"Under the guidance of senior experts with years of experiences in the field, we learnt to make model planes, test and fly them. We are so happy to see the planes we made flying in the sky," Yan said in an appreciation letter to Boeing.

Wang said "Soaring with your dream" is just the latest of several education projects Boeing's been involved with in China over the past five years. In addition to helping the young people of this emerging country, the programs have raised Boeing's visibility in an important new market.

"This program is aligned with China's objectives and meets its education needs, while leveraging Boeing's strong reputation in aviation technology leadership and our sense of citizenship," Wang said.

The project also supports GCC's focus on education, which is one of five strategic focus areas that contribute to sustaining a community's well-being. The others are health and human services, arts and culture, civic awareness, and the environment.

"Investing in enhanced training opportunities for educators who work with children of all ages is one way that we can make a significant impact on how children learn and how they ultimately use their skills in the future," said Anne Roosevelt, vice president, GCC. "Our hope is that a positive early learning experience with programs such as 'Soaring with your dream' will translate into positive attitudes about applied learning; the pursuit of careers in math, science and technology; and an inspired community."

– Eric Fetters-Walp

PHOTOS: Captain Rici Johnson, a Boeing instructor pilot based in Beijing, joins Chinese school children tossing small wooden gliders during an event sponsored by Boeing Global Corporate Citizenship. WANG JIANHUA

Out of this **world**

Dazzling images showcase success of Boeing-supported Hubble Space Telescope upgrade

NGC **6302**

By Ed Memi
Photos by NASA

They say a picture is worth a thousand words, but recent images from the upgraded Hubble Space Telescope elicit just one: Wow.

Stunning new images released last month, including one of butterfly-shaped galaxies far, far away, would not have been possible but for the work of Boeing teams.

Boeing was responsible for readying Hubble's new instruments for launch on the recent—and final—space shuttle servicing mission to the 19-year-old space telescope. As the primary payload integrator for the STS-125 shuttle mission in May, Boeing provided the engineering analysis and support for the complex Hubble payload. It also oversaw installation of a network of power, cooling, mechanical and data interfaces in

PHOTO: NASA's Hubble Space Telescope captured NGC 6302, a butterfly-shaped nebula, 3,800 light-years from Earth. The delicate wings are actually roiling cauldrons of gas at more than 36,000 degrees Fahrenheit (20,000 degrees Celsius).

Markarian **817**

the space shuttle's payload bay. In processing the payload for launch, Boeing also had to meet ultra-clean room requirements to safeguard the delicate instruments from even the smallest contaminants.

As a major subcontractor to the shuttle's operations contractor, Boeing also provided extensive engineering support for Shuttle *Atlantis* during the servicing mission, which featured five lengthy back-to-back spacewalks to repair and upgrade the telescope.

NASA says the new instruments are functioning properly, and the recent images clearly show the telescope's enhanced capabilities. The repairs should prolong the life of the telescope to at least 2014.

PHOTO: Rings of blue stars encircle the bright, active core of the Markarian 817 spiral galaxy. Star-forming regions and dark bands of interstellar dust appear along its spiral arms.

Boeing lead cargo integration engineer Charlene Miller, who has worked on three of the five Hubble servicing missions, had the task of ensuring the many electrical, data and mechanical connections were tested and worked properly. "When I look at any of the pictures from Hubble, I have this feeling I was a part of that whole effort and it just makes me very proud."

Next, Hubble will tackle a range of observations. These include taking a census of the population of Kuiper Belt objects residing at the fringe of our solar system, witnessing the birth of planets around other stars, and probing the composition and structure of the atmospheres of other worlds. ■

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‘Culture of inno

PHOTO: Tony Dymarkowski of the IT Infrastructure Data Center Management Group (right), checks a floor opening with Alan Woolf, facilities engineer, Shared Services Group Site Services, at a Puget Sound–area data center. Using insulating pillows to reduce cooling air loss helps cut energy use. **MARIAN LOCKHART/BOEING**

/ation'

Green Teams help Boeing achieve environmental targets

By Bill Seil

It was clearly a mission for the Green Team—stop the escape of expensive cooled air at six U.S.-based Boeing computing data centers. In these centers, computer cabinets are placed on raised floors to allow wiring to run underneath. The space beneath the floor is also used to circulate cooled air, which rises from floor grates just below the intake vents on the computing equipment. But some of the cooled air was escaping through openings in the floor where cabling was routed.

The team's solution was a simple one: Block the openings with small, simple insulating pillows. According to Tony Dymarkowski of the IT Infrastructure's Data Center Management group, the Green Team member who coordinated the project, the installation of the floor pillows is expected to save approximately about 685,000 kilowatt-hours of electricity for cooling per year, or about $55,000 annually.

"We're seeing a growing Green Team 'culture of innovation.' Environmental best practices are beginning to spread from site to site, and Green Team leaders are extremely generous in sharing their learning with new teams and site leaders around Boeing."

That's how Mark Arvizu, senior manager for Boeing Environment, Health and Safety, characterizes some 25 employee-led Green Teams operating companywide.

Green Teams are groups of environmentally engaged Boeing employees. Working with the company's EHS organization and the Shared Services Group Conservation Initiative, these teams take on a variety of environment-oriented tasks—from Earth Day activities in their communities to recycling at their facilities. In some cases they are joining forces with Lean+ leaders to advance Lean practices, generating operational as well as environmental efficiencies. While most Green Teams are created to support a site, some support enterprisewide organizations.

Protecting Earth's environment is a priority at Boeing, and employee Green Teams, working with individual sites and programs, are playing a major role in keeping this commitment. In doing so, they are also making an important contribution to the business success of the company by reducing waste and increasing efficiency.

"Last year, there was a sense among employees that Boeing was getting more and more environmentally focused," Arvizu said. "With the economic downturn in the third and fourth quarters and the changing business environment, it became more important than ever that the Green Teams prioritize what they do and focus their time on projects with the most relevant impact."

Green Teams are increasingly taking on projects that help Boeing achieve its environmental improvement targets (see box on Page 28). These activities illustrate how employees understand business realities and see these conditions as an opportunity to demonstrate the value of responsible environmental practices.

MEASURABLE IMPACT

Indeed, the IT Infrastructure's "Environmentally Friendly IT Project" Green Team decided to pursue information technology improvements that would create a measurable business impact.

"We got started by gathering a group of employees and identifying a number of projects that were 'green' in nature," said Fred Hardy, project manager for this Green Team. "Then we eliminated the nebulous stuff and got down to a number of projects that, when implemented, would have a real, measurable impact on the company."

Given this team's work in computing systems, many of its ideas relate to increasing energy efficiency, which is one of the company's five-year environmental goals.

One recently completed project involved those six computing data centers and the escaping cooled air.

Other projects of the Environmentally Friendly IT Project in-

"Environmental best practices are beginning to spread from site to site, and Green Team leaders are extremely generous in sharing their learning with new teams and site leaders around Boeing."

– Mark Arvizu, senior manager for Boeing Environment, Health and Safety

"We got started by gathering a group of employees and identifying a number of projects that were 'green' in nature."

– Fred Hardy, Boeing project manager, Computing and Network Operations Green Team

clude upgrading to newer computing equipment with lower power utilization and higher processing power; stocking Enterprise Print Services printers with paper that's 30 percent recycled; conducting power management evaluations of servers; and other projects related to energy efficiency and recycling. Combined, the efforts of this Green Team are expected to generate $1.6 million in savings in 2010.

CONSERVATION TAKING ROOT

Environmental improvements are taking place in production facilities as well. At the Commercial Airplanes site in Auburn, Wash., a Green Team has been formed in the Boeing Fabrication Machining and Emergent Operations area. One project involves finding the right balance of trash containers and recycling bins to encourage employees to dispose of waste in the most environmentally responsible way.

Another team project involves working with Lean manufacturing personnel to install more energy-efficient ovens for accelerating the cure of sealant used in bonding during assembly. The goal is to use ovens that are the right size for the parts being cured, equipped with timers to shut them off when the curing process is complete.

"It's really exciting seeing people on the shop floor who are so interested in environmental topics," said Tessa Higgins, Auburn site environmental scientist. "Some of them are motivated to make big changes."

And in El Segundo, Calif., one of the first Green Teams, organized in one building in early 2008, now promotes environmental activity throughout the entire site.

"Our goal was to make it a grassroots effort, where employees could take ownership of projects to help make Boeing greener," said Matt Robinson, an electrophysics engineer in the Space and Intelligence Systems business of Integrated Defense Systems. "We particularly wanted win-win ideas that would improve both the environment and Boeing's business position."

In February, the El Segundo Green Team held an electronic waste (e-waste) event where employees brought in old personal electronic equipment for recycling. The team also has planted a drought-tolerant garden at the site and it plans to work with the site energy focal to get employees more involved in energy conservation.

LEAN, GREEN SYNERGY

The need to better align environmental programs with the company's overall business goals has led to a closer relationship with Lean+.

"Environmental and lean activities don't stand alone," said Leslie York, director of Environment, Health and Safety for IDS. "Cost, quality and productivity improvements can benefit both the business and the environment. In the current business climate, we need to make sure our environmental priorities are relevant to the overall success of the company."

This year, IDS incorporated environmental elements in its Lean manufacturing assessment, York said. The assessment now includes such factors as energy use, recycling and the handling of hazardous material. Results from the assessments will be used to make improvements. One example is evaluating the use of reusable

PHOTO: (TOP) Employees at Commercial Airplanes' Auburn Machining and Emergent Operations organization, in Auburn, Wash., test a mock-up of a future seal dryer that will save time and energy. In the foreground, from left, are Gordon Little, electrical technician, and John Ferrieri, material and process technology. Standing in the background are, from left, Steve Burke, mechanic; and Michael Dilger and Don Zueger, spar assembly mechanics. MARIAN LOCKHART/BOEING **(RIGHT)** Show Me Green Team members Erin Flaschar (left), support coordinator, and Rich Hill, supply chain management analyst, toss plastic into a recycling container at Boeing's St. Louis site. RON BOOKOUT/BOEING

Green Teams at work

Employee Green Teams at Boeing—groups of environmentally engaged Boeing employees—typically focus on areas such as developing environmentally innovative products and services; manufacturing or business process improvements; conservation of energy and resources, recycling, reduction of waste and source reduction strategies; and environmental projects that better their communities.

Although most Green Teams are based at individual sites, some support Boeing organizations that operate across the enterprise. To learn more about Green Teams, or locate a team at your site, visit the online Environment Information Center at http://ehs.web.boeing.com/enviro on the Boeing intranet.

"It's really exciting seeing people on the shop floor who are so interested in environmental topics."

– Tessa Higgins, Auburn, Wash., site environmental scientist

containers to avoid labor intensive packing and unpacking of parts. In addition to saving time and work, the containers reduce the need for packing materials.

Boeing also is incorporating environment considerations along with traditional metrics such as cycle time, lead time, safety and ergonomics in Accelerated Improvement Workshops. Full implementation is expected this fall.

GREEN COLLABORATION

Green Teams are grouped at Boeing sites across the United States. But thanks to virtual—and green—meetings, they can exchange ideas and find new volunteers.

Earlier this year, Boeing's EHS organization launched Green Team Reviews, quarterly WebEx sessions that include EHS news updates and presentations by individual Green Teams.

"The Green Team Review is a very positive, collaborative forum for Green Teams to share their creativity and their desire to make improvements both within and outside their four walls," said Cheryl Fievet, a member of Boeing's Employee Advisory Council and the St. Louis–based Boeing Employees for Environmental Protection Green Team. She served as the employee moderator during the first two quarterly reviews of 2009.

The July 31 Green Team Review included presentations by the 2-122 Green Team, based in Seattle, and Boeing Employees for Environmental Stewardship, based in Everett, Wash. (For information on participating in a Green Team Review—or any other aspect of Green Teams—visit the Environment Information Center at http://ehs.web.boeing.com/enviro on the Boeing intranet.)

At the end of each review, Fievet, an industrial engineer on the F-15 flight line in St. Louis, cites what she calls the "three P's": passion, patience and perseverance. "If you want to do anything about the environment, you have to have all three," she said. ■

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Target-rich environment

Boeing is pursuing aggressive targets for improvements in energy efficiency and recycling rates, as well as reductions in greenhouse gas emissions intensity and hazardous waste, from 2008 to 2012.

- **25 percent increase in energy efficiency**
- **25 percent increase in recycling rates of solid waste**
- **25 percent reduction of hazardous waste per dollar of revenue**
- **25 percent reduction in greenhouse gas emissions intensity**

PHOTO: Marvin Knoblauch (left) and Fausto Ochoa help forklift driver Steve Knoblauch stack reusable materials at the Everett, Wash., Interiors Responsibility Center. GAIL HANUSA/BOEING

By the numbers

Green Teams across the company are helping Boeing facilities improve their environmental performance. Here's a sample of the many achievements these teams have helped lead.

85 tons (77 metric tons) of paper recycled by Boeing's Huntsville, Ala., site in 2008

56 tons (51 metric tons) of items reused and not put into landfills in 2008 and year-to-date in 2009 at Commercial Airplanes' Interiors Responsibility Center in Everett, Wash.

15 percentage reduction in electricity use at the Boeing-SVS facility in Albuquerque, N.M., from December 2008 through June 2009, compared with the same period a year earlier (Boeing-SVS is part of Laser and Electro-Optical Systems)

10,820 pounds (4,900 kilograms) of unwanted personal consumer electronic equipment collected at a Long Beach, Calif., electronics recycling event organized by that site's Green Team (the equipment was recycled by a third-party company)

147,080 pounds (66,700 kilograms) of cardboard collected in St. Louis and St. Charles, Mo., from January through July 2009; Green Teams at both locations started and continue to maintain recycling programs for cardboard, beverage containers and plastic wrap

PHOTO: Scott Lowry, Green Team leader and electrical technician for F-15 Long Term Fleet Wire Assembly in Mesa, Ariz., is pictured here among spools that are now being recycled. After a three-month search for a plastics recycler, these spools are no longer going to the landfill.
MIKE GOETTINGS/BOEING

A tale goes on as another ends

Recent wind-tunnel tests of the X-48C blended wing body demonstrator were noteworthy for more than just the data that will help prepare this research aircraft for its first flight

By Junu Kim

A Boeing Research & Technology team working at a NASA wind tunnel recently finished a series of aerodynamic tests that were significant for more than just the results.

This effort generated data that will help the Boeing-NASA X-48 team prepare for flight tests of the X-48C blended wing body (BWB) research aircraft, designed to burn less fuel and make less noise than not only conventional airplanes but also its predecessor—the X-48B. It also marked the last tests conducted in the historic wind tunnel at NASA's Langley Research Center in Virginia.

"Our tests in the wind tunnel at NASA Langley were aimed at helping us better understand and quantify the aerodynamics of the new vehicle," said Dharmendra Patel, X-48C project manager with BR&T. "That is a crucial step in order to safely and efficiently conduct the flight-test program next year."

The X-48C is a modified version of the Boeing X-48B demonstrator, which Boeing and NASA have flown more than 60 times since 2007 to demonstrate the flight qualities offered by the larger lifting surface of the BWB compared to traditional airplane designs. The top- and rear- mounted engines of the BWB are also designed to reduce noise, although that has not been part of the X-48B testing.

But reduced noise and fuel consumption will be part of X-48C testing, which is why Boeing and NASA have replaced the winglets and three engines mounted on the rear of the X-48B with only two engines mounted slightly forward of the rear and flanked by twin canted fins.

"Our goal with the X-48C is to investigate the low-noise properties of the BWB concept while retaining the flight qualities that have been demonstrated with the X-48B," Patel said.

X-48C flight testing is expected to begin next year at NASA's Dryden Flight Research Center in California.

The X-48 airplanes, which have a 21-foot (6.4-meter) wingspan and weigh 500 pounds (227 kilograms), are 8.5 percent scale models of a heavy-lift, subsonic airplane with a 240-foot (73-meter) wingspan that the Phantom Works organization of Integrated Defense Systems believes could be developed in the next 15 to 20 years for military cargo applications.

The X-48C test program also represented the final tests to take place at NASA Langley, a fabled site in aerospace history. Built in 1930, the 30-foot-by-60-foot (9.1-by-18.3-meter) tunnel has hosted tests of vehicles including World War II fighters, submarines, the Mercury space capsule and concepts for a supersonic transport.

"For those of us on the test, it is a bittersweet moment," Patel wrote in a note to colleagues as the test program drew to a close. "After the aircraft has been removed from the test section, we will measure the wind-on-strut effects. This will be the last piece of data recorded at the Langley Full Scale Tunnel. It has been a great privilege for us to be a part of its 78-year history of service in advancing aviation." ■

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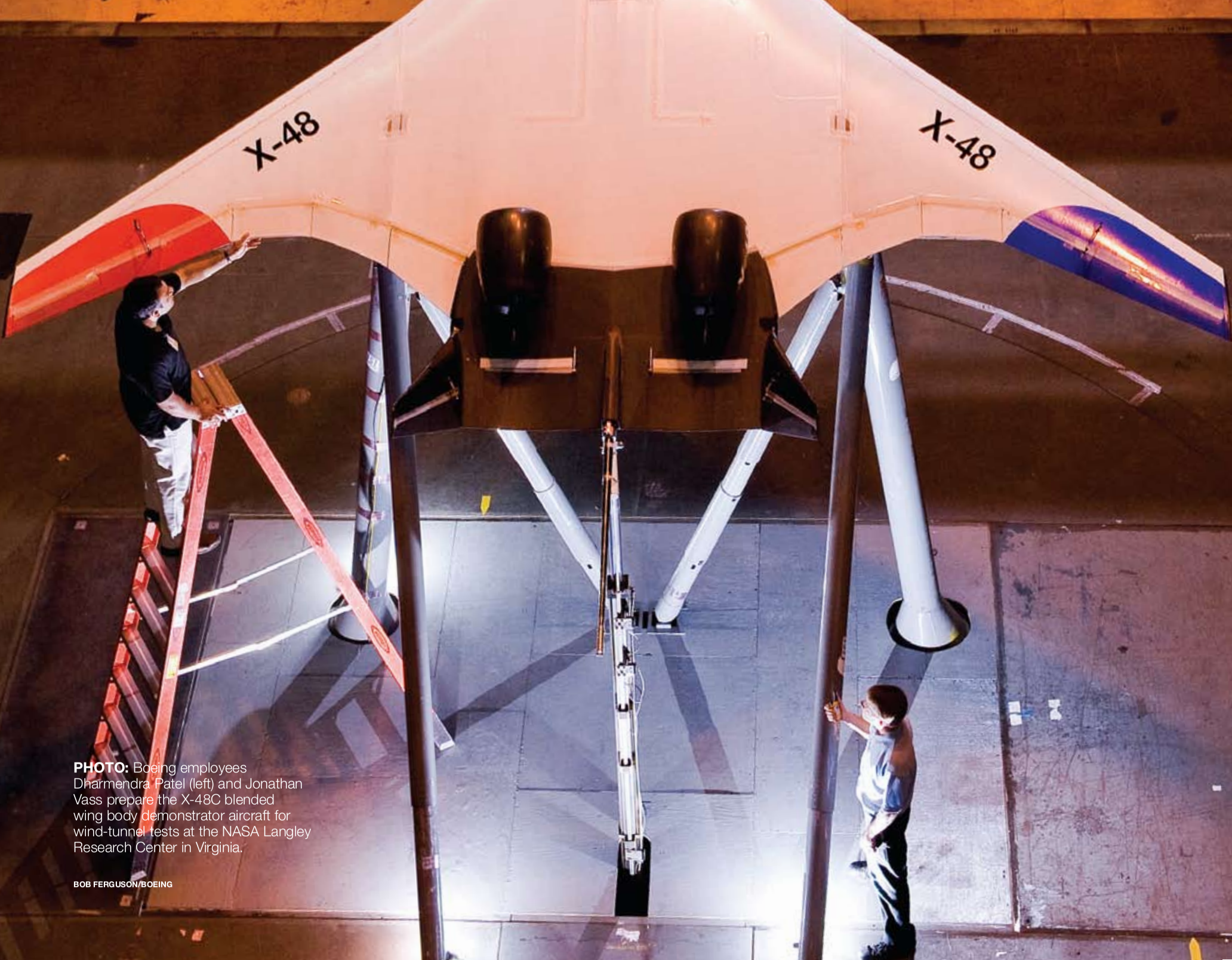

PHOTO: Boeing employees Dharmendra Patel (left) and Jonathan Vass prepare the X-48C blended wing body demonstrator aircraft for wind-tunnel tests at the NASA Langley Research Center in Virginia.

BOB FERGUSON/BOEING

Early birds

Boeing's support for learning in the early years helps prepare kids for school—and life

PHOTO: Boeing Global Corporate Citizenship endorses programs such as the Family and Child Education Center in Diyarbakir, Turkey. MOTHER CHILD EDUCATION FOUNDATION

(RIGHT) To inspire early learning, Boeing supports the "Sid the Science Kid" TV series. TM & © 2008 THE JIM HENSON CO.

In this ongoing Lifecycle of Learning series, *Boeing Frontiers* explores how Boeing, itself a continuous learning organization, collaborates with primary and secondary schools, institutions of higher education, and government, industry and community organizations to promote and guide learning over a lifetime. In this issue, *Frontiers* focuses on nurturing development and learning during the early childhood years—in children around the globe.

By Eric Fetters-Walp

Working together to accomplish tasks and creating effective learning habits are skills that serve people well from the earliest days of school and throughout a career.

That's why Boeing's support for lifelong learning efforts includes programs that help children well before they set foot in a classroom. Childhood development specialists and educators have come to recognize how crucial those early years are for future success.

"Really, the first three years of life is when all the brain development happens—when you learn and develop things like trust, relationships and learning habits," said HyeSook Chung, Early Care and Education Program officer for the Washington (D.C.) Area Women's Foundation, which receives support from Boeing.

Making sure children are ready to learn by the time they reach kindergarten requires plenty of help from any parent. For families facing financial difficulties or other added challenges, having the time or skills to do that can be doubly tough. Joyce Walters, who directs Education and Workforce Initiatives for Boeing Global Corporate Citizenship, said that's why Boeing has turned its focus toward early education efforts in the past eight years.

"This ensures that children aren't watching TV alone but rather the adults in their lives are engaged in helping nurture their natural creativity, curiosity and exploration."

– Joyce Walters, Education and Workforce Initiatives, Global Corporate Citizenship

"So many children are showing up one, two, three years behind their peers when they are starting kindergarten," Walters said. "We wanted to address that issue by providing support for parents and others who are caring for young children, so they can maximize the learning opportunities in the early years to help get kids ready for school and for life."

SMALL SCREEN, BIG IMPACT

Perhaps the most visible symbol of Boeing's commitment to helping young children learn is its support of "Sid the Science Kid," an animated series starring Sid, a preschooler who possesses a great helping of the natural enthusiasm for learning.

"Sid the Science Kid" launched in fall 2008 on PBS television stations across the United States. Boeing is one of two major supporters of the program, which is produced by KCET-TV in Los Angeles and The Jim Henson Co.

"The show is a science-readiness program for preschoolers and kindergartners that celebrates the natural curiosity of that age range and gets them excited about science and science learning," said Lisa Henson, chief executive officer of The Jim Henson Co. "We were very excited that immediately upon launch, this new show connected strongly with kids. We have had excellent ratings and good feedback from both parents and kids."

Henson said the show's elements, which include live-action segments with real kids at school doing simple experiments, are designed to reinforce that science can be understandable for young children—and their parents, who themselves may not always feel knowledgeable about science. That ability of the show to engage parents and caregivers is the main reason Boeing is sponsoring the program, Walters said.

"This ensures that children aren't watching TV alone but rather the adults in their lives are engaged in helping nurture their natural creativity, curiosity and exploration," Walters said. "The research indicates adults who watch the show with young children were more confident with science content and reported increased comfort and interest in engaging in science activities with their pre-school-aged children."

The series already is airing around the world in countries including Mexico, Brazil and Canada, with more international premieres expected in the next year.

Additionally, PBS affiliates are leading workshops that expand on the show's curriculum—Preschool Pathways to Science—for parents, caregivers and preschool educators around the United States.

PROMOTING SYSTEM CHANGE

Boeing GCC also is backing local programs that aim to spark learning in young children. One example is the Early Care and Education Funders Collaborative in the greater Washington, D.C., area.

In 2008, Boeing, PNC Bank and a number of charitable foundations dedicated a multimillion-dollar fund to improve early childhood education in the region around the U.S. capital. The collaborative fund is managed by the Washington Area Women's Foundation.

With the new fund, 40 percent of Boeing's 2008 charitable giving in the Washington, D.C., area was focused on early education efforts, up from 12 percent two years earlier. That large increase was enough to get others interested in early learning, said Dale Rainville, Community and Education Relations focal for GCC.

"There was really an opportunity to bring attention to this," Rainville said. "So far, in that way, it's worked, but there's much more we hope to do."

Chung, of the Washington Area Women's Foundation, said help with early learning readiness is a big need among low-income families, especially those headed by single mothers. The commitment of backers such as Boeing, along with more research into early learning, helped create momentum to expand such programs, she said.

The Early Care and Education Funders Collaborative has ambitious goals to improve early childhood education (including increasing the size and stability of such programs in the Washington, D.C., region) and to help early education organizations better use their resources. It hopes to encourage systemic changes in early care and education programs to make lasting improvements, Chung said.

INVESTING IN THE FUTURE

Companies are realizing that such efforts aren't just part of being a good corporate citizen. Children who start off on the right foot in the early years of school are more likely to become promising employees in the next generation. "I think that whole work force approach has helped industry understand the importance of this," Chung said.

Around Chicago, home to Boeing's corporate headquarters, the company is nurturing early education in several ways. Through GCC, Boeing is building the early learning field by supporting the Erikson Institute, a national leader in child development.

Boeing also is a lead partner training a new generation of experts in that field through the Illinois Early Childhood Fellowship, which gives a diverse population of emerging leaders firsthand experience in early childhood advocacy and related public policy through two-year fellowships with qualified nonprofit organizations in Illinois.

"Innovative and creative leadership is critical to any field, including early learning," said Nora Moreno Cargie, director of GCC programs in Chicago. "Both the Erikson Institute and this fellowship honor the idea that strong leaders are critical to the success of our children."

"Innovative and creative leadership is critical to any field, including early learning."

– Nora Moreno Cargie, director of Boeing Global Corporate Citizenship programs, Chicago

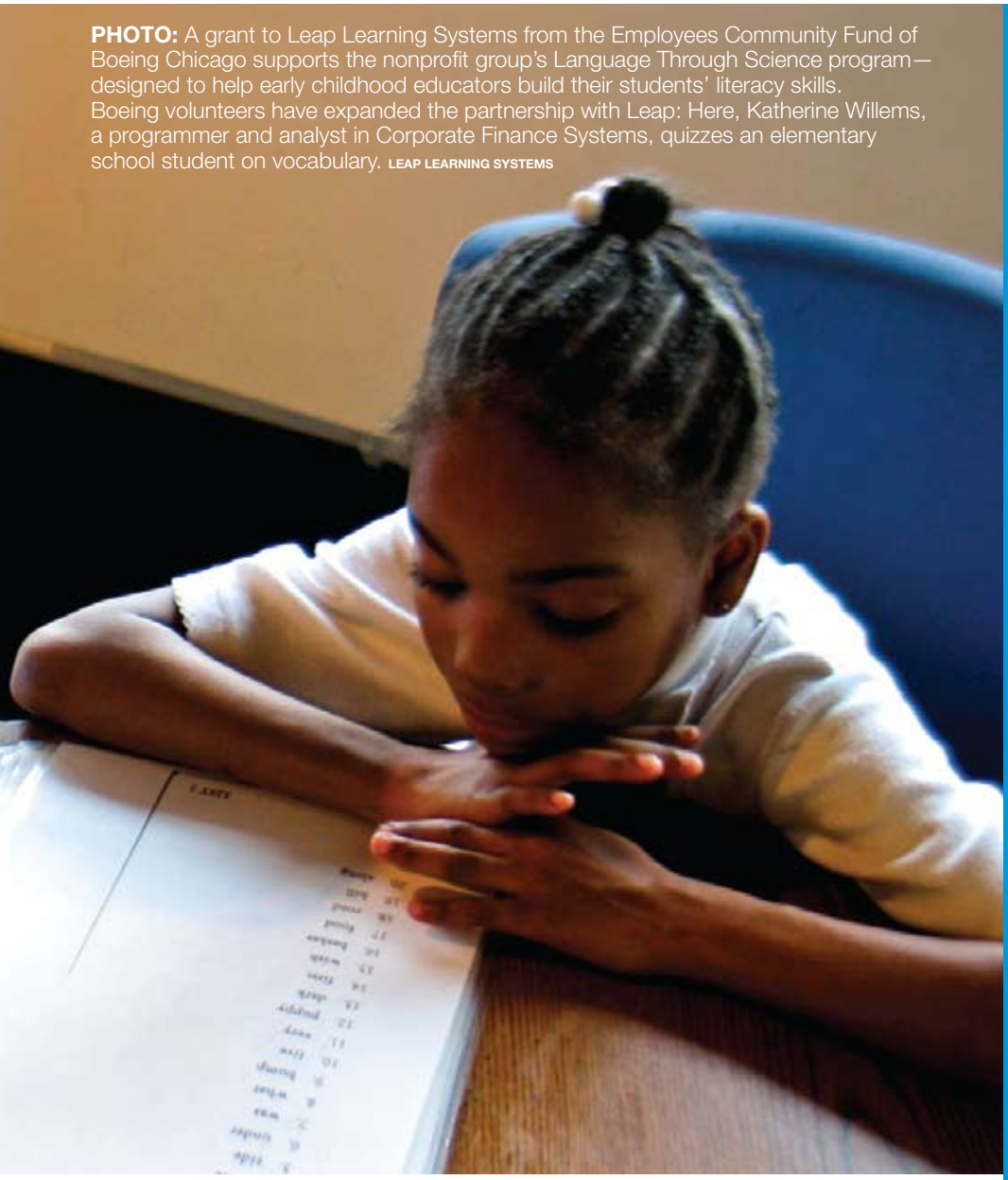

PHOTO: A grant to Leap Learning Systems from the Employees Community Fund of Boeing Chicago supports the nonprofit group's Language Through Science program—designed to help early childhood educators build their students' literacy skills. Boeing volunteers have expanded the partnership with Leap: Here, Katherine Willems, a programmer and analyst in Corporate Finance Systems, quizzes an elementary school student on vocabulary. LEAP LEARNING SYSTEMS

GLOBAL REACH

Boeing's support of early education programs extends overseas as well. In Turkey, the company is supporting the Family and Child Education Center in Diyarbakir. Located in the nation's rural southeastern region, the center's preschool program aims to improve readiness for learning math, literacy and language skills in 5- and 6-year-olds.

The center also holds meetings with fathers to make them more aware of their role in their children's development. A support program for mothers touches on parent-child relationships, nutrition, hygiene and other vital topics.

"An equal opportunity in education, especially in disadvantaged areas, must be created for all individuals," said Greg Pepin, president of Boeing Turkey. "This program strives to accomplish this objective."

Walters added that from the many nations in which Boeing has a presence, lessons can be learned on innovative ways to prepare children for a life of learning. "When you nurture children's imagination and curiosity, they can do amazing things," she said. "And that's exactly what our company is about—building amazing things that others can only dream about." ■

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Early learning

Parents are the most important teachers their children will ever have

Child development experts and educators now recognize that the first six years of a child's life set the stage for success in school and beyond.

"I see tangible business and societal value stemming from educational investments in early childhood," said Rick Stephens, senior vice president of Human Resources and Administration. "Accordingly, Boeing is shifting some of its educational monies to expand our impact in this area."

Stephens challenged parents of young children "to take an active role in creating an environment that nurtures learning and creativity. Parents are the key to helping children reach their full potential," he said.

The Institutes for the Achievement of Human Potential, a nonprofit educational organization, agrees. It teaches parents how to enhance child development because its experience indicates that "parents are the most important teachers that their children will ever have."

"Early learning is a part of our emphasis on lifelong learning, which starts at birth and continues through one's senior years," Stephens said. "It is also the first step in ensuring that we have a work force that allows us to remain competitive."

For more information, visit The Institute for the Achievement of Human Potential online at www.iahp.org

Simple as...

New technique removes complexity and saves millions

By Elaine Brabant
Photos by Marian Lockhart

The Boeing Company has done it for nearly a century. And very successfully. But developing a new airplane remains an enormously complex task.

Now, a new tool in Boeing's how-to arsenal is making that task a little simpler. It's known as Lean+ 10X. The concept is so basic it might be easily dismissed in the complex aerospace environment: Prioritize work and complete tasks without interruption.

"It's a notion that's surprisingly simple, but counterintuitive," said Charles Toups, vice president of Engineering and Mission Assurance for Boeing Integrated Defense Systems. "To go faster, with higher quality, you want to limit the number of tasks you are working on at any given time. We tend to think getting everything started is the fastest way to finish, but we end up with too many different tasks at once and actually go slower."

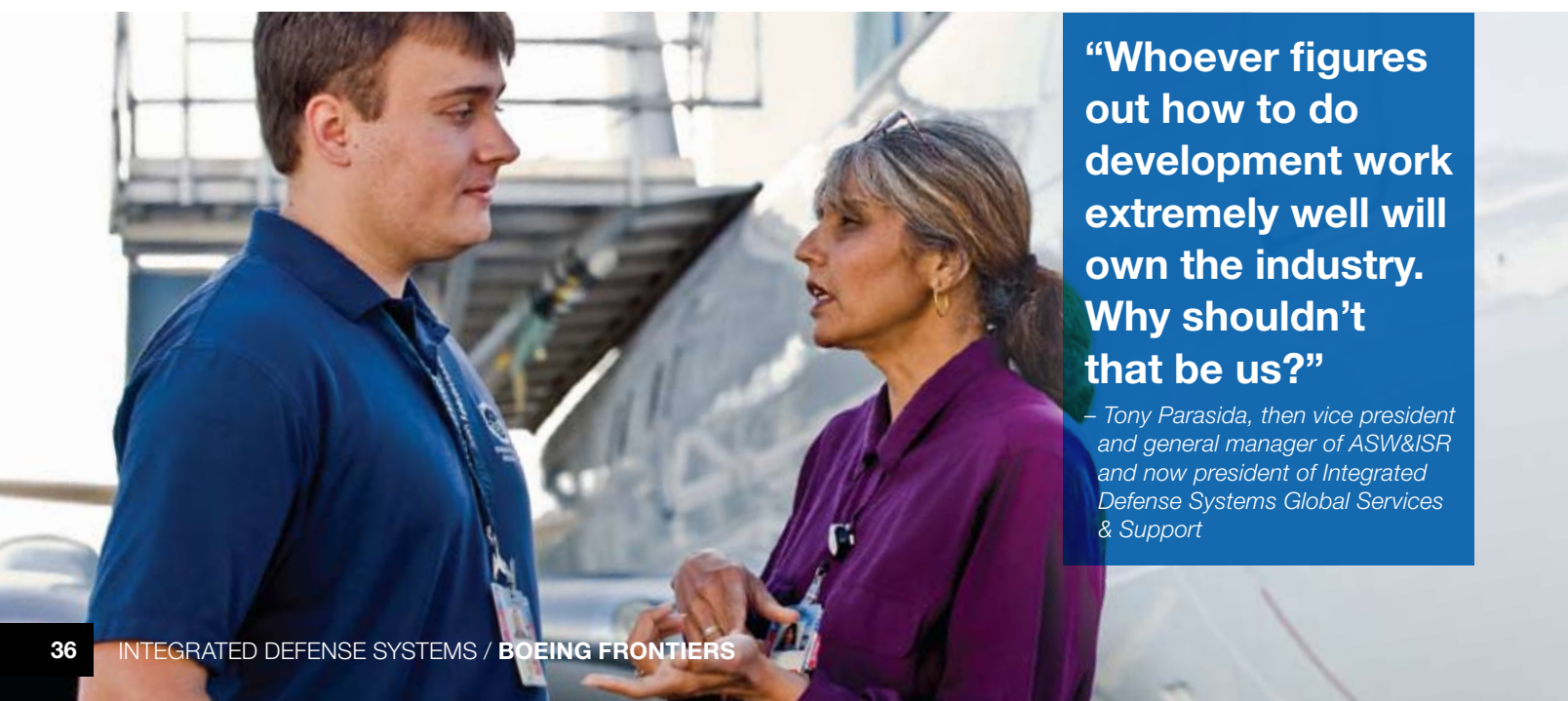
Introduced last fall by Toups' unit, Lean+ 10X is already paying rewards on programs such as the P-8A Poseidon for the U.S. Navy and the Airborne Early Warning & Control (AEW&C) system planes for international customers.

"Whoever figures out how to do development work extremely well will own the industry. Why shouldn't that be us?" said Tony Parasida, then vice president and general manager of Airborne Anti-Submarine Warfare & Intelligence, Surveillance and Reconnaissance Systems (ASW&ISR), the division leading the P-8A and AEW&C programs, and now president of IDS Global Services & Support.

A plane is an incredibly complex system composed of thousands of subsystems, many of them highly complex, which must function flawlessly and be able to work with one another. To that challenge add a fiercely competitive business environment. Customers are focused on affordability, and contractors are under pressure to be even more competitive. Customers hold them accountable with tough penalties for not meeting commitments.

Although these challenges aren't likely to disappear, Boeing leaders agree that the company—in fact, the entire aerospace industry—must become more nimble and responsive in the development stage of products.

That's where Lean+10X has entered the picture. Parasida



"Whoever figures out how to do development work extremely well will own the industry. Why shouldn't that be us?"

– Tony Parasida, then vice president and general manager of ASW&ISR and now president of Integrated Defense Systems Global Services & Support

7 disciplines of Lean+ 10X

- Establish clear priorities.
- Eliminate bad multitasking—focus and finish.
- Limit the release of work in process to deliver earlier (i.e., limit the amount that is processed at one time).
- Prepare—start to finish.
- Use checklists to prevent defects and "traveled risk" (mistakes or incomplete work passed on to the next workstation, which can cause problems later).
- Face into and resolve issues quickly.
- Drive daily execution.

Visit *http://10x.ids.web.boeing.com/index.aspx?com=102&id=1* on the Boeing intranet for more information.

has embraced Lean+ 10X to rapidly bring about change in ASW&ISR aircraft development programs. "It will help us perform better than plan and get the job done better, faster and less expensively," he said.

For example, an ASW&ISR team received the okay from the customer to delay development of a subsystem for Korea's AEW&C planes until similar work had been completed on Australia's aircraft. One team focused exclusively on building the Australian customer's subsystem. After completing the job, the team used what was learned to quickly build the Korean subsystem, with necessary tailoring. By performing the jobs sequentially, rather than simultaneously, the team avoiding spending $50 million.

Parasida believes Lean+ 10X can be adopted at every level of the organization, not just in the factory.

Conrad Ball, ASW&ISR chief engineer, agrees and encourages teams, whatever their size or work type, to look at their entire work statement—not just a piece of it—and start applying Lean+ 10X.

"There isn't a team that can't apply the concept," Ball said. "It's that simple. No matter what our core skill, we need to realize that the development of new products involves everyone from the inventor to factory-line workers to office personnel. Each of us must think like businesspeople in everything that we do. Lean+10X is a small step toward that goal."

But a big step toward securing Boeing's future, according to Parasida.

"Shorter but more productive development cycles, bidding confidently and accurately on more competitive programs—that's the ultimate goal," Parasida said. "That's when we can say we've been successful." ■

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PHOTOS: (LEFT) Using Lean+ 10X techniques to prioritize work and limit interruptions, test engineers Chris Dangelo (left), Rekha Rabadia and the Wedgetail Integrated Test Team for mission-computing software have significantly improved the quality and speed of airplane software tests. **(ABOVE)** Josh Sting, leader of the Wedgetail Integrated Test Team for mission-computing software, monitors team work assignments to prevent task overload.

We beat work overload … and thrived

How an Integrated Defense Systems test team ramped up production—by slowing down

The picture wasn't pretty.

Last spring, our team, responsible for one-third of the Wedgetail program's test activities, was overwhelmed. There was too much work, too many errors and not enough time. With priorities constantly changing, we could barely start one task without being interrupted with another.

But in one week, we transformed the way we operate.

How? By slowing down, using Lean+ 10X as our guide. In doing less, we actually ended up accomplishing more.

Our customer, the Royal Australian Air Force, is scheduled to receive its first two Wedgetail aircraft next month. These are 737s modified as Airborne Early Warning & Control system platforms. Our team, the Wedgetail Integrated Test Team for mission-computing software, ensures the aircraft's mission-computing software functions correctly and completely. This is critical, as this software can be considered the "brain" of the operation and controls every other subsystem on the aircraft.

Testing is a thorough process that requires documentation at every step. Our team writes and validates the test procedures. Then we conduct tests in the air, on the ground or at simulators. Finally, we report our findings.

This last step is where we found

(Continued on Page 38)

While we expected the Lean+ 10X changes would bring improvement, we were surprised by how much and how quickly. *– Wedgetail Integrated Test Team*

ourselves with more reports to complete than we could handle. Plus, our customer, who reviews our documents, was returning reports due to quality issues. It was clear we had to improve the report process.

As we explored Lean+ 10X in just one hour of training, we realized that to get the greatest benefit we needed to focus not just on the reports but on our entire work statement.

Per the Lean+ 10X disciplines (see Page 37), we first established clear priorities. Previously, when groups we do not support asked for help we felt compelled to respond, even if it took us away from our primary duties. But with management's help, we provided training to these groups that improved efficiency for all involved.

Next, we prioritized work that was within our scope. We created a simple electronic queue to stage and assign tasks by priority. Now, no team member works more than a few tasks at one time. We also created checklists to prevent common mistakes.

The most difficult part of the Lean+ 10X journey was finding a way to measure throughput. A mentor suggested weighting tasks based on difficulty. Using this system, we now balance workload between team members and can more accurately measure completed work.

While we expected the Lean+ 10X changes would bring improvement, we were surprised by how much and how quickly. Within one week we saw a 50 percent improvement in throughput and an immediate reduction in quality errors. Within four months, throughput improved 100 percent, and quality increased 75 percent.

Our team leaders play important roles in maintaining the new process. They monitor work to ensure the right priorities are being addressed. And by carefully controlling the work flow, they allow us to focus on our jobs without interruption.

Now we are getting more done in a shorter time. Our accuracy has improved dramatically. And, while schedule and resource pressures are still high, we are better positioned to respond to challenges and execute on plan. Also, having clear priorities and being able to work without interruption has greatly improved team morale.

– Wedgetail Integrated Test Team

PHOTO: Heidi Harwood, Wedgetail Integrated Test Team sub-lead, along with test engineers Tom Wolford (center) and Jon Hamilton and their team, have improved speed and quality using Lean+ 10X.

Sights on cyber

By Michelle Roby and Jenna McMullin
Photos by Fred Troilo

Boeing division takes on cybersecurity

In the movie *Hackers*, amateur and professional computer hackers crash thousands of systems, influence a significant drop in the New York Stock Exchange and discover a computer virus that threatens to put a global oil company on the brink of ecological disaster.

The movie, which came out nearly 15 years ago, was way ahead of its time. Today, computer networks and systems are an attractive target for rogue "coders," or hackers, who seek to disrupt operations, shut down systems or cripple information-sharing. The more valuable the information or more critical the asset, the greater the risk—if hackers can access it—to a nation's economic prosperity and national security.

Some have described the cyber threat as an emerging adversary.

"In short, America's economic prosperity in the 21st century will depend on cybersecurity. … For all these reasons, it's now clear this cyber threat is one of the most serious economic and national security challenges we face as a nation," President Barack Obama stated in May in conjunction with the release of a White House Cyber Policy Review.

Current events show the cyber threat already is very serious. For example, several South Korean Web sites were attacked in July, bringing much of the country's network traffic to a halt. At a Cyberspace Symposium in April, U.S. Army Brig. Gen. John Davis, deputy commander of Joint Task Force Global Network Operations, said: "In the last six months we spent more than $100 million reacting to things on our networks after the fact. It would be nice to spend that money proactively to put things in place so we'd be more active and proactive in posture rather than cleaning up after."

Realizing the urgency of the threat and the importance of supporting and protecting customer missions, Boeing is working to design solutions in the cybersecurity arena.

> "Our military and government customers have stated that protecting vital information networks against cyberattacks is one of the nation's highest priorities, and Boeing is responding to the call."
>
> *– Jim Albaugh, then president and CEO of Integrated Defense Systems and now president and CEO of Commercial Airplanes*

PHOTO: Integrated Defense Systems' Cyber and Information Solutions organization integrates real-time network situational awareness with tools to identify and respond to threats, as shown in this command center scenario.

"Our military and government customers have stated that protecting vital information networks against cyberattacks is one of the nation's highest priorities, and Boeing is responding to the call," said Jim Albaugh, at the time president and CEO of Integrated Defense Systems and now president and CEO of Commercial Airplanes.

Specifically, Boeing Intelligence and Security Systems (I&SS) formed its Cyber and Information Solutions organization last year to develop and integrate comprehensive cybersecurity capabilities.

The new division designs, integrates and operates cyber defense solutions on U.S. Department of Defense and other government agency platforms and networks. The organization also provides analysis and operational support to cyber networks around the world through a suite of interactive tools and services.

Boeing's own networks are also a focus. "Our ongoing priority—given the size and activity across our internal and external networks, with more than 2 million logins each month on our external business network alone—is to develop improved capabilities for protecting those networks," said Steve Oswald, I&SS vice president and general manager.

"Cybersecurity is everyone's business," said Barbara Fast, vice president of Cyber and Information Solutions. "It's an economic and national security issue for both the U.S. and the rest of the world. Government and industry networks are only as strong as the weakest network link. Accordingly, Boeing is addressing these challenges with the art and science required to meet this type of threat."

Fast worked with industry leaders and the National Security and Homeland Security Councils in providing comprehensive recommendations on what aspects of cybersecurity the White House should consider as part of the U.S. national strategy. The 60-day review culminated in numerous recommendations; a key finding was the need for government-industry partnership, a need Cyber and Information Solutions stands ready to address.

"Innovation is key, and ensuring that companies large and small are able to freely innovate, hand in hand with government, will help mitigate and overcome this dynamic threat," Oswald said.

Still, Boeing faces tough competition in the cybersecurity market, including Lockheed Martin, Northrop Grumman and General Dynamics.

Acquisitions are vital in the company's strategy to expand its presence in the cyber and intelligence markets. Boeing's decision to acquire eXMeritus, announced in June, complements last year's acquisitions of Digital Receiver Technology, RavenWing and Kestrel Enterprises. eXMeritus products are certified and accredited by the U.S. government to secure networks on its most trusted systems.

"The addition of eXMeritus to our team is a strong enhancement to the Boeing capabilities developed through years of experience on secure networks for some of the most complex systems in national security today," Albaugh said. ■

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"Cybersecurity is everyone's business. It's an economic and national security issue for both the U.S. and the rest of the world."

– Barbara Fast, Boeing vice president of Cyber and Information Solutions

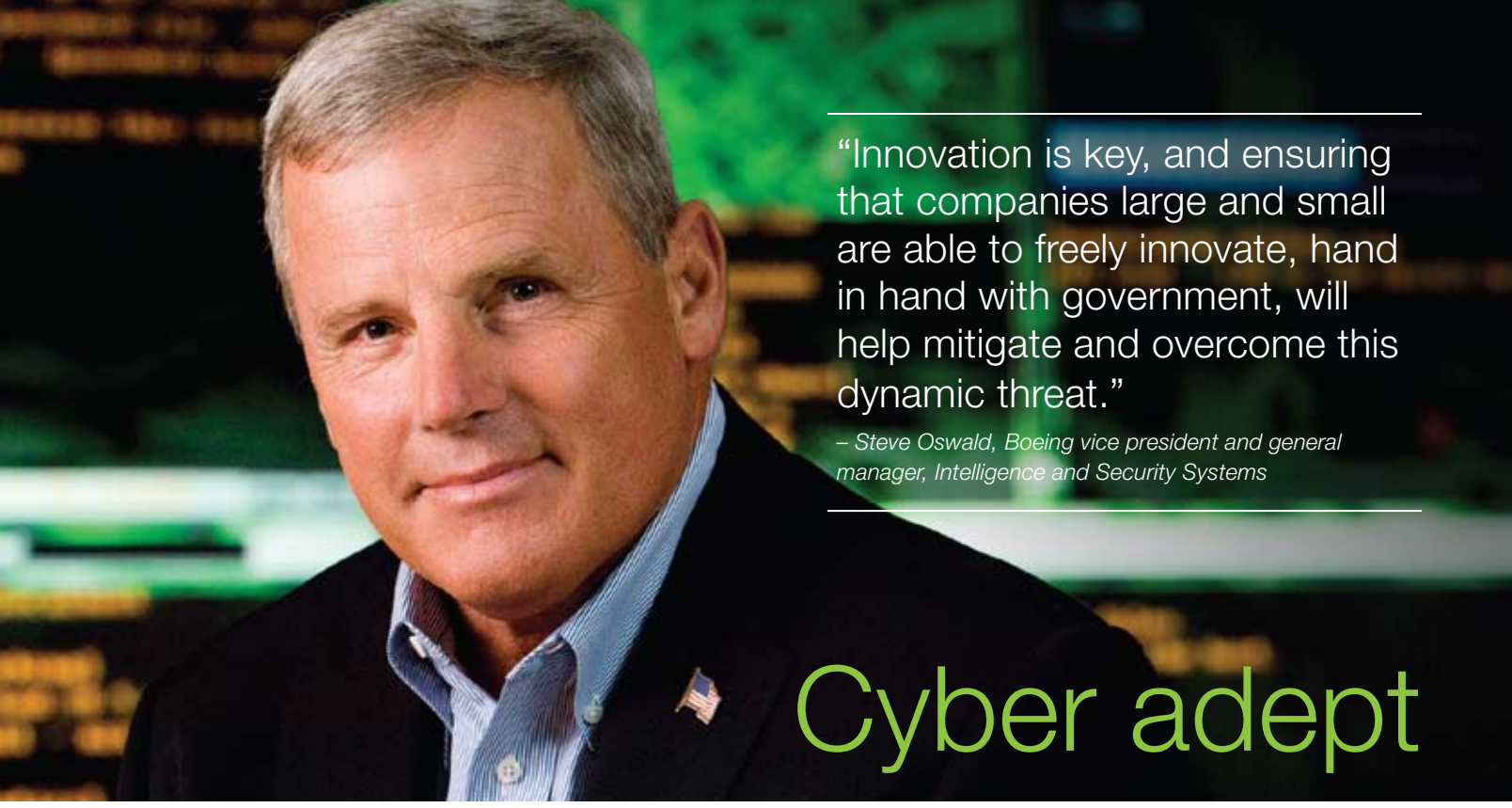
Cyber defenders

Cybersecurity curriculum changes almost as quickly as it's written. In addition to keeping technology up to pace with the threat, cybersecurity is a training challenge. To react quickly, the experts behind a network need substantial practice at detecting and foiling would-be hackers situated anywhere around the globe, and Boeing is doing its part to develop future cyber professionals.

In March, Boeing served as a key sponsor for the Western Regional Collegiate Cyber Defense Competition. The three-day event provided these up-and-coming experts the opportunity to address cyber challenges in a simulated environment, focusing on managing and protecting an existing commercial network infrastructure from intruders. Students tested their knowledge and skills as they worked with experts on developing protective measures to defend their networks. Boeing Technical Fellow Alan Greenberg helped judge the competition.

"These students did an outstanding job in learning how to defend their networks, and also in articulating their actions," he said. "Students like these are our future cyber defenders."

– Michelle Roby and Jenna McMullin



"Innovation is key, and ensuring that companies large and small are able to freely innovate, hand in hand with government, will help mitigate and overcome this dynamic threat."

– Steve Oswald, Boeing vice president and general manager, Intelligence and Security Systems

Cyber adept

While Boeing is better known for its aerospace products and services than for cybersecurity, the company has actually been a leader in this arena for years, according to Steve Oswald, vice president and general manager of Boeing Intelligence and Security Systems (I&SS). Boeing builds cybersecurity into many of its products, including information assurance (the guarantee that the information being sent reaches the correct recipient and in the form the sender intended) and network defense (keeping the right users in and the wrong users out).

On the current cyberwarfare front, "Boeing cyber experts deal every day with determined and intelligent adversaries who attempt to steal defense and commercial data and technologies," said Linda Meeks, Boeing chief information security officer. "On average, we block more than 500,000 virus attacks per month on our network."

In June, I&SS' Cyber and Information Solutions organization demonstrated a sampling of its defensive capabilities at its Arlington, Va., facility. The Security Monitoring Infrastructure System, which detects and reports network anomalies and is used on multiple Boeing networks, was developed by Boeing's Analysis, Modeling, Simulation and Experimentation group. The SMIS product has been in development for more than three years and has proved highly effective and efficient in numerous real-world situations, said Barbara Fast, vice president of Cyber and Information Solutions for I&SS.

During the simulation, SMIS reported suspicious network activity and alerted personnel so they could take appropriate action—the same as it does every day on Boeing's LabNet network, Boeing's internal network for distributed simulation, network evaluation, and network-centric operations testing.

The Boeing team also demonstrated the Common Open Research Emulator, a virtual, or cyber, "range" for mission rehearsal, exercise scenarios, training, modeling, simulation and testing. Together, SMIS and CORE represent how vigilance and training is enabled by technology.

"We have to become more predictive in defending our networks," Fast said. "Products such as SMIS and CORE alert our Intelligence Community and government customers to potential dangers and provide the awareness to defend their own networks today, while collecting the information necessary to prepare and rehearse in order to better defend against future cyberattacks."

Although customers gain advantages through defensive network tools, Fast said, behind every network is a person. When it comes to defending networks there is no substitute for a well-trained, educated work force, she said. Ultimately the best response is not just technical, such as blocking a virus, but in finding the individual or group behind the attack. Situational awareness and the ability to make decisions in incredibly short timelines are critical, Fast said.

– Michelle Roby and Jenna McMullin

"On average, we [Boeing] block more than 500,000 virus attacks per month on our network." *– Linda Meeks, Boeing chief information security officer*

Signing on

Rotorcraft Systems sites improve work environment for deaf employees

By Lisa Dunbar
Photos by Bob Ferguson

When Robert Sherwood, James Albert and Ken Reitz get briefed on the latest processes, join the discussion in staff meetings or converse with their manager about the Apache helicopter wire harnesses they build, they use a sign language interpreter.

In the past, the three electrical technicians and eight other deaf employees who work at the Rotorcraft Systems site in Mesa, Ariz., often had to receive information from staff meetings in writing or had to postpone instructions from managers while they waited to access a sign language interpreter from outside the plant.

Impromptu requests were even more challenging to accommodate and often required that meetings be rescheduled.

Furthermore, the costs of bringing in an interpreter increased by more than 20 percent between 2004 and 2008, according to Bill Kipper, Mesa Site Human Resources generalist. "We had to pay premiums for meeting cancellations and last-minute requests and had to pay for a minimum of two hours, even if we just brought someone in for a 20-minute meeting."

The solution: The site's Human Resources department hired a contractor interpreter to work a 20-hour-a-week shift at the site, becoming among the first across the Boeing enterprise to do so.

A deaf employee was included in the interview process for the newly hired certified interpreter, Sandy Pieper, who keeps her Outlook calendar available for deaf employees to schedule meetings as well as a special, dedicated cell phone for them to reach her for impromptu events.

The idea is working so well that Mesa Human Resources is proposing it as a Reasonable Accommodation (see related sidebar) best practice across Rotorcraft Systems and Boeing, Kipper said.

"Hiring Sandy Pieper has reduced annual interpreter costs

“Now that we have Sandy available, we understand more ... I am more aware of customer needs, which makes me a better employee.”

– Robert Sherwood, electrical technician, Rotorcraft Systems, Mesa, Ariz.

by more than 22 percent a year, while providing better service to our deaf employees, managers and HR generalists,” Kipper said.

Deaf employees say hiring an on-site interpreter has enhanced their work environment and helped the business by improving the quality of the wire harnesses they build.

“Now that we have Sandy available, we understand more,” Sherwood said. “I am more aware of customer needs, which makes me a better employee. And I have a deeper understanding of business operations and what is happening in a broader sense with our work. Feeling more connected improves the quality of my work and the product I am producing.”

Managers are also pleased with how communication has improved with their deaf employees.

“When I had meetings with my team, I used to have to write everything down for the deaf employees,” said Roger Pazan. “Now I can call Sandy, or the employees can call her, and she attends our meetings, and the deaf employees understand and participate.”

The interpreter expertise, along with the formation of the site’s Boeing Employees Abilities Awareness Association (BEAAA) affinity group, has served to increase awareness among all employees about the deaf community at Boeing.

“Since I have been here, the teams with deaf employees are now more cohesive because of the improved access to communication for everyone involved,” said Pieper, who—along with deaf employees Sherwood and Rodd Gatewood—has been teaching sign language classes at the site. “We have a beginning class, Level 2 class and a practice session available. It is done on employees’ own time, but has been a great opportunity to encourage communicating with deaf teammates and enhancing personal development goals.”

In January, Pieper and the deaf employees collaborated with Cultural Diversity and Inclusion and the newly launched BEAAA to conduct two ‘Lunch and Learn’ sessions about deaf culture and communication, which included a question-and-answer panel with deaf employees. This event, the first for Mesa’s BEAAA affinity group chapter, was followed by a second awareness Lunch and Learn in February and the launch of the sign language course.

The synergy between the affinity group, Pieper, management and the deaf employees has contributed to an accessibility process improvement for Rotorcraft Systems in Mesa.

“Employees learned to spell their names in sign language and watched television using closed captioning without sound,” Pieper said. “It was a real eye-opener for people.”

Across the country in Philadelphia, another Rotorcraft site is offering an American Sign Language class for the second year. This and other efforts coordinated by the Philadelphia Diversity Council to enhance communication among Boeing colleagues led to the Council winning a 2008 Diversity Award. ■

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A helping hand

What is a reasonable accommodation?

It’s a modification or adjustment to a job, the work environment or in the way work is usually performed that allows a qualified person with a disability to perform the essential functions of the job.

What are some examples?

- Qualified sign language interpreters or readers for deaf or hearing-impaired employees
- Reserved parking for employees who have mobility impairments
- Readily accessible and usable facilities for individuals with impairments
- Adaptive equipment or devices
- Modified work schedule
- Reassignment to a vacant position

For more information on reasonable accommodation, employees should contact their manager or visit http://insidees.web.boeing.com/AccomServ/template.asp?id=4760 on the Boeing intranet or e-mail: accommodationservices@boeing.com

PHOTOS: (LEFT) Interpreter Sandy Pieper assists deaf workers at Boeing’s Rotorcraft Systems site in Mesa, Ariz. She is making a sign language symbol that can indicate “cooperation” or “teamwork.”

(BELOW) Rodd Gatewood, a deaf Boeing employee, helps teach sign language classes at Mesa.

BOB FERGUSON/BOEING

Come to Pápa

Boeing C-17s in Hungary provide critical support to multinational missions

By Jerry Drelling

When the Boeing C-17 known as SAC 01 touched down at Pápa Air Base in western Hungary, emotions ran high.

"We've been working hard to get the base ready," said U.S. Air Force Col. John Zazworsky, the first commander of the Heavy Airlift Wing for the 12-nation Strategic Airlift Capability consortium. "The initial arrival [in July] was emotional because, for one thing, the families were all out there."

The second C-17, SAC 02, arrived last month.

The arrival of SAC's third C-17, slated for this month and completing the initial order, is scheduled to take place as the SAC nations are set to begin supporting multinational commitments in Afghanistan.

There's tremendous pride at Pápa because NATO and Partnership for Peace nations teamed up to acquire and operate the three Boeing airlifters out of this former Warsaw Pact fighter base—a first-of-a-kind multinational joint venture.

Most of those who came out to watch the first plane arrive had never seen anything like the muscular, hulking gray airlifter known for its role in saving lives in humanitarian, peacekeeping and aeromedical missions worldwide.

The 30-year SAC agreement, forged over a nearly three-year period, created a multinational airlift fleet that will serve the requirements of 10 NATO and two Partnership for Peace nations, which will share acquisition and operating costs. The group will also support airlift requirements for the European Union and United Nations. The SAC nations include NATO countries Bulgaria, Estonia, Hungary, Lithuania, the Netherlands, Norway, Poland, Romania, Slovenia and the United States. Partnership for Peace members are Sweden and Finland.

"So much cooperation was achieved in such a short amount of time to make this happen, and we're thrilled that the SAC nations selected the C-17," said Jean Chamberlin, Boeing vice president and general manager of Global Mobility Systems.

The arrival of the C-17s, bearing the colors of the Hungarian flag on their tails, signaled a new era in the history of Pápa, a small community of about 30,000 residents located between Budapest and Vienna. Over its long history, Pápa served as a base during World War II and the Cold War. A reminder of what life used to be like here, old wooden guard towers still sit adjacent to hardened aircraft bunkers that are now used as storage facilities.

Boeing personnel serve as the primary maintenance, material management and support team under the C-17 Globemaster III Sustainment Partnership program working out of a pilot alert building where Soviet fighter pilots were once housed.

For members of Boeing's team, working in Hungary has been a fascinating career move. "The new friends you make from the different forces, tight friendships with all the members—the Swedes, the Finns, the Romanians, the Dutch and the U.S. Air Force team. I think we're pretty close," said Steve Ramella, Boeing's spare parts lead.

Crystal Remfert, a Boeing senior avionics technician, arrived in mid-June. "That's probably one of the most exciting things about being here," she said of the opportunity to support the multinational effort. "And for my career management and my experience, it's definitely going to help me." ■

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PHOTOS: (LEFT) The Strategic Airlift Capability consortium's first Boeing C-17 basks in the sun after wing activation ceremonies in July at Pápa Air Base, Hungary. **(ABOVE)** The Heavy Airlift Wing at Pápa Air Base, Hungary, is staffed by multinational crews assigned from 12 participating nations. JERRY DRELLING/BOEING

Model for the future?

Frontiers magazine recently sat down with Henryka Bochniarz, president of Boeing Central and Eastern Europe, and Antonio De Palmas, president of Boeing European Union and NATO Relations, to discuss the Strategic Airlift Capability consortium's recent acquisition of three Boeing C-17s and how it has opened the door to future defense acquisition opportunities.

Antonio De Palmas
Vice president, Boeing International, and president, European Union and NATO Relations

BOB FERGUSON/BOEING

Henryka Bochniarz
Vice president, Boeing International, and president, Boeing Central and Eastern Europe

CONFEDERATION LEWIATAN

What makes the Strategic Airlift Capability acquisition so unique?

Bochniarz: This program enhances international cooperation not only in Central and Eastern Europe but also beyond this region. For nearly a year now, personnel from 12 nations have worked as a team in Pápa, Hungary, blending their varied skills, military experiences and cultures into a new form of multinational military unit. The team has focused on conducting strategic airlift missions as soon as the first aircraft was delivered—positioning itself to provide aid anywhere, at any time and on any mission—humanitarian, disaster relief or peacekeeping.

De Palmas: When the SAC international consortium of 10 NATO members—joined by two Partnership for Peace nations—agreed to acquire three C-17 Globemaster III long-range cargo jets, the agreement set the stage for NATO's first major defense purchase in 30 years. All the members of the SAC consortium now can count on a heavy-airlift capability, and the C-17 will allow each nation to meet its airlift requirements to support sovereign and multinational mission requirements. Another reason why this program is so significant is the involvement of 10 European Union countries, making this a truly EU capability.

What impact does this have on international defense markets?

Bochniarz: The SAC nations share acquisition and operating costs for the C-17s over the nearly 30-year course of the agreement. This model is helping new members of NATO, like Central and Eastern European countries, with limited defense budgets to acquire capabilities that they could normally not afford.

De Palmas: The unique SAC approach to shared use of the strategic airlifter is viewed as a model for future acquisition and management of defense capabilities. The same model could be applied for other international defense and Boeing programs.

What does this program mean to the Central and Eastern European regions?

Bochniarz: This is a significant milestone for participating Central and Eastern European countries. The aircraft have been assigned to SAC's Heavy Airlift Wing and are jointly operated by the alliance from Pápa Air Base, Hungary. The advanced C-17 airlifter recently started flying missions in support of International Security Assistance Force operations in Afghanistan. Hungary agreed to both host the wing at Pápa Air Base and to register the C-17s under the Hungarian flag.

– Eszter Ungar

Doing the heavy lifting

“The most important challenge is to work in an effective way together. We have to meet that challenge, and I’m sure we will.”

– Col. Fredrik Hedén of the Swedish Air Force

At Pápa Air Base in Hungary, Boeing employees have taken on a role usually performed by active duty air force personnel and reservists.

“They’re supervising the refueling crews, they’re supervising the oxygen servicing, they’re taking care of the basic trouble-shooting and maintenance,” said U.S. Air Force Col. John Zazworsky, the first commander of the 12-nation Strategic Airlift Capability’s Heavy Airlift Wing at Pápa.

“Boeing’s hiring great folks,” he added.

Zazworsky and his vice commander, Col. Fredrik Hedén of the Swedish Air Force, are both responsible for bringing Pápa Air Base to life in its new heavy-airlift role, serving the requirements of 10 NATO and two Partnership for Peace nations. The consortium, known as the Strategic Airlift Capability, is sharing the acquisition and operating costs of three C-17s that make up the wing’s strategic airlift fleet.

The two commanders wasted little time in taking advantage of the arrival of the first C-17, known as SAC 01, in July.

“The first aircraft came, we unloaded it. The next day it launched again,” said Zazworsky, who flew the airlifter to Hungary from Boeing’s C-17 final assembly facility in Long Beach, Calif. “Few active-duty air force units try that.”

When SAC 01 touched down, there was a sense of excitement and relief—excitement that the airlift wing was officially activated, and relief that it could finally begin flying missions to support the multinational forces serving in Afghanistan. That mission profile is expected to make up a large part of the wing’s early business.

In another unique arrangement for Zazworsky and Hedén, Boeing’s Globemaster III Sustainment Partnership is responsible for all flight-line maintenance for the fleet.

And that kind of support reminds Hedén of Boeing’s role in helping the SAC consortium become a reality when the idea of a multinational heavy-airlift group was just that: an idea.

“Without the cooperation from Boeing from the first minute, it wouldn’t have come through,” he said. “I still think the most important challenge is to work in an effective way together. We have to meet that challenge, and I’m sure we will.”

Both Zazworsky and Hedén believe the success this multinational team has achieved so far should make SAC an attractive alternative for other nations that are looking for creative ways to fill their heavy-airlift requirements. “A number of them have asked questions,” Hedén noted.

The multinational blueprint that is working so well for SAC could be applied to help solve other critical needs, Hedén said.

“What’s next? My answer would be, maybe, tankers. I think this could be examined the same way. It’s a personal comment, but I think that could be a good step for the future.”

– Jerry Drelling

PHOTO: U.S. Air Force Col. John Zazworsky (left) is commander of the Strategic Airlift Capability consortium’s Heavy Airlift Wing, based in Pápa, Hungary. His vice commander, Col. Fredrik Hedén, is a member of the Swedish Air Force. JERRY DRELLING/BOEING

Spinal Tap

What Boeing teams did to get B-1B bomber *Swift Justice* flying again

By Lisa Maull

It was just another day in the sky for *Swift Justice*, a routine mission for one of the U.S. Air Force's B-1 bomber fleet.

When a temperature warning light illuminated, the crew was not overly concerned. They landed the bomber at Ellsworth Air Force Base, S.D., anticipating nothing more than routine maintenance and a quick fix.

It was Dec. 4, 2007.

But this would be no easy repair job, and the story of what happened in the months ahead to get the bomber ready for duty again is a testament to the ingenuity and perseverance of a dedicated team from across Boeing, its suppliers and the Air Force.

After the bomber landed at Ellsworth, mechanics discovered that an engine bleed air duct had ruptured, severely damaging the jet's "backbone," its upper center longeron. But that 47.5-foot-long (14.5-meter-long) part, made from boron-epoxy composite, is unique to each aircraft, with no spares available.

"It seemed impossible at first," said Michelle Voorheis, technical lead from the Boeing B-1 airframe team, of the effort needed to recreate the damaged part to return this valuable asset to flight.

Voorheis' team, along with Air Force project engineer Brian Koehl, first had to find and restore the original tooling for the part. When production of the B-1 bomber ended in 1987, the Air Force stored B-1 tooling in the Arizona desert at Davis-Monthan Air Force Base.

The team eventually found the correct tooling in the desert and then worked with Boeing's C-17 tooling group to remove the corrosion and grime from 20 years of outdoor exposure.

Next, Specialty Materials Inc. in Lowell, Mass., the original boron and epoxy supplier, provided 14,000 feet (4,267 meters) of 4-inch-wide (10-centimeter-wide) unidirectional tape to fabricate the new part. Cytec Engineered Materials Inc., in Tempe, Ariz., supplied the adhesive film and primer.

Boeing's Composite Fabrication & Assembly Center near Seattle performed the layup and cured the part in its 90-foot-deep (27-meter-deep) autoclave. The center's layup crews worked around the clock for 11 days to meet deadline.

"I worked with composite experts across Boeing to gather data and knowledge on boron-epoxy composite fabrication," said Lamar Dearth, manufacturing engineer at the fabrication center, who wrote 357 planning pages needed for the fabrication effort. "I also drew extensively on the technical people of the Boeing Research and Technology organization. This enabled me to plan the teardown of the damaged longeron, salvage and recondition the titanium component, and master the fabrication techniques to recreate the unique part."

The B-1 was flown (under ferry-flight restrictions) to the Boeing Recovery and Modification Services Center in Long Beach, Calif. There, a team led by Mark Hayes, a C-17 Maintenance Operations Support manager, removed the damaged part and installed the new one as well as associated structural panels and other components. "We appreciate the opportunity to showcase our talents," Hayes said. "It gave us a sense of pride that the B-1 team wanted to work with us. Hopefully, this will open doors for future modification jobs with other programs at Boeing."

A few months ago, after 15 months spent grounded, *Swift Justice* roared down the runway of the Long Beach airport to return to its base in South Dakota.

"This B-1 effort is a perfect example of reaching out and applying capabilities from across the enterprise," said Mahesh Reddy, B-1 program manager. "It's a great example of what can happen when diverse groups within Boeing work with engineers, aircraft mechanics, suppliers and our customer to find a solution." ■

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PHOTO: The 47.5-foot-long (14.5-meter-long) replacement longeron was installed on B-1 bomber *Swift Justice* at the Boeing Recovery and Modification Services Center in Long Beach, Calif. MICHELLE VOORHEIS/BOEING

A **drop** of innovation

Water conservation is bringing environmental and cost savings to Boeing

By Bill Seil
Photos by Gail Hanusa

Conservation-minded Boeing employees are finding creative ways to avoid pouring money down the drain.

From 2002 through 2008, the company reduced its water consumption by 40 percent, according to the company's 2009 Environment Report. That's a total reduction of 4.2 billion gallons (15.9 billion liters) for a total savings of more than $10 million.

That momentum continues as Boeing sites around the United States share water conservation ideas. From 2007 to 2008 alone, enterprise water consumption was reduced by 17 percent.

Spiro Xenos, leader of Shared Services' Water Conservation Initiative, said the recent reductions are impressive because there was no major reduction in company facilities.

"That 2008 percentage reduction—from 2.3 billion gallons (8.7 billion liters) to 1.9 billion gallons (7.19 billion liters)—was quite a lot for one year," Xenos said. "In 2002, we reduced our footprint through major building consolidations. Consequently, we had some comparable reductions in water use. The recent water reductions are due primarily to conservation projects at several sites."

Water and sewer charges account for only 15 percent of the company's total utilities budget, Xenos said. The rest of the budget is energy, which includes electricity and natural gas. That's why so much of the company's conservation investment to date has been devoted to energy—there's more of it and the return on investment is much higher.

But the potential of water conservation started gaining momentum several years ago when new approaches to reducing consumption became available. This included technology that allowed zero liquid discharge from cooling towers, which are part of building cooling systems. Water-saving bathroom fixtures, some already popular in other countries, were evaluated for use in company restrooms. Lawn irrigation in Everett, Wash., was improved, based on more accurate precipitation data. In addition to reducing consumption, methods were found to cut back on wastewater disposal costs.

"While purchasing water is a significant expense, it costs three or four times as much to dispose of it after it is used," Xenos said. "It's not like electricity, where it does its job and that's it. We also have to consider sewage rates and any special processing costs."

"While purchasing water is a significant expense, it costs three or four times as much to dispose of it after it is used."

– Spiro Xenos, leader of the Shared Services Group Water Conservation Initiative

Measurement is vital in keeping sewage costs under control. Meters are used to measure water that is lost due to evaporation and irrigation. This way, the company is not charged sewer fees for water that goes elsewhere.

Xenos said water conservation focals at individual sites continue to make steady progress. Facilities located in the U.S. Southwest, including Southern California and Mesa, Ariz., along with other regions with water shortages, have been the most aggressive at implementing conservation measures. Water supplies in the past have also been limited in Houston, as well as some areas in the East, including Huntsville, Ala., and Philadelphia.

"Most sites focus on energy conservation, because that's where the greatest savings can be found," Xenos noted. "But areas that experience frequent droughts, like Mesa and Huntsville, tend to give energy and water the same weight."

Mona Simpson, director of Site Services for El Segundo and Seal Beach, Calif., said Southern California has been experiencing drought conditions that have lowered the level of Lake Mead to less than 67 percent of capacity. Water is expected to be a matter of serious concern in the region for years to come.

"Our claim to fame in El Segundo has been our retrofit of toilets in all the men's rooms and ladies' rooms," Simpson said. "Understandably, this has led to some humorous comments by employees. But that's good, because it has made the project visible and drawn attention to our commitment to water conservation."

The conversion was conducted over three months, with financial support from the local Metropolitan Water District. Two hundred toilets with dual-flush valves were installed in women's restrooms in 23 El Segundo buildings. Dual-flush valves allow flushers to use less water for liquid waste disposal (pull the lever up) than solid waste disposal (push the lever down). Men's restrooms are also conserving water with the installation of ultra-low-flush toilets. The site also is considering the use of waterless urinals. Overall, it is estimated that the existing toilet conversions will save about 870,000 gallons (3.3 million liters) per year.

Water conservation also is key in a program at the El Segundo site to construct a fully "green" building that is certified under the Leadership in Energy and Environmental Design, or LEED, program.

El Segundo also has reduced water, sewer and maintenance costs by using new zero-liquid-discharge systems in its building of cooling towers, an approach piloted at Boeing's Kent, Wash., facility. (See related story on Page 50). Boeing's Mesa, Ariz., site is installing a water treatment system to support its cooling tower maintenance processes as well. It is expected to reduce water consumption by 10 million gallons (37.9 million liters) per year, according to Rick McKenney, senior maintenance manager for Mesa Site Services.

Mesa's very hot climate naturally makes water conservation a high priority.

"Evaporation is a big problem here due to the heat," McKenney said. Like El Segundo, Mesa is reducing water consumption in its restrooms through the installation of reduced-flow toilets and aerators to reduce the flow of water from faucets. McKenney credits the site's plumbing team with brainstorming the restroom improvements. They stepped forward because they wanted to contribute to Mesa's conservation cost-containment goals, he said.

Future water conservation efforts will involve water that is used in industrial processes. But this is more difficult, since each site operates in a unique way and making changes can be complicated, Xenos noted.

"It's going to take time because our industrial processes are very large and change does impact production," Xenos said. "There are opportunities to reduce water-related costs, but they need to be thoroughly planned before they're implemented." ■

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PHOTO: Mike Hennen, Shared Services Group Engineering, checks the rain gauge in a weather station atop the 40-11 building in Everett, Wash. The gauge monitors daily rainfall and is linked to a computer system. When rainfall totals reach a certain threshold, the computer automatically deactivates the irrigation system.

A big splash in savings

New water pre-treatment process reduces costs and conserves water

By Kathleen Spicer

At a Boeing building in Kent, Wash., nine cooling towers can support the production of 23,000 gallons (87,000 liters) per minute of chilled water that is used to support critical heating, ventilation and air-conditioning systems.

A conservation initiative by Site Services of Shared Services Group is expected to save 7.6 million gallons (28.9 million liters) a year there, plus eliminate harmful chemicals and significantly reduce maintenance. Similar improvements at Boeing facilities in El Segundo, Calif., are expected to save an estimated 95,000 gallons (356,600 liters) of water a month.

What is a cooling tower and why is this important? A cooling tower works in combination with a chiller to remove heat from the air inside a building and release it to the outside atmosphere. An efficiently operating chilled water system provides air conditioning for offices, labs, fabrication and assembly areas.

Optimizing cooling-tower operations is critical to maximizing a facility's performance and reducing its environmental footprint. No one knows that better than the Site Services teams and councils who sponsored an improvement pilot that resulted in a major step toward saving water, reducing chemical usage, and lowering sewage and maintenance costs.

FROM RESEARCH TO REALITY

Roger Sampair, SSG lead mechanical plant engineer at Kent said the idea started when looking for improved technology in cooling-tower operations that would be better for the environment and save on maintenance costs. Sampair learned about a process to pre-treat the water used in cooling towers that doesn't involve chemicals and softens the water to prevent scale buildup.

"The result is a more efficient tower," Sampair said. "The steel industry uses a similar process to eliminate the buildup of chemicals and scale during steel production. The same philosophy can be applied at Boeing."

The testing at the Kent site showed significant results: Fresh water entering the operation has decreased by 40 percent; maintenance costs on cleaning the towers have been reduced from once a month to a couple times a year—approximately an 80 percent reduction—and harmful chemicals have been eliminated in the process. And these savings may just be a drop in the bucket—the potential savings could be $5 million or more per year across the enterprise.

HOW IT WORKS

Cooling towers hold an average of 800 gallons (3,028 liters) of water. A building's or site's chiller operation uses the tower water to make chilled water for building, equipment and computer-room air conditioning to optimize operating temperatures.

PHOTO: Boeing heating, ventilation and air-conditioning mechanic Brett Weberg adds salt used in regeneration tank for cooling-tower water softeners at the Kent, Wash., site. The water softener is part of a new process initiated by lead mechanical engineer Roger Sampair (right) that will save water and reduce sewage and maintenance costs across Boeing. MARIAN LOCKHART/BOEING

However, as water naturally evaporates in the tower, minerals are left behind that can form hard deposits. These remains can stick to the surfaces in the cooling towers, affecting their efficiency. To reverse this, chemicals are added to keep the minerals suspended in the water, and then the water is drained out of the tower and replaced. This is known as a "blow-down" process. The cycle is periodically repeated to keep the tower maintained.

Sampair led the Kent Maintenance team in a one-year trial using the water softener with a 500-ton (454-metric-ton) tower that supports operations at the 7-107 building. Following promising results, a second system was installed in the Kent 18-54 building, where the benefits have been even greater due to high usage of the nine cooling towers.

Several groups, including the Site Services Plant Engineering and Enterprise Mechanical Technical Committee councils, identified this improvement as an enterprise operating cost reduction and championed its replication to other Boeing sites.

Cooling-tower water-saving improvements recently earned Kent's Maintenance team a Boeing Conservation Award as one of 18 projects that reduced the company's energy and water usage or increased alternative commuting and recycling rates.

The awards were recently expanded to include water initiatives, noted Jeff Nunn, SSG Conservation Initiative program manager.

PHOTO: Site Services engineer Art Kienle (left) and mechanic Doug Macpherson helped replicate water and cost savings from Kent, Wash., to El Segundo, Calif. GLADYS WICKERING/BOEING

CHANNELING SUCCESS

The Site Services team at the Boeing satellite manufacturing facility in El Segundo, Calif., was first to replicate the improvement with a similar pilot program.

Cooling towers are an important part of the site's environmental control infrastructure because certain temperatures and the proper humidity are required when assembling and integrating satellites—and this Site Services business partner depends upon that reliability.

"The new process has made a noticeable difference," said Art Kienle, a plant mechanical engineer in El Segundo who helped facilitate the pilot program. "The piloted tower was much easier and faster to clean than the others, which means the new system is working well and minerals aren't depositing to the sides of the tower."

According to Kienle, 90,000 to 100,000 gallons (340,600 to 378,500 liters) of water per month are saved using the new process.

The benefits add up—from reducing chemicals to consuming less water to lowering sewage and water costs, Kienle said. "Even our equipment will last longer because it will run more efficiently."

Although the costs of water vary from site to site, Site Services Maintenance is looking for other opportunities across Boeing.

"That's the real value—this new process can be replicated at other Boeing sites, so we not only conserve water, help protect the environment and save on maintenance costs here," Sampair said, "but at other locations as well." ■

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Picking up the pace

Transportation team revamps freight services to speed delivery of airplane parts

By Kathleen Spicer

Not that long ago, it took anywhere from one to three days to deliver parts and materials from Boeing's Fabrication facility in Auburn, Wash., to its airplane assembly plants in nearby Renton and Everett.

Feedback from Boeing's internal business unit partners about the unreliable service was clear—improvements were needed.

Today, those delivery times have been slashed dramatically and are being accomplished in one to three hours.

"This is fantastic news for the business units we support," said Bob Sullivan, a manager in Licensed Transportation with Shared Services Group (SSG).

How was this possible? Like many improvements within Boeing, the Lean+ initiative was used by the SSG Licensed Transportation team in the Puget Sound region to examine the entire operation. The result was the creation of a direct-delivery freight service program that simplifies five processes into one and makes picking up and dropping off freight more efficient.

Previously, delivery runs involved five modes of transportation and a variety of vehicles that delivered to Renton and Everett hub locations, including special "hot truck" runs for high-priority items. Now, all freight is treated with the same priority and organized on standard semi-truck and trailer runs that deliver directly to local receiving areas. From there, the freight is quickly moved to support final assembly activities. Nonstandard deliveries, or what were known as "hot truck" requirements, continue to be met. But the increased speed of the new process has helped reduce work requests that require expedited transportation.

"Scheduled streamlined delivery times are quicker and more reliable for our customers," Sullivan said. "We've also improved our freight-tracking system to provide increased visibility into shipment dates, truck assignments and drop-off locations so we can provide better customer service."

Standard runs also save on costs in equipment maintenance and fuel and reduce in-plant traffic congestion because fewer vehicles are used in the process.

For Kevin Moeller, warehouse manager of Commercial Airplanes' Community Manufacturing Partnership in Algona, Wash., the new process means same-day parts delivery from Renton.

"We're thrilled with the timeliness and efficiency of the new system," he said. "It also reduces lost freight and improves quality because there are less product 'touches.'" This is the number of times a product or shipment is handled by a Boeing employee.

After a successful launch of the new delivery program from Auburn to Renton, where the single-aisle 737 is assembled, the team turned its attention to delivery runs from Auburn to the Everett twin-aisle manufacturing site.

"There have been a few setbacks, but we continue to take steps forward," Sullivan said. "We've included everyone in the process from Fabrication to the truck and forklift drivers to our Renton and Everett business partners in final assembly. Everyone got their questions answered upfront, which made a huge difference when we began to implement."

Jim Gunderson, a Licensed Transportation manager who oversaw the pilot project in Renton, said input from the business partners was invaluable, and streamlining the delivery process has reduced the number of times a part is touched by 65 percent.

"Without our partners' participation, we would have ended up with a solution that worked well for us, not them," Gunderson said.

Bob Schunzel, a Renton motorized equipment operator, was part of the original Lean+ workshop that outlined the team's tasks. "It's slick," he said. "The dedicated runs help make it more timely and efficient for our business partners; it's a different system than what we're used to, but it's working well."

The new system is a big deal in terms of how Licensed Transportation delivers freight to the region, said Mike Turek, director of Licensed Transportation for the Puget Sound region. "Most important, it's what our business partners want in terms of saving time, cutting costs, and eliminating cumbersome processes and excess handling of shipments. Partnering with them is the best way to help them meet their cost targets."

Next up is the Spares Distribution Center in Sea-Tac, Wash., and the North Boeing Field corridor in Seattle. ■

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PHOTO: Licensed Transportation truck driver Mike Singleton helps support the new direct-delivery freight service implemented by Shared Services Group Licensed Transportation. ED TURNER/BOEING

Boeing Company – **BA**

NYSE: Industrials/Aerospace & Defense

As of 9/18/09

$53.02

Stock snapshot

52-week range:	
52-week high	**$61.00**
52-week low	**$29.05**

International competitors

EADS* – **EAD.PA**

As of 9/18/09	**€16.40**
52-week range:	
52-week high	**€16.57**
52-week low	**€8.12**

**Prices in euros*

U.S. stock indexes

S&P 500

As of 9/18/09	**1,068.30**
52-week range:	
52-week high	**1,265.12**
52-week low	**666.79**

S&P 500 Aerospace and Defense Index

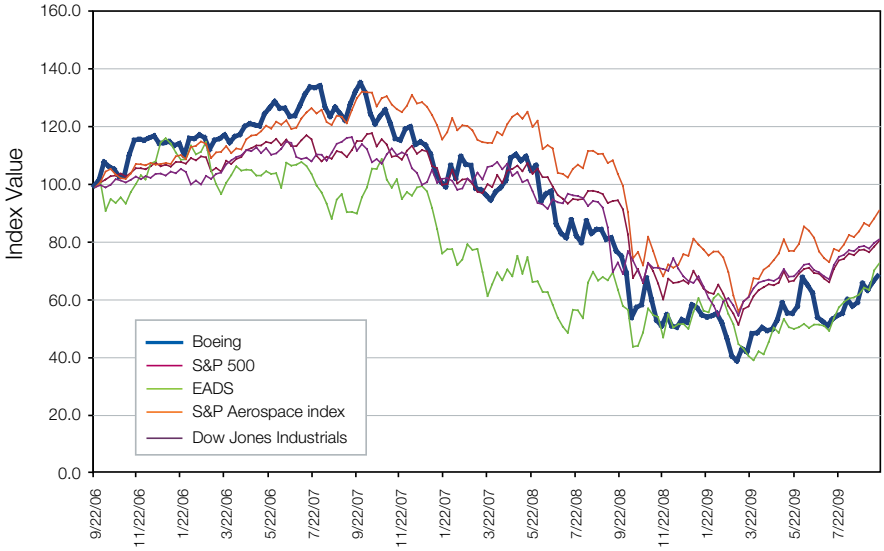
As of 9/18/09	**318.19**
52-week range:	
52-week high	**346.02**
52-week low	**194.13**

Dow Jones Industrials

As of 9/18/09	**9,820.20**
52-week range:	
52-week high	**11,450.80**
52-week low	**6,440.08**

Stock price chart

The chart below shows the stock price of Boeing compared with other aerospace companies, the S&P 500 index, the S&P 500 Aerospace and Defense Index, and the Dow Jones Industrials. Prices/values are plotted as an index number. The base date for these prices/values is Sept. 22, 2006, which generates three years of data. The prices/values on that date equal 100. In other words, an index of 120 represents a 20 percent improvement over the price/value on the base date. Each data point represents the end of a trading week.



Boeing stock, ShareValue Trust performance

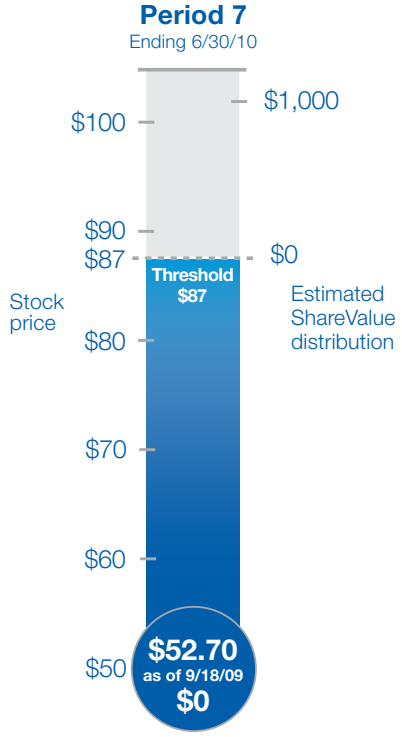
ShareValue Trust is an employee incentive plan that allows eligible employees to share in the results of their efforts to increase shareholder value over the long term.

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

This graph shows an estimate of what a "full 4-year participation" ShareValue Trust distribution (pretax) would be for Period 7 if the end-of-period average share prices were the same as the recent price shown.

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

For more information on the ShareValue Trust, visit www.boeing.com/share.



Milestones

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

Robert Jaeger, 14 years
Thomas Jenkins, 24 years
Dale Johnson, 21 years
Wayne Johnson, 26 years
Diana Jones, 25 years
John Jordahl, 36 years
Edward Julian, 30 years
Marilyn Kapic, 32 years
Kenneth Kayser, 23 years
William Kearns, 30 years
Richard Keith, 33 years
Sharon Key, 23 years
Tae Kim, 20 years
Shirley Kindred, 25 years
Don Koehn, 22 years
Vickie Kotyluk, 29 years
Geneil Krueger, 12 years
Timmy Kwan, 35 years
Linda Lambert, 33 years
Kenneth Lamury, 30 years
Thomas Lavery, 32 years
Thomas Lawrence, 22 years
Khai Le, 21 years
Thu Le, 24 years
Richard Lentz, 38 years
Jenny Lewis, 23 years
Andrew Limon, 44 years
Billy Littlefield, 18 years
Michael Lovelace, 21 years
Rodney Mael, 36 years
Edward Malone, 42 years
Richard Marrett, 30 years
Richard Marsden, 14 years
Jeffrey Martin, 32 years
Roland Martir, 38 years
Marilyn Mc Intyre, 42 years
Thomas McCoy, 7 years
Walter McDaniel, 31 years
Robert McDowell, 23 years
Larry McGhee, 30 years
Henry McKee, 29 years
Joan Miller, 30 years
John Minges, 26 years
Patricia Montgomery, 25 years
Jesus Motta, 23 years
Byron Muck, 36 years
Alamo Murrell, 23 years
Michael Neighbors, 33 years
Robert Nelson, 20 years
Phuong Nguyen, 26 years
Ven Nguyen, 19 years
Dean Nordstrom, 36 years
Randolph North, 26 years
Barbara O'Melia, 24 years
Gayle Olcott, 30 years
Jackie Overkamp, 40 years
Mary Pace, 34 years
James Parks, 30 years
John Pass, 44 years
Gary Peterson, 26 years
Glen Peterson, 41 years
George Philips, 23 years
James Philp, 31 years
Sandra Postel, 30 years
William Powell, 32 years
William Pugnetti, 35 years
Greg Rainwater, 31 years
Mark Reising, 23 years
Marian Remy, 18 years
Frederick Reynolds, 35 years
Martin Richards, 31 years
Joseph Richardson, 37 years
Maree Rona, 23 years
Gilman Rud, 14 years
James Sanborn, 21 years
Gregg Schmidt, 35 years
Walter Schmidt, 9 years
George Schroeder, 30 years
Larry Simpson, 22 years
Shelby Slater, 20 years
Donald Smith, 35 years
Richard Smithey, 30 years
Michael Sorenson, 31 years
Herbert Souza, 35 years
George Steed, 32 years
Cheryl Steinberg, 35 years
Susan Stewart, 38 years
Randall Swanson, 31 years
David Switzer, 39 years
Jimmy Taylor, 17 years
Norman Thomas, 39 years
Milton Till, 29 years
Donald Tommervik, 30 years
Kent Vandusen, 30 years
Tonita Walker, 6 years
James Webber, 22 years
Kendall Weis, 33 years
Theodore Weiss, 30 years
Alberta Wilson, 29 years
Ronald Wolfe, 18 years
Lyle Wolfs, 22 years
Marilyn Woods, 20 years
Richard Woskoski, 43 years
Dennis Wright, 16 years
Randall Wyatt, 19 years
David Yeh, 23 years
James Zander, 24 years

IN MEMORIAM:

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

Donald Ayers, supplier quality specialist; service date Nov. 14, 1978; died Aug. 20

Linda Barkley, quality engineer; service date Jan. 3, 1978; died Aug. 15

Matthew Bock, mechanical systems engineer; service date April 30, 2001; died Sept. 6

Jayson Briggs, crane operator; service date June 9, 2006; died Sept. 13

Richard Brown, government property management specialist; service date Feb. 19, 1979; died Sept. 11

James Darrah, precision assembly reworker; service date March 3, 1986; died Aug. 20

Josefina Delgado, mechanical assembler; service date Sept. 19, 1998; died Aug. 25

Dale Disert, aircraft mechanic; service date April 15, 1985; died Sept. 1

David Fairchild, equipment operator and dispatcher; service date March 3, 1978; died Aug. 27

Daniel Hecker, skin mill operator; service date April 15, 1980; died Aug. 21

Glenda Holm, software engineer; service date Sept. 30, 1984; died Aug. 21

Pauline Joe, software engineer; service date Feb. 14, 1975; died Sept. 13

Michael Kelley, quality test specialist; service date Nov. 18, 2002; died Aug. 20

William Kerr, integrated schedule specialist; service date Feb. 19, 1976; died Aug. 30

Nancy Kono, employee development specialist; service date Aug. 28, 1975; died Sept. 10

Peter Ludwig, shipping and distribution facilitator; service date June 9, 1988; died Aug. 18

Alan Mater, integrated schedule specialist; service date April 17, 1986; died Aug.15

Walter Mayberry, flight mechanic; service date Dec. 22, 1968; died Sept. 2

Paul Morris, computer operator; service date Oct. 9, 1984; died Aug. 29

James Morrow, electrophysics engineer and scientist; service date Feb. 19, 1973; died Aug. 22

Terry Pate, plasma spray skin repair mechanic; service date Oct. 3, 1988; died Sept. 3

Wayne Rann, sheet-metal assembler; service date June 6, 2000; died Sept. 13

Lawrence Setran, manufacturing planner; service date April 5, 1978; died Sept. 13

Deborah Smith, procurement multifamily manager; service date Feb. 20, 1984; died Aug. 13

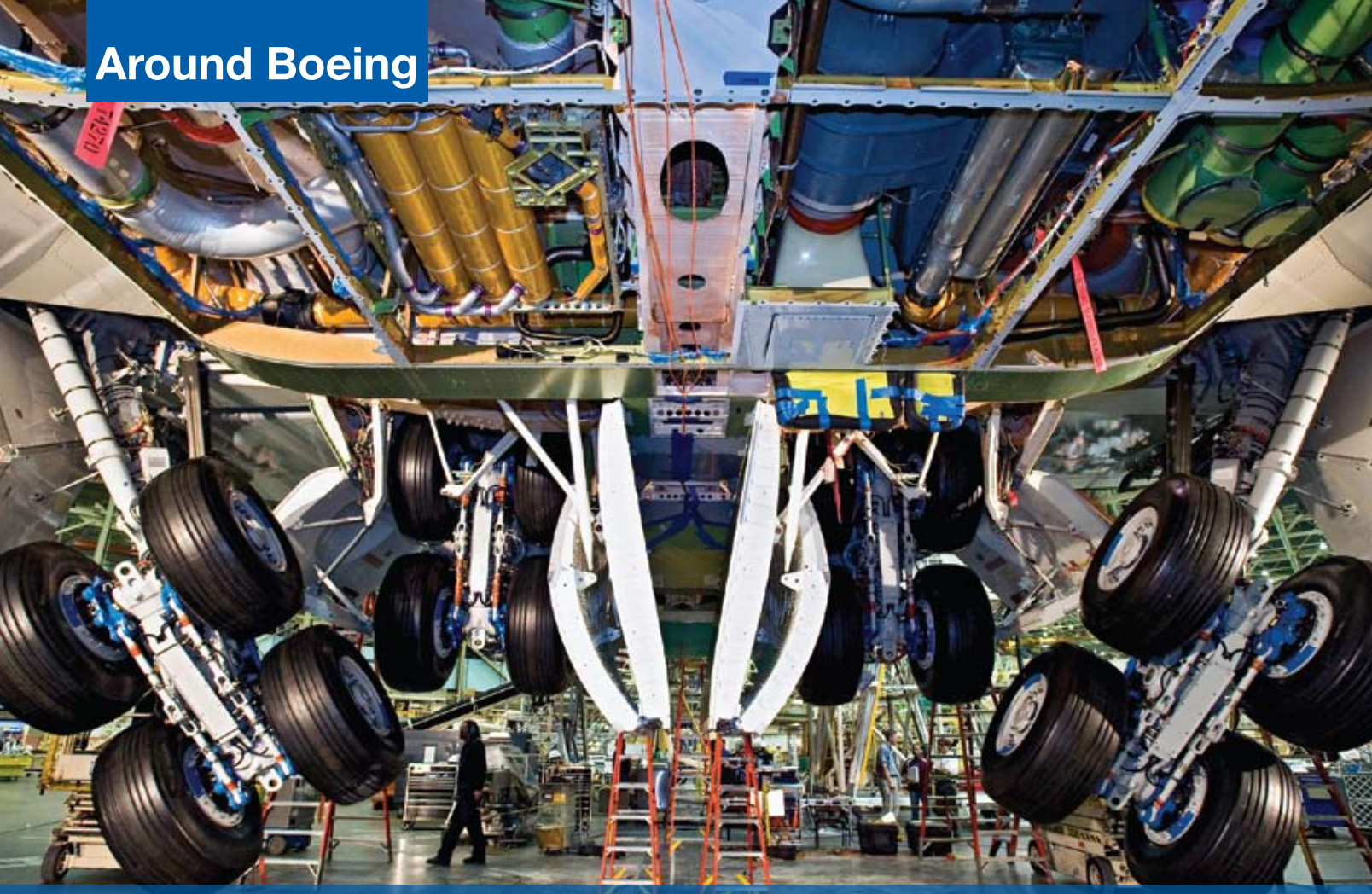
Erika Song, wire group assembler; service date Aug. 22, 1984; died Sept. 16

Terry Tiefenauer, sheet-metal assembler and riveter; service date Aug. 15, 1983; died Aug. 21

Marie Valenta; employee development specialist; service date March 23, 1999; died Aug. 19

Frank Zlupko, air conditioning mechanic; service date March 11, 1985; died Aug. 31

Around Boeing



THE WHEEL DEAL

The complexity of the engineering that goes into the development of a Boeing jetliner is captured in this photo, which shows the main landing gear of the new 747-8 Freighter during recent gear swing tests. GAIL HANUSA/BOEING

BOEING, FEDEX EXPRESS CELEBRATE CARRIER'S FIRST 777 FREIGHTER

FedEx Express recently took delivery of its first 777 Freighter. It was the ninth 777 Freighter delivered to customers and the first to enter service with a U.S.-based global freight carrier.

"The 777F is a game changer," said Michael L. Ducker, president, International, FedEx Express. "Its operational efficiencies and environmental benefits alone are impressive, but combine those advantages with the service improvements it delivers and FedEx Express will be able to take international shipping to another level. Our customers around the world will benefit from more point-to-point routes and the shorter flight times, increasing their competitiveness in the global marketplace."

In the FedEx Express operation, the 777 Freighter can fly 5,800 nautical miles (6,675 statute miles, or 10,740 kilometers), an increase of 2,100 nautical miles (2,410 statute miles, or 3,890 kilometers) over the airline's MD-11 Freighter fleet. Some 58 customers have ordered more than 1,100 777s, including 71 freighters.

BOEING DELIVERS QANTAS' 75TH 737

Last month Boeing and Qantas celebrated the airline's 75th 737 at a ceremony in Auckland, New Zealand. The Next-Generation 737-800 featured 8.2-feet-tall (2.5-meter-tall) Blended Winglets, which reduce fuel consumption, increasing range and payload. Qantas named the airplane in honor of Jean Batten, a New Zealand aviator who broke many flying records in the 1930s.

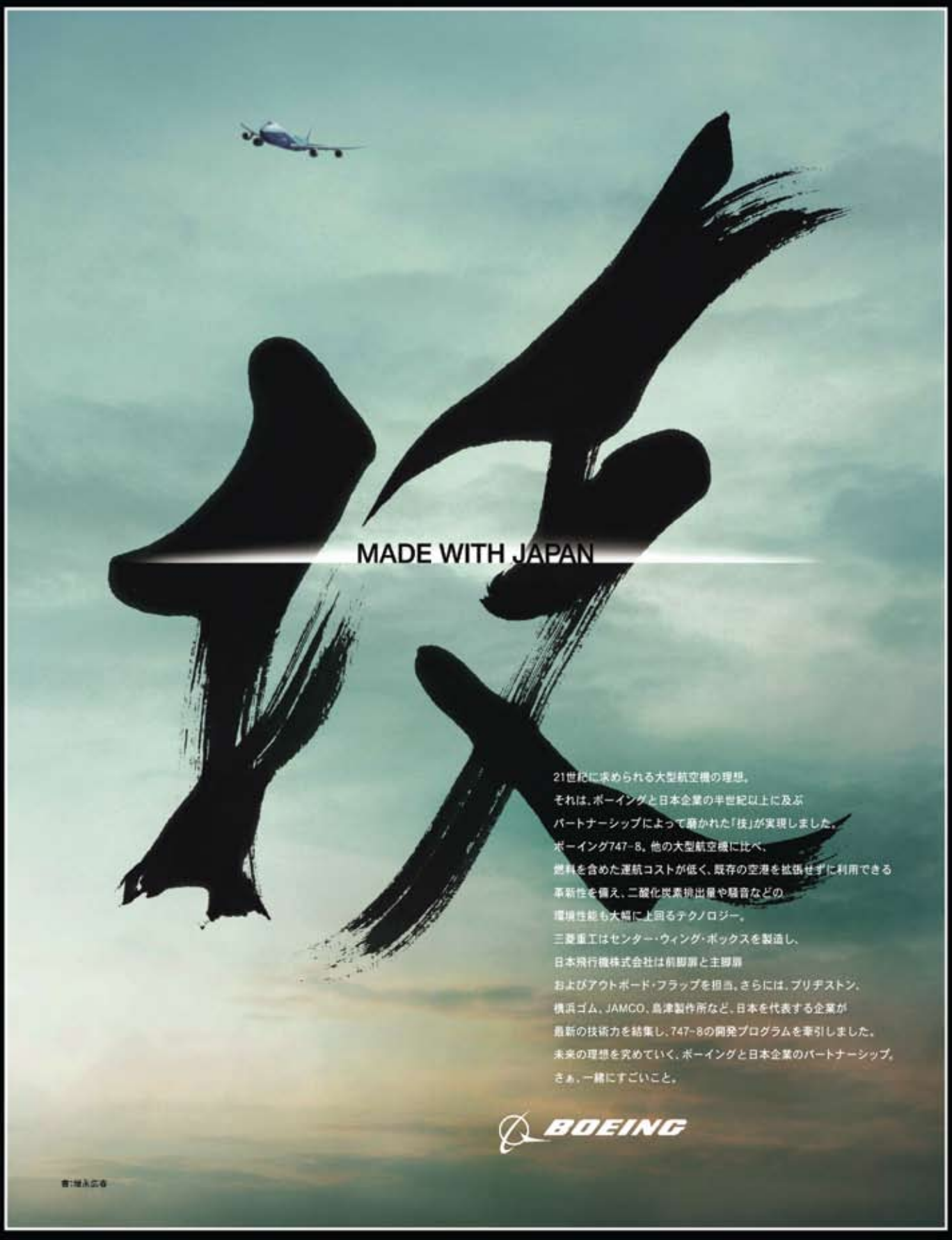
With more than 8,000 orders, the Boeing 737 is the world's most popular commercial jet transport.

TWO-SIDED PRINTING NOW THE NORM FOR BOEING NETWORKED U.S. PRINTERS

In a move that reflects the company's commitment to continually improve its environmental performance, Boeing in September made two-sided (duplex) printing the default setting on documents sent to company-owned, networked Lexmark printers in the United States.

The change affects all Windows-based PCs but excludes international and classified area printers and print jobs sent from mainframe and UNIX applications. It will save about 115 million sheets of paper and 9,660 trees annually and help the company move toward its goal of reducing paper consumption.

"By making two-sided printing the norm, we are taking another step to improve our company's business performance and reduce our environmental footprint," said Mary Armstrong, Boeing vice president of Environment, Health and Safety.



"747-8" begins a new series of advertisements that reinforce Boeing's partnership with Japan, a relationship that began more than 50 years ago. The campaign features the art of calligraphy, a symbolic tradition of the Japanese spiritual culture that not only communicates words but also communicates a deeper and richer meaning. The ad highlights Boeing's collaboration with Japanese companies such as Mitsubishi Heavy Industries and NIPPI Corp. on the production of the Boeing 747-8. It currently is running in Nikkei Business, Toyo Keizai, WING, Nikkei Shimbun *and* President.

This ad was created to build awareness of Boeing's partnership with China, a relationship that has existed for decades. China produces parts and components for all Boeing commercial airplane programs, making Boeing the largest foreign customer of China's aviation industry. This ad features Boeing's support for China in the establishment of a complete, safe and efficient national aviation system and ran in ACP Magazine.