

 **BOEING**

Frontiers

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MARCH 2010 / Volume VIII, Issue X



Picture **perfect**

During its historic first flight on Feb. 8, the 747-8 Freighter passes majestic Mount Rainier



MADE WITH JAPAN

人に優しいこと、環境に優しいことが、
 今ほど未来のために必要とされる時代はありません。
 ボーイングは、日本の航空宇宙産業を担うパートナー企業と共に、
 半世紀以上にわたって地球環境により優しい性能を追い求めています。
 そのひとつの理想形が、次世代中型旅客機787ドリームライナー。
 同クラスの航空機よりも大幅に改善された燃料効率と
 二酸化炭素排出量は、世界に衝撃と希望をもたらしたといえるでしょう。
 この最先端の機体の35%は日本で製造されており、
 三菱重工、川崎重工、富士重工を始めとするパートナー企業が
 同じ思いで開発を支えています。
 東と共同開発した強く軽い炭素繊維複合材料による機体は、
 従来は不可能であった快適な湿度コントロールをも実現しました。
 また、ボーイングは、環境負荷の少ないバイオ燃料の開発テストを
 JALやANAなどと世界に先駆けてスタート。
 地球の未来のために、さあ、一緒にすごいこと。



On the Cover



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A jumbo tradition

The 747-8 Freighter, which made its first flight on Feb. 8, will give air cargo operators improved operating economics when it enters service at the end of the year. It is the longest 747 that Boeing has ever built, with a redesigned wing and the fuel-efficient engines developed for the 787 Dreamliner. The 747-8 Freighter will provide cargo operators with 16 percent more revenue cargo volume compared with the 747-400 Freighter.

COVER IMAGE: DURING ITS 3-HOUR, 39-MINUTE FIRST FLIGHT ON FEB. 8, THE 747-8 FREIGHTER FLEW PAST 14,411-FOOT-HIGH (4,392-METER-HIGH) MOUNT RAINIER IN WASHINGTON STATE. LEO DEJILLAS/BOEING

PHOTO: SEVERAL THOUSAND BOEING EMPLOYEES WATCHED THE 747-8 FREIGHTER TAKE OFF FOR THE FIRST TIME FROM PAINE FIELD IN EVERETT, WASH. RON PFAFF/BOEING



Ad watch

The stories behind the ads in this issue of *Frontiers*.

Inside cover:



This ad, from the "Made with Japan" campaign, highlights the partnership between Boeing and Japan to provide environmentally progressive aerospace solutions to the world. The effort includes developing key elements of the new 787 Dreamliner with Mitsubishi Heavy Industries, Kawasaki Heavy Industries and Fuji Heavy Industries, as well as joint efforts to promote biofuels with Japanese carriers Japan Airlines and ANA. The ad is running in publications such as *Nikkei Business* and *Toyo Keizai*.

Page 57:



This *Flight International* ad has been developed to call for entries for the Boeing-sponsored Engineering Student of the Year Award. Part of the Flightglobal Achievement Awards, the Boeing Engineering Student of the Year Award recognizes an outstanding student working on aeronautical or space technology. Applications must be received by May 4, 2010.

Inside back cover:



This new Boeing Defense, Space & Security print ad is designed to establish Boeing as a key player in the cybersecurity field and as uniquely qualified to provide comprehensive solutions to a growing threat. The ad will run in targeted trade publications.



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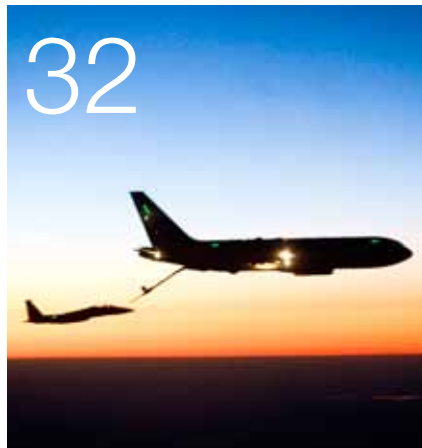
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Training day

When a Missouri National Guard company received orders to deploy to the Middle East to maintain Apache helicopters, it first called Boeing's Training Systems & Services, which offers a range of training solutions and instructors. For two weeks at a base in South Carolina, the maintainers learned about the AH-64D Longbow from one of Boeing's top maintenance people.

PHOTO: BOB FERGUSON/BOEING



Full tank

Delivery of the fourth and final Boeing KC-767 tanker to Japan has strengthened Boeing's relationship with an important customer and provided Japan with the capability to perform airlift and refueling missions. The tankers, too, can quickly be converted to carry cargo or passengers and used for long-range humanitarian and disaster-relief flights.

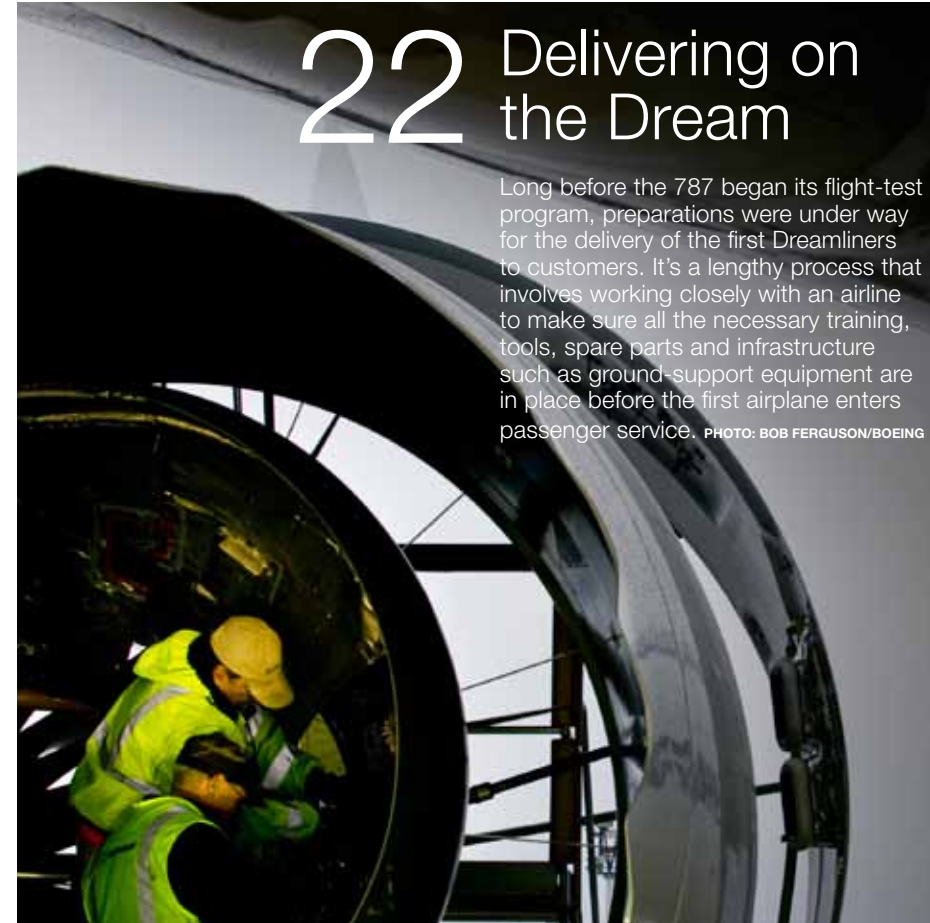
PHOTO: BUZZ SHADDEY/BOEING



The face of Boeing

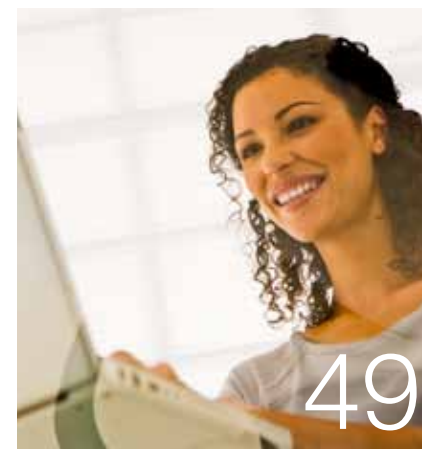
The Boeing Company has more than 8,000 employees working in more than 70 countries around the globe, along with tens of thousands more in the United States. Together they are "One Boeing," whose strength is the diversity of its people and global presence. Meet Boeing teammates from around the world in this photo feature.

PHOTO: ASSOCIATED PRESS



22 Delivering on the Dream

Long before the 787 began its flight-test program, preparations were under way for the delivery of the first Dreamliners to customers. It's a lengthy process that involves working closely with an airline to make sure all the necessary training, tools, spare parts and infrastructure such as ground-support equipment are in place before the first airplane enters passenger service. PHOTO: BOB FERGUSON/BOEING



The right choice

Making good choices is crucial to living healthier and having more financial security; Boeing provides employees with a number of resources to help them choose wisely. In 2010, even more health and financial tools and programs are being added to Boeing's portfolio of Well Being offerings. These include around-the-clock telephone access to a registered nurse for answers to questions about routine symptoms or for tips on treating an injury or illness.

PHOTO: SHUTTERSTOCK.COM

INSIDE

06 Message From a Customer

The president and chief executive officer of Cargolux Airlines, a launch customer for the 747-8 Freighter, tells Boeing employees why his airline is so excited about getting the first of these freighters and why the improved operating and environmental performance of the newest member of Boeing's 747 family will make Cargolux even more competitive.

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Setting the standard

The CEO of Cargolux, launch customer for the 747-8 Freighter, talks candidly about his company's partnership with Boeing and the importance of innovation, quality and meeting commitments



Dear readers,

Congratulations on the first flight of the 747-8. I am honored to have the opportunity to address you all.

Some of you may not know Cargolux Airlines. After all, we are just a small carrier based in the Grand Duchy of Luxembourg, a little country in Europe. But I am proud to say that Cargolux, as small as it is, is a major player in the air cargo industry today. We are the eighth-biggest cargo carrier worldwide, measured in tonne-kilometers (ton-miles) flown, and the biggest all-cargo airline in Europe. We operate a fleet of 14 747-400 Freighters.

Cargolux and Boeing go back a long way. We received our first new 747-200F in 1979, at a time when we operated a fleet of DC-8 aircraft. The 747 has taken us to new heights, opened many new markets and opportunities for us, and brought us into the major league of the industry. Our first -200 freighter was also the first of its kind in Luxembourg, bringing new standards in efficiency, environmental consciousness and growth to this country.

In 1993, Cargolux was the first airline worldwide to introduce the 747-400F. Again, we were proud to work with the fine people of Boeing to take the next step. I can safely say that the -400 has been a major success for us. At the time, many in the industry questioned our decision to buy a new, highly advanced aircraft when cheaper secondhand, converted passenger aircraft dominated the world freighter fleets. But our trust in Boeing has paid off and many competitors introduced their own 747-400 Freighters when they saw we could make money with it.

The 747-400F set new benchmarks in payload, range and environmental friendliness and has helped to turn Cargolux into a billion-dollar company. Recently, we saw the departure of our very first -400 aircraft to a major U.S. carrier after 16 years of nonstop service. In fact, Cargolux has always had one of the highest daily utilization rates for the 747-400F in the industry and that airplane has never let us down.

As our first -400 has left us, we are looking to the future in the shape of the 747-8F, of which we are a launch customer. We are very excited about this new aircraft that will take Cargolux through the next decades.

Innovation has always been one of our biggest qualities and was decisive in paving the way for the success of our company. The new aircraft will reinforce our competitiveness and increase our presence in the market. Environmental performance, not only of our fleet but of our company as a whole, has been a major concern for me for many years. Therefore, I particularly appreciate the improved environmental performance of the -8, translating into sustained noise reduction, lower emissions and increased fuel efficiency.

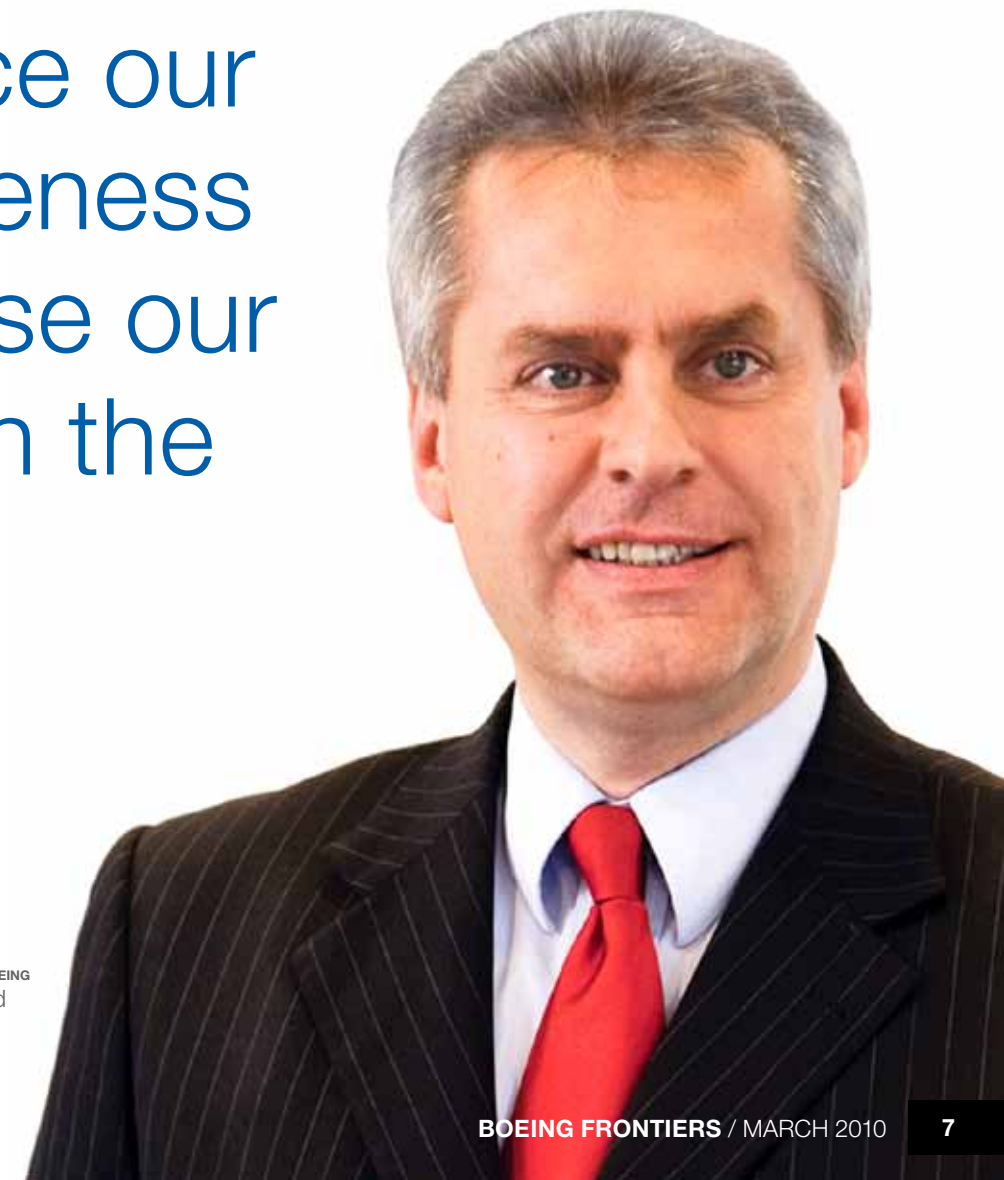
Of course, we cannot mention the 747-8 without touching on the sore point of the production delay. Initially, we were to receive our first units in 2009. That has now been pushed back to late 2010. I see this development with regret. On one hand, the current economic crisis, which has not only hit Cargolux but Boeing and the rest of the industry as well, has shown us that the markets still suffer from a lot of overcapacity. On the other hand, we could well need the added fuel efficiency and payload of the new freighter today to help us lower our operating costs. Right now, it would have made a lot of economical sense for us to operate this aircraft and it also might have given us a competitive edge in times when every little move counts toward survival.

I cannot deny that Cargolux has suffered because of the delay. Still, operating the 747-400F, one of the most modern and efficient aircraft around today, has lessened the impact of the crisis for us somewhat. We are now looking forward, proud of our contribution to the development of the new 747-8F. I dare say that without Cargolux, chances are there would be no new 747.

I am happy that Boeing and Cargolux have strengthened their good relationship and respect for each other even further. Two companies that offer quality, excellence and a superior product—that sounds like a winning team to me.

Best regards,
Ulrich Ogiermann
President and CEO
Cargolux Airlines International
Luxembourg

“The new 747-8 will reinforce our competitiveness and increase our presence in the market.”



PHOTOS: (Top) A Cargolux 747-400F. TIM STAKE/BOEING (Right) Ulrich Ogiermann, Cargolux president and chief executive officer. CARGOLUX AIRLINES

Quotables

“Going forward ... we could be competing against four or five different companies: Airbus, Bombardier, Embraer, Comac [China], maybe the Russians.”

– Boeing Commercial Airplanes President and CEO Jim Albaugh, in a Feb. 19 interview with the *Financial Times*, on the course and challenges ahead in the commercial airplanes market.

“P-8 is now the premier example of how Boeing Defense, Space & Security and Commercial Airplanes work together.”

– Dennis Muilenburg, president and CEO of Boeing Defense, Space & Security, talking with employees in Renton, Wash., about opportunities to build additional military derivatives of Boeing commercial airplanes, such as the P-8A Poseidon, a modified Next-Generation 737 that the U.S. and India navies plan to operate for maritime patrol.

Snapshot

SLING SHOT

Boeing's unmanned A160T Hummingbird rotorcraft recently completed a series of flights transporting and delivering sling loads at a test facility in Victorville, Calif. The loads were carried in a net attached to the underside of the aircraft by a 50-foot (15-meter) line. The Hummingbird features unique rotor technology that improves performance by adjusting the rotor's speed at different altitudes, gross weights and cruise speeds. The autonomous aircraft eventually will fly at speeds up to 165 knots (190 miles per hour, or 306 kilometers per hour), with a ceiling of 30,000 feet (9,100 meters) and endurance of more than 20 hours. Endurance of 18.7 hours and hover capability up to 20,000 feet (6,100 meters) have already been demonstrated. **BOEING**

IAM PROMOTIONS

No promotions listed for periods ending Jan. 29 and Feb. 5, 12 and 19.

ETHICS QUESTIONS?

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



Why We're Here

Stream of care

Using technology and teamwork helps this employee demonstrate Boeing's commitment to environmental stewardship

by Blythe Jameson and photo by Paul Pinner

Boeing Environment, Health and Safety project manager Lori Blair oversees a multimillion-dollar surface-water remediation program at Santa Susana, Calif. In this *Frontiers* series, which profiles employees talking about their jobs and the way their work fits into Boeing's overall goals, Blair describes how innovative technologies, teamwork and consideration for others equates to environmental stewardship in action.

capture, control and treat rainwater on a 2,850-acre (1,150-hectare) cleanup site that is largely undeveloped and filled with valleys, open spaces, ravines and steep ridgelines. Surface water that leaves Santa Susana, a former federal government rocket engine testing and energy research facility in Southern California, must meet levels specified in our permit for a wide range of constituents. Many of these levels must be cleaner than drinking water. It is unlikely another facility in the United States has permit limits at these very stringent levels.

Working at Santa Susana is a challenge, but it is the most satisfying job I have ever had. There are tremendous physical challenges, technical hurdles, regulatory agency requirements and community concerns to consider in the management, treatment and discharge of surface water.

We are forging new paths in the management of surface water and employ many different technologies and systems to comply with our permit requirements. These range from traditional chemical and physical treatment systems to in-ground flow-through systems using carbon and zeolite that are installed within the natural contours of the land. We also are looking into systems that use plants to slow water flow while treating the water with natural processes.

Teamwork motivates me more than anything and it's really the incredible team at Santa Susana that gets the job done effectively and safely. I have the privilege of working with a great group of engineers, field crews and water quality management experts—all with the same vision and commitment to compliance. Seeing how

“Teamwork motivates me more than anything and it's really the incredible team at Santa Susana that gets the job done effectively and safely.”

hard work, transparency and good communication promote trust, collaboration and positive working relationships has been especially satisfying.

This work fits perfectly with Boeing's environmental strategies, plans and commitments. We are working to improve our environmental performance in storm-water quality while minimizing our impact on the environment. I like the idea that I'm making a difference. Everyone who works at Santa Susana is aware of the importance of the work we are performing and its significance to our neighbors, the animals that live on the site and the ecosystem. ■

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To learn more about Santa Susana, visit the Community and Environmental Affairs page: www.boeing.com/aboutus/environment/community_affairs.html



“The principle of transferring fuel in flight will prove very important in military operations in the future.”

– Capt. Ira Eaker, Question Mark’s chief pilot

Going the distance

Boeing’s legacy of air refueling began with a biplane known as the *Hornet Shuttle*—and a long flight into history **by Mike Lombardi**

Boeing has long been a pioneer in the development of in-flight refueling. Its leadership in the field began during the early days of the Cold War, when Boeing invented the “flying” refueling boom and built the first-production aerial-refueling tankers. But the company’s experience with aerial refueling goes back much further, to the days of open-cockpit biplanes—when the focus of aviation was delivering mail.

In 1929, The Boeing Airplane Company partnered with the U.S. Army Air Corps to conduct a transcontinental aerial-refueling experiment to prove the practicality of in-flight refueling—and make nonstop transcontinental travel a reality.

The experiment followed a historic endurance flight in January 1929 by five Army Air Corps pilots in a Fokker C-2 called the *Question Mark*. That flight set an endurance record by staying aloft for 150 hours while flying a circuit over Southern California. Although the flight was made solely for the purpose of setting a record, William Boeing saw a practical application for aerial refueling in speeding the delivery of air mail.

The *Question Mark*’s chief pilot, Capt. Ira Eaker, who would

later become a four-star general, also saw the military potential of aerial refueling but believed the concept needed to be proved on an actual mission.

For this demonstration, Boeing provided two modified Model 40s and the Air Corps provided two Douglas C-1 transports as refueling planes. Boeing also provided one of its newest mail-plane designs, a Boeing Model 95 nicknamed *Boeing Hornet Shuttle*, as the endurance airplane. The pilots for the *Boeing Hornet Shuttle* were Eaker and Army Air Corps Lt. Bernard Thompson.

The Model 95 was a single-seat biplane designed by Boeing in 1928 to carry mail and cargo. For the demonstration flight, an extra seat was added for a second pilot, as well as extra fuel tanks and an in-flight fuel-receiving unit. The *Hornet Shuttle* was to follow the regular transcontinental air-mail route—the longest in the world, stretching from Oakland, Calif., to New York City. The plane would be refueled by Boeing flight crews over Elko, Nev., and Cheyenne, Wyo., and by Army Air Corps flight crews over Omaha, Neb., and Cleveland.

At 8:35 on the morning of Aug. 27, 1929, the *Hornet Shuttle* lifted off from the Oakland airport, circled San Francisco and headed east. The four refueling rendezvous were conducted successfully despite fog and storms that forced the refueling at Cheyenne to be performed at a mere 500 feet (150 meters) altitude. After 28 hours and 25 minutes in the air, the *Hornet Shuttle* reached Mitchell Field in New York. A bag of mail from San Francisco was dropped over the field, and after circling New York City Eaker and Thompson headed back toward Cleveland to continue the flight.

During refueling over Cleveland, one of four 5-gallon (19-liter) cans of oil that were being transferred along with the fuel dislodged from the refueling plane and plunged through the wing of the *Hornet Shuttle*, puncturing the oil tank and just missing the center spar. Eaker landed the plane immediately.

After repairs, the *Hornet Shuttle* returned to Mitchell Field to continue the westward leg of the transcontinental flight and on Sept. 2 headed for Oakland. The flight was uneventful but, due to head winds, took 33 hours. After circling Oakland, the *Hornet Shuttle* headed east once again, but just outside of Salt Lake City, clogged fuel lines led to a forced landing—and an end to the endurance flight.

Based on the flight, Eaker concluded that “the principle of transferring fuel in flight will prove very important in certain military operations in the future.” And in a commemorative letter that was carried on the *Hornet Shuttle*, Bill Boeing proclaimed the flight as a “forerunner of the day when larger airplanes ... will fly great

distances without stopping, thus still further reducing the time required for transportation and communication between the Atlantic and the Pacific.”

Eaker and Boeing both proved prophetic. Only 20 years later, Boeing provided the U.S. Air Force with the planes and technology for the first nonstop circumnavigation of the world. The plane was a Boeing B-50A Superfortress, called *Lucky Lady II*, which was refueled four times in air by Boeing KB-29M tankers. In perfecting the technology and proficiency to conduct regular aerial refueling worldwide, Boeing and the Air Force had delivered results—coming a long way to making the once-risky and uncertain task of aerial refueling a routine operation. ■

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PHOTOS: (Left) U.S. Army Air Corps Capt. Ira Eaker, an early proponent of aerial refueling and pilot-in-command of a cross-U.S. demonstration flight. (Middle) A Boeing poster promoting the *Boeing Hornet Shuttle*’s transcontinental aerial-refueling achievement. (Top) The modified Model 95 mail plane, shown with U.S. Army Air Corps pilot Lt. Bernard Thompson, who served as co-pilot of the *Boeing Hornet Shuttle*. (Above) The *Lucky Lady II*, a Boeing B-50A Superfortress, was the first to fly nonstop around the world—in 94 hours, 1 minute. BOEING ARCHIVES



A jumbo leap

The 747-8 Freighter is defined by its new technology and efficiency

by Lauren Penning and photos by Bob Ferguson

“The 747 still reigns as queen of the skies.”

– Steve Huard, the 747-8 senior project manager, to a *Seattle Times* reporter

When the 747-8 Freighter lifted off from Paine Field in Everett, Wash., on Feb. 8, the event marked a new chapter in the storied history of the 747 program. The 747-8's first flight came just one day shy of the 41st anniversary of the first flight of the 747—the world's first twin-aisle jetliner—which took off from the same airfield in 1969.

Although the iconic “hump” identifies the new airplane as a 747, it is the latest technology and improved efficiency that distinguishes the -8 model. “Our customers are really excited because they will get a product that is more efficient,” said Mo Yahyavi, vice president and general manager of the 747 program.

PHOTO: The 747-8 Freighter, the longest 747 ever built, taxis out to the Paine Field runway in Everett, Wash., for its first flight on Feb. 8.

Stretching 250 feet (76.2 meters), the 747-8 is 18 feet 4 inches (5.6 meters) longer than any previous 747; and the wingspan, at 225 feet (69 meters), is 13 feet (4 meters) wider.

Compared with its predecessor, the 747-400F, the 747-8 Freighter will have nearly equivalent trip costs and 16 percent lower ton-mile (tonne-kilometer) costs, in addition to room for 16 percent more revenue cargo. The new airframe also is more environmentally friendly, with a 30 percent smaller noise footprint and a 16 percent reduction in carbon emissions, thanks to a newly designed wing and fuel-efficient engines similar to the ones powering the 787 Dreamliner.

Boeing studied how to replace the 747-400 for years. "The missing piece was always the engines," said Jim Peterson, 747-8 Propulsion leader. The 747-8 team got its break with the development of the two-engine Dreamliner. The 787 engines provided the right amount of thrust for a four-engine 747 and were a good replacement, with some modification. Thus was born the GENx-2B powerplant for the 747-8, manufactured by General Electric.

The new 787 engines, however, were larger than any ever used on production 747s. "The wing needed to accommodate them,"

said David Loffing, Product Development engineer supporting the 747-8 Program Integration Team. The wing also needed to be redesigned to maintain the same takeoff and landing performance as the -400 while carrying 16 percent more payload. "It was a really interesting problem," Loffing said.

Looking down the edge of the 747-8 wing to the tip, the human eye can spot the complex curvature of the wing and how it accommodates the engines. But manufacturing advanced designs such as the 747-8 wing would not be possible without proper tooling. "What the team was trying to achieve with aerodynamics in the new wing design, for example, also had to structurally support everything with proper wing thickness. At the same time we had to keep an eye on the factory to see how we were going to fasten it, sequence it and maintain it," said Michael Teal, 747-8 chief project engineer.

The design team counted on Boeing Fabrication. The raw material for the wing skins ranges from 34 feet (10 meters) to more than 100 feet (30 meters) long and is more than an inch (2.54 centimeters) thick in places. Traditional methods to contour the wing skin included shot peening, which involves spraying

thousands of pounds (kilograms) of tiny, cut steel wire at the wing skin. This method would not work on the thicker parts of the 747-8 wing skins, so the team used a new technology—laser peening.

"We are the first in the world to use this tool with this type of application," said McKay Kunz, material and process technology engineer, who works at the Fabrication facility in Fredrickson, Wash. The airplane industry has used laser peening for fatigue or compression testing and peening on fan blades, but never before for forming wing skins. Now, the longest part on the 747-8 wing, the lower enclosure panel, receives a quarter-million precisely placed laser spots.

Boeing's fabrication team pushed the limits of another new technology, too—fabricating monolithic parts. Instead of attaching individual stringers (to provide structural support) in the wing-to-body join area, requiring a more complex fabrication process and more work to build, the team adapted a machine used to build 737 skins to cut a 9,800-pound (4,445-kilogram) block of solid material into a final 747-8 part that weighs 588 pounds (267 kilograms). "The first part we cut went on the airplane," said Tom McDonald, team leader for monolithic side-of-body 747-8,

(continued on Page 17)

"Two things haven't changed: It still looks like a 747 and it still flies like a 747, and quite frankly, it just doesn't get any better than that."

— Mark Feuerstein, command pilot of the first flight, speaking at news conference afterward

PHOTO: The General Electric GENx-2B engines for 747-8 are a modified version of the fuel-efficient GE engines developed for the 787 Dreamliner.

Test time

Planning the flight-test program for the 747-8 Freighter began early in the design phase

by Patrick Summers

Before the first 747-8 Freighter is delivered to launch customer Cargolux later this year, the airplane will complete months of rigorous testing that began in earnest with first flight.

"The flight-test team represents several thousands of people who have poured their hearts and souls into bringing the airplane to this point and making it a reality," said Mark Feuerstein, chief 747-8 pilot who commanded the first flight on Feb. 8.

The flight-test program will verify the design and performance specifications of the 747-8, its compliance with Federal Aviation Administration and other regulatory requirements, and its ability to meet customer expectations. That's a big job. Over the next several months, every component, system and flight maneuver will be tested under routine and extreme operating conditions.

Planning for the 747-8 test program began several years ago. "As the airplane goes through early concept design, firm configuration and into assembly, we're designing the instrumentation and the flight-test hardware specific to that airplane," said Dennis O'Donoghue, vice president of Boeing Test & Evaluation. "Then we fabricate, assemble and install it, all while the airplane is going down the production line."

The 747-8 flight-test program will use three freighters and two Intercontinental (passenger) airplanes. "We calculate the number of test airplanes based on the number and type of tests we need to complete, the estimated flight hours necessary to meet the testing requirements and the time we have to get it all done," explained Andy Hammer, 747, 767 and 777 test program manager.

Flight testing of the Intercontinental is scheduled to begin in early 2011.

One challenge for Boeing Test & Evaluation is executing simultaneous flight-test programs for both the 747-8 and the new 787 Dreamliner. The solution, O'Donoghue said, was to geographically separate the testing. The 787 flight tests will take place mostly in the Puget Sound area. Initial flight testing of the 747-8 Freighter is being carried out at Moses Lake in Eastern Washington, with the remaining tests in Palmdale, Calif.

Flight testing on the first 747-8 Freighter is scheduled to be completed in the third quarter, with the airplane then refurbished and delivered to launch customer Cargolux by the end of the year. ■

patrick.a.summers@boeing.com



"It's a great experience to be able to see a brand-new airplane go flying up high. It makes all our hard work worth it."

— Joe Farra, one of many Boeing employees who lined the runway to watch the 747-8 take off for the first time

PHOTO: The 747-8 continues a Boeing legacy of 747 Freighters that today carry more than half the world's air freight.

commenting on the quality of the new part's design, fit and finish.

"Our customers see the 747-8 as a departure—an improvement to what they already have," Yahyavi said. "They have a confidence that they are getting a better product."

That confidence comes, in part, from the Freighter Working Group. Starting in early 2005, Boeing met with technical experts in the cargo community to discuss the next generation of freighters. Pilots and operators of 747-400 Freighters wanted the new airplane to fit easily into existing 747 fleets. So the design team made sure that the new airplane could use the same ground-support infrastructure as the -400. The only exception is a beefed-up tow bar, necessary because of the aircraft's added weight. Meanwhile, the systems integration team focused on making the flight controls mimic the handling characteristics of the -400. "Our goal is to have it feel and handle identically to the -400 while still getting increased performance and better reliability," said Debra Fahey, 747-8 flight controls integration.

Another takeaway from the meetings was a better understanding of what features customers wanted on the airplane—and how to reduce options and add value. This strategy has reduced the number of options on the new freighter by about 70 percent, simplifying the buying process for the customer and upping the resale value because there is increased commonality between customer fleets.

This also has benefits on the factory floor. "A good Lean production system is built on stability," said Paul Nuyen, vice president of 747-8 Manufacturing. "Having a more stable configuration allows us to get the production system on a real rhythm."

The team also needed to prepare the factory for the larger dimensions of the 747-8 airframe and related materials. "Lots of things needed to be gauged up," said Tom Miller, tooling engineer lead for the 747-8. This included creating or reworking 2,046 tools. For example, in wing-to-body final assembly, more than 60 percent of the tools are new. "We had management down on the factory floor asking us what we needed to get the job done," said Jose Diaz, mechanic on the 747-8.

The new tools are designed to be more ergonomically friendly. The automated spar assembly tool, for example, is "a leap into the future" for the program, Miller noted. Instead of performing hand drilling, an automated tool guides the process.

As the program assembled the major components of the initial 747-8 Freighter, late maturity of designs caused more rework than expected and first flight was pushed back to 2010. Although this was disappointing, lessons learned on the 747-8 Freighter are being applied to the Intercontinental, the passenger version of the



747-8 that will follow. The Intercontinental design is more complex because of the passenger interior and added stretch to the aircraft's hump. "We have a more thoughtful resource plan and NRPD [non-recurring product development] process," said Todd Zarfos, vice president of 747 Engineering. The result: "We have had more than 50 weeks of 100 percent performance, compared with 95 percent, which is a traditional recurring metric," he said.

Assembly of the Intercontinental is scheduled for mid-2010, and "the improvements on the engineering performance of the Intercontinental are a good indicator that we will have a better time putting it together," Nuyen said.

Meanwhile, with first flight of the freighter accomplished, the team needs to remain focused, according to Yahyavi. "We are entering the flight-test phase, and like every development program, we have to go through that process, and we will find things that need to be addressed. In the meantime, we need to finish work on the production system to get the airplanes ready on time for our customers." ■

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"It was a big day for a big airplane."

– Mark Feuerstein, command pilot of the 747-8 on its first flight, speaking afterward at a news conference

PHOTO: After a successful first flight that lasted 3 hours, 39 minutes, the 747-8 returned to Paine Field in Everett, Wash., where it is shown here in the golden light of late afternoon.

Meet the *launch customers*

Boeing has 108 orders for the 747-8, of which 76 are for the freighter. Below are brief profiles of the launch customers for the biggest and most efficient 747 ever.

Company: Cargolux Airlines International S.A.

President and CEO: Ulrich Ogiermann

Fleet: All-Boeing operator of 14 747-400 Freighters; launch customer for the 747-8 Freighter, with an order for 13

Markets served/major routes: Cargolux is one of the world's leading cargo airlines, operating scheduled and charter services on a network covering 90 destinations in all continents. The company has 40 years of experience and, measured in ton-miles (tonne-kilometers) flown, ranks as the eighth-largest cargo airline worldwide. Cargolux is an integrated transportation company, operating exclusively with freight forwarders. It is the largest all-cargo airline in Europe.

What you didn't know: Cargolux is an expert in the transportation of special cargo, including live animals. Recently, two *hippopotamus amphibius* traveled on board of a Cargolux flight from Tel Aviv's zoological center to their new home in a zoo in Almaty, Kazakhstan.

Company: Deutsche Lufthansa

Chairman of the Executive Board and CEO:

Wolfgang Mayrhuber

Fleet: Total for the Lufthansa Group is 570 airplanes, including 63 737 Classics (-300, -500), 11 Next-Generation 737s (-600, -700, -800), 6 767-300ERs (Extended Range), 4 777-200ERs, 30 747-400s and 19 MD-11 Freighters; Lufthansa is a launch customer for the 747-8 Intercontinental, with 20 on order

Markets served/major routes: Deutsche Lufthansa operates a global network that, together with its Star Alliance partners, performs more than 800,000 flights annually.

What you didn't know: Deutsche Lufthansa is the largest airline by fleet size in Europe. Wholly owned subsidiary Lufthansa Technik, which provides aircraft maintenance, repair, overhaul and modification services, is a completion center for Boeing Business Jets, installing highly customized interiors.

Company: Nippon Cargo Airlines

CEO: Tadamasu Ishida

Fleet: Operator of eight 747-400 Freighters; launch customer for the 747-8 Freighter, with 14 on order

Markets served/major routes: Nippon Cargo's worldwide network covers 15 major cities in seven countries in Asia, America and Europe. From Tokyo's Narita International Airport, Nippon Cargo flies to Amsterdam; Anchorage, Alaska; Bangkok; Chicago; Hong Kong; Los Angeles; Milan; Nagoya and Osaka, Japan; New York; San Francisco; Seoul, South Korea; Shanghai; and Singapore.

What you didn't know: Nippon Cargo Airlines is Japan's only all-cargo carrier. As part of the "flying wheelchairs" project, 59 Japanese high schools recondition used wheelchairs, which the cargo carrier then transports to people in need around the world, particularly in Southeast Asia.

"It's the culmination of a lot of 'working together' meetings with Boeing, Cargolux and Nippon Cargo. And it's fantastic to see the airplane fly after all this work."

– Sten Rossby, Cargolux chief technical pilot

PHOTO: The 747-8 Freighter climbs away from Paine Field in Everett, Wash., on its first flight, one day shy of the 41st anniversary of the first flight of the original 747 in 1969.



Dream introduction

Getting the 787 Dreamliner ready for airline service begins long before delivery **by Jay Spenser and photos by Bob Ferguson**

With flight testing of the Boeing 787 under way, Boeing employees are focused on its progress toward certification and delivery in the fourth quarter of this year.

But introducing an all-new jetliner into commercial operation involves much more than just delivering a great airplane. Successful debuts also require that the airlines be fully ready to operate the new airplane, and that they have available to them a full spectrum of customer services and support. These three elements—airplane, airline and support—together create service readiness.

“When we deliver a new commercial airplane, we in effect place the Boeing brand in our customers’ hands and they entrust us with their brand,” said Mike Fleming, 787 director of Services and Support. “For this to all go well, a great deal has to happen behind the scenes. The preparation begins long before the first airplane is delivered, and we work hand in hand with our airline customers throughout the process.”

ANA (All Nippon Airways of Japan) is the launch customer for the 787, with 55 on order for domestic and international routes. “We worked very closely with Boeing throughout the 787’s development and are pleased with the results,” said Michihide Kono, ANA vice president of Engineering and Maintenance. “In addition to being more comfortable, fuel-efficient, better for the environment and easier to maintain, the 787 brings e-enabled maintenance capabilities that reduce the time [the airplane] will spend on the ground between flights. This is a really important advantage in our domestic operations.”

To introduce a new airplane into its fleet,

an airline must address training, information, tools, spare parts and infrastructure issues such as ground-support equipment and airplane compatibility with airport gates. Airlines look to Boeing for comprehensive support that will help them have a successful entry into service. Once revenue operations begin, they depend on Boeing support to help keep their airplanes flying without disruption.

“Expectations were high for Boeing’s previous all-new airplane, the 777, which quickly established itself as the most reliable twin-aisle jet in the world,” said Larry Slate, who is leading the entry-into-service process for the 787. He is a former United Airlines executive who was the airline’s 777 fleet manager when it introduced the airplane in 1995. “Today the bar is set even higher with the 787,” Slate said. “Although the Dreamliner represents a quantum leap in technology, we’re working to ensure that it attains a consistently high level of reliability even faster than the 777. For this to happen, we need to have a more mature airplane and more mature product support before service entry.”

Commercial Aviation Services is providing an unprecedented level of support to the test program. This effort includes the Boeing field service engineers who will soon be based with 787 operators around the globe, as well as key suppliers to the 787 program who are participating at Boeing’s request.

“This flight-test involvement helps us better understand the expected reliability of the 787’s systems and components, most of which are monitored by the airplane and are designed to last longer than those of previous airplanes,” according to

PHOTOS: Supporting 787 flight test, manufacturing and maintenance in Seattle and Everett, Wash., are: **(main photo)** Mark Baird and **(insets, from top)** Adrian Butler, Kishor Joshi (left) with Cam Le, and Paul Patterson.



“The Dreamliner will be an industry game changer on all fronts. Not only the airplane itself but also the services and support that help airlines long before they actually begin flying the 787.”

– Susan Linde, Material Management leader for 787, Commercial Aviation Services

Dale Wilkinson, vice president of Material Management, Commercial Aviation Services. "And once the 787 enters service, its operators will count on us and our suppliers to anticipate and develop rapid short-term solutions and implement final fixes to eliminate any issues that might crop up."

Airlines typically want their spare parts on hand two months before receiving the airplane. But they need to order this inventory six months before then. And before the airlines place their order, they must first decide which and how many spare parts to procure. They also may need approval for this expenditure from their board of directors, which can take time. So Boeing must provide the right information for informed spares-provisioning decisions as much as one year before entry into service.

A very large number of Commercial Airplanes and other Boeing employees directly or indirectly support the 787 entry-into-service process. "Introducing the 787 is an exciting challenge," said Jeff Haber, 787 Maintenance Training manager, Training and Flight Services, Commercial Aviation Services. "From its composite structure and more electric architecture to its extensive use of information technology, this airplane presents a great deal that's new on the hardware and software fronts. We're working closely with our customers to help ensure they're ready."

Boeing delivers Dreamliner maintenance training through the Maintenance Performance Toolbox, an integrated suite of software applications and tools that provides users with airplane maintenance data in

advanced formats. Although the Toolbox is an existing Commercial Aviation Services product offering, the 787 is the first Boeing airplane to use it as its single source of both maintenance data and maintenance training.

"The decision was made at the outset of the 787 program to provide technical information in an entirely new and better way," said Freelon Hunter, director of Maintenance Information Systems. "Toolbox is a key component of this decision, which exploits the 787's unique capabilities as the world's first e-Enabled jetliner."

With delivery of the first ANA 787 scheduled for later this year, training has already begun for 450 ANA maintenance technicians around the world. Before Boeing could develop comprehensive training, however, a wealth of airplane data needed to be completed and manuals and illustrations created. Boeing employees also developed, among other things, training for 787 flight and cabin crews, laid out the regulatory basis for the operational certifications that airlines must secure from their regulatory authorities, and prepared the minimum-equipment list that carriers and authorities will use to define airplane-related dispatch criteria. It's all part of the entry-into-service process.

"The Dreamliner will be an industry game changer on all fronts," said Susan Linde, Material Management leader for the 787, Commercial Aviation Services. "Not only the airplane itself but also the services and support that help airlines long before they actually begin flying the 787." ■

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"When we deliver a new commercial airplane, we in effect place the Boeing brand in our customers' hands and they entrust us with their brand."

— Mike Fleming, 787 director of Services and Support



PHOTOS: (Right) Helping prepare the 787 for a smooth entry into service is Kelly Haggin. **(Inset)** A 787 is shown in the Everett, Wash., factory.

The e-Enabled advantage

Electronic links between the 787 and airline operator streamline maintenance and data collection

Starting with the 787, information technology is joining maintenance and engineering on the front lines of airplane readiness.

Or as Bob Manelski, director of Crew Information Services, Commercial Aviation Services, explains it: "The e-Enabled 787 provides a direct electronic link to airline offices. Whereas other airplanes operate in relative isolation, the 787 is integrated into airline ground networks."

What e-Enabling does is streamline airplane maintenance. For example, airlines can load software upgrades wirelessly rather than having technicians perform this task manually on the plane. For operators with large fleets, this will save significant time, effort and expense.

Another advantage e-Enabling provides is access during flight to the 787's Electronic Logbook, an onboard system that automatically records any maintenance

issue that arises. As a result, technicians can be standing by with the correct spare parts and tools when the 787 arrives at an airport gate.

A key e-Enabling tool is the Maintenance Laptop, which revolutionizes 787 line maintenance. Applications on this laptop allow fault isolation, software management, data downloading and many other tasks to be performed. These laptops can also host the Maintenance Performance Toolbox, a Boeing software suite providing complete maintenance guidance for the 787 airplane.

When working in and around the airplane, airline technicians can connect their Maintenance Laptops to a Dreamliner by any of three wired Ethernet connections or a wireless interface. More than one laptop can be used at the same time. All the links are protected with security measures, including encryption and passwords.

— Jay Spenser



All systems go

Teaching soldiers how to maintain Apache Longbow helicopters is just one of the many missions at Training Systems & Services **by Yvonne Johnson-Jones** and photos by **Bob Ferguson**

When Boeing's Mike Flynn arrived at the classroom to conduct his next training event at the U.S. Army's National Guard base in Eastover, S.C., recently, he brought with him more than 30 years' experience performing maintenance on military aircraft.

But his real passion is teaching those skills to students—in this case, troops headed to Kuwait to maintain Apache helicopters used in the fighting in Afghanistan. They were there to learn from Flynn how to keep Boeing's AH-64D Apache Longbow helicopter operating safely, reliably and effectively.

When an Apache Longbow pilot flips the switch to start the rotors turning, every system and subsystem has to be ready to do its job—flawlessly, Flynn said. "When something goes wrong with an aircraft thousands of feet in the air, you can't pull over and get it fixed. I take a great deal of ownership in making sure that the soldiers who will maintain the aircraft are trained and ready to keep it flying safely."

On this occasion, the training was for the Missouri National Guard's "A" Company, Theater Aviation Sustainment Maintenance Group, which was headed to Kuwait to help maintain the *(continued on Page 28)*



"I take a great deal of ownership in making sure that the soldiers who will maintain the aircraft are trained and ready to keep it flying safely."

— Mike Flynn, maintenance training instructor, Boeing Training Systems & Services



PHOTOS: (Left) Mike Flynn, a maintenance training instructor with Boeing Training Systems & Services, is shown with the AH-64D Apache Longbow helicopter. **(Inset)** Boeing Training Systems & Services' Mike Flynn provides maintenance training to members of the Missouri National Guard.

AH-64D Longbow. (Previously, the group had been trained to maintain A-model Apaches only.) To get it ready to perform this critical mission, the National Guard contacted Boeing's Training Systems & Services organization, which is part of Boeing Defense, Space & Security.

With more than 1,800 employees, Training Systems & Services has operations at 58 sites and in seven countries. It offers a range of training solutions including mission planning, state-of-the-art aircrew and maintenance training, as well as instructors and logistics support. Training Systems & Services also makes courses available to domestic and international customers through an online catalog.

Flynn began his career in the military,

maintaining Bell AH-1 Cobra helicopters. He is now qualified to train others on every system of the AH-64 Apache and is one of only three maintenance instructors from Boeing's Mesa, Ariz., site who can provide complete training in theory, operation and maintenance of all configurations of the Apache. Last year, Flynn and his team taught more than 20 courses and trained more than 200 aviation technicians and contractors for U.S. as well as international militaries.

For "A" Company, its two-week training course from Flynn covered how to service, troubleshoot and repair nearly 30 systems and subsystems on the Apache. After lectures and textbooks, it was out to the aircraft for hands-on experience in

systems identification and operations, adjustment techniques and inspections.

Safety was a big part of the training. "Safety is fundamental to every course we teach, without exception," Flynn said. "The ramifications are too great to take anything for granted."

At least one of his students, Staff Sgt. Cory Davis, an avionics technician stationed in Springfield, Mo., felt Flynn accomplished what he wanted. "Mike did a great job preparing me for deployment," Davis said. "I am ready!" ■

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“Safety is fundamental to every course we teach, without exception.”

– Mike Flynn, maintenance training instructor, Boeing Training Systems & Services



PHOTOS: In a two-week course for the Missouri National Guard's "A" Company, Boeing maintenance training instructor Mike Flynn covered how to service, troubleshoot and repair nearly 30 systems and subsystems of the Apache helicopter.

It's usually the tail end of the rocket that gets all the early attention, providing an impressive fiery display as the spacecraft is hurled into orbit. But mission success also depends on what's on top of the rocket: a piece of metal called the payload fairing that protects the rocket's cargo during the sometimes brutal ride to orbital speed.

"There's no room for error," said Tracy Allen, Boeing's manufacturing production manager for a Huntington Beach, Calif., team that made fairings for the Delta IV. The fairing not only protects the payload from launch to orbit but also must jettison properly for deployment of the satellite or spacecraft.

Allen and his colleagues built the 65-foot-long (20-meter-long) aluminum isogrid fairings for the Delta IV heavy-lift launch vehicle. The design was based on 41 similar fairings Boeing made for the Titan IV rocket. Isogrid refers to the triangular grid pattern formed by stiffeners on the inboard side of the fairing structure.

The team delivered its final product last September, with fairings for two future launches in inventory. While their management works on opportunities for new orders, team members have moved on to

other work. But they'd jump at the chance to work together again.

Their story is one of challenges and solutions. And they attribute their success to Lean+ practices and good old-fashioned teamwork.

"The team took it upon themselves to make an excellent product," said program manager Thomas Fung. "We had parts issues and tool problems, but the guys really stepped up and took pride and worked through the issues."

The aluminum fairing team went through a major transition when Boeing merged its Delta Program with Lockheed Martin's Atlas Program to form United Launch Alliance in 2006.

"There were a lot of process changes in the transition phase because we were working with a new company," Fung said. "We had part shortages because of vendor issues, and that caused an impact to the schedule. We had personnel changes, and we had to spend a lot of time transferring knowledge. We had culture differences from Lockheed Martin's Atlas program as to how Boeing does things."

Added Mike Miller, director of structures for the Delta and Atlas vehicles at United Launch Alliance: "None of these folks should

have anything less than a complete sense of pride knowing the product they built and the support they provided has enabled our mission success."

Finding ways to use Lean+ tools was key to their efficiency.

"We benefitted from some of our Lean concepts, such as 'point of use.' All of our supplies and parts were located where we were using them. Kits were detailed and toolboxes were 'shadowed,'" or marked to highlight tools that were unaccounted for, Allen said. "It was a very visual workshop—you could walk into the assembly area and know if something was out of place."

Good work practices translated into a quality product. Of the 45 isogrid fairings Boeing produced for both the Titan and Delta programs, the last fairing had the fewest manufacturing discrepancies and came in at a lower-than-expected cost, Fung said.

"Each fairing was top-quality, a good product," said Tone Pekich, responsible structures engineer on the project. "They all have their challenges, and some take a little bit more work depending on the issues that come up. They're like our kids, and all kids are special."

The team found additional inspiration in the nature of the customer. All of the payload fairings went to United States national security missions. They'll watch with pride when their final two fairings launch soon on National Reconnaissance Office missions.

"We were part of helping the warfighters to combat terrorists," Fung said.

Safe travels

This Boeing team's skills at producing Delta IV rocket fairings helped protect critical national security satellites during launch **by Melissa Mathews**



The customer agrees. The isogrid fairing, according to Miller, "has protected some of the most important assets we've launched and has maintained an impeccable track record of hardware quality and overall system reliability."

Team members say there are lessons to be learned across the Boeing enterprise as a result of their experiences. "The Lean+ tools can be applied to any office, any shop, any engineering process," Allen said. "Anything that has more than one step—it's all applicable." ■

PHOTOS: (Left) Tracy Allen, Boeing manufacturing manager for Network and Tactical Systems, is shown with tooling used to assemble payload fairings in Huntington Beach, Calif. **PAUL PINNER/BOEING (Right)** A Delta IV Heavy rocket with a National Reconnaissance Office payload lifts off from Cape Canaveral, Fla., in January 2009. **UNITED LAUNCH ALLIANCE**





PHOTOS: A KC-767 aerial-refueling tanker fuels an F-15 in flight. **BUZZ SHADDY/BOEING (Insets, from left)** International Tanker Program's team members Tim Walburn (left) and Don Quiring review the KC-767 cargo handling system. **BEVERLY NOWAK/BOEING** Thuoc Etezazi (foreground) and Joe Seiler of the International Tanker Program route refueling camera fiberoptics on a tanker. **BEVERLY NOWAK/BOEING** International Tanker Program's Don Quiring (left) is shown with a customer performing a walk-through of the Japan 1 tanker before its ferry flight. **GINA DREHER/BOEING**

Mission accomplished

The delivery of Japan's fourth KC-767 tanker strengthens Boeing's relationship with an important customer **by Felix Sanchez**

When the KC-767 aerial-refueling tanker landed in Gifu, Japan, in late December, after a ferry flight of more than 6,100 miles (9,820 kilometers) from Wichita, Kan., it marked more than just a milestone for Boeing's International Tanker Program.

The delivery of Japan's fourth and last tanker was a testament to how Boeing teams in St. Louis, Wichita and Japan worked together to satisfy a key international customer.

"Constant customer communication allowed us to incrementally complete the delivery requirements for these tankers and, most important, address issues as they came up," said Randy Eno of the International Tanker Program and part of the Wichita-based delivery team for the Japan tankers.

And some of those issues proved challenging. Boeing signed the contract for four tankers in 2003, with the first scheduled for delivery in the spring of 2007. But that first KC-767 was not delivered until February 2008—some 12 months late. However, the remaining three tankers were delivered on time to the Japan Ministry of Defense. Boeing delivered the second tanker to Japan in March 2008 and the third tanker a year later.

"Throughout the program we have constantly applied lessons learned from each aircraft to improve upon the next delivery," said George Hildebrand, Boeing's Japan KC-767 program manager. The last delivery, known as J4, was the smoothest of the four, he added. "Our ability to deliver J4 on schedule reflected the total team approach between program, engineering and operations within the tanker program, our Boeing team in Japan and with Itochu," Hildebrand said.

Itochu is Boeing's Japan partner in the tanker program. Boeing delivered each tanker to Itochu, which performed the final in-country processing before handing the tankers over to the Japan Air Self-Defense Force.

"Our tanker team put in long hours to create this innovative aircraft and made good use of what we call our 'all in' approach, where teams leverage company resources, no matter where they are geographically within the organization, to meet or exceed customer expectations," said Chris Chadwick, president of Boeing Military Aircraft.

Chadwick lauded the collaboration of Boeing's tanker employees in meeting the customer's requirements. "The



Boeing Company has a long and close relationship with the people of Japan. Our tanker team ... built on and strengthened that relationship by working hand in hand with our customer to produce and support a state-of-the-art tanker that will meet the needs of the Japan Ministry of Defense and the [Japan Air Self-Defense Force] for many years to come."

The four tankers are undergoing Operational Evaluation by the Japan Air Self-Defense Force, a process that should be completed later this year. The fleet achieved Initial Operational Capability in March 2009. The KC-767s are assigned to the 1st Airlift Wing with the Japan Air Self-Defense Force at Komaki Air Base.

"Providing Japan with the fourth and final KC-767 tanker on schedule means a great deal to our company and our relationship with this important customer," said Dennis Muilenburg, president and chief executive officer of Boeing Defense, Space & Security. "Because of these tankers, Japan now has the capability to perform vital self-defense, refueling and airlift missions. Also, when necessary, it possesses the capability to perform critical humanitarian and disaster-relief missions across the Pacific region and beyond."

The KC-767 is a military derivative of the 767-200ER (Extended Range) commercial twin-aisle airplane built in Everett, Wash. It is configured with the advanced Boeing air-refueling boom and the associated Remote Aerial Refueling Operator II system. Japan selected the convertible freighter configuration so it can also carry cargo or passengers, but its primary role is aerial tanker. With a convertible freighter interior, the Japan tanker can be quickly converted from all-passenger to all-cargo configurations.

Nicole Piasecki, former president of Boeing Japan who in January was named vice president of Business Development for Commercial Airplanes, said the tankers will play a significant role in Japan's ongoing strategic self-defense policy. "They are yet another example of the kind of partnership and harmonious teamwork developed between Japan, Itochu, Kawasaki Heavy Industries and The Boeing Company, which we hope to foster and grow in the future," she said. ■

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Target acquired

The Harpoon missile program takes aim at Lean+ and scores again **by Tim Deaton**

For more than 35 years, Boeing's Harpoon missile has been one of the most successful anti-ship weapon programs in the world. It's deployed in 29 countries.

More recently, and closer to home, the program zeroed in on cost, performance and schedule—and it is hitting those Lean+ targets, too.

"To maintain our competitive edge, in the spring of 2009 we challenged each facet of the program to improve processes, reduce costs and reinforce our performance," said program manager Jim Young. The Harpoon Supplier Management team has been working with key suppliers to reduce lead times—the interval between when a purchase order is placed and delivery of parts begins. The team targeted 13 major suppliers whose lead times exceeded 12 months. Using its Lean+ expertise, the team worked with each supplier to identify areas where processes could be improved to reduce production times.

"We walked their production floors, reviewed processes and discussed issues," said David Ryan, Lean expert with the Harpoon Supplier Management team. He led several of the supplier studies. The effort has paid off.

- Kemco Aerospace Manufacturing, which provides a number of machined parts, has cut its lead time nearly in half, from 18 months to 10.
- ATK Tactical, which provides the Harpoon rocket motor, has reduced its lead time from 19 months to 14, a 27 percent improvement.
- General Dynamics Ordnance and Tactical Systems, which supplies the warhead case, has slashed its lead time by 43 percent, from 16 months to 11.
- MB Aerospace, which builds the missile canister, has cut lead time from 19.5 months to 13.5, a 30 percent savings.

The 13 suppliers have reduced lead times by a combined 20 percent—from 204 months to 164 months. That means big savings for Boeing and suppliers and, most important, competitive prices for the customer and the potential for additional missile sales.

"When we place orders for these long lead time items, we have to commit company funds for an extended time period," said



Jeff Kutterer, a manager with Harpoon Supplier Management. "Our goal was to reduce the suppliers' lead times to 12 months so that our purchase orders could be issued closer to the actual need date and free up cash."

Beginning with 2010, purchase orders for long-lead items will be placed an average of three months later than in the past, freeing up \$6 million in company funds, or \$2 million for each month's delay in ordering.

"In terms of cash flow and saving money, this is a big deal," Ryan said. "But we're not stopping here." The goal for 2010 is to reduce lead times to nine months. ■

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PHOTOS: A Harpoon Block II anti-ship missile is launched by the U.S. Navy during training. **U.S. NAVY (Inset)** Amy Rauls, procurement agent (left), and Jeanine Dickherber, supplier manager (right), examine a Harpoon guide shell while working with Richard Zimmerman, chief executive of Kemco Aerospace Manufacturing, to lean out processes and reduce costs. **RON BOOKOUT/BOEING**

Following the clues

'Detective' work by Boeing engineers helps keep the space shuttles flying **by Ed Memi**

When *Atlantis* flew to the Hubble Space Telescope for a servicing mission in May 2009, one of the space shuttle's elevons (used to control the shuttle's side-to-side and up and down movement) short-circuited. The circuit worked as expected right up to the day of launch, but once the main engines fired and the boosters were lit, the problem surfaced.

Fortunately for the crew, critical flight systems are redundant and the mission went on as planned. But the electrical short got everyone's attention.

On the shuttle's return to Earth, a team of Boeing, United Space Alliance and NASA engineers began troubleshooting the nearly 170 miles (275 kilometers) of wiring throughout *Atlantis*. Among them was Nick Utley, a Boeing wiring subsystem engineer.

"It's detective work," Utley said. "You have to take what you know, collect any new information, dig deep and just follow the clues."

Digging for clues is what Utley loves. As a kid, he was always disassembling or tinkering with electronics to see how they work. Now, he gets to carry out that childhood passion in and around the space shuttle.

In troubleshooting the problem with *Atlantis*, Utley and the rest of the wiring team zeroed in on a damaged wire harness buried inside the right wing. The harness had rubbed on an adjacent structural fastener that, over time, damaged the wire insulation and exposed the conductor within. Contact between the exposed



conductor and a fastener during the vibration of launch resulted in the short circuit.

Although his job is largely behind the scenes and routine, Utley said it's all worth it on the day of launch. "When you watch the shuttle fire up and successfully rocket into space, and then remember that you and your teammates—crawling around in one of the compartments to locate and fix a problem—played a part ... that makes the launch personal and special."

Utley and his team know the Space Shuttle program will soon be retired. "Doesn't matter," Utley said. "This is about doing your best day by day in the smallest details. That kind of attitude is transferable to anything you do." ■

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PHOTO: Boeing Space Shuttle wiring experts Dario Garcia (left), K. Nick Utley (foreground) and Ryan Smith, inside a space shuttle at Kennedy Space Center. **INDYNE**



One Boeing

The face of Boeing is the talent and diversity of the company's employees around the world

by **Kathrine Beck, Stephen Davis, Rob Henderson and Jeff Wood**

The heart and spirit of Boeing can be found in more than 70 countries. Boeing employees, both international locally hired and U.S.-based, are part of a broad tapestry of diversity and talent—a well-integrated work force that contributes, and is essential, to the company's success in global markets.

More than 8,000 employees live and work outside the United States, complementing the many thousands who work at U.S.-based sites on Boeing products and programs to serve, connect and protect people worldwide.

"Boeing employees around the world support our customers, suppliers, partners and one another," said Shep Hill, president, Boeing International. "They are Boeing's competitive advantage and a critical component to our success as a global company."

Pictured on the pages of this issue of *Frontiers* are just a few of the many faces of Boeing's global presence. ■

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For more information about Boeing International, visit <http://boeingintl.web.boeing.com> on the Boeing intranet.

FERNANDO MIWA

"In Brazilian culture, people are used to a lot of negotiation. But in other cultures, it's often more direct."

Fernando Miwa, Boeing Commercial Airplanes field service representative in Sao Paulo, provides support to Brazilian airlines and maintenance, repair and overhaul customers, representing Engineering, Sales, Marketing, Technical Publications and other Commercial Airplanes organizations.

"I like working for Boeing. I like the Boeing culture," said Miwa, a mechanical and aeronautical engineer with a degree from the University of Sao Paulo.

Like roughly a million other Brazilians in his large and diverse country, Miwa is descended from immigrants who came to Brazil from Japan generations ago. He supports Boeing customers in Portuguese and English, using his cross-cultural expertise to foster good two-way communication.

For example, "In Brazilian culture, people are used to a lot of negotiation," Miwa said, "but in other cultures, it's often more direct." As a cultural facilitator, he explains Boeing processes to customers and Brazilian business customs and expectations to Commercial Airplanes employees.

Soon after he was hired, about six years ago, Miwa spent three and a half months in Seattle to develop technical expertise in Boeing airplanes and learn about Commercial Airplanes organizations. He then did a stint in Dallas with Southwest Airlines to learn how Boeing interacts with its customers. "In Seattle, I learned what we do and how we do it—and got technical training. Then I learned how we integrate that with the customer," Miwa said.

"I like going to Seattle once a year or so," he added. "There are always new people to meet and new things to learn." ■

PHOTO: ASSOCIATED PRESS





50° 50' 0" N, 1° 11' 0" W

THOMAS BAKER-SCHMIDT

“Boeing is my first experience working for an international company. There’s a lot of opportunity and I really like the mentality and work ethic.”

A native of Portsmouth, on the south coast of England, Thomas Baker-Schmidt is a Boeing Defence UK employee—part of Defense, Space & Security—working for the UK Rotorcraft Support organization as a Warehouse and Distribution manager for Supply Chain and Asset Management. He supports the Royal Air Force, managing warehouses and parts distribution for the RAF fleet of Chinook helicopters at Fleetlands in the county of Hampshire. One of more than 70 Boeing employees who support the Chinook fleet, Baker-Schmidt oversees a team managing three warehouses, scheduling work and making sure spares are there when needed.

He began his career as an apprentice mechanic working on helicopters for the UK Ministry of Defence’s Aviation Repair Agency, or DARA, which became part of Boeing supplier Vector Aerospace.

Later, he was a mechanic on the Grand Prix auto racing circuit, working on engines that power Formula One race cars up to 220 miles per hour (350 kilometers per hour). “I flew around the world with the team and stayed in lots of nice hotels,” he said. Then he met Louise, now his wife, and traded in his life on the road.

For several years, he worked as a planner for Vector, providing hands-on maintenance for the RAF Chinook fleet. When the Supply Chain job opened at Boeing in 2007, he applied.

“Boeing is my first experience working for an international company,” he said. “There’s a lot of opportunity and I really like the mentality and work ethic. Boeing employees take pride in the things they produce—whether for land, sea or air. We are very customer-oriented.” ■

PHOTO: ASSOCIATED PRESS



45° 28' 0" N, 9° 12' 0" E

FEDERICA GOTTI

“I was amazed at the amount of resources on the Boeing intranet, especially the online learning opportunities.”

Federica Gotti, an employee of Boeing Italy and the Human Resources leader for Southern Europe, provides HR support to international Boeing employees at many sites in Italy and Spain. Her versatility and ability to speak French, English and Italian are key skills, as these employees work for all parts of the company.

In Italy, Boeing has supplier partners building components for Boeing commercial and military aircraft in several locations—from Venice in the north to Naples, Foggia and Grottaglie in the south, where supplier Alenia Aeronautica is building the 787 fuselage. And in Spain, home to Madrid’s Boeing Research & Technology Europe research center, Boeing scientists and engineers from many European countries work on new projects that involve the environment, safety and reliability, as well as air traffic control technology.

“I meet regularly with employees and partner closely with their managers,” Gotti said. She provides expertise in many areas, including staffing, employee relations, careers and performance management. She also ensures that Boeing processes are adapted within the context of local culture and language, they comply with local laws, they are compatible with local business customs, and they respond to local needs.

Though not new to working in large multinational companies, Gotti was impressed by Boeing, which first hired her as an HR generalist in Belgium in 2002. “I was amazed at the technical sophistication and the amount of resources on the Boeing intranet, especially the online learning opportunities,” she said. “That is something I hadn’t seen in other companies.” ■

PHOTO: BOB FERGUSON/BOEING



EKATERINA YURKOVA

“We find the gaps and show how to improve our processes—and improve relationships with customers and suppliers.”

Ekaterina Yurkova, known by her nickname Katya, works for Boeing Moscow, but her job as a Boeing Lean+ practitioner can take her far from the office. The distances she often travels to lead Lean workshops—more than 300 miles (500 kilometers) south to Voronezh, near Ukraine, followed by a 10-hour flight to Komsomolsk in the Russian Far East—may not seem lean in practice, but for Yurkova, the results have made the journey worthwhile.

Leading the workshops is important, she said, “because a lot of processes have gaps, and we find the gaps and show how to improve our processes—and improve relationships with customers and suppliers.”

The native Muscovite first came to Boeing Moscow as a secretary, a job that requires being able to use computer keyboards and cell phones that include both Russian Cyrillic letters and the English alphabet.

In 2007, Yurkova joined Boeing Moscow’s Lean Office. She received Lean training in Everett, Wash., and is now part of a three-person team that, in addition to leading workshops, is tasked with translating Lean terms into Russian—although some Japanese Lean terms, such as *kaizen*, remain Japanese.

There have been challenges deploying Lean with an experienced aerospace work force, Yurkova said. “At first, they didn’t know who we were and why we were there teaching them.” But by applying the Lean practices, they learned, she said, adding, “They have achieved real success.” ■

PHOTO: ASSOCIATED PRESS



Nearly a year ago, Bala Bharadvaj moved from Southern California, where he worked for Boeing since 1987, to Bangalore, India. There, he serves as director of the Boeing Research & Technology–India organization, part of Engineering, Operations & Technology, working with academia and research labs in India on new technologies.

“India has been very strong in mathematical sciences and basic science and has a great deal of expertise in metallurgy and materials science,” he said. “We are working with experts who have worldwide recognition. We can learn from them, and they from us.”

Before moving to Bangalore, Bharadvaj had been there only as a tourist—but the American citizen was born in the Southern Indian city of Cuddalore on the Bay of Bengal. He speaks English, one of India’s many languages, as well as Hindi and regional Indian languages such as his native Tamil and Telugu. He can get by in Malayalam, and in Kannada, the language of Bangalore.

“Language in India is a huge enabler in terms of getting accepted,” he said. “Having a reasonable familiarity with multiple languages has really helped out.”

Bharadvaj, who holds a doctorate degree in aeronautical engineering and a master’s degree in business administration, said the Boeing name has great brand value in India. “In my role, I meet so many people who want to meet me not because I am of Indian origin but because I represent The Boeing Company. Employees like me—who used to work in the United States and are now living abroad—really need to uphold the Boeing image. It’s a responsibility we share.” ■

PHOTO: ASSOCIATED PRESS



BALA BHARADVAJ

“Employees like me—who used to work in the United States and are now living abroad—really need to uphold the Boeing image. It’s a responsibility we share.”



NADINE HABR FATTOUHI

“The appreciation and positive feedback I get from business partners and service delivery leaders make the greatest effort worthwhile.”

As a Shared Services Group business support manager for the Dubai office in the United Arab Emirates, Nadine Habr Fattouhi is the first point of contact for employees of Boeing and its subsidiaries who need help accessing SSG support.

“No two days are the same,” Fattouhi said. “We get requests for a wide variety of services—ranging from help in preparing office budgets to support for employee relocations and whatever else might be necessary to ensure that business partners can conduct daily operations.” Fattouhi served as the contact person for Boeing International executives visiting the 2009 Dubai Air Show, the largest air show in the region.

The 33 employees in the Dubai office come from 14 different countries. Fattouhi, who joined Boeing in 2005, was born in Lebanon and moved to Dubai 10 years ago. “We are a very diverse group,” she said. “But we work together as one Boeing team.”

Although you might hear a dozen languages spoken on the streets of Dubai, English is the language of business in the city and is widely spoken by residents. Fattouhi, who grew up speaking Arabic around the home, also speaks French and English.

“It can be a challenge to work in an international organization that is spread out across the globe, but it is exciting to be part of Boeing and this dynamic industry,” she said. “The appreciation and positive feedback I get from business partners and service delivery leaders make the greatest effort worthwhile.” ■

PHOTO: ASSOCIATED PRESS

SAKIKO MATSUBARA

“It’s an honor to be part of making history and to be a bridge between Boeing and our Japanese and other Asian partners, who play such a huge role in the [787] program.”

Sakiko Matsubara, a staff analyst supporting Business Operations on the 787 Asia team in Nagoya, started her career at Boeing in 2006 as a contract interpreter. At the time, her job was to help with communications and coordinate between program leadership and Boeing’s Japanese industry partners.

“At first it was quite challenging, not only because of the language barrier but the cultural differences, too,” Sakiko said. Having studied International Communication and English in Tokyo, and lived for a year in Canada, she was well-placed to use her knowledge of both Western and Japanese culture to help bridge the gaps.

Soon after, she became the first locally hired Japanese employee on the 787 team. Today, more than three and a half years and three roles later, she has worked with a variety of people, from chief executive to part chaser, all the while making sure that communications flow smoothly.

She appreciates that Boeing is adapting to the local scene and is working closely with its global partners, thanks to the 787 global supply chain. As more Boeing employees from the United States work with Japanese partners, and more staff is recruited locally, the team has a better understanding of the working styles of both cultures.

“It’s an honor to be part of making aviation history,” she said, “and to be a bridge between Boeing and our Japanese and other Asian partners, who play such a huge role in the program.” ■

PHOTO: FERNANDO VIVANCO/BOEING



ANISSA CLOYD

“We’re working to standardize our processes so that airline customers won’t perceive a difference in service, regardless of what country the order comes from.”

Soon after beginning work in the shipping organization at Boeing Commercial Airplanes Spares in Everett, Wash., in 1997, Seattle native Anissa Cloyd began to appreciate the opportunities for career growth and education that a global company like Boeing offers.

Cloyd works at the Spares Distribution Center near the Seattle-Tacoma International Airport, where she readies orders for dispatch and builds kits of spare parts for Boeing jetliners in service around the world.

Her end-to-end understanding of Distribution Center processes enables Cloyd to help improve the way orders are sorted and reduce shipping costs. “We now group orders by the customer’s requested shipping time, rather than by the order in which orders are received,” she said. “This allows us to bundle together multiple orders that are going to the same destination.” Bundling multiple orders into a single shipment reduces the amount of packaging material used and cuts shipping costs to airlines, especially on international shipments.

“We specialize in urgently needed parts,” she said. “Standard processes allow us to provide complete and consistent training for all tasks, encourage competency in multiple jobs, and ensure accountability for the quality of our domestic and international service.”

For Cloyd, the opportunity to learn how the global operation works through cross-training keeps the job interesting. “Lean+ workshops have given me the chance to learn a lot of our processes and understand how they fit together,” she said. “That’s my favorite part of the job. We’re working to standardize our processes so that airline customers won’t perceive a difference in service, regardless of what country the order comes from, where the parts will be delivered, or what day of the week and time of day the order is received.” ■

PHOTO: MARIAN LOCKHART/BOEING



RICHARD HAILS

“I make sure everyone is signed off properly, that the fuel and configuration is correct, and that the aircraft is completely serviceable.”

On the flight line at the Royal Australian Army’s Oakey Army Aviation Centre in Queensland, Richard Hails is known to all as Dicky. As flight-line operations officer at the base where Australian pilots have trained since World War II, he supports Boeing Defence Australia, which is certified by the Commonwealth as an authorized maintenance organization for the Royal Australian Army fleet of Bell 206B-1 Kiowa and Sikorsky S-70-A Black Hawk training helicopters.

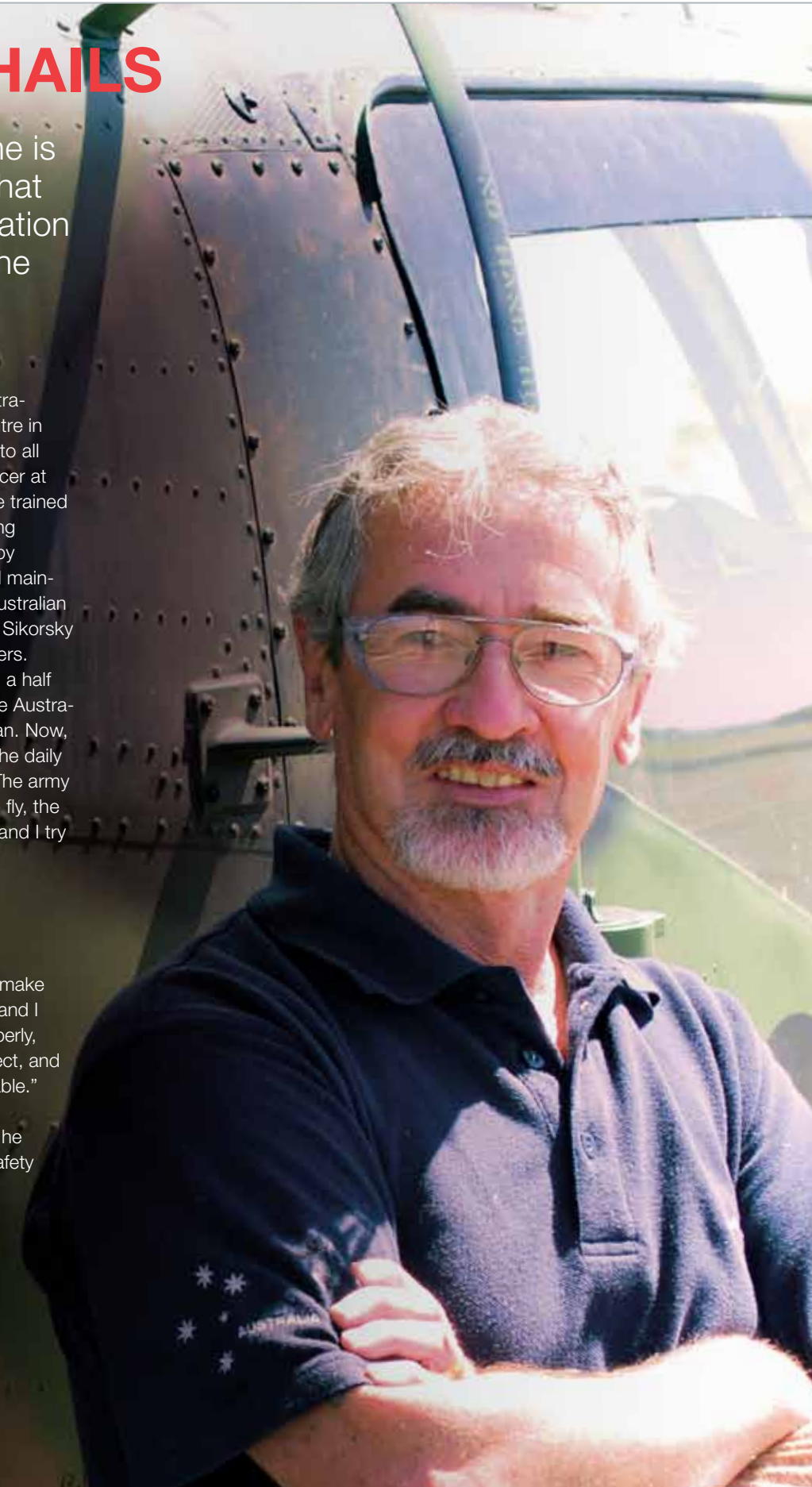
Before coming to Boeing two and a half years ago, Hails spent 20 years in the Australian Air Force as a weapons technician. Now, his job is to organize the aircraft for the daily flying program and maintain them. “The army tells me what and when they want to fly, the technicians give me the helicopters, and I try to make it all happen,” he said.

In addition to serving for six years in Malaysia during his military career, Hails worked in the Middle East for British Aerospace.

Safety, he said, is priority No. 1. “I make sure everything is safe on the aircraft and I make sure everyone is signed off properly, that the fuel and configuration is correct, and that the aircraft is completely serviceable.”

For Hails, being mindful of the challenges faced by the trainee pilots he and his crew support shows where safety and knowing the customer intersect. “There’s a big difference between helicopters and fixed-wing aircraft. It can be like learning to fly all over again,” he said. “The safety aspect is especially important with these young trainee pilots.” ■

PHOTO: FERNANDO VIVANCO/BOEING





Environment for change

Employees are helping the company meet its aggressive environmental targets **by Blythe Jameson**



“Besides helping us reduce our environmental footprint, it’s making us more efficient and competitive.”

– Les Weige, Renton’s Environment, Health and Safety director

A year ago, all major Boeing manufacturing sites were certified to the ISO 14001 international environmental standard. Today, with the framework in place, employees are continuing to eliminate waste, reduce the company’s environmental footprint and improve productivity. And that is helping Boeing meet its aggressive targets for cutting energy use, greenhouse gas emissions and hazardous waste, as well as improving recycling rates.

The certification “really has had a ripple effect,” said Terry Mutter, director of Enterprise Strategy and Risk Analysis for Environment, Health and Safety. “Cross-functional teams are working together, sharing best practices and finding new ways to drive environmental improvement.”

ISO 14001 was released in 2004 by the International Organization for Standardization (ISO). Organizations earning the certification have met a global third-party standard for implementing or improving an environmental management system—a set of processes, systems and practices the organization uses to reduce its environmental impact and to operate more effectively. ISO 14001 doesn’t stipulate precise performance targets such as cutting greenhouse gas emissions by a certain percentage. Rather, it strengthens an organization’s ability to set its own environmental objectives and to monitor and continually improve environmental performance.

In the past year, employees’ efforts have helped additional Boeing sites achieve ISO 14001 certification. These include Anaheim/Huntington Beach, Palmdale and Los Angeles–based subsidiary Continental DataGraphics, in California; Houston; Macon, Ga.; and Wichita, Kan.

Here’s how the certification has played a role in helping Boeing and its employees generate measurable environmental improvements.

- **Wichita, Kan.** Recycling of beverage containers increased 276 percent, the demand for recycling containers in conference rooms and at special events is at an all-time high, and office paper use has gone down thanks to two-sided printing.

“ISO 14001 is driving us to look at the bigger environmental footprint—not only at the site but among our suppliers as well,” said Pam Reiz, with the Wichita Environment, Health and Safety team. “We have seen a threefold increase in projects to address not only recycling but also chemical, energy and water reduction.”

Involvement in the local community also has increased as employees volunteered more than 700 hours on environmental projects such as planting trees, cleaning the Arkansas

PHOTOS: (Far left) Matthew Portelli of the Boeing Aerostructures Australia facility in Fishermans Bend discards metal fasteners in a recycling bin. ISO 14001 certification led to the creation of standardized recycling bins such as these. **ANDREW HENSHAW**
(Left) Employees in Wichita, Kan., are more active in environment-related community volunteering activities following the site’s ISO 14001 certification. **BOEING**



River, monitoring vehicle exhaust and more.

"We are seeing an incredible level of engagement from employees," noted Bob Martin, Environment, Health and Safety manager for Wichita. "People are looking for ways to carpool, recycle and reduce emissions. ISO 14001 really brought this out."

- **Australia.** To certify as a single site under ISO 14001, both Boeing Aerostructures Australia locations at Fishermans Bend and Bankstown needed to make improvements to meet the same standard and operate as one organization.

Certifying under ISO 14001 "has standardized our procedures and operations quite significantly," said Alison Stewart, Environment, Health and Safety manager for Boeing Aerostructures Australia.

"We've seen an increase in the reporting of environmental issues and the sharing of ideas and recommendations. Employee response has made all the difference."

- **Renton, Wash.** In planning for ISO 14001 certification, the Renton team worked to ensure environmental improvements continue to be integrated into the 737 production system. These efforts have produced impressive results: Hazardous waste generated per airplane has been cut nearly in half, and solid waste sent to landfills has been reduced by 35 percent.

Other initiatives in oil recycling, building lighting and food waste composting are the result of people working together to identify opportunities for improvement. Recycling used oil eliminated 100,000 pounds (45,360 kilograms) of waste.

Replacing light bulbs with more efficient models in the 4-20 factory building reduced site electricity use by 1.7 percent. Behind-the-counter composting is diverting nearly seven tons (6.5 metric tons) of food waste from landfills per month.

"Everyone is mindful of the impact their actions have on the environment and continuously looking for ways to reduce or eliminate that impact," said Les Weige, Renton's Environment, Health and Safety director. "Besides helping us reduce our environmental footprint, it's making us more efficient and competitive." ■

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PHOTOS (Above left): David Glenn (left) and Mark Andrews, 737 Materials Management project managers, are shown with ducts wrapped in reusable protective covering. MARIAN LOCKHART/BOEING
(Above) Anita Glossop uses a standardized plastics recycling bin at the Boeing Aerostructures Australia facility in Fishermans Bend. ANDREW HENSHAW

Measures of Success

With support from employee activities, projects aimed at reducing Boeing's environmental footprint and improving productivity are generating numerous advances in environmental performance. These efforts include:

Anaheim and Huntington Beach, Calif.:

Used energy-efficient light fixtures in parking lots, resulting in an estimated cost savings of \$61,000 per year

Long Beach, Calif.: Reduced annual energy consumption by 20 percent, natural gas by 60 percent and water by 25 percent since 2008; energy savings exceeded \$1 million last year

Everett, Wash.: Reduced solid waste to landfill by 18 percent in 2009 compared with 2008

Florida: The Florida Operations' ISO 14001 Solid Waste Reduction Team and the Paper Smart Team together cut site paper use by 37 percent from 2008 to 2009

Frederickson, Wash.: Reduced power use during weekend and holiday downtimes in 2009, which saved more than \$2,500 per day

Houston: Building 91-51 was the first Boeing facility to achieve Leadership in Energy and Environmental Design (LEED) Gold certification for existing buildings; it has also received an ENERGY STAR label from the U.S. Energy Department

Kent, Wash.: Earned LEED Gold certification for renovation of the 18-26 building and received a Green Business Award from the City of Kent for 2009 environmental stewardship activities

Salt Lake City: Achieved zero waste sent to landfills and cut irrigation water use by 30 percent

St. Louis: Increased solid waste recycling 150 percent since 2007, thanks to employee engagement

In addition, Boeing Defense, Space & Security sites in the Puget Sound region cut hazardous waste output by 38 percent and increased recycling by 15 percent from 2008 to 2009.

— Blythe Jameson

A year of

choosing well

Boeing offers programs, tools and resources to live a healthier and more financially secure life by Susan Birkholtz

It's all about making choices.

Whether it's the food we eat, the amount of physical activity we get, the way we manage stress or how much we contribute to a savings plan, these simple, everyday choices can have a significant effect on our health and financial well-being.

"Ultimately, how you choose to live your life and take care of your physical, emotional and financial health is your responsibility," said Rick Stephens, senior vice president, Boeing Human Resources and Administration. "Boeing provides comprehensive and competitive programs, tools and resources to empower and encourage you to manage this responsibility wisely. Just as our business is continually challenged to grow and improve its performance each year, we should all personally challenge ourselves to make choices each day that positively affect our health and financial well-being."

To assist employees in making good choices every day, new health and financial well-being resources are being added to Boeing's portfolio of Well Being offerings in the year ahead.

NEW AND ENHANCED HEALTH WEB SITE AND TELEPHONE SERVICE

A Web site for all health-management programs will launch this summer, allowing more content to be customized to specific, individual interests and needs. The *BoeingWellness Health Letter* also will have a new look this summer.

In addition to the Web site launch, a health-management telephone service will be available to employees and eligible family members. The service includes a line that provides around-the-clock access to a registered nurse for answers to questions about routine symptoms or for tips on treating an illness or injury. Additional programs, including a



companywide physical activity campaign, also are planned for the summer.

ON-SITE HEALTH SCREENINGS AND ONLINE HEALTH ASSESSMENT

The on-site health screenings will again take place during the summer months, and the online Health Assessment will be conducted in the fall. New this year will be an opportunity for employees and eligible family members to get involved in health coaching year-round.

Confidential on-site depression screenings will be conducted in the fall by professionals from the Boeing Employee Assistance Program, and the year will close out with the on-site flu shot program heading into the holiday season. This also is a time when many people choose to take advantage of stress-management services through the Boeing Employee Assistance Program or with help from a health coach.

FINANCIAL ADVISER SERVICES

Boeing's employee financial planning seminars, Retire Well and Plan Well, will run throughout 2010, both in person at Boeing sites and through live or on-demand webcasts on the Boeing Education Network. In addition to these seminars, new adviser services provided through ING, Boeing's record keeper for the Voluntary Investment Plan, will be available to nonunion employees to help with retirement planning and investment management. The service is expected to be available in early April through Boeing Savings Plans Online as well as by telephone.

The 'choose well' tool kit

The following Well Being resources are available to help you choose well.



Well Being Resource Center: <http://wellbeing.web.boeing.com>

The Well Being Resource Center highlights the breadth of programs, tools and resources in the Boeing Well Being portfolio.



2010 Well Being Calendar: <http://wellbeingcalendar.web.boeing.com>

Keep your priorities organized with the 2010 Well Being calendar, which features helpful facts and tips about well-being-related topics, as well as photos of Boeing employees who have used Well Being programs, tools and resources.



2010 Pay & Benefits Profile: available in June

The Pay & Benefits Profile provides a snapshot summary of your total package of pay and benefits. The profile is housed on Boeing TotalAccess and can be viewed from work or using Boeing Express on the Internet.

PHOTOS: BOEING

Also in April, a mix of investment fund choices will be introduced to provide a wider range of alternatives to meet employees' personal goals. Employees also will be able to elect to automatically rebalance their investments with a new option available through Boeing Savings Plans Online.

"Your satisfaction and productivity are at their peak when you feel your best and you are doing everything possible to maximize your future financial security," Stephens said. "This comes from making good choices along the way, with help from the programs, tools and resources Boeing provides." ■

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PHOTOS: SHUTTERSTOCK.COM

Boeing Company – BA

NYSE: Industrials/Aerospace & Defense

As of 2/19/10

\$63.59

Stock snapshot

52-week range:	
52-week high	\$64.34
52-week low	\$29.05

International competitors

EADS* – EAD.PA	
As of 2/19/10	14.87
52-week range:	
52-week high	16.57
52-week low	8.12

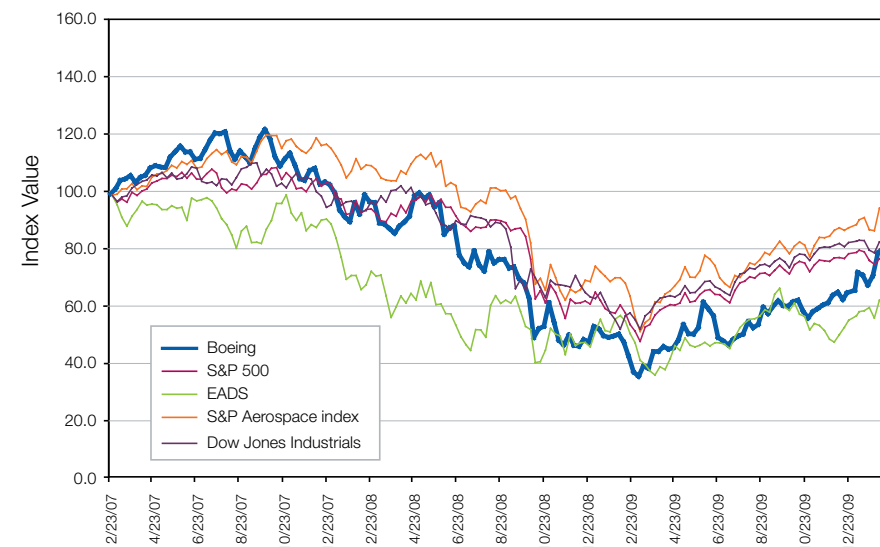
*Prices in euros

U.S. stock indexes

S&P 500	
As of 2/19/10	1,091.17
52-week range:	
52-week high	1,150.45
52-week low	666.79
S&P 500 Aerospace and Defense Index	
As of 2/19/10	350.00
52-week range:	
52-week high	352.83
52-week low	194.13
Dow Jones Industrials	
As of 2/19/10	10,402.35
52-week range:	
52-week high	10,767.21
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 Feb. 23, 2007, 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

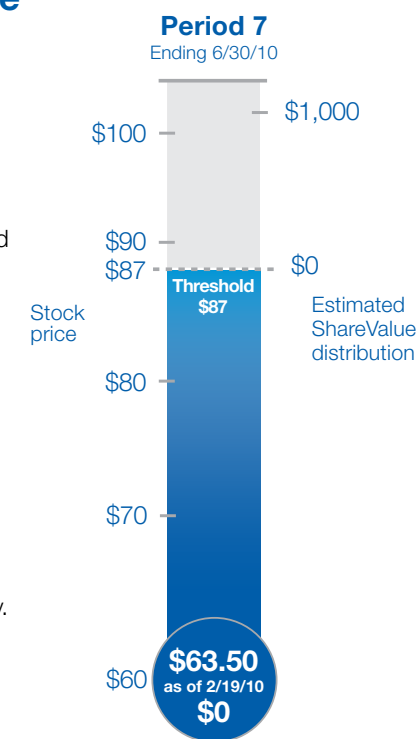
ShareValue Trust, or SVT, is an incentive plan that allows eligible participants to share in the success of their efforts to improve productivity and grow the business.

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.



STUDENTS: HOW ARE YOU ENGINEERING YOUR FUTURE?



The Boeing Engineering Student of the Year Award recognizes the achievement of an outstanding engineering student working on aeronautical or space technology. This prestigious Flightglobal Award, sponsored by The Boeing Company, recognizes the potential impact of a candidate's work on current or future technology.

In addition to industry recognition of this honour, the winner will receive the award at the Flightglobal Achievement Awards ceremony to be held at the Farnborough Airshow in July. The competition is open to any engineering student currently enrolled in a program leading to a recognized academic degree. The submission deadline is 4 May 2010.

For more information and entry details go to: www.flightglobal.com/student. Don't miss your chance to engineer the future.



Flightglobal
Achievement
Awards 2010

BOEING ENGINEERING STUDENT OF THE YEAR

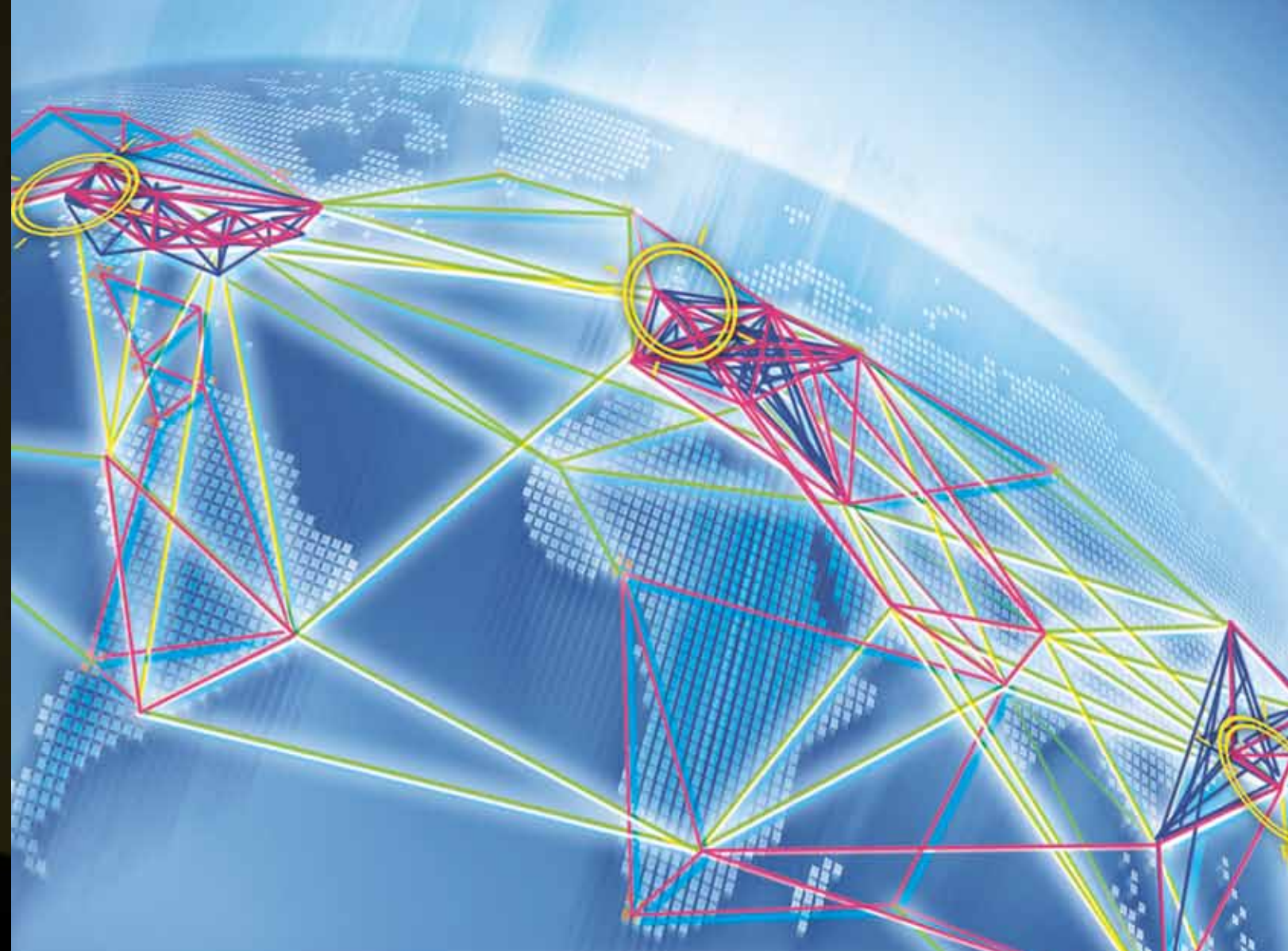


ONE LAST NIGHT

Space Shuttle *Endeavour* roars away from Launch Pad 39A at Kennedy Space Center, Fla., last month, one of the last scheduled night launches of a shuttle. On a mission to the International Space Station (ISS), *Endeavour* carried the Tranquility and Cupola modules, essentially completing the U.S. construction of the orbiting laboratory. Boeing is the prime contractor to NASA for the station; in addition to designing and building all the major U.S.-supplied elements, Boeing is responsible for ensuring the successful integration of new hardware and software. With space shuttle operations scheduled to end this year, Boeing will draw on its extensive human spaceflight experience, as well as its expertise

in space station operations and cargo processing, to bid on NASA's upcoming ISS Cargo Mission Contract. NASA released a Request for Proposals on Jan. 15 and the space agency is scheduled to select a contractor at the end of September, with work to begin in January 2011. "Boeing's experience with the International Space Station program allows us to provide an offer that supports NASA's priorities for safety, mission success and innovation," said Brad Cothran, Boeing's capture team lead for the contract. "The ISS is an important international asset as both a research laboratory and test bed for living and working in space," he said.

STORY BY ADAM MORGAN/BOEING. PHOTO: NASA



CYBERSECURITY THAT'S FULLY INTEGRATED.

Every day, government and commercial cyber networks are at risk of being compromised. Protecting them requires comprehensive cybersecurity solutions. Leveraging advanced security technologies and experience garnered from its vast internal network, Boeing's expertise includes cyber capabilities across a wide array of commercial, defense, space and security systems. The result is customized, integrated solutions that ensure cybersecurity at every level.

