

Frontiers

www.boeing.com/frontiers

START OF SOMETHING

BIG

Boeing has begun final assembly on the first P-8A Poseidon. The people who work on this U.S. Navy aircraft explain why this program is important to the customer—and to Boeing.





FAST APPROACHING.

The P-8A Poseidon, the world's most advanced maritime patrol aircraft, is on schedule and in production. Designed to combat present and future threats, Poseidon's advanced capabilities will enable it to detect and strike any time, anywhere. The P-8A will soon provide the critical capabilities the Navy needs to ensure maritime safety and security.



This new Integrated Defense Systems print ad supports the P-8A Poseidon, the U.S. Navy's new multi-mission maritime patrol aircraft. With Boeing now producing the P-8A, the ad highlights the significant progress being made on this critical U.S. security asset. Look for this ad to appear in key newspapers, military trade and congressional publications.

ON THE COVER: The first P-8A Poseidon fuselage is lowered into a tooling fixture in Renton, Wash.
Photo by Jim Anderson



JIM ANDERSON PHOTO

COVER STORY

Strong start | 12

Bob Feldmann (left) and Mo Yahyavi lead the P-8A Poseidon teams for Integrated Defense Systems and Commercial Airplanes, respectively. Final assembly on the first P-8A recently began at the Boeing factory in Renton, Wash. Feldmann, Yahyavi and other P-8A teammates explain why this aircraft program is important to the U.S. Navy customer—and to Boeing.

FEATURE STORY

Going strong at 60 | 30

This year marks the 60th anniversary of the founding of Israel. During this time, the nation and Boeing have seen their partnership grow and prosper. Here's a look at why Israel is important to Boeing.

All pulling in the same direction | 18

Three employees working in different areas of the Boeing Fabrication facility in Auburn, Wash., noticed separate situations that could use process improvement. Thanks to a cross-functional team in Auburn, they had a forum where they could raise these issues, trade ideas and put their heads together to develop solutions.

Helping everyone travel | 20

Boeing engineer Vicki Curtis is driven by the quest to make the flying experience more accommodating for everyone, including those who have disabilities. Her goal is not to fix what now exists, but to find a breakthrough that can be designed into tomorrow's airplanes.

Color me impressed | 21

Members of the paint shop team in St. Louis are on the lookout for ways to Lean-out processes while enhancing quality and keeping people and the environment safe. With the help of others across the site, they've made some impressive improvements.



20 Vicki Curtis, a Boeing engineer in Everett, Wash., is looking for advances that can be designed into the next generation of commercial jetliners to improve accessibility—as well as everyone's traveling experience. GAIL HANUSA PHOTO



One of test pilot Chuck Killberg's proudest moments was climbing out of the cockpit after the first flight of an F-22 Raptor and being greeted by son Daniel, 5 at the time, and wife Judi. He'd received a ceremonial dowsing from ground crew moments before; hence the soggy flight suit.

28

LOCKHEED MARTIN PHOTO BY JOHN ROSSINO

Boeing provides guidance | 23

The upgrading of all active Minuteman III Intercontinental Ballistic Missiles with Boeing-built modernized guidance-system electronics is now complete. This upgrade extends the service life of the navigational heart of this ICBM weapon system—a linchpin in the United States' strategic deterrent—to 2030.

Heavy work for lighter loads | 24

In support of NASA's future goals for manned space flight, Boeing is sharing with NASA composites expertise from its commercial airplanes, space and defense programs. The lower mass of composite structures will allow larger payloads to be transported to and from the moon, and eventually to Mars.

INSIDE

6 Letters
7 Notebook

8 Historical Perspective
10 New and Notable



44 John Tracy (foreground, left), Boeing senior vice president of Engineering, Operations & Technology and chief technology officer, met April 3 at Ocana airfield in Spain with Boeing employees and the industry team involved in the design, assembly and flight of the Boeing Fuel Cell Demonstrator Airplane. With Tracy is Nieves Lapena, Environmental Technologies team leader at Boeing Research & Technology Europe. RAFAEL MARTIN PHOTO

In the pilot's seat | 28

The experience of Chuck Killberg, director of Flight Operations for Global Mobility Systems in Integrated Defense Systems, includes being one of the test pilots responsible for developing the F-22 Raptor. Indeed, he has a special fondness for the Raptor and the team that brought it to life.

Big hearts | 36

Total donations made by Boeing employees to the Employees Community Fund of The Boeing Company recently topped the \$1 billion mark. These funds represent hope and opportunity for countless people whose lives are being changed every day through the services of nonprofit organizations the fund supports.

45 Stock Charts
46 Milestones

49 Around Boeing
50 Spotlight

Save it for later | 38

It's never too early to start planning for retirement. Boeing offers tools and resources to help employees build their retirement incomes—but it's up to individual employees to take an active role in planning and saving for their futures.

Development for all | 40

In another step to make Boeing the world's best-integrated and most competitive aerospace company, the company last year devised an enterprisewide technology-development strategy. In this article, read about this strategy—and about Amy Buhrig, the person leading the Enterprise Technology Strategy team.

A historic flight | 44

An engineering team at Boeing Research & Technology Europe in Madrid, Spain, recently demonstrated for the first time that man can fly in an airplane powered by environmentally friendly hydrogen fuel cells only.

Frontiers

Publisher: Tom Downey
Editorial director: Anne Toulouse

EDITORIAL TEAM

Editor:
 Paul Proctor: (312) 544-2938
Managing editor:
 Junu Kim: (312) 544-2939
Designer:
 Brandon Luong: (312) 544-2118
Commercial Airplanes editor:
 Dick Schleh: (206) 766-2124
Integrated Defense Systems editor:
 Diane Stratman: (562) 797-1443

Engineering, Operations & Technology editor:
 William Cole: (314) 232-2186

Shared Services editor:
 Mick Boroughs: (206) 919-7584

Human Resources and Administration editor:
 Geoff Potter: (312) 544-2946

Copy editor:
 Walter Polt: (312) 544-2954

ONLINE PRODUCTION

Production manager:
 Alma Dayawon: (312) 544-2936

Web designer:
 Michael Craddock: (312) 544-2931

Graphic artists:
 Brandon Luong: (312) 544-2118
 Cal Romaneschi: (312) 544-2930

Web developers:
 Lynn Hesby: (312) 544-2934
 Keith Ward: (312) 544-2935

Information technology consultant:
 Tina Skelley: (312) 544-2323

How to contact us:

E-mail:
 BoeingFrontiers@boeing.com

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

Phone:
 (312) 544-2954

Fax:
 (312) 544-2078

Web address:
 www.boeing.com/frontiers

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

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



Here's what you should know about the KC-X decision

There's been a lot said and written about Boeing's appeal of the U.S. Air Force's decision to award a contract for refueling tanker aircraft to a team of Northrop Grumman and European Aeronautic Defence and Space Company.

In this special Letters to the Editor section, Boeing addressed these assertions about its tanker proposal—and the bidding process—to help clarify its position and dispel any false notions.

Myth: Boeing is whining because it lost

Truth: After examining the tanker decision, Boeing found “serious flaws in the acquisition process that we believe warrant appeal,” the company said. “This is an extraordinary step rarely taken by our company, and one we take very seriously. We found irregularities and inconsistencies in the process that resulted in an unfair application of the procurement rules and the ultimate selection of a higher-risk, higher-cost airplane.”

Myth: Boeing didn't listen to the customer

Truth: According to Boeing, the Air Force's Request for Proposal—the formal document that defines the requirements for the tanker—clearly stated a need for a medium air tanker that placed expanded cargo and passenger transport as a secondary consideration. “The Air Force ended up with an oversized tanker that will consume 24 percent more fuel and cost the taxpayer nearly \$29 billion more than Boeing's KC-X tanker over 40 years, as today's oil prices continue to climb,” Boeing said. “Our proposal was based on the stated criteria in the RFP. In

this case, the RFP defined a medium-size, low-risk and low-cost tanker. We stand by our offering and believe that it did, and continues, to best meet the requirements and offer the best total value.”

Myth: Boeing was arrogant and unresponsive

Truth: Boeing steadfastly denied this assertion. “In light of such media reports, we asked the Air Force during the debriefing if there were any so-called ‘relationship issues.’ The Air Force has assured us there is no basis for these reports, and such issues did not factor into the evaluation or influence its ultimate decision,” Boeing said.

Myth: The competition was not close; Northrop-EADS won four out of five categories

Truth: Boeing and the Northrop/EADS team were assigned identical ratings across all five evaluation factors: Mission Capability, Risk, Past Performance, Cost/Price, and an Integrated Fleet Aerial Refueling Assessment. “An objective review of the data as measured against the RFPs shows that Boeing had the better offering in terms of Most Probable Life Cycle Costs, lower risk and better capability,” Boeing said.

For more tanker talk

Want to continue the discussion on tankers? Boeing has established blogs for employees and the public:

- Employee blog: <http://kc767tanker.blog.boeing.com> on the Boeing intranet
- Public blog: www.boeing.com/tankerfacts

Letters guidelines

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

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



SNAPSHOT

SPOT ON

Structural mechanic Richard Flores labels fasteners to be removed from a United Kingdom C-17 as part of the Large Aircraft Infrared Countermeasures (LAIRCM) modification at the Boeing facility in San Antonio. The aircraft was delivered in February and flown to San Antonio to undergo the modification before entering service. The LAIRCM system provides added safety for C-17 aircrews against missile threats.

LANCE CHEUNG PHOTO

QUOTABLES

“This is a schedule they say is conservative. If it’s for real, the world will forgive them for everything.”

— Richard Aboulafia, an analyst with the Teal Group, on Boeing’s announcement of a revised schedule for the 787 Dreamliner program, in the April 9 *Seattle Post-Intelligencer*

“Chinook has proven itself over there time and time again.”

— U.S. Army Col. Newman Shufflebarger, Army Chinook project manager, about the performance of the Boeing-built CH-47 Chinook helicopter in Afghanistan and Iraq, in the April 8 *Defense Daily*

“I’ve been in engineering and program management and quality assurance, and [I’ve] run a site, and I’ve never had to leave the company.”

— Gina DeSimone, vice president, Division Operations, for Missile Defense Systems, on her varied experiences at Boeing during her 25-year career, in the March 30 *Huntsville (Ala.) Times*

IAM PROMOTIONS

No promotions listed for periods ending March 28 and April 4, 11 and 18

ETHICS QUESTIONS?

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



Fifty years ago this month, the F-4 Phantom II made its initial flight. The advanced aircraft would go on to set performance records, and more than 5,000 Phantoms would be built.

BOEING ARCHIVES PHOTO

A 'PHABULOUS' FIGHTER

50 years ago this month, the Phantom took to the skies for the first time

By HENRY T. BROWNLEE, JR.

The sun, peering around clouds, cast a lazy warmth on the Terminal Building, the hangars, the grass between the grease-stained runways. It was a quiet weekday morning at the airport." That's how David Brown of the *St. Louis Post-Dispatch* newspaper described May 27, 1958—the day that the McDonnell-built F4H-1 made its first flight.

"Off at the end of the runway the quiet morning was shattered by the horrendous racket of jet engines," Brown continued. "And the little group of men who looked like engineers bristled with tension. The unearthly noise came from a plane which picked up speed, streaked along the runway. It was a white streak, for the plane was new and white. And it was slender and sleek, with a nose pointed like that of a missile."

Brown and these managers and engineers were watching Bob Little, McDonnell Aircraft Company's chief test pilot, take up the newest, most advanced fighter aircraft of its time. The plane was so new that it did not have an official designation that day. It was still known only by the impersonal designation F4H-1—but it would later be christened the Phantom II.

The F4H-1, which was originally designated F3H-G/H and redesignated AH-1, was in competition with the Chance-Vought F8U-3 to succeed the U.S. Navy's existing squadrons of all-weather fighters, the F3H-2Y Demons, also built by McDonnell, and Douglas F4D-1 Skyrajs. The Navy's requirements were tough. Its new fighter was to be an all-weather twin-jet interceptor and attack plane that could fly at speeds up to Mach 2 for 1,000 miles (1,600 kilometers) to a target and back again without refueling—which at that time was the longest range of any carrier-based fighter. Its function would be to defend or attack day or night in any kind of weather, using radar to find its target in low-visibility situations.

McDonnell's F4H-1 was designed to meet and exceed the Navy's requirements. It would carry a radar operator and was powered by two GE J-79 turbojet engines. The addition of the radar operator and the fact that the plane was powered by two engines became decisive factors in the final selection of the F4H-1 in December 1958. James S. McDonnell, the founder of McDonnell Aircraft Company, came on the public address system and proclaimed, "This is Mac. Well, this is it! The Navy has just announced in Washington that our F4H has won the competition as the Navy's new all-weather fighter."

On July 3, 1959, at the 20th Anniversary of McDonnell Aircraft, the F4H-1 was christened the Phantom II. The F-4 Phantom II would go on to earn the title of the "Phabulous Phantom." Though it was initially ordered as a Navy and Marine Corps carrier-based fighter, the Air Force also selected the Phantom II for its squadrons.

The Phantom II established several speed, altitude, and time-to-climb records, many of which remained until relinquished to the F-15 Eagle in 1975. The capture of the speed, altitude and time-to-climb records were significant. When the Phantom II established a new speed record of 1,217 miles per hour (1,959 kilometers per hour) in 1960, Vice Admiral Clarence Ekstrom noted that "this speed means more than a record, it means that we now have a weapons system capable of operating from aircraft carriers that can go higher, faster and farther, and thus able to intercept any attacker aircraft." Ekstrom further argued that day that the Phantom's capabilities gave adversaries reason to reassess possible acts of aggression—because of the results of encountering one of McDonnell's Phantoms in combat.

By the time the McDonnell Douglas Company celebrated delivery of the 5,000th Phantom on May 24, 1978, the F-4 Phantom II had established several "firsts." Accord-

ing to the *McDonnell Douglas Spirit Eastern Edition*, in 1978 the Phantom had the largest production run of any supersonic fighter in the free world, surpassed only by the F-86 Sabrejet, which was not capable of supersonic speed in level flight. The Phantom II was the first fighter with Doppler radar having "look-down, shoot-down" capability, and the first operational fighter configured for low drag, or semi-recessed, carriage of medium-range Sparrow III air-to-air missiles in addition to its Sidewinder dogfight missiles and a 20mm rapid-fire gun. Furthermore, it was the first aircraft to make extensive use of both titanium in its primary structure and chemical milling for structural parts. In addition, the Phantom possessed several unique design features. Among them: a bell mouth to control the engine inlet and secondary airflow through an aerodynamic nozzle, and a movable inlet duct ram system used for Mach 2-plus performance.

Ultimately, the Phantom performed every classic mission required by a fighter. It served as a first-line interceptor, fighter-

bomber, escort, reconnaissance and "Wild Weasel" air defense suppression aircraft. It was the only fighter to fly concurrently with the Air Force Thunderbirds and the Navy Blue Angels military-aerobatics flight demonstration teams. The Phantom saw combat in Vietnam and Operation Desert Storm and served in squadrons of 11 other countries. Some 5,057 Phantoms were manufactured in St. Louis and the last one was delivered to the United States in 1979. There are currently between 450 and 550 F-4 and RF-4 aircraft serving nations including Japan, Korea, Turkey, Greece, Germany, Israel and Egypt. ■

henry.l.brownlee-jr@boeing.com



In this 1958 photo, David Lewis (from left), vice president, Project Management; Bob Little, chief test pilot; and Herman Barkley, F4H project engineer, share congratulations following the Phantom's first flight.

BOEING ARCHIVES PHOTO





A hire calling

New hires receive orientation training at the Seattle Hiring Center. Global Staffing has made hiring-process improvements that expedite getting new employees on board—which supports Commercial Airplanes' increased production rates.

DANIEL THOMPSON PHOTO

Global Staffing makes improvements to place people 'just in time'

By KATHRINE BECK

You can't build airplanes without highly skilled workers," said Barb O'Dell, former vice president of Manufacturing and Quality for Boeing Commercial Airplanes. "Today, more job requisitions are being filled on the day we want them filled. A predictable, repeatable, stable process is of immense value to the factory."

A new hiring process that is getting Puget Sound-region production job applicants assessed, screened, hired and reporting to work "just in time" is keeping production Lean and flowing smoothly.

In previous years, getting a candidate hired and at work when needed didn't happen 59 percent of the time. Today, that failure rate has been trimmed to less than 15 percent. "Since implementing the new process, we've experienced a total turnaround in customer confidence," said Bob Thomas, Human Resources manager for BCA Engineering and Manufacturing Skills Management.

A smooth hiring process is crucial to BCA's success during an upswing, but there have been real challenges. Not only is production ramping up, but for the first time in a decade, BCA in the Puget Sound area is hiring hourly employees who are new to Boeing. Screening and training requirements make getting these employees on the job a much more complex task than recalling former Boeing employees.

UNDERSTANDING THE CHALLENGE

Leaders in Global Staffing and BCA

Manufacturing realized two years ago that getting applicants assessed, trained, hired and available when needed would be crucial to getting airplanes built and delivered on time.

"We needed to be able to hire more people in less time with the resources we already had," said O'Dell, now vice president of 787 Support. "Doing more without adding more resources is the classic Lean challenge, so I asked Global Staffing to develop and implement a 'hiring factory' and to do it using Lean tools."

It started with an accelerated improvement workshop (AIW) that included hiring managers, staffing specialists, recruiters, assessment and training personnel, Learning, Training and Development instructors, Boeing Medical, Boeing Security, HR generalists and senior skills-team managers.

One idea generated from the AIW was to establish a central hiring center so that many pre-employment functions could be performed at one time.

Applicants first complete an online form on the Boeing external employment Web site. Global Staffing then invites those applicants selected through the online tool to come to the hiring center near Boeing Field in Seattle. There, applicants complete the required paperwork and get on-the-spot help from staff if there are any errors.

The center also provides computer-based assessments for assembly mechanics and electrician applicants. The assessment items include computer literacy, mechanical rea-

soning, measuring and an understanding of spatial relationships.

"Industry data has shown that using this type of robust assessment and pre-employment process results in a better quality of hire and matches the employee to the right job skill more effectively," said Bud Fishback, senior manager, Staffing Operations. "That's not just good for Boeing; it's also good for the employee."

After the assessment, applicants applying for assembly mechanic and assembly electrician jobs can go through a variety of pre-employment requirements such as vision tests and security background checks right there at the center.

"Previously, a lot of this was done at different times and locations," Fishback said. In addition, he noted that conducting security checks, which had been done by a vendor, was moved in-house to the Security Background Investigation organization. The result: a reduction in background-check cycle time from an average of six days to less than one day. "With the recent volume of new hires coming through the process, that's a significant improvement," Fishback said.

"It's great to see the teams run this process like a hiring factory," O'Dell said. "This has helped the factory face a very difficult rate challenge with greater success. And the ultimate benefit is getting employees on board, trained and ready to build airplanes—where and when we need them." ■

kathrine.k.beck@boeing.com

Entries sought for engineering student award

Nominations will be accepted through June 13 for the third annual Engineering Student of the Year Award. Boeing is the sponsor of this worldwide competition, held in association with the aerospace trade publication *Flight International*.

The competition is open to any full- or part-time engineering student in a program leading to a recognized academic degree such as a bachelor's degree, a master's degree or a doctorate. The winning student's work will be judged on how likely it will be to affect the future of aerospace engineering in areas such as new or enhanced systems, processes or tools; new levels of performance; improved life-cycle costs; new capabilities; or other areas.

The Boeing sponsorship is among the company's many efforts aimed at encouraging students to pursue careers in aerospace-related engineering fields.

"Boeing places a high value on helping to develop the engineering and technical skills required to grow and sustain our business. We are committed to developing the engineering work force of tomorrow," said Charles Toups, Integrated Defense Systems vice president, Engineering and Mission Assurance. "The recognition and exposure that this award brings are meant to shine a light on students who are striving to obtain critical engineering and technical skills."

Boeing is sponsoring the third annual Engineering Student of the Year Award, held in association with the magazine *Flight International*. In the above ad, *Flight* is promoting this program and encouraging nominations.

The 2007 winner, Kevin Lohner, is a Stanford University doctoral degree candidate who specializes in rocket-propulsion technologies. He holds four patents and has published

several research papers on advanced rocket-propulsion-related technologies.

"I've been fascinated with rockets and space travel for as long as I can remember. The underlying goal for all this work has been to make more-efficient, lower-cost and/or higher-performance engines for future space-vehicle applications," Lohner said. "This work has strong potential for impact in areas such as in-space propulsion, power generation and energy conversion; rocket booster vehicles; laser systems; microsatellite launch systems; and space tourism."

Entries each year are evaluated and judged by a panel of former Boeing senior engineering leaders. Past judges have included Thad Sanford, former IDS vice president of Engineering; Tuncer Cebeci, retired Boeing Tech Fellow; Carlos Paiz, a former program engineering director in Phantom Works; and Frank DeMattia, former senior program director of the Future Combat Systems program.

The winner will be rewarded with an expenses-paid trip to this year's Farnborough International Airshow as a guest of Boeing. The award will be presented July 15, during the week-long event, as part of *Flight's* 100th anniversary celebration.

For further details and to submit an entry, visit www.flightglobal.com/student.



DANIEL THOMPSON PHOTO

Here comes a hot one!

The Advanced Metal Structures business unit of Boeing Fabrication in Auburn, Wash., in late March completed and shipped its first 747-8 heat shield for the flying test bed used for engine testing. The heat shield, made of a formed titanium sheet and attached to the bottom of the engine strut, helps deflect engine heat from the strut and wing. Pictured is Blair Emry, Advanced Metal Structures cell technician, completing work on the initial heat shield. The first production heat shield was delivered to Boeing Winnipeg late last month. The first 747-8, a freighter, is scheduled for delivery to Cargolux in late 2009.

A thunderous start



The P-8A Poseidon means a lot to Boeing. Just ask the people who work on this aircraft.

By DEBORAH BANTA DUSTMAN

For Boeing, Monday, March 31, was the start of much, much more than just another workweek.

On that day, final assembly of the first P-8A Poseidon for the U.S. Navy began on plan and on schedule at the Boeing Commercial Airplanes factory in Renton, Wash. The fuselage of the first aircraft arrived by train from Spirit AeroSystems in Wichita, Kan., and BCA mechanics in Renton started installing floor panels, systems, wires, tubing and other small parts on the aircraft's fuselage section.

The P-8A Poseidon is the U.S. Navy's newest aircraft in 30 years to serve maritime patrol and reconnaissance missions. Integrated Defense Systems and BCA have been working together with the program's key industry partners for more than four years to plan, design and build the P-8A, a military derivative of the Next-Generation 737-800.

"It's a very exciting time for our team—IDS and BCA together—designing and building a fully tactical airplane through the Boeing Production System," said Mo Yahyavi, Boeing vice president and P-8 program manager for BCA. "The fuselage is built by Spirit AeroSystems; airplane final assembly is performed by BCA; and the mission equipment is installed by IDS. That's called working together."

"The start of final assembly of our first test aircraft is a tremendous milestone," said Bob Feldmann, Boeing vice president and P-8A program manager for IDS. "When you see this kind of teamwork coming together, delivering a no-traveled-work, perfect fuselage into the start of our production line, it's just an incredible feeling—just incredible!"

Feldmann added that working together as one Boeing team is one of the keys to success for the P-8A program as employees manage complex aircraft-integration and export-compliance issues. The program expects to deliver the first test aircraft to the Navy in 2009.

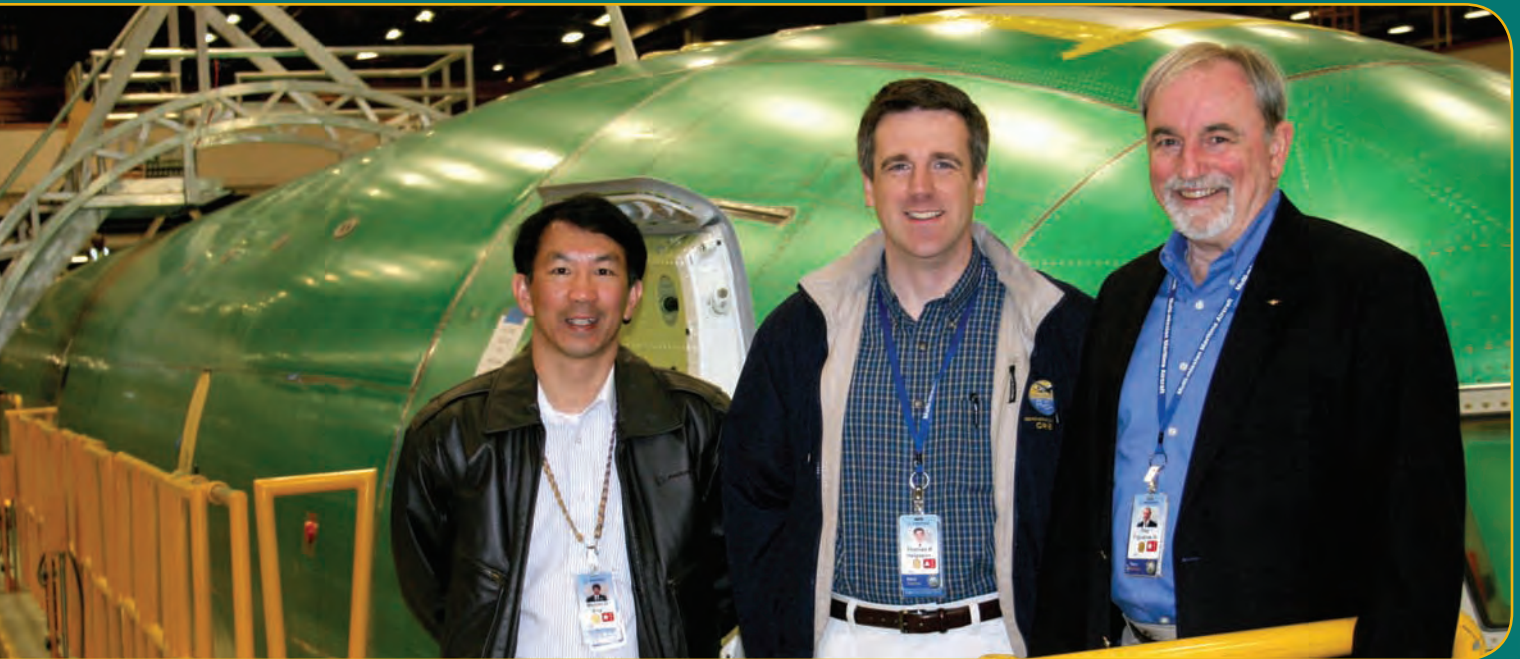
The P-8A platform represents a new solution with mission systems that provide the latest in anti-submarine warfare, anti-surface warfare, and armed intelligence, surveillance and reconnaissance capability. The aircraft's open architecture will enable its customers to insert weapon system upgrades and future technologies in an affordable and timely way to meet evolving threats.

The Boeing employees who plan, design and build the P-8A Poseidon shared with *Boeing Frontiers* their excitement about—and priorities for—working on the program. Their comments appear on the following pages. ■

deborah.b.dustman@boeing.com

The fuselage for the first P-8A Poseidon arrives at the Boeing factory in Renton, Wash., from Spirit AeroSystems in Wichita, Kan. Boeing recently began final assembly on the first P-8A.

JIM ANDERSON PHOTO



DEBORAH DUSTMAN PHOTO

‘Big Green’ arrives at Renton

Ray Figueras, Product Support Director, P-8A Program, Integrated Defense Systems

Ray Figueras (right) was one of the first Boeing employees to work on the P-8A Poseidon program. On March 31, he and dozens of program representatives anxiously waited at Boeing Renton for the arrival of the first Poseidon fuselage by train from Spirit AeroSystems in Wichita, Kan. Joining Figueras for an exuberant shipside visit the next day were fellow P-8A IDS Support Systems engineering managers Melvin Eng (left) and Thomas Helgeson.

“In 2003 I was lucky enough to chronicle our exploits as we took a Next-Generation 737-800 around to Navy bases selling a Boeing solution to the multimission maritime aircraft competition. I tagged that aircraft as ‘Big Green,’ in deference to the protective coating it still had applied. Today (March 31) at 5:48 p.m., YP-001, 2599, T-1, P-8A, the real Big Green, rolled into the yard at Boeing Renton. To say it was a milestone event does not give credit to how far we have come. The state of Washington has few thunderstorms each year, and rarely any lightning. But just as Big Green entered the train well, thunder rolled, lightning flashed and it started hailing—hard. I am sure it was Poseidon* marking the arrival of his offspring.”

* Figueras’ reference to Poseidon is from the literature of ancient Greeks, who believed the mythological figure was the god of the sea. Poseidon, also referred to as Neptune in Roman mythology, was believed to have power to offer calm seas, which sailors relied upon for safe voyages. The Greeks and Romans both believed that, when angered, the god of the sea could cause lightning, storms, shipwrecks and earthquakes.

‘A perfect marriage of BCA and IDS’

Melvin Eng, P-8A Support Systems Senior Manager, Integrated Defense Systems

Melvin Eng (above, left) visited Boeing Renton’s new Final Assembly Line 3 the morning after the first P-8A fuselage “flew” by crane into the factory to start the last phase of production on the first test aircraft. Eng is responsible for the continuing airworthiness of the airplane as it goes through the next stages toward the hand-off from BCA to IDS this summer.

“The P-8A is the perfect marriage between the commercial and military sides of our business. We’re bringing the best of Boeing to this product, with BCA building the airplane and IDS installing the mission systems—without the need for costly, time-consuming structural modifications. We believe it’s a Lean, efficient, best-value way to build a military derivative from a commercial platform, that nobody else can do. And by working together as one Boeing team, we’re building outstanding teamwork and leveraging best practices in our planning and production processes—both within Boeing and across our industry-partner team.”



JIM ANDERSON PHOTO

‘Crew eager to face new challenges’

Perry Moore, P-8A Director of Manufacturing Operations, Commercial Airplanes

Perry Moore (right, with IDS Vice President Tony Parasida) regularly meets with P-8A mechanics to see how he can facilitate production issues and ensure the program keeps its delivery commitments to IDS and the U.S. Navy.

“Even though our crew is very experienced, everyone’s excited to face new challenges of working on such a unique aircraft. Our team is using standard best practices of the Boeing Production System, incorporating the nine tactics of Lean and proven processes that fit with Poseidon’s build requirements. This is an opportunity to bring everything together so we can leverage efficiencies and gains we’ve already achieved on our 737 final assembly lines. One of the most significant new 737 Lean process improvements we’re trying is the use of what we call the ‘Alaska tool,’ which streamlines the flow of the airplane as

it moves between final assembly positions by reducing the need for movable scaffolding. Our team is always on the hunt for opportunities to do the job better, faster and safer, and so we’re looking to make more Lean improvements. That’s how we plan to continue providing a best-value product for Boeing and our U.S. Navy customer.”

‘This changes the way we’ll do derivative airplanes’

Tony Parasida, Integrated Defense Systems vice president, Airborne Antisubmarine Warfare and Intelligence, Surveillance and Reconnaissance Systems

Tony Parasida (above, left) leads the IDS division of ASW & ISR Systems, which counts the P-8A Poseidon among its programs. Because of the mission of the P-8A Poseidon, the aircraft requires few observer windows—a striking fact apparent from inside the fuselage where, on March 31, quality control inspectors began work after taking delivery from Spirit AeroSystems.

“For me, it’s important to look back on why Boeing was awarded the P-8A Poseidon contract by the U.S. Navy. The award to Boeing and our industry partners was made because our customer received our commitment that we would deliver an aircraft using a different business model. By working together as one Boeing team, we’re fundamentally changing the way this aircraft is planned, designed and built. As a result, we can provide tremendous savings to the U.S. Navy and taxpayers by eliminating unnecessary rework, cost and schedule flow times and improving quality for every aircraft we deliver. It’s unbelievably significant, as this changes the way we’ll do derivative airplanes forever.”



DEBORAH DUSTMAN PHOTO

‘Getting it right from the get-go’

Steve Cobb, P-8A Quality Inspector, Commercial Airplanes

Steve Cobb started with Boeing as a 747 mechanic in 1979, but the P-8A Poseidon is his first start-up airplane program. Cobb more recently volunteered to move from Final Assembly to serve as a Conformity Coordinator on the P-8A program. His mission is to help ensure Renton Engineering’s Integrated Product Teams create designs so that parts go together easier and faster with first-pass quality.

“My job is to catch ‘produceability’ issues early. The P-8A program is trying to avoid habits of the old days, when the tendency was to throw issues ‘over the fence’ to be fixed later. Now, I ask Engineering three things: ‘Can I understand the drawing? If I build the part to specification, will it perform as intended? Can I easily inspect the part after installation?’ Being side-by-side with Engineering allows me to suggest ways to simplify part designs so they can fix issues before they release drawings. With the 400-plus entries I’ve made so far, we’ve eliminated drawing errors on parts and installations that affect P-8A electrical, plumbing, interiors and other systems across our Wings, Systems & Installation and Final Assembly areas in Renton. I hope to see this role duplicated on other airplanes, because I see it as a value-added way of getting it right from the get-go.”

errors on parts and installations that affect P-8A electrical, plumbing, interiors and other systems across our Wings, Systems & Installation and Final Assembly areas in Renton. I hope to see this role duplicated on other airplanes, because I see it as a value-added way of getting it right from the get-go.”

‘Export compliance affects everyone’

Tracie Wilds, P-8A Program Contracts Manager, Commercial Airplanes

Tracie Wilds oversees a team of employees who manage complex contract details for the P-8A program’s integrated work statement shared by BCA and IDS.

“Boeing as an enterprise has invested nearly four years developing, implementing, training and communicating about our export control plans to maintain compliance with the International Traffic in Arms Regulations. Export compliance affects everyone, and hundreds of processes used to plan, design and build a military aircraft in-line within Boeing’s commercial production system. The P-8A Contracts organization manages a large volume of working-together issues and processes across Boeing and our supply chain. Like everyone else, we’re challenged and committed to do our jobs well and find ways to comply effectively and productively with export controls that enter the contracts arena.”



DEBORAH DUSTMAN PHOTO



ALAN MARTS PHOTO

‘Boeing Renton’s legacy of performance is growing’

Helene Michael, vice president, 737 Manufacturing, Commercial Airplanes

As the leader of 737 Manufacturing on the Boeing Renton site, Helene Michael (right, with engineer Hyungsuk Kim) is excited to open the program’s third final assembly line with the start of P-8A Poseidon production.

“What a tremendous job people have done to get to this point! I speak on behalf of the thousands of employees past and present who take great pride in the proven performance of the Next-Generation 737. As we open Final Assembly Line 3, the new home of the P-8A Poseidon, Boeing Renton’s legacy of performance is growing. Our employees can enjoy a closer connection with the airplanes we provide to the men and women in military service. And we can share the honor of helping deliver a military derivative of the best-selling airplane in the world.”

P-8A status update

The P-8A Poseidon is designed to provide the U.S. Navy with the newest and most advanced capabilities in antisubmarine warfare; antisurface warfare; intelligence, surveillance and reconnaissance. A military derivative of the Next-Generation 737-800, the P-8A will replace the Navy’s fleet of P-3C Orions.

Under the system development and demonstration contract for the P-8A that the Navy issued in 2004, Boeing will build five test vehicles: three

flight-test and two ground-test aircraft. The first flight-test aircraft now is in final assembly at the Boeing factory in Renton, Wash. Last month, P-8A teammate Spirit AeroSystems began production of the fuselage for the first ground-test airframe.

The first flight-test aircraft will be delivered to the U.S. Navy in 2009, with initial operational capability planned for 2013. Flight testing will take place at Naval Air Station Patuxent River, Md. The Navy plans to purchase 108 production P-8As.

—Ellen LeMond

The Sea Ranger aircraft was built at the Boeing site in Renton, Wash., for the U.S. Navy. Now, with the P-8A Poseidon, Renton has resumed working on a Navy aircraft.

BOEING ARCHIVES PHOTO



Back *to the future*

Renton returns to roots building Navy aircraft

The P-8A Poseidon, a military derivative of the Boeing 737-800 that will be used by the U.S. Navy, is being built in the heart of Boeing Commercial Airplanes' production system in Renton, Wash. In a twist that's both ironic and natural, the first mission of the Renton site was to build aircraft for the Navy.

In 1941, the United States needed a location to build the XPBB-1 Sea Ranger, an experimental flying boat that would serve as a long-range flying boat, bomber and patrol airplane. The Boeing XPBB-1 Sea Ranger, or the Model 344, was the largest twin-engine airplane built at the time of its first flight in 1942. It used a wing similar to the four-engine B-29 bomber and incorporated aerodynamic features of the Boeing Model 314 Clipper.

The Navy ordered 57 Sea Rangers to be manufactured at a new plant on 95 acres in Renton, on the south shore of Lake Washington. The waterfront site provided natural protection from prevailing winds, so it was easier to launch seaplanes directly from the plant. The Sea Rangers were designed for a "boosted takeoff" by being catapulted from huge barges. Although the normal range of the aircraft was 4,245 miles (6,832 kilometers), designers believed this distance could double if fuel was saved by the catapulted takeoff.

However, before the first Sea Ranger was finished, it was surrounded by B-29 bombers: In mid-1942, the U.S. military changed its strategy and favored land-based bombers. Only one Sea Ranger

was built, and the aircraft was nicknamed the "Lone Ranger." The Boeing 25-year tradition of building seaplanes ended when the Lone Ranger flew out of Renton for the last time on Oct. 25, 1943, heading for the Navy base in San Diego. This one-of-a-kind seaplane served the Navy in a variety of ways for several years before it was placed in storage at the Norfolk Naval Air Station in Virginia.

The Renton plant was traded to the Army for North American B-25's (PBJ-1s in Navy service) that were built at the NAA plant in Kansas City. The Kansas City facility was slated to produce B-29s, but Renton was seen as a better choice. So the Navy agreed to give up Renton for the B-25s it wanted from Kansas City. After World War II, the Renton plant eventually became a manufacturing facility for Boeing commercial jet transports.

Now, some 67 years from its beginning as a military aircraft assembly site, Boeing Renton connects with its past by building a military derivative based on a commercial platform—the U.S. Navy's newest marine patrol and reconnaissance aircraft, the P-8A Poseidon.

For more about the history of the Renton site, visit www.boeing.com/commercial/facilities/rentonsite.html on the World Wide Web. For more about the Sea Ranger, visit www.boeing.com/history/boeing/xpbb1.html.

Renton and defense

Here's a list of the military aircraft built at the Boeing site in Renton, Wash., between the XPBB-1 and the P-8A Poseidon.

- B-29 Superfortress
- TB-50H
- KC-97 Stratofreighter
- KC-135 Stratotanker
- E-3 AWACS
- VC-137
- T-43A
- E-6
- C-32
- C-40

A cut above

Focus on ergonomics creates an elegant solution that solves multiple issues

By JEFF WOOD

Jeff Bacon, Cutting Tool Service Center tool grinder, had an idea for a quick-release mechanism that would make it easier and quicker to load heavy cutting tools into a fixture for maintenance.

Dave Scholze, Auburn (Wash.) Tooling Services (ATS) machinist, noticed that the nylon sling of the overhead chain hoist used for lifting the cutting tools required frequent inspection for wear where it contacted the tools' sharp edges.

Mark Stuart, Materials and Process Technology (M&PT) Associate Technical Fellow, saw that mechanics were forced to work in awkward positions—and sometimes to bear the full weight of the bulky tools by hand—because the chain hoist did not reach to cover their full work area.

These three employees, working in a variety of job classifications and in different areas of the Boeing Fabrication facility in Auburn, might have gone their separate ways to resolve their issues. But thanks to the M&PT and Environment, Health & Safety Ergonomics groups, they had a forum where they could raise issues, trade ideas and put their heads together to develop solutions.

GETTING INVOLVED

Every Monday morning, the ATS ergonomics team gathers for an hour in a conference room. The goal of this cross-functional group, which includes mechanics, engineers, and managers, is to make their jobs safer and develop ways to perform their tasks as efficiently and effectively as possible.

Bacon took advantage of connections made during ergonomics meetings to talk to Scholze about his ideas for a quick-release mechanism. Scholze got involved with the ergonomics team upon returning to work after an injury.

Jeff Bacon (from left), Dave Scholze and Guy Bandieramonte try out the clamp and quick-release device they developed to grasp cutting tools. The arm of the air balancer (yellow) can rotate to reach any point in the work area. Operators turn a dial on the red block to select the amount of weight the balancer will counteract.

JIM ANDERSON PHOTO



olve



“Working with the ergonomics team gave us leverage to get the time and resources we needed to work on the issues,” Scholze said. “Anyone can participate.”

Scholze and ATS tool programmer Guy Bandieramonte began working on prototypes and eventually codeveloped an innovative clamp to replace the nylon sling of the chain hoist that was used for lifting cutting tools to the grinding fixture. “We began tossing ideas back and forth at lunch time, and before long we were trying out solutions,” Bacon said.

Scholze and Bandieramonte integrated a quick-release mechanism with that clamp, which grips cutting tools without coming in contact with sharp edges. They were recently granted a meritorious invention award after submitting the invention to Intellectual Property Management.

The final element of the solution came into place when Stuart discussed the incomplete floor coverage of the chain hoist with ergonomist Brian Poggioli, who was working with a group in another Auburn building. Poggioli knew the group was preparing to “surplus” a lifting aid called an air balancer.

“The balancer uses air pressure to counteract the weight of the tool,” Poggioli said. “You dial in how much weight you want to counteract, and the balancer allows you to move a 75-pound (34-kilogram) cutting tool as if it weighed only 2 or 3 pounds (1 or 2 kilograms).”

Stuart was immediately interested, because the balancer’s 10-foot (3-meter) arm covers the entire work area, from the cutting tool drop-off area to the maintenance tool fixtures. He said ergonomic risk assessment revealed three major risk factors in the old process that depended on the chain hoist. Operators repeatedly lifted heavy tools, held the tools with arms extended away from the body to avoid the sharp edges, and adopted awkward postures when attaching and detaching the nylon web. The 10-foot reach of the air balancer would address all three issues.

Focusing on the ergonomic risk factors helped the team bring together three good ideas—the quick-release, the clamp, and the air balancer—to create an elegant solution to several long-standing issues.

RID OF THE CHAIN HOIST

Bacon is happy to be rid of the chain hoist. “Using the balancer, I can move a cutter to the grinder in no more time than it takes to lift it

by hand,” he said. The quick-release reduces the amount of handling required to position the tool for maintenance. “And I don’t have to worry about chains swinging back through the work area after the tool is released from the sling,” he added.

The Auburn ergonomics process encourages employees to take charge of improvements in their own areas by providing a structured way for employees to develop their ideas that make their work experience better. Auburn M&PT ergonomists Stuart, Todd Lefkowitz and Poggioli work with groups throughout the Auburn site.

“We can often put team members in touch with other teams that have had experience with related issues,” Stuart said.

The Auburn ergonomics process, led by Kim Holtman of EHS, measures results using standard metrics and documents improvements so that best practices can be shared with other areas.

Stuart said beyond reducing the risk of injury, improvements such as this benefit the whole company.

“By reducing the amount of lifting and physical strength required to do the job, we open opportunities to perform this function to a wider number of Boeing employees,” Stuart said. This creates a larger pool of potential employees who can qualify for the function and increases the variety of functional areas where individual employees can choose to work. ■

richard.j.wood@boeing.com

Boeing engineer Vicki Curtis stands next to a mannequin wearing a "suit" that researchers wear to experience the limitations felt by many older individuals. Curtis' job—and passion—is making the traveling experience more accessible for everyone.

GAIL HANUSA PHOTO

Accessible solutions

Meet Vicki Curtis, a Boeing engineer who seeks ways to make air travel easier for everyone

By DAN IVANIS

Sometimes Vicki Curtis is a 20-something parent traveling with a toddler. Other times, she's middle-aged with creaky knees and too many extra pounds around the middle. Sometimes, she's a paraplegic who is totally dependent on a wheelchair and the help of others.

In real life, Curtis is an engineer in TheConceptCenter at Boeing in Everett, Wash., who spends her time looking through other people's eyes, touching with their hands and feeling with their emotions in an effort to make air travel more accommodating for everyone. Formed in 1999, TheConceptCenter (formerly known as the Payloads Concept Center) generates forward-looking concepts for passengers and flight crew, flight decks, and airplane structures and systems. The Payloads Studio at TheConceptCenter focuses on the needs of people, developing ideas that bring benefits to Boeing's customers and the traveling public.

Whether it is airport signage, an airline Web site or the process of transferring a passenger from wheelchair to airplane seat, Curtis watches to see how different people react. She explores whether something can be made more accessible or, if it is already accessible, adapted to other situations.

"It started out as a job, but it's become a major part of my life," said Curtis, a 30-year Boeing employee. "It's a passion—something I think about constantly. Can everybody use it easily? Does it put someone at a disadvantage?"

Her quest recently led her to host a two-day workshop at TheConceptCenter that was attended by representatives of airlines, seat manufacturers, disability advocacy groups and Boeing employees. Representatives of The Walt Disney Company, renowned for its accessibility policies and service, also took part.

"Sometimes you feel like you've gone as far as you can and you need to get a bunch of people with different perspectives together so that we can look at the problems from different points of view," she said. "There were many 'Aha!' moments. The Boeing people who were there came up with some new ideas."

When people with disabilities travel, they're often told how they will be boarded, and the process is often conspicuous and inconvenient, Curtis said. "We're looking for ways to make it possible for someone with a disability to fly and not have to go through the indignity that is often associated with the process," she added.

Curtis' overarching goal is not to fix what now exists, but to find a breakthrough that can be designed into the next generation of aircraft.

"We came up with a couple ideas that the seat suppliers are willing to work with us on," she said. "It's a different way of making seats that uses existing technology. It does more than make the airplane more accessible. It makes it more marketable."

More than a proponent for people with disabilities, Curtis sees herself as a champion for the masses.

"We are all disabled at one time or another," she said. "A parent trying to board a plane with a toddler—their arms full of car seats, diaper bags and carry-ons—for all intents and purposes, that person has no hands. What have we done to help them travel?"

More central to Curtis' passion is an issue that will affect everyone: aging, and the various physical changes that go with it. Curtis was introduced to the problem shortly after joining TheConceptCenter about five years ago.

A 2002 report by the United Nations details the issue of the aging global population. By 2050, experts expect the number of people age 60 and up to be greater than the number of people under age 14 for the first time in history.

"This is an enormous issue for airlines, and therefore for Boeing," Curtis said. "Reduced vision, reduced hearing, reduced mobility and dexterity—the list goes on. The good news is that most of us will be healthy enough to live independently and do things we like to do, like travel."

And Vicki Curtis is determined to make it more accessible for all of us. ■

daniel.j.ivanis@boeing.com

'Patchwork'

in the paint shop

St. Louis team reduces painting time for F/A-18

By KATHY COOK

They cut the time required to paint an F/A-18 fighter jet by 150 hours, the gallons of paint per plane by 11 and the amount of hazardous waste by 25 percent.

They're members of the paint shop team in St. Louis, looking for ways to Lean things out while enhancing quality and keeping people and the environment safe. With the help of others across the site, they've made some impressive improvements.

First, the team eliminated a time-consuming step of the paint process by implementing new sealants. Sealants, applied to the aircraft before its trip to the paint shop, are used not only to protect it from corrosion in salt-air environments but reduce the ability of radar to pick up a plane's lines, such as where two parts are joined. The old process called for the sealant to be applied and then covered with a material that made it appear to radar waves like a continuous surface, minimizing returns. Application of the overlay coating required painters to mask off areas not needing it, apply it where needed, and sand it to a smooth surface. By replacing the old sealant with one that matches the metal "look" of the plane's surface to radar, the team eliminated the coating overlay step.

Next, they revised their process for applying specialty coatings used for classified tactical purposes. The coatings are applied to an aircraft in more than 70 different areas, vary-

ing in shape and size from a few inches to several feet. When these areas surround areas that aren't coated, painters have to mask, spray, sand and often redo portions.

RICH RAU PHOTO

"The work was a nightmare," said Stan Bozarth, paint shop manager. "The work was time-consuming, done in very tight spaces, required sophisticated protective equipment and precluded any other kind of painting during application and an eight-hour curing period."

The solution was to create patches of specialty coatings that could be applied with adhesive. A robot creates the patches, eliminating any hazard to humans, providing consistent materials, and eliminating the masking and sanding steps as well as the time required to cure the paint. Because the patches are pre-cured, painters don't need to wear protective equipment, and other work can be performed during application. "Best of all, a lot of rework is eliminated," Bozarth said.

The team started with just a few patches, and now applies around 70 per aircraft. The time required to paint one aircraft has dropped from six days to five.

"It's great," said Steve Meintz, a High Performance Work Organization team leader and collateral inspector in the paint shop. (An HPWO is a group of co-workers who are

responsible for a common function or product, share common goals and exercise self-determination in continuously improving the quality of their output and the efficiency of their processes.) "Everything is concise and consistent. The patches can be made in any size or shape, and cutouts can be created for areas not covered by the coating."

"The new cycle helps us avoid overtaxing the paint shop and moves us toward the Lean+ goal of standard work," said Rich Tiemann, industrial engineer. Sharon Sofian, Surfaces Finishes team lead, added: "We've increased capabilities without increasing cost, and that's good for everyone."

Mike Kerr, who's worked as a painter for 25 years and who helped implement changes in the paint shop, said: "This is one of the biggest things we've ever done in the shop."

"It's really a testament to teamwork," Bozarth added. "This wouldn't have happened with just one group pushing it. It took everyone—engineering, manufacturing, the High Performance Work Organizations, and the customer—to make it happen." ■

kathleen.m.cook@boeing.com

Support Systems team keeps UK Chinooks flying

By MADONNA WALSH

The short definition of “operational”: fit, ready for use. For UK air crews that fly the Mk2 version of Boeing Chinook helicopters in hostile situations, it implies a lot more.

It means the integrity of the aircraft isn't an issue. It means the aircraft should be absolutely reliable, its systems should work in the most extreme conditions, and it should be able to perform perilous missions effectively.

Toward this end, the Boeing UK Chinook Through Life Customer Support team provides engineering technical support, heavy maintenance, component repairs and upgrade services for the aircraft, enabling their military customer to perform frontline duties effectively and efficiently around the clock. Since the introduction of TLCS in 2006, the Boeing team and its partners have reduced the number of cycle days for major maintenance by nearly 20 percent, with a goal of 27 percent reduction this spring. For minor maintenance they achieved their 2007 year-end goal of a 40 percent reduction in cycle time.

“[Under the TLCS partnership] we've promised to have 27 Chinooks available to the Royal Air Force 24 hours a day, seven days a week,” said James O'Loughlin, Boeing Programme Director, UK Chinook TLCS Programme. The requirement to have 27 out of the RAF's 40 Chinooks be available demands strong performance.

Each day, the needs of the UK Chinook fleet are transmitted to the TLCS team. The team performs regularly scheduled maintenance on aircraft as well as repair of aircraft that have been damaged in operations.

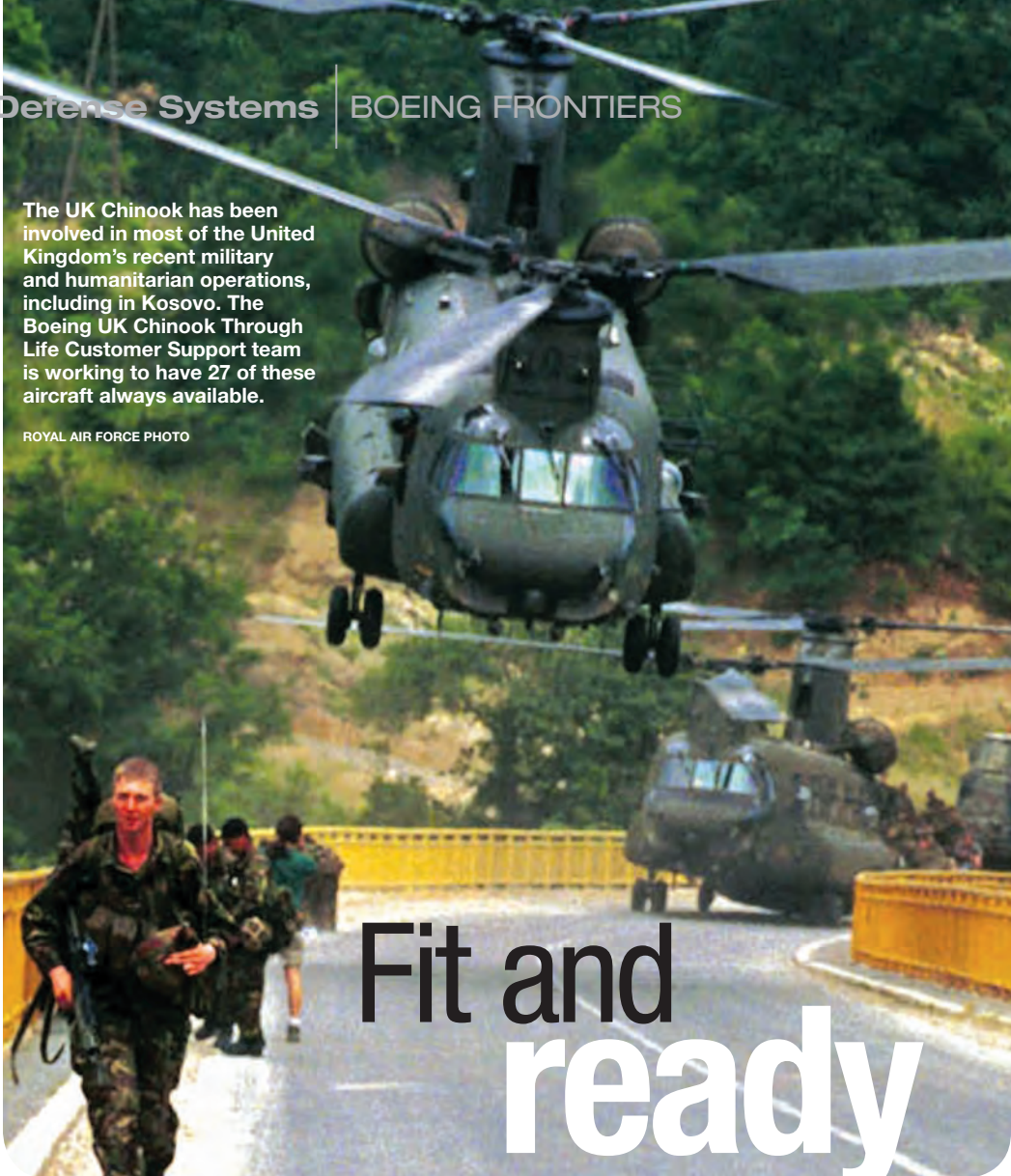
The TLCS network includes teammates across the UK, from Gosport and Royal Air Force (base) Odiham in the south, to Perth, Scotland, in the north—and the Boeing site in Philadelphia.

Main operations are housed at Vector Aerospace Fleetlands in Gosport. In most cases, Boeing employees are colocated with their military customer and partners, which has been vital to the team's success.

“Having Boeing on site has cut overall repair time in half for aircraft damaged in

The UK Chinook has been involved in most of the United Kingdom's recent military and humanitarian operations, including in Kosovo. The Boeing UK Chinook Through Life Customer Support team is working to have 27 of these aircraft always available.

ROYAL AIR FORCE PHOTO



Fit and ready

“There's a profound difference in the level of support [provided for Chinooks] since the introduction of TLCS. ... It makes all the difference in the world.”

— Group Captain Andy Turner, UK Chinook Force Commander and RAF Odiham Station Commander

operations,” said Group Captain Mark Sibley, Chinook Integrated Project Team leader.

“There's a profound difference in the level of support [provided for Chinooks] since the introduction of TLCS,” said Group Captain Andy Turner, the UK Chinook Force Commander and RAF Odiham Station Commander. “Today, every person at every level is fully engaged. It makes all the difference in the world.” ■

madonna.a.walsh@boeing.com

TLCS happens here

Through Life Customer Support work for the UK Chinook program is taking place at the following locations:

Vector Aerospace Almondbank, formerly Defence Aviation Repair Agency Almondbank, or DARA Almondbank Perth, Scotland

Royal Air Force (base) Odiham (RAF Odiham) Hampshire, England

Vector Aerospace Fleetlands, formerly DARA Fleetlands Gosport, England

The Boeing Company Philadelphia

Royal Naval Air Station Yeovilton (RNAS Yeovilton) Yeovilton, England

It's good with directions

Boeing upgrades electronics of ICBM guidance system

By CHERYL SAMPSON

The upgrading of all active Minuteman III Intercontinental Ballistic Missiles (ICBMs) with Boeing-built modernized guidance-system electronics is now complete, signaling the readiness of this linchpin in the United States' strategic deterrent.

The attainment of this milestone, eight years in the making and referred to as Full Operational Capability, was recognized during a recent ceremony at Warren Air Force Base in Cheyenne, Wyo. In attendance were members of the ICBM Prime Integration U.S. Air Force/contractor team, including prime contractor Northrop Grumman Mission Systems, Boeing and Honeywell.

Boeing has the distinction of having been the only U.S. Air Force ICBM guidance system integration contractor for more than 50 years, not only on the Minuteman series of ballistic missiles but also the Peacekeeper and Small ICBM.

"The Boeing Guidance Replacement Program (GRP) team in Anaheim, Calif., El Paso, Texas, and Heath, Ohio, has delivered exceptional performance to meet our customer's requirements," said Peggy Morse, director of ICBM Systems for Boeing's Command, Control and Communications Networks business unit.

The Minuteman GRP is extending the service life of the Minuteman III Missile Guidance Set, designated NS50—the navigational heart of the ICBM weapon system—through 2030 by modernizing its electronics.

Full-rate production of the new electronic sets began in 2000 with a total of 652 units being produced to support 450 operational Minuteman III ICBMs. So far, Boeing has delivered 593 units on or ahead of schedule for six years. The final sets are scheduled for delivery in 2009.

"The Guidance Replacement Program team has consistently demonstrated attention to technical excellence, continuous product improvement and customer satisfaction," said Charles Dutch, Boeing Guidance Replacement Program director. "When dealing with a long-duration program like GRP, losing some of our suppliers is inevitable. The team tackled this challenge by identifying alternate sources and making life-time buys when needed. This flexibility has helped achieve six years of being on or ahead of schedule in our deliveries." ■

cheryl.a.sampson@boeing.com

As part of an operational test, a Minuteman III Intercontinental Ballistic Missile is launched from Vandenberg Air Force Base, Calif., to determine the weapon system's reliability and accuracy. All active Minuteman IIIs now feature Boeing-built modernized guidance system electronics.

U.S. AIR FORCE PHOTO

A bittersweet milestone

Achieving Full Operational Capability, where all active Minuteman III Intercontinental Ballistic Missiles (ICBMs) have been equipped with Boeing-built modernized guidance-system electronics, is a significant milestone for the Boeing Guidance Replacement Program team in Heath, Ohio. The center is a recognized leader within Boeing as a Strategic Center for maintenance, repair and spares of military guidance and navigation systems. The Jan. 29 return to Heath of the last unit from the original Minuteman III guidance set—designated NS20—was marked with memories and pride. It will be upgraded to an NS50 and is scheduled for delivery in 2009.

"The return of the final NS20 is one of those bittersweet events," said Miike Emmelhainz, Heath center director. "It closes out one chapter in the Minuteman III work that has been performed at this site, but opens the next chapter in Minuteman as part of our 50-year ICBM legacy."

For Heath veteran John Jenkins, "There are a lot of memories." Jenkins has worked in missiles since the early 1960s, performing diagnostics and testing on everything from the Titan and Peacekeeper missiles to Minuteman I, II and III.

"The Minuteman program has provided a steady workload since its arrival," said Heath ICBM Program Manager Ron Yates. "This has permitted investment in this facility and the ability to attract and retain employees and other workloads in Heath."

—Dawn Pettit

Lighter lunar loads

Boeing's knowledge in composites can cut cost for return to the moon

Shown here is a Delta IV fairing. Boeing developed the composite fairings for Delta and Sea Launch. Although Delta manufacturing has moved to United Launch Alliance—a joint venture in which Boeing is a partner—Boeing still manufactures composite payload fairings for Sea Launch.

BOEING PHOTO



By Ed MEMI

Boeing is sharing with NASA composites expertise from its commercial airplanes, space and defense programs to help reduce the weight and development costs of new rockets and vehicles planned for a return to the moon by 2020.

Large composite structures, which can be 20 percent to 30 percent lighter than comparable aluminum structures, are being studied for use on elements of NASA's Constellation program, including the Ares I crew launch vehicle, Ares V cargo launch vehicle and the Altair lunar lander. The lower mass of composite structures will enable larger payloads to be transported to and from the moon, and eventually to Mars. Composite structures also can be less labor intensive to manufacture.

Composite material typically consists of

high-strength fibers embedded in a resin matrix, such as epoxy, that is heated under pressure to form finished parts and structures. Composites are pervasive today, used in products from automobiles to sporting goods to aircraft. Boeing uses composites in jetliners such as the 777 and the 787 Dreamliner, and in military aircraft such as the F/A-18 fighter attack aircraft and Bell-Boeing V-22 tilt rotor. The company also uses composites in launch vehicles, satellites, missiles, ground vehicles and unmanned air vehicles.

The 787 employs more composites than any other commercial jetliner in production today. "Besides the strength and weight advantages, Boeing also is projecting a reduced lifecycle cost, because you do not have the corrosion issues that aluminum airplanes have," said Brice Johnson, a Phantom Works engineer and a Technical Fellow.

Boeing Ares I upper stage composites lead Don Barnes, who works alongside NASA at Marshall Space Flight Center in Huntsville, Ala., has a mission to show NASA how composites can be applied to future spacecraft. Similarly, NASA has expressed interest in Boeing efforts, and its representatives have toured Boeing commercial-aircraft and defense-program facilities to learn more about Lean composite manufacturing.

Composites currently are in use in other space applications. The Delta IV launch vehicle uses composites in all major structures except its cryogenic tanks. Boeing Commercial Space Company currently builds composite fairings and payload-accommodation structures for Sea Launch rockets in its Seattle facility.

Boeing will manufacture a composite interstage, systems tunnel and various small shrouds, fairings, covers and doors for the

Ares I rocket, under current plans, when it begins production in late 2009 at NASA's Michoud Assembly Facility in New Orleans.

Barnes said he sees numerous applications of composites for lunar landers and habitats. "Their lighter weight is a key advantage, since getting things to the moon is quite expensive," he said. "Another benefit is better radiation protection inherent in composite materials."

Boeing intends to use composites on launch-vehicle propellant tanks as well. "No

10-meter/33-foot-diameter cryogenic tanks for the Ares V. With more than 18 years' experience with composites, his primary focus has been in automating the manufacturing of composites for Boeing.

"The 10-meter tanks for Ares V are well beyond anybody's current capability. However, all the manufacturing process and tooling that we developed on the 787 are scalable to larger structures," he said.

Dianne Wiley, a Technical Fellow for Boeing Space Exploration, is working with colleagues

posite Delta II fairing in the late '80s. He then moved on to lead development of the Delta III 4-meter/13-foot- and Delta IV 5-meter/16-foot-diameter composite fairings. "It is much cheaper today to use composites because the aluminum fairings are so labor intensive. By unitizing the structure with composites, we eliminated 90 percent of the piece parts," Cleveland said.

Cleveland is helping NASA develop its vision for a 10-meter-diameter Ares V fairing by combining the best Boeing and Sea Launch



David Frost (from left), Boeing Commercial Space Company, Sea Launch Systems Engineering and Integration manager; Todd Mather, BCSC program manager; and Kevin Davis, senior principal engineer for 787 Fuselage Structures, examine the 787 Section 46/47 Fuselage Structural Test Article. Boeing showed a team of NASA officials some of the innovative uses of composites on the 787.

ED TURNER PHOTO

other company surpasses Boeing in the utilization and knowledge of composites, including the development of cryogenic tanks. We've built four large tanks and we've done significant development work at the structural element and coupon level," said Michael Robinson, an Associate Technical Fellow who works in Phantom Works structures research and development at Huntington Beach, Calif.

Boeing—through predecessor company McDonnell Douglas—learned about composite cryogenic tanks when it built and flew the world's first composite liquid-hydrogen tank as part of the DC-XA test program during the 1990s. The program built a vertical-takeoff-and-landing launch vehicle much like a prototype lunar lander. Both Barnes and Robinson worked on the DC-XA program.

Johnson is working with Boeing's Space Exploration team on payload fairings and

from Phantom Works and Integrated Defense Systems on utilizing technologies developed in other programs to leverage and tailor them to new programs.

"We are evaluating the potential development of a large cryogenic tank demonstrator in the Ares I class to demonstrate manufacturing technologies that could be scaled up in anticipation of an Ares V application," she said. "Composites are a way for us to tailor the structure to the load environment and to make the most efficient types of structures that we possibly can. This is very exciting because they are infinitely variable and 'tailorable' to the application."

Mark Cleveland is a principal engineer in advanced design for structures and materials for Boeing Phantom Works. His first job with composites structures was leading the design and build of the 3-meter/10-foot-diameter com-

capabilities. "We are currently exploring design and construction options in trying to figure out the best way to fabricate and transport this massive fairing." ■

edmund.g.memmi@boeing.com

"It is much cheaper today to use composites, because the aluminum fairings are so labor intensive. By unitizing the structure with composites, we eliminated 90 percent of the piece parts."

— Mark Cleveland, Principal Engineer in advanced design for structures and materials, Boeing Phantom Works



HERE'S TO THOSE WHO STAND OUT IN A FIELD OF BRILLIANCE.



Through partnership we shine. Boeing is proud to recognize those who rose to the top as the 2007 Suppliers of the Year. Only with world-class partners do we achieve world-class results.

Valiant Machine & Tool Inc.

M.C. Gill Corporation

Woodland Trade Company Inc.

American Semiconductor Inc.

Omega Precision

HITCO Carbon Composites Inc.

Watson's Profiling Corporation

GE Global Research

Aerojet

Harris Environmental Group Inc.

JWD Machine Inc.



Not by the seat of his pants

Test pilot Chuck Killberg demystifies his job—and the F-22 Raptor

BY DOUG CANTWELL

He's flown more than 180 different aircraft, including the world's most advanced fighters. He currently flies C-17s, T-33s and various derivatives of the 737, 757 and 767.

It's easy to imagine his kind as cowboys of the sky, but Chuck Killberg debunks that image. "Test pilots are first and foremost engineers," he said. They're fascinated by all complex systems, especially those that fly. They study a new winged machine, wondering what they can learn from it—whether it's a Piper Cub, a 737 or an F-22 stealth fighter.

Killberg cited one of his heroes, test pilot and astronaut Neil Armstrong. "You might expect he'd want to talk about walking on the moon," said Killberg, director of Flight Operations for Global Mobility Systems in Integrated Defense Systems. "but he'd much rather discuss the characteristics of some interesting aircraft or an engineering problem."

THE MISSING LINK

Killberg spent most of his first decade at Boeing as one of the test pilots who helped developed the F-22, for which Boeing pro-



Chuck Killberg sits at the controls of a Boeing C-17 in Long Beach, Calif., where he is currently director of Flight Operations for Global Mobility Systems. Killberg's experience includes having been a Boeing test pilot for the F-22 Raptor.

GINA VANATTER PHOTO

vides the wings, aft fuselage, avionics integration and training programs. Indeed, he has a special fondness for the Raptor and the team that brought it to life. “We pilots tried to beat everything out of the airplane that didn’t make sense,” he recalled. They wanted to free the pilot to concentrate on tactics rather than on operating the aircraft. “We wanted this advanced fighter to be the most user-friendly.”

The test pilots appealed to F-22 subsystem engineers to automate as many aircraft startup functions as possible, which eventually reduced the number of discrete steps from 18 to just three. Today, the entire startup sequence for the F-22 is: battery—ON; auxiliary

for example, would describe what happens during a particular malfunction.

“Sometimes you’d see a light go on when another engineer would realize that the hydraulic failure would also cause problems with his system, one he hadn’t expected,” Killberg recalled. “That was one of the most intense and satisfying parts of the job.”

RAPTOR 03’S FIRST FLIGHT

Killberg piloted the first flight of Raptor number 4003, the third F-22 but the first structurally representative airframe. Even though it wasn’t Raptor 01, there was still uncertainty in the air.

“Blessedly uneventful would be a good

sign and build it. “You just happen to be the lucky guy who gets to fly it,” he said.

“After it’s over, you owe the team a thorough and technically accurate debrief on how their systems and subsystems performed and interacted,” he added. “But while it’s happening, you want to convey the enthusiasm and pride they all feel.”

ON THE FLYING TEST BED

Killberg joined Boeing in 1991 after 21 years in the U.S. Air Force, where he’d directed developmental flight test of the F-15E Strike Eagle fighter. Besides serving as Boeing’s first F-22 test pilot, he was assigned in 1995 to manage a team that operated and maintained the prototype Boeing 757 as it was transformed into a flying avionics lab.

The 757 Flying Test Bed (FTB) resembles a giant prehistoric bird with its chin pod, F-22 radome nose and sensor wing mounted on top of the fuselage just aft of the cockpit. It was used to test the Raptor’s avionics in flight, before the first F-22 ever flew. This was critical because the F-22’s avionics—more highly integrated than anything in existence—needed a head start. The flying lab sped development while reducing risk and costs.

Killberg has logged about 1,000 hours flying the FTB and will fly it again during the next phase of avionics testing, which starts later this year. Although a 757 doesn’t provide the visceral thrill of the Raptor, he knows it makes a serious contribution.

“The FTB allows engineers to ‘fly’ on board an F-22, observing their systems first-hand in real time on a moving platform,” he said. “That gives them a huge advantage over looking at recorded, post-flight data.”

Sooner or later, one has to ask a test pilot the inevitable question: Has he ever had to “punch out” (eject from an aircraft) during flight?

“Fortunately, takeoffs equal landings so far,” Killberg responded. He’s come close to ejecting a few times but in each case resisted the impulse long enough to find a better solution.

“Folks assume that test pilots have lightning-fast reactions,” Killberg said. “But sometimes a slow, deliberate response is better.

“Or maybe it’s just slow reactions,” he added with a shrug, “and an innate distrust of parachutes.” ■

doug.cantwell@boeing.com



Besides flight-testing the F-22 (as he’s doing here), test pilot Chuck Killberg managed operation of the prototype 757 (shown here, above the F-22) as it was transformed into a testbed to expedite development of the Raptor’s avionics. LOCKHEED MARTIN PHOTO BY KEVIN ROBERTSON

power unit—START; throttles—IDLE. All other systems start automatically and perform initial checks with no pilot input.

In this and other areas, Killberg and his colleagues contributed an operational perspective on how individual systems needed to interact with one another and with the pilot, even though they lacked the detailed knowledge that the individual systems engineers had.

During emergency procedure reviews preceding first flight, test pilots and subsystem engineers would gather in a conference room and work through every anticipated failure of every subsystem. The lead hydraulic engineer,

way to describe it,” said Killberg of the March 2000 flight at Marietta, Ga. “Because of all the buildup work, we knew there might be failures but were hoping for no big surprises.”

But surely there was a good deal of pressure on the man operating the world’s first fifth-generation fighter, “destined to change the way we fight wars,” as proponents were promising.

“Several thousand people came out to see the flight, and you’d hate to screw up with that many people watching,” Killberg said. But more than anything, he realized he was carrying the hopes and dreams of thousands of people who had worked long and hard to de-

The Tower of David is among the notable sites in Jerusalem. Boeing is strengthening and expanding its partnerships in Israel—a nation whose relationship with Boeing is as old as the country, which was founded 60 years ago.

SHUTTERSTOCK.COM PHOTO

Inside

Why Israel matters: Boeing and Israel have built a comprehensive relationship that provides benefits to both parties. **Page 31**

Fact box: A quick look at some facts and figures about Israel. **Page 32**

In-country teammates: Meet some Israel-based Boeing employees. **Page 33**

History: Boeing has played a role in the growth and development of Israel's aerospace industry. **Page 34**

Partnerships: A peek at some of Boeing's extensive involvement with Israel's aerospace industry. **Page 35**

Airlines: Who's who among Israel's airlines? Here's a quick look. **Page 35**

Built to endure

El Al operates exclusively Boeing airplanes, including the 777. The airline historically has put Boeing jetliners to good use, including operating them on routes that set records for the longest nonstop commercial flights.

GAIL HANUSA PHOTO



This year Israel commemorates its 60th anniversary. During its lifetime, the nation and Boeing have seen their partnership grow and flourish

By MAUREEN JENKINS

For sure, relationships are the glue that allows Boeing to maintain strong bonds with its commercial and government customers across the globe. And in most cases, these bonds eventually develop into partnerships, as each side helps the other grow.

That's especially been true in Israel, a country where Boeing and its products have played a supporting role since the modern state's founding in 1948—60 years ago. On both the commercial and military side, Israel has been a strong Boeing customer; likewise, Boeing has been a key partner of the country as it evolved from a fledgling state into a technologically advanced economy with a highly skilled work force.

"It's a comprehensive relationship that is mutually beneficial and has us working together as suppliers, partners and customers," said Boeing International President Shep Hill. "El Al, Israel's leading airline, celebrates its 60th anniversary later this year. It started business with a Douglas C-54 transport borrowed from the military. Today, it continues to fly only Boeing planes. And the Israeli Air Force started with the B-17 Flying Fortress back in 1948."

But why? The reasons are many; the roots run deep.

Explained Tom Pickering, president of Boeing International Relations from 2001 to 2006 and U.S. ambassador to Israel from 1985 to 1988: "The United States' strong supportive relationship with Israel over the years has made it an easy working relationship for Boeing. Boeing has what Israel would call a multifaceted relationship—it not only sells products, but *purchases* items on the military and commercial sides. Even prior to globalization, Israel was a high-tech country with well-developed international business relationships. It became natural to us to seek products in Israel that would meet our needs.

"Because it was very early on a relationship that prospered in the various areas, it was a relationship that was complementary," he added. "[Boeing was] both buyer and seller; [Israel was] both buyer and seller. It was a relationship balanced in the way we did business."

In 2003, Pickering appointed David Ivry, a former Israeli ambassador to the United States, head of the National Security Council, Director General of the Ministry of Defense, and Commander of the Israeli Air Force, to coordinate Boeing's companywide business activities in Israel.

"First, from the defense point of view, the Israeli Air Force—which is one of the best in the world—uses Boeing products, and that helps promote Boeing products," said Ivry, an aeronautical engineer and pilot who also has held leading positions within the Israeli business world. "Second, we can say the same about the commercial side. El Al is using 100 percent Boeing products, and they have a very good record for safety and security. Israel is a small country but has a good history of selecting good products."

Arka, another significant player in the aviation and travel business in Israel, also operates an all-Boeing fleet. The airline is slated to be the first Israel-based carrier to operate the 787; parent company Nakash Group of America ordered two 787s in late 2006.

And when it comes to supplying technological know-how and parts to its Boeing partner, Israel has stepped up. "The quality demanded by Boeing is such that it forced the local industry to come up to standards so they can compete on a global scale," Ivry said. "We are trying to make a really good team between Israeli industries and Boeing in selling to other countries."

Both Boeing and Israeli industry have their "own very high demands for quality and capability," Ivry said. "Israeli high-tech industries are famous for having front-line systems which are produced here for the challenges the defense industry is facing."

Today, Israeli industry supplies parts for many Boeing commercial and military products, including the F-15, the AH-64D Apache Longbow, and the 737, 777 and 787 airplanes (see story on Page 35).

From platform sales to joint production agreements like those between Boeing and Israel Aerospace Industries, these reciprocal ties

have paid off for both sides and in many ways, Pickering said, serving as a model for other Boeing relationships around the world.

Israel's "highly skilled work force provides top-quality products to Boeing; that enables us to deliver value to our customers," Hill said. "Our 60-year relationship with Israel has helped Boeing grow and evolve into a premier global aerospace company. Through mutual collaboration and partnerships, the best of both sides are used to develop the technology and deliver a final product that generates value for all."

SECURITY ALWAYS PARAMOUNT

Over the past 60 years, Israel's national identity has been forged from adversity, making its citizens and government resilient and putting a premium on security. With a military that largely relies upon call-up reservists

(mandatory military service for both men and women has been an Israeli hallmark), citizens play an active role in maintaining their own security.

That's one reason, Pickering explained, that "there was an early attachment to aviation, the feeling they needed an air force. Israelis have gotten used to the reality that they live in an unpredictable part of the world. They, more than any other people I know of, are prepared to deal with change.

"It's a country with a very strong tradition of 'tell it like it is,' with intense politics where there are many views," he added. "It's a country of immigrants from many parts of the world."

German, French and Czech aircraft played early roles in Israel, but the 1960s ushered in an era that has largely featured American-built military planes ever since. The Boeing-Israel

partnership "was established along the way by Boeing [selling] good products and services to the defense industry," said Ivry. "The customer wants a reliable product, and the Boeing product has a very good reputation."

Trust is essential to doing business in Israel—and, as it does everywhere, takes time and history to build. Within the country, Pickering and Ivry said, Boeing has traditionally been viewed as an American company, a private-sector ally in Israel's quest for security and its citizens' mobility across the globe.

"In Israel, 'Boeing' was interchangeable with 'airplane,'" Ivry said. "Even now, a lot of people will say, 'I flew Boeing,'" rather than the name of a specific airline. Added Pickering: "Israel has much less concern about 'foreign companies' than other countries do, because they see a close relationship with the United States as a strategic advantage."

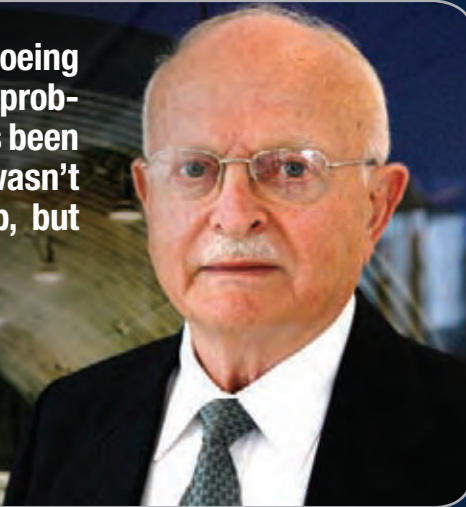
This U.S. relationship is "a very important national security asset" to Israel, Ivry said. After the Six-Day War in 1967, he said, McDonnell F-4 Phantoms and Douglas A-4 Skyhawks became mainstays of the Israeli Air Force. Today, the country flies a large fleet of F-15I jet fighters—the first U.S.-made fighter that includes Israeli contractors in its production. The Israeli Air Force also operates the AH-64D-I, an Apache Longbow helicopter that features Israeli-specific systems and technologies.

"One of the major advantages Boeing has is we respond very quickly to problems, especially with defense," said Ivry. It's been a "really reliable relationship. It wasn't a customer-supplier relationship, but much more a partnership." ■

maureen.l.jenkins@boeing.com

"One of the major advantages Boeing has is we respond very quickly to problems, especially with defense. It's been a really reliable relationship. It wasn't a customer-supplier relationship, but much more a partnership."

— David Ivry, President of Boeing Israel



MOTI MILROD PHOTO

Israel at a glance

Official name: State of Israel

Modern state established: May 14, 1948

Location: On the southeastern coast of the Mediterranean Sea

Area: 20,770 square kilometers (8,019 square miles)—slightly smaller than the U.S. state of New Jersey

Population: About 7 million

Median age: 28.9 years

Official language: Hebrew

Key cities: Jerusalem (capital), Tel Aviv-Yafo, Haifa, Be'er Sheva, Petah Tikva

Gross domestic product, 2007: \$184.9 billion

Estimated GDP growth rate, 2007: 5.1 percent

Key industries: High-technology fields, diamond cutting and polishing, agriculture, construction, transport and communication, tourism

Major export partners (2006, in order): United States, Belgium, Hong Kong

Major exports: Machinery and equipment, software, cut diamonds, agricultural products, chemicals, textiles and apparel

Major import partners: United States, Belgium, Germany, Switzerland, United Kingdom, China

Major imports: Raw materials, military equipment, investment goods, rough diamonds, fuels, grain, consumer goods

Military spending as part of GDP, 2006: 7.3 percent

Sources: CIA/The World Factbook, Israel Ministry of Foreign Affairs

Shalom from Israel

Meet some of the many Boeing employees who work in this nation

Quality specialist, Supplier Quality, Commercial Airplanes

Years at Boeing: 5

On representing Boeing in Israel: "It's a kick! Boeing has such an incredible name and presence here. People hear what you do and it raises eyebrows. I feel a strong sense of pride representing Boeing."

Challenges of working internationally: "Staying tied to my group, which is scattered throughout Europe, and to my Boeing 'customers' in the United States. I'm 10 hours ahead of Seattle. Sometimes I can leverage that time difference, so that I can have information they need by the first thing in their morning. But sometimes they'll need something from me when I'm asleep, or vice versa."

Why working in Israel is rewarding: "It's rewarding to assure the flow of quality assemblies to colleagues almost half a world away. Of course, Israel is an interesting country with an incredibly diverse society, and you meet people from very different backgrounds. In the end, my job is about bringing together people and products."



**Bob
Goldrich**

Office manager, Boeing Israel office

Years at Boeing: 35

Challenges of working internationally: "Our office must deliver and coordinate a full range of services to all Boeing employees in Israel: Finance and accounting, payroll, timekeeping, relocation, customs clearance, travel, local procurement, facilities management."

Proudest moments at Boeing: "The arrival ceremonies for the F-15I and the Apache Longbow helicopter. I felt proud to know that people who work at my company designed and built these aircraft that help Israel defend itself."

Why working in Israel is rewarding: "Boeing has a strong, cohesive in-country profile and is highly respected in Israel. There's a lot of prestige in my role."



**Dorit
Shaashua**

Vice president, Israel, Integrated Defense Systems

Years at Boeing: 8

On representing Boeing in Israel: "Representing Boeing in Israel demands that Boeing understands the culture here and, on the other side, that Israelis understand the company's culture. That understanding and the genuine relations with the customer help us work together for the best solution."

Why working in Israel is rewarding: "As an Israeli who works for Boeing, seeing our company and its people and products help this ally of the United States gives me lots of satisfaction."

Proudest moment at Boeing: "A few years ago, I was taxiing in a TA-4 aircraft at an Israeli Air Force base. Suddenly, approaching us on the ramp was an F-15I loaded with a few JDAMs for an integration test. Watching this F-15 taking off with the JDAMs that the Boeing team worked hard to deliver made me so proud. But I wanted to share the experience with someone. I had my cell phone, so I called the Boeing Israel program manager for JDAMs in St. Louis and said to him, 'Guess what I just saw!'"



**Avi
Barber**

TOP AND MIDDLE: MOTI MILROD PHOTO
BOTTOM: PETER GEORGE PHOTO

Boeing has had important role in development of aerospace in Israel

By MICHAEL LOMBARDI

Mighty things are born from adversity, and Israel's aerospace heritage is no exception. And Boeing has played a part in the growth and development of the nation's aerospace industry.

The aviation history of Israel was born out of necessity, as airplanes became both a bridge to the rest of the world and a decisive force for defense and victory. Shortly before Israel's formation in 1948, the need for air power to protect the emerging state inspired the formation of a small clandestine air force called Shirut Avir—which on May 14, 1948, became the Israeli Air Force.

The fledgling service was equipped with a handful of airplane types including 62 British-built Spitfire Mark IXs and 25 Avia S-199s (German Me-109s built in Czechoslovakia). Within a year the Israeli Air Force had acquired 30 different types of airplanes, including a Boeing B-17G.

Other airplanes from Boeing and its predecessor companies that became part of the IAF include the P-51 Mustang, the T-6 Texan and the C-47. When Boeing Stratocruisers were being eclipsed by brand new 707s, five of the still-useful Stratocruisers found their way to Israel where they were converted to freighters. In fact, the world's only surviving intact Stratocruisers today are part of the collection of the Israeli Air Force Museum, near the city of Be'er Sheva.

Later conflicts required more advanced jets that first came from European nations. But in the late 1960s, the United States began supplying Israel with the McDonnell Douglas A-4 Skyhawk and F-4 Phantom II.

Currently the IAF employs all versions of the F-15 Eagle, including the advanced F-15I "Ra'am" ("Thunder"), a version of the F-15E Strike Eagle. The IAF also operates the AH-64A Apache and AH-64D Apache Longbow helicopters—known as the "Petan" and "Saraf" in IAF service.

Strength in the skies



Among the aircraft the Israeli Air Force acquired in its first year was a Boeing B-17G. Today, the service operates the F-15 fighter and the Apache helicopter. BOEING ARCHIVES PHOTO

Upon its founding, Israel was surrounded by adversarial states on three sides and by the Mediterranean Sea on the fourth. The only way to go was "to the skies"—or in Hebrew, "El Al," the name of Israel's largest airline.

El Al's inaugural flight took place in September 1948, bringing home Israel's first president, Chaim Weizman, from Geneva in a Douglas C-54. The airline was formally established as a state-run carrier on Nov. 15, 1948, and began operations in July 1949 with routes from Tel Aviv to Rome and Paris. Like the Israeli Air Force, El Al began with former military aircraft and surplus planes including Douglas DC-3s and DC-4s.

The airline soon purchased longer-range Lockheed Constellations. But with the coming of the jet age, the "Connies" were retired in favor of the new Boeing commercial jets.

El Al's changeover to an all-Boeing fleet began with an order for three Rolls-Royce-powered 707-458s, the first delivered in a formal ceremony at Boeing Field on May 7, 1961. In attendance were officials from the government of Israel and El Al, as well as Albert Rosellini, then the governor of Washington.

On June 15, 1961, El Al's 707 set a record for the longest nonstop commercial flight, flying the 5,682 miles (9,144 km) from Tel Aviv to New York in 9 hours and 33 minutes.

El Al continued to turn to Boeing to support its growth plans. Being a small airline from a country facing uncertain times, the 1968 deci-

sion to acquire the 747 was one of the most ambitious events in El Al's history.

The airline has put its 747s to good use on long-distance routes. In May 1988, it set a record for the first ultralong-haul passenger flight from Los Angeles to Tel Aviv, completing the 7,574-mile (12,189-km) journey in 13 hours and 41 minutes.

El Al not only depended on the 747's range but also its strength. As part of an evacuation airlift operation in May 1991, a single El Al 747 transported a record-breaking 1,087 passengers from Addis Ababa, Ethiopia, to Tel Aviv.

El Al continued to increase its global coverage. The airline, now privately owned, serves more than 40 destinations on four continents. El Al operates Boeing 747s, 767s and 777s, along with the Boeing 737 and 757 for regional service. Also using 757s is Israeli carrier Arkia.

Just as aviation has contributed to the advance of global peace and prosperity, aviation has also contributed greatly to Israel's ability to defend itself and "bring the blessings of progress to all the country's inhabitants," as is stated in the nation's declaration of independence. ■

michael.j.lombardi@boeing.com

Partners in Israel

Boeing has a long history of working in partnership with many aerospace firms in Israel and continues to seek such relationships for common benefit. Here's a peek at some of Boeing's extensive involvement with Israel's aerospace industry.

Elbit Systems Ltd.

Elbit Systems is a defense electronics company that's engaged in programs worldwide. The Haifa-based firm operates in many areas, including aerospace, land and naval systems; unmanned air vehicle systems; data links; and military communications systems and radios. Elbit had \$1.98 billion in sales in 2007, up 30 percent from \$1.52 billion in 2006.

Elbit and its subsidiaries—including the U.S.-based companies EFW Inc. and Vision Systems International (an EFW joint venture with Rockwell Collins)—provide numerous components for Boeing products, including

- Avionics for the V-22 and F/A-18.
- Laser guidance systems for the Laser Joint Direct Attack Munition.
- The Joint Helmet Mounted Cueing System.
- Structural components for the F-15, 737 and 787.
- Structural parts and forthcoming avionics hardware for the AH-64D Apache Longbow.

Israel Aerospace Industries

IAI develops aviation and aerospace technology for the defense and commercial markets. IAI provides an expansive range of services and products in areas including aircraft, missiles, satellites, avionics systems, advanced radar, precision-guided munitions, and unmanned aerial vehicles. The company recorded \$3.3 billion in sales in 2007, up 18 percent from 2006.

IAI designs and manufactures various components for the Boeing 787 Dreamliner and makes structural components for F-15 aircraft. Other notable IAI activity with Boeing includes

- The Arrow missile project. In 2003, IAI and Boeing signed an agreement to manufacture components of the IAI-developed Arrow

missile in the United States. The Arrow missile is part of the full Arrow antiballistic missile system, the world's first operational antiballistic missile system.

- Systems for the UK Royal Air Force's Nimrod maritime surveillance aircraft. IAI subsidiary Elta Systems Ltd. delivered and supports the Electronic Support Measures System for the Nimrod aircraft—for which Boeing was the tactical command system integrator.

Rafael Advanced Defense Systems Ltd.

Boeing has cooperative ties with Rafael Advanced Defense Systems, formerly known as Rafael Armament Development Authority. Rafael designs, develops, manufactures and supplies a wide range of advanced defense systems, including air-, ground-, and sea-launched precision munitions, electro-optic systems, electronic warfare systems, unmanned systems, armored protection, breaching munitions, and space technologies.



Israel aerospace companies handle work on different Boeing aircraft, including the F-15. BOEING PHOTO

Who's who among Israel's airlines

Israel's airlines serve a market that's a magnet for international tourists—but where geopolitics can affect tourism trends. Here's a quick look at some of the major carriers that serve this nation of about 7 million people.

El Al Israel Airlines

Approximate number of jetliners: 37

Key jetliners in fleet: Boeing 737-700 and -800, 777-200ER, 747-400 and -200, 767-300ER, -200ER and -200

El Al was formed in 1948 and now serves about 40 destinations on four continents. Since the beginning of the jet age, the carrier has operated only Boeing airplanes. In 2005, the carrier was privatized. According to Standard & Poor's, the carrier recorded revenues in 2007 of \$1.93 billion, up 16 percent from the previous year.

Arkia Israeli Airlines

Approximate number of jetliners: 2

Key jetliners in fleet: Boeing 757-300

Arkia operates scheduled domestic service, mainly with turboprop aircraft. The airline also operates international charter flights and scheduled service to destinations in Europe and in the Mediterranean region using

757-300s. As a sign of the airline's future growth plans, its parent company, Nakash Group of America, ordered two Boeing 787-9 Dreamliners in December 2006. With that order, Arkia will be the first Israeli airline to offer 787 service to its passengers.

Israir Airlines

Approximate number of jetliners: 3

Key jetliners in fleet: Airbus A320, A330

Israir offers scheduled service domestically, as well as from Tel Aviv to New York. It also provides charter service to destinations in Asia, Europe and North America. Israir became the first (and only) Israeli airline to order Airbus airplanes, when it placed a firm order in April 2007 for two A320s.

CAL Cargo Air Lines

Approximate number of jetliners: 2

Key jetliners in fleet: Boeing 747-200 Freighter

CAL Cargo Air Lines operates scheduled cargo flights carrying perishable goods and general cargo to Europe and the rest of the world. The company is privately owned by the Nir Shitufi agricultural cooperative.



TreePeople works with Los Angeles Girl Scouts to plant trees in Los Angeles County, Calif. These volunteers joined more than 600 other scouts at a “tree jamboree” planting in the San Fernando Valley’s O’Melveny Park. The organization has partnered with ECF for almost 25 years. STEPHEN READMOND PHOTO

Giving big

By LIZ LANE

When it comes to helping those in need, Boeing employees have big hearts that are collectively beating at the rate of \$1 billion and counting. That’s how much Boeing employees have provided in charitable donations. Over the past 10 years, annual contributions have totaled at least \$30 million, despite an employee base that’s decreased about 30 percent during this span.

Contributions from employees in the Puget Sound region just passed the \$500 million mark. St. Louis employees, who recently celebrated 60 years of giving, donate about \$2.4 million per year, making them one of the city’s top philanthropic funding sources. Employees at other Boeing sites also are helping people in their communities.

It’s all done through Employees Community Fund of The Boeing Company, which actually is a collection of individual site-based funds throughout the enterprise. Many of these funds will begin their annual fundraising campaign this month.

ECF is the world’s largest employee-owned and -operated entity of its kind, and it’s been a part of Boeing for a long time. In fact, the earliest form of the employee-giving program was founded in 1947, and it has empowered employees to improve their local communities ever since.

Employees make tax-deductible donations to ECF through recurring

How Boeing employees change the world, one life at a time, through their contributions to ECF

payroll deductions or one-time gifts. These funds are distributed to non-profit organizations either via an employee-elected board or committee from a pooled fund, or directly through designated giving. Most important, because Boeing assumes all administrative and promotional costs, *every cent* goes directly to the charities.

A HISTORY OF HOPE

ECF represents hope and opportunity for the countless people whose lives are being changed every day through the services of the nonprofit organizations the fund supports. Today, more than 4,000 nonprofits count on ECF for funding every year. Dollar by dollar, the program is changing the world—one life at a time.

Pennsylvania’s City Team Ministries uses ECF funds to help those most in need in their area. The group provides services such as disaster response, food, shelter and employment services, alcohol and drug addiction recovery programs, a child-sponsorship program, and more. It’s grown to become a significant resource that helps poor Pennsylvanians break the multigenerational poverty cycle.

In Phoenix, Boeing employees are supporting Homeward Bound, a housing and social services program for homeless families and victims of domestic violence. With 162 living units, the organization houses close to 600 people, most of whom are children. The group’s philoso-

“The ECF has been one of our most extraordinary partners, because their approach of employee leadership delivers the critical energy—both money and volunteers—that helps solve or ease our community’s most pressing issues. They can do this because Boeing’s employees have their fingers on the pulse and pain of their communities.”

— Andy Lipkis, TreePeople President

phy is to provide a hand up, not handouts—so program recipients help pay for the services they receive. It’s definitely working. Since its inception in 1990, Homeward Bound has helped thousands of children and their families become self-sufficient.

Dave Bowman, Integrated Defense Systems vice president/general manager, Global Mobility Systems, and Long Beach, Calif., site leader, is an ECF advocate. “ECF is the people of Boeing giving personally, together, to provide meaningful support in our communities for present and future generations to come,” he said.

The money that is donated in a city or region stays in that area, supporting causes that relate to health and human services, arts and culture, education and the environment.

TreePeople, a Los Angeles-based non-profit environmental organization, has partnered with ECF for almost 25 years. The group will use recent ECF donations to launch the Urban Forestry Watershed Education project. This program will teach residents how to maintain a healthy and sustainable urban environment by appropriately adapting and caring for home, neighborhood, park and school landscapes.

“The ECF has been one of our most extraordinary partners, because their approach of employee leadership delivers the critical energy—both money and volunteers—that helps solve or ease our community’s most pressing issues,” said TreePeople President Andy Lipkis. “They can do this because Boeing’s employees have their fingers on the pulse and pain of their communities.”

START MAKING A DIFFERENCE

Although employees can sign up to donate at any time through TotalAccess (via “My Community Giving”), there’s no time like the present to start making a difference—especially since about half of all current ECF donors will retire in the next 10 years.

“It’s critical to the future of ECF that those employees who do not participate get involved,” said Patrice Mingo, Global Corporate Citizenship director. She noted that if every eligible Boeing employee who isn’t currently

a member would donate just the \$5 per paycheck minimum, the overall Fund would increase by \$10 million.

“Boeing employees who give find they really enjoy the experience and are amazed by what can be accomplished through pooling their funds with fellow employees,” she said. “Employees usually become long-time supporters once they take that first plunge.”

Tony Tumminello, counsel for Boeing in Mesa, Ariz., is one of these supporters. “ECF is uniquely positioned to enable Boeing employees to make a genuine impact in the community,” he said. “It provides a simple yet powerful means for employees to give back and demonstrate leadership in living the Boeing values.”

It’s easy to get started. Employees can make tax-deductible donations to ECF-pooled funds and/or earmark their contributions for eligible nonprofits of their choice through designated giving.

The inherent value of the pooled fund is its potential to solve community problems. It enables donors to pool their contributions so they collectively can make a larger contribution, compared to what they might be able to give individually.

Grants from ECF-pooled funds are made by employee-elected boards and committees following a self-established set of grant-making guidelines. Potential grantees use an online system to apply for funding in support of a project or program. Board and committee members carefully evaluate the grant applications and make site visits before approving grants. Suggestions from ECF participants for nonprofits to support are always welcome.

Designated giving allows employees to make individual contributions to eligible nonprofit organizations other than ECF. Unlike ECF pooled-fund grants, these individual contributions usually are applied to the nonprofits’ overall operating funds.

“It’s important to note that employees can do both if they wish: give to a pooled fund and another nonprofit of their choice,” Mingo said. “Either way, our communities are helped.”

Along with employee volunteerism and

Still generous, after 57 years

“When it comes out of your paycheck, you don’t even miss it,” said Diana Rhea, a Boeing employee for 65 years and a member of the Employees Community Fund of Boeing Puget Sound since 1951. Rhea began working as a clerk-typist in the parts-ordering group at Boeing in 1942. Today she works on the Renton, Wash., 737 line in the panel-maintenance group.

As the Puget Sound ECF commemorates passing the \$500 million mark of employee and retiree donations to local communities since its inception, Rhea celebrates 57 years of giving. “It just makes you feel good,” she said. “I wish more people would help.”

corporate philanthropic investments, ECF is an integral part of Boeing’s identity as a good corporate citizen and neighbor. For as little as \$5 a paycheck, employees can make positive changes that will ripple throughout their communities. Small investments that yield big paybacks: That’s what it’s all about. ■

liz.lane@boeing.com

Something you can *bank on*



SHUTTERSTOCK.COM PHOTO

There's a 'you' in retirement: Start planning, and use Boeing tools

BY BRAD CHRISMAN AND GEOFF POTTER

Planning for retirement is a highly personal process. There is no quick checklist, and no single formula works for everyone.

But if you're one of the 105,000 U.S.-based Boeing employees who have viewed your online Pay & Benefits Profile, you've taken an important step toward planning a secure future for yourself. The profile provides a personalized snapshot of your total pay and benefits package and other sources of income available to you during retirement—as well as tools to help you estimate your future income needs.

"It's never too early to start planning, and the Pay & Benefits Profile is a great place to start," said Pam French, director of global employee benefits. "We encourage people to look at their individual profile and take advantage of the profile's interactive financial modeling tools. The profile can also be a helpful reference in discussions with financial planners or tax advisors."

Ready to peer into your financial future? You'll find a wealth of information waiting for you in the Profile—available at work or from home

through the "My Pay & Incentives" section of TotalAccess. It includes

- Projections of your savings plan balances at specified retirement ages.
- Estimates of your monthly pension benefits and Social Security benefits at specified retirement ages.
- Calculators to help you estimate other sources of income and projected expenses to help determine how much you will need in retirement.

The profile makes it easy for you to determine your "income replacement ratio"—an estimate of your projected monthly income during retirement, compared to your pay. The tool summarizes your estimated total monthly retirement income from Boeing (pension benefits and savings plan balances) and lets you chart other potential income (Social Security and personal savings).

Remember that a secure retirement comes from planning and from funds from a variety of sources: Your total retirement income comes from Boeing retirement benefits, Social Security and personal savings.

HOW MUCH WILL YOU NEED?

Planning and saving for retirement often begins with the question, "How much money will I need?"

There's no single "correct" answer. According to U.S. Department of Labor estimates, you'll need at least 70 percent of your preretirement income to maintain your standard of living when you stop working (lower earners need 90 percent or more).

"Of course, your own 'magic number' will depend on your personal situation, which calls for taking a realistic look at what you expect your expenses to be in retirement and how they will be affected by inflation," said Julie Curtis, Boeing director of actuarial services. With the average annual inflation rate at 3 percent, it takes only 24 years for your income needs to double.

Your personal income needs when you retire will depend on a variety of factors. Among them: the lifestyle you desire, your life expectancy, the number of dependents you'll be supporting, where you plan to live, whether you'll be paying a home mortgage, your future health care needs. The Pay & Benefits Profile links to an online tool designed to estimate your monthly expenses in retirement, including the impact of inflation. By comparing the total projected income to your known expenses, you can see how close you are to meeting your income needs in retirement.

As you plan, remember that your expenses may change as you grow older. While you'll spend less on work-related things like transportation and clothing early on, you may spend more on traveling, hobbies, or other activities you've long wanted to do. And as you age, more of your budget will likely go toward medical expenses. Benefits consultancy Hewitt Associates estimates that retirees

spend an average of 20 percent of their income on health care.

"It's never too early to lay out your personal plan, and it's never too late to crunch the numbers and see where you stand," Curtis said. She cited the Labor Department publication "Taking the Mystery Out Of Retirement Planning," which states: "Few people will have exactly the amount of money they will need in retirement. Most will get a negative figure—a gap—when they do the math."

It suggests five ways to close the gap: contribute the maximum to your retirement plan; work longer, retire later; cut expenses, big and little; delay your start date for Social Security benefits; and "put your money where the returns are" by allocating your assets and diversifying your investments.

What else can you do?

- Increase your contribution to the Boeing savings plan if you are not contributing the maximum.
- Go to the Financial Resource Center available at Boeing Savings Plans Online for information on retirement investment planning, help with personal finance, online plan savings and retirement planning calculators, and more.
- Talk to a financial advisor about financial and investment planning.

"Boeing offers tools and resources to help you build your future retirement income, but you need to take an active role in planning and saving," French said. ■

*brad.chrisman@boeing.com
geoffrey.potter@boeing.com*

Top 10 ways to prepare for retirement

Americans spend 18 years in retirement, on average, according to the U.S. Department of Labor, yet only 43 percent of U.S. workers have calculated how much they need to save for it. And experts now suggest planning to spend 30 years in retirement. If you're a U.S. person at Boeing, here's how you can prepare.

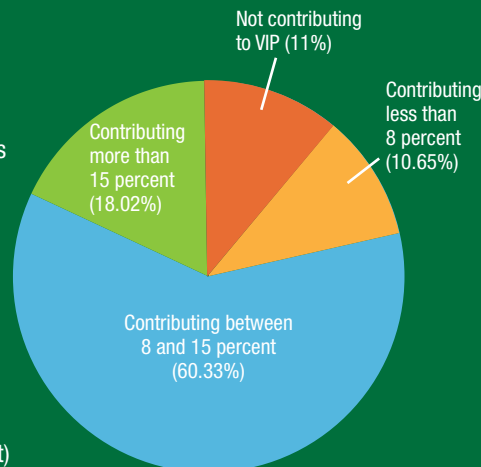
- 1. Know your retirement needs**
Retirement is expensive. Experts estimate you'll need 70 to 90 percent of your annual preretirement income to maintain your standard of living when you stop working.
- 2. Find out about your Social Security benefits**
Social Security pays the average retiree about 40 percent of preretirement earnings. Visit www.socialsecurity.gov to learn more.
- 3. Learn about your pension benefits**
Check out your Pay & Benefits Profile on TotalAccess. (Data in the profile, which is updated annually, will be refreshed this summer.)
- 4. Contribute to a tax-sheltered savings plan**
Your taxes will be lower, Boeing may kick in a contribution, and automatic deductions make it easy.
- 5. Put your money into an Individual Retirement Account (IRA)**
You can put up to \$4,000 a year into an IRA and gain tax advantages. Over time, compounded interest and tax deferrals make a big difference in the amount you will accumulate.
- 6. Choose a Roth or traditional IRA plan**
The tax treatment of your contributions—and the after-tax value of your withdrawal—will depend on inflation and the type of IRA you choose.
- 7. Don't touch your retirement savings**
You'll lose principal and interest—and maybe even tax benefits.
- 8. Start now, set goals, and stick to them**
Put time on your side. The sooner you start saving, the more time your money has to grow. Devise a plan, stick to it, and set goals for yourself.
- 9. Consider basic investment principles**
How you save can be as important as how much you save. Inflation and the type of investments you make play important roles in how much you'll have saved at retirement.
- 10. Ask questions**
Consult your bank or a financial advisor. Also, the Labor Department's Employee Benefits Security Administration offers information at www.dol.gov/ebsa/publications or 866-444-EBSA.

Source: U.S. Department of Labor

Who's in VIP

Some 146,773 Boeing employees are eligible to participate in the Boeing Voluntary Investment Plan (VIP). Many employees are eligible for company matching contributions in the VIP; learn more by visiting the Boeing Savings Plans Online Web site via TotalAccess.

How much are they setting aside for retirement? This pie chart shows employee-contribution rates as of Dec. 31, 2007.



Who's not participating?

The average age of eligible employees who do not participate is 45—putting them just 20 years from retirement—with 13 years of service. Just 1 in 6 nonparticipants (17 percent) has less than one year of service.



BOB FERGUSON PHOTO

One company

One technology plan



JIM ANDERSON PHOTO

An integrated technology strategy promises to give Boeing a competitive advantage—as well as deliver growth and productivity

It's been the "opportunity of a lifetime." That's how Amy Buhrig described her work with the team that's been developing and implementing Boeing's Enterprise Technology Strategy.

Late last year, Buhrig was selected to lead the Enterprise Technology Strategy team, reporting to John Tracy, Boeing senior vice president of Engineering, Operations & Technology and chief technology officer. In this capacity, Buhrig leads the Enterprise Technology Board, whose members from Commercial Airplanes, Integrated Defense Systems and EO&T collaboratively developed the strategy in 2007 as another step toward making Boeing the world's best-integrated and most competitive aerospace company.

Part of this plan involves creating Enterprise Technology Domains, which let similar technical communities develop a shared understanding of technology needs, capabilities and investments across the enterprise. "Amy and her team are working to maximize the leverage of our technology investments and ensure that the right technologies are available at the right place at the right time, both today and in the future," Tracy said.

'TEAM OF ALL-STARS'

Buhrig has been on a series of trips and briefings to communicate the plan. "Everyone on our team is thrilled about the opportunity to contribute to the future of Boeing," she said. "I feel as if I'm playing on a team of all-stars."

A recent addition to this team are enterprise domain leaders, who have a crucial role in developing integrated plans for Boeing's eight technology domains, established by consolidating all the various technology pursuits within BCA, IDS and EO&T. The domains are Environment, Manufacturing, Structures, Platform Systems, Platform Performance, Networked Systems, Support and Services, and Systems Engineering and Analysis (see story on Page 42). The leaders will play a crucial role in helping to advance the plan's strategic objective: create a sustainable competitive advantage for Boeing.

Intense competition in the marketplace is something that Buhrig knows about firsthand, having held strategic planning positions in IDS, BCA and Phantom Works. "Having technology that adds value for our customers is the key to our future at Boeing," Buhrig said, "along with meeting our execution commitments at an affordable price and maintaining the safety and integrity of our products."

But achieving that technological advantage is going to demand an efficient, cohesive and focused one-Boeing strategy. And that's why Buhrig described the plan's creation and implementation as a golden opportunity for Boeing's top technical experts.

Each domain leader has an enterprise team to leverage the best of

Boeing. These teams are composed of domain focals from IDS and BCA and technical representatives from EO&T's Phantom Works, Intellectual Property Management, and Global Technology and Industry Assessment organizations. In addition, to utilize the talent from the Technical Fellowship, a Senior Technical Fellow has been aligned with each domain to tap the expertise of the Fellowship.

Historically, Buhrig said, each business unit invested in technology projects independently, resulting in some duplicative investments and some gaps in investments. The new strategy is designed to eliminate these inefficiencies and maximize the yield of Boeing's investments.

"It is vitally important," she said. "When we look at the company investment in aggregate, we can see how much we're investing in concept development, processes and tools, and technology, as well as the expected time frame for transitioning technology to our next generation of products and services. And, we've always got to be looking out for disruptive technologies that can give us a competitive advantage in the future. The unifying plan will optimize technology investments at the enterprise level to ensure we're delivering the right capability to the businesses, at the right time."

No matter how sophisticated the plan might be, Buhrig said, research begins and ends with what the customer needs. "Understanding how technology can add value for our customers through Boeing products and services is the foundation for our plan," she said.

Although the domain leaders don't have day-to-day execution responsibility for the projects they plan, they have oversight responsibility to ensure that the commitments promised to businesses and programs remain on track, Buhrig said. From a process perspective, the primary objective is to make sure the strategy's planning and oversight processes are transparent, efficient and responsive to changing environments.

NEW GOVERNANCE STRUCTURE

The Enterprise Technology Strategy has brought with it a new governance model for technology integration. The Boeing policy known as POL-1, which sets out the company's functional and business unit responsibilities, states that the Boeing chief technology officer and the business-unit presidents and CEOs jointly approve each year's technology plan. To ensure strategic alignment and integration at multiple levels within the company, a series of integration boards also have been established (see story at the bottom of Page 43).

"We spend a lot of time these days talking about the Enterprise Technology Strategy because it's new," Buhrig said. "But the most important ingredient in this formula is the part that translates the strategy into action: the technical community of Boeing."

"In this industry, technology is the key to our future, and there are thousands of men and women who are turning imagination into reality at Boeing every day," Buhrig added. "With all the quantifiable benefits of this endeavor, I think the most powerful will be the communities of practice this architecture will enable. Sharing understanding of needs and capabilities across the enterprise will open new doors for sharing ideas and solutions—and that's Boeing at its best." ■

Photos

Boeing's Enterprise Technology Strategy covers many technical and operational aspects across Boeing, including Support and Services. Above, Mohammad Redha performs work on a C-130 at Edwards Air Force Base, Calif., in support of Boeing's C-130 Avionics Modernization Program duties. Leading the Enterprise Technology Strategy is Amy Buhrig (below, right), who has been meeting with technical teams across Boeing to communicate this strategy.

The Technology Domains and how they work

One of the first steps in the creation of the Enterprise Technology Strategy was to develop a framework that would allow similar technical communities to develop a shared understanding of technology needs, capabilities and investments across the enterprise.

The eight Enterprise Technology Domains were developed by integrating the Phantom Works thrusts, the Boeing Commercial Airplanes technology themes and Integrated Defense Systems key program technologies into a manageable number of technical areas that span Boeing product and service needs. Their definition is still evolving, but they give Boeing a common language to communicate with colleagues, as well as a baseline structure, as the team develops the planning and process infrastructure necessary to achieve enterprise integration.

The domains represent one of three complementary dimensions in the technology development process. Here are the other two dimensions:

- Business-unit programs and company R&D groups such as Phantom Works define customers' capability needs.
- Boeing's functional organizations infuse functional excellence into both technology and the planning for the skills, expertise and experience needed for a particular project or program. They also provide the people—the leading engineers and scientists—who execute the plans.

The domains complement these efforts with an integrated set of technology roadmaps, focused on providing strategic capabilities at the right time to influence Boeing's long-range business plan.

The domain leaders report to Amy Buhrig, Enterprise Technology Strategy leader, and Boeing Chief Technology Officer John Tracy. In addition to developing the technology plans for their domain, each leader is responsible for finding ways to collaborate with other domain members in replicating common technologies, leveraging Contract Research & Development, and drawing capabilities from the global R&D community.

Here's a brief look at each domain:



Environment

Leader: **Vanessa Gemmill**, formerly BCA Technology Collaboration leader

The Environment domain enables Boeing to be a leader in aerospace environmental responsibility. The focus is on energy efficiency, reduced emissions, resource utilization and recycling, and understanding the life-cycle impact of all phases of Boeing's products and processes. Key technology programs address aircraft emissions, efficient aircraft operations, noise reduction, passenger comfort, alternative fuels, green and sustainable manufacturing processes and materials, and recycling and reuse of Boeing products. Given the integrated nature of environmental issues, the Environment domain works closely with the other domains and technology teams.



Networked Systems

Leader: **Faye Francy**, formerly Phantom Works' Network-Centric Operations Thrust leader

This domain develops discriminating networking technologies and infrastructures to dramatically improve mission effectiveness. The domain's technology investments focus on providing secure, adaptive networked systems enabling ubiquitous connectivity; networked information and knowledge; smart mission management; optimized decision making; intelligent systems; and dynamic planning with performance prediction. The premise of this domain is that a robustly networked environment improves information sharing, that information sharing and collaboration enhances the quality of information and shared situational awareness, and that shared situational awareness enables collaboration and speed of decision, resulting in increased mission effectiveness.



Platform Systems

Leader: **Doug Swanson**, formerly Phantom Works' liaison to BCA Technology

The Systems and Subsystems domain is driven by business-unit strategies to provide a competitive advantage for Boeing through the addition of features and functionality for platform systems. The goal: provide value while minimizing cost, weight, volume and power. Internally, the domain works on the development of innovative technologies for systems architecture definition, integration, validation and verification. Selective investments are also made in associated subsystems. Externally, the domain collaborates with global partners, suppliers and technology providers to produce leading-edge solutions for subsystems and components.



Platform Performance

Leader: **Don Leopold**, formerly Huntington Beach, Calif., site leader for Phantom Works Flight Sciences Technology

This domain enables development of advanced, affordable platforms with superior performance that will create a competitive advantage and greater value for the customer. Such platforms include air vehicles, space vehicles, and weapons systems in support of commercial and military applications, as well as space exploration. To achieve this objective, the domain aligns research and development across the enterprise in areas that influence overall vehicle performance. Among these areas: concept and configuration development; aerosciences; propulsion; guidance, navigation and control; flow control; computational sciences; and advanced conceptual design processes.



Manufacturing

Leader: **Mike Vander Wel**, formerly 787 Final Assembly senior production engineering leader

The Manufacturing domain focuses on four areas of technology development. **Integrated design/build** focuses on the future production-system architecture, driving manufacturing requirements into future product design and development. **Prototyping and simulation** lets Boeing validate designs early in product development. **Product Integration** includes processes vital to final integration and product validation, such as drilling, bonding and inspection. Within **Materials Transformation**, metallic technologies examine each step of the transition of a raw material to a finished product.

Woven into all areas are quality, ergonomics, and environmental factors.



Support and Services

Leader: **Steve Swaine**, formerly Training Technology leader at IDS Support Systems' Training Systems and Services Division

This domain focuses on enhancing readiness for both military and commercial aircraft, which means providing trained people and available equipment at the right place, at the right time and for the minimum cost. The domain covers areas such as advanced maintenance and modification, materials management, technical data, ground support equipment, and training—along with myriad associated technologies, from nondestructive evaluation to reverse engineering to real-time virtual simulation and networking. Integrating these technologies is Network-Centric Logistics, complementary technologies that form a seamless operational environment in which the aircraft and its support environment are totally integrated.



Systems Engineering and Analysis

Leader: **Marc Nance**, formerly Airborne Early Warning and Control Program Planning and Execution manager at IDS

This domain provides Boeing with the systems engineering knowledge, processes and tools to design, build, deliver and support complex systems that fly, float and soar into space. Key areas in the domain include modeling and simulation, operations and systems analysis, cross-functional integration, and the knowledge management and processes and tools that support them all. The domain plans to achieve a common set of processes and tools that will create greater efficiency for Boeing.



Structures

Leader: **Andy Bicos**, formerly Phantom Works Manufacturing, Structures and Materials Technology Thrust leader

The Structures domain has four key areas of technology development. **Cross-functional architectures** develops structural systems that have additional functionality beyond load bearing, such as multifunctional structures that have antenna and sensor systems incorporated into them for higher weight efficiency and greater sensitivity. **Structures/interiors architectures** develops technologies for low-cost, weight-efficient airframes and interiors. **Materials and processes technologies**, developed with materials suppliers, includes composites, metals, and ceramic materials—and materials developed at the molecular level for next-generation products. **Methods, tools, and validation** develops the processes and tools needed to design and analyze materials and structural systems and for certification and qualification of the materials and vehicle airframes.

Structure for technology integration

The Enterprise Technology Strategy features a new governance model for technology integration. Here's a look at this structure, starting with the highest level and working down.

Enterprise Technology Steering Team

- Meets quarterly to reinforce engagement across the enterprise and ensure the strategy is aligned with company direction
- Chairman: John Tracy, chief technology officer and senior vice president of Engineering, Operations & Technology
- Representation: Team includes high-level representatives from Integrated Defense Systems, Commercial Airplanes, Phantom Works, and Business Development and Strategy

Enterprise Technology Board

- Meets monthly to ensure strategy and investment process integration, as well as manage change and risk at an enterprise level.
- Chairwoman: Amy Buhrig, Enterprise Technology Strategy leader
- Representation: Team includes members of Intellectual Property Management, IDS, BCA, Phantom Works and the Office of the Chief Technology Officer



A green machine

An engineering team at Boeing Research & Technology Europe conducted three test flights of a manned airplane powered by hydrogen fuel cells. The research is an example of how Boeing is exploring future improvements in the environmental performance of aerospace products.

Boeing makes history with flights of Fuel Cell Demonstrator Airplane

By TOM KOEHLER

An engineering team at Boeing Research & Technology Europe in Madrid, Spain, has demonstrated for the first time that man can fly in an airplane powered by clean, quiet hydrogen fuel cells only.

During three flights in February and March, a piloted motor-glider, modified by Boeing, with assistance from industry partners in Austria, France, Germany, Spain, the United Kingdom and the United States, flew straight and level for approximately 20 minutes on power solely generated by the fuel cells.

Company leaders said the history-making research is a tangible example of how Boeing is working to develop new technologies for environmentally progressive aerospace products. It also shows how Boeing is reaching out to work with the best and brightest engineers and scientists in the world to explore the most innovative and affordable aerospace solutions for its customers.

"I have a great deal of pride in the creative Boeing Research & Technology Europe team," said John Tracy, Boeing senior vice president of Engineering, Operations & Technology and chief technology officer. "They have demonstrated the potential of integrating fuel cell technology into aerospace products and the promise of a brighter, greener future."

"This Fuel Cell Demonstrator Airplane project has given us an opportunity to demonstrate our capabilities," said Paco Escarti, BR&TE's managing director. "It has been a great satisfaction to see the talents and innovative spirit of our team put to use."

A two-seat Dimona airplane, built by Diamond Aircraft Industries of Austria, was used as the airframe. With a 53.5-foot (16.3-meter) wingspan, it was modified by BR&TE to include a Proton Exchange Membrane (PEM) fuel cell/lithium-ion battery hybrid system to power an electric motor coupled to a conventional propeller.

During the flights, which took place at the airfield in Ocana, Spain, pilot Cecilio Barberan climbed to an altitude of 3,300 feet (1,000 meters) above sea level using a combination of battery power and power generated by hydrogen fuel cells. Then, after reaching the cruise altitude and disconnecting the batteries, Barberan maintained level flight at a speed of about 60 miles per hour (100 kilometers per hour) for 20 minutes on fuel-cell-generated power alone.

A fuel cell is an electrochemical device that converts hydrogen directly into electricity and heat with none of the products of combustion such as carbon dioxide. Other than heat, water is its only exhaust.

With zero carbon dioxide emissions, very low noise levels and an insignificant infrared signature, PEM fuel cell technology has potential for use in powering small manned and unmanned air vehicles for surveillance missions, said Escarti, who indicated that BR&TE will pursue follow-on enabling research in this area.

"Over the longer term, fuel-cell technology could be applied to secondary power-generating systems, such as auxiliary power units for large commercial airplanes," added Jose Enrique Roman, BR&TE's director of Engineering and Programs. He added that Boeing does not envision that fuel cells will ever provide primary power for large commercial airplanes, but the company will continue to investigate the potential of fuel cell technology as well as other alternative fuel and energy sources that improve environmental performance.

Researchers at BR&TE, part of the Boeing Phantom Works R&D unit, have worked closely with researchers in Boeing Commercial Airplanes and a network of partners since 2003 to design, assemble and fly the experimental craft.

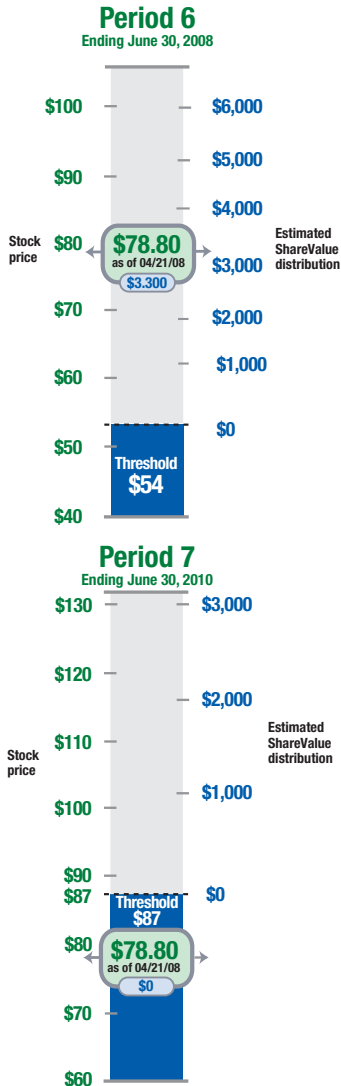
After accomplishing its mission to prove that manned flight of a fuel-cell-powered airplane is possible, the BR&TE team said no more flights of the Fuel Cell Demonstrator Airplane are planned. However, plans are being made to display the vehicle at air shows in Berlin and Farnborough, England, this year. ■

thomas.j.koehler@boeing.com

Boeing stock, ShareValue Trust performance

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

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



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

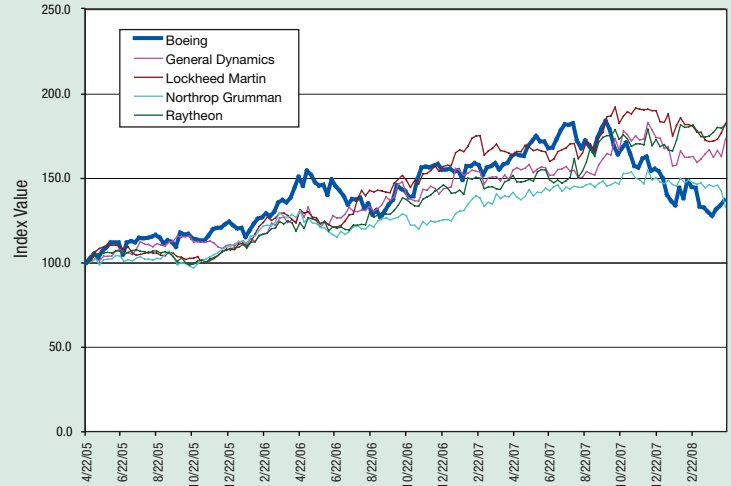
The share price shown is the average of the day’s high and low New York Stock Exchange prices. Updates to participant/employment data will be made periodically.

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

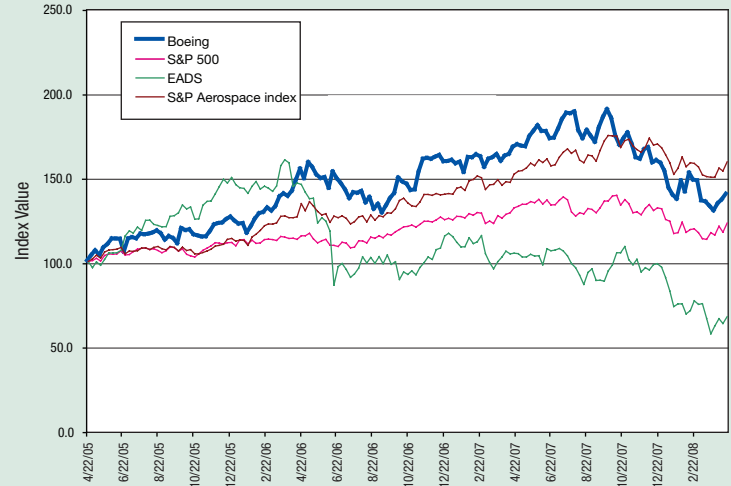
STOCK WATCH

The chart below shows the stock price of Boeing compared to other aerospace companies, the S&P 500 index and the S&P 500 Aerospace and Defense index. Prices/values are plotted as an index number. The base date for these prices/values is April 22, 2005, which generates three years of data. The prices/values on that date equal 100. In other words, an index of 120 represents a 20 percent improvement over the price/value on the base date. Each data point represents the end of a trading week.

Boeing vs. U.S.-based competitors



Boeing vs. stock indexes and international competitors



Comparisons:

4-week, 52-week	Price/value as of 4/18/08	Four-week comparison		52-week comparison	
		Price/value as of 3/21/08	Percent change	Price/value as of 3/23/07	Percent change
BOEING	78.66	74.80	5.2%	93.29	-15.7%
U.S. COMPETITORS					
General Dynamics	88.98	85.66	3.9%	79.55	11.9%
Lockheed Martin	106.24	100.05	6.2%	95.40	11.4%
Northrop Grumman	71.36	78.43	-9.0%	76.10	-6.2%
Raytheon	66.14	63.72	3.8%	55.43	19.3%
INT'L COMPETITORS					
EADS *	15.94	13.85	15.1%	23.70	-32.7%
U.S. STOCK INDEXES					
S&P 500	1390.33	1329.51	4.6%	1484.35	-6.3%
S&P 500 Aerospace and Defense Index	422.46	399.73	5.7%	404.41	4.5%

* Price in Euros



Around Boeing

777 Freighter achieves milestones

Work on the first 777 Freighter passed several production milestones last month. Mechanics began final assembly at the Boeing plant in Everett, Wash. (above), and the airplane experienced its first electrical “power on,” when its systems successfully were powered in final assembly. Boeing will deliver the first 777 Freighter—which will fly farther and provide more capacity than any other twin-engine cargo airplane—to launch customer Air France in the fourth quarter of 2008. GAIL HANUSA PHOTO

BOEING FILLS INT’L LEADERSHIP ROLES, NAMES NEW TREASURER

Boeing last month made several appointments for key international and financial positions.

- Paul Kinscherff has been named president of Boeing Middle East. Kinscherff, who will be based in Dubai, will work with Riyadh-based Boeing Saudi Arabia President Ahmed Jazzar to strengthen the company’s presence in the region. Previously, Kinscherff was Boeing treasurer; succeeding him in this role is Dave Dohnalek, who had been vice president of Financial Planning and Analysis.

- Retired U.S. Marine Corps Lt. Gen. Michael DeLong was appointed Integrated Defense Systems vice president for the Middle East. DeLong will be responsible for maintaining strategic relationships with key defense and industrial partners in the Middle East region. He will focus on major business-development initiatives and sales campaigns among nations that are part of the Gulf Cooperation Council, while working with the IDS team to develop markets throughout the region.

- Antonio De Palmas has been named president of European Union and NATO Relations, effective May 21. In this position, De Palmas will represent Boeing interests at the EU, European Parliament and NATO, and will work with other European institutions. De Palmas,

currently director of communications for Boeing International in Italy, succeeds retiring leader Joris Vos.

BOEING HONORS ITS TOP SUPPLIERS FOR 2007

Boeing last month recognized its top 11 suppliers for superior performance and customer satisfaction in 2007.

The 2007 Suppliers of the Year were selected from a pool of 250 Boeing Performance Excellence Award winners. These companies hold 2007 Boeing Performance Excellence Awards for achieving silver or gold levels of performance, based on quality and delivery metrics over a 12-month period.

The 2007 Boeing Suppliers of the Year are

- Major Structures: HITCO Carbon Composites Inc., Gardena, Calif.
- Common Aerospace Commodities: M.C. Gill Corp., El Monte, Calif.
- Purchased Outside Production: JWD Machine Inc., Fife, Wash.
- Aerospace Support: Watson’s Profiling Corp., Ontario, Calif.
- Non-Production/Shared Services Group: Valiant Machine & Tool Inc., Windsor, Ontario.
- Technology: GE Global Research, Niskayuna, N.Y.
- Technology: American Semiconductor Inc., Boise, Idaho.

- Propulsion: Aerojet, Rancho Cordova, Calif.
- Diversity/Woman Owned Small Business: Harris Environmental Group Inc., Tucson, Ariz.
- Diversity/Small Disadvantaged Business: Omega Precision, Santa Fe Springs, Calif.
- Diversity/Small Business: Woodland Trade Company Inc., Tacoma, Wash.

BOEING DELIVERS 1ST LASER JDAMS

Boeing last month said it delivered the first Laser Joint Direct Attack Munition (LJDAM) kits to the U.S. Air Force. LJDAM provides low-cost flexibility to engage targets of opportunity, including fast-moving ones, with a single weapon.

The initial \$28 million LJDAM contract, awarded in May 2007, will add 600 laser seekers to the existing inventory of bombs of the Air Force and the U.S. Navy. Air Force tests showed LJDAM engaged and destroyed targets moving at up to 70 miles per hour (113 kilometers per hour).

The Laser JDAM uses a Precision Laser Guidance Set, a modular laser sensor kit that is easily installed on existing JDAM weapons in the field. The laser sensor further enhances the highly capable Global Positioning System/Inertial Navigation System JDAM.

LJDAM is expected to be operational this year with both the Air Force and Navy. Boeing will deliver the contracted kits by June 2009.



The My Telecom development team

Boeing spends a great deal every month on its basic telecommunications equipment and services—the desk phones, cell phones, pagers and other mobile devices used by almost every employee. It's a cost that's managed down to the individual device.

Now, employees can help control these costs by using an intranet tool called My Telecom, which our team developed. Located in the “My Information” section of the MyBoeing Tools&Services portal, My Telecom is a simple and accessible way to track monthly costs and use of telecommunications devices assigned to an employee. And, through My Telecom, employees can order a new device or disconnect any that are no longer needed or used.

We are a virtual, cross-functional team from Boeing Information Technology and Shared Services Group – Employee Services working in telecommunications, Web development, business systems and customer service. We're from the Puget Sound area; southern California; Mesa, Ariz.; and St. Louis, which means we rely on the equipment and services that we are tasked to make more efficient and cost-effective.

My Telecom was introduced last October. Since then, it's received almost 250,000 visits as people reviewed and updated their telecommunications records. We're excited to find that employee-initiated phone and pager disconnections have increased by about 37 percent compared with the previous six months. And we're committed to improving My Telecom to reflect the most current status of Boeing telecommunications usage.

We're proud to be doing our part to help Boeing employees reduce costs and make Boeing more efficient and productive.



Above: Washington-based team members include Eric Leonard (from left), David Songer, Ken Lee, Kathleen Ochs, Judy Unwin, Christine Hill, Marc Thompson, Rochelle Handy, Karen Lohrman, and Jerrod Larson. **Below:** California-based team members include Lynda Van Vleet and David Aguilar. **Not pictured:** Damian Floth, Annalisa Engelbach, Craig Hone, Felix Jih, Tam Lam, MiAe Lee, Daryl Moore, Wes Mutschler, Howard Raddatz, Brian Sherwood, Mark Sullivan, Neil Weber, Karen Wega, Cynthia White, Lori Williams, and Jerry Zhang.



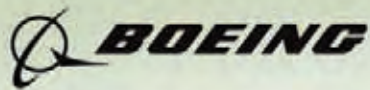
\$500 MILLION

A MILESTONE ALL OF BOEING CAN BE PROUD OF.

In early 2008, the Employees Community Fund of Boeing Puget Sound achieved a historic milestone. Its total dollar contributions to the community surpassed half a billion dollars. Owned, managed and funded by Boeing people, the ECF plays a vital role in supporting health and human service organizations throughout the region. Achieving this milestone is a tribute to the caring and generosity of Boeing employees, retirees and its labor unions. We thank them for building the best, including our communities.



In early 2008, contributions to the Employees Community Fund of Boeing Puget Sound surpassed \$500 million since the fund's founding in 1951. The Employees Community Fund is the largest employee-managed philanthropic organization in the world and supports a wide range of health and human service programs. This ad ran in Puget Sound area newspapers as well as hometown papers of communities that benefit from the generosity of Boeing employees and retirees.



GET YOUR GREATEST IDEAS HEARD. QUIETLY.

THE SAFETY OF THE NATION depends on the highly sensitive projects and programs that you will develop at Boeing. Your ideas will help shape the future for our soldiers in the field and our citizens at home. That's why we're here. The job categories below reflect skills we are seeking for various positions in Alabama, Arizona, California, Colorado, Florida, Kansas, Maryland, Missouri, Oklahoma, Pennsylvania, Texas, Virginia and Washington. To view the available jobs at each location and to apply, visit: boeing.com/collegecareers

- AERONAUTICAL ENGINEERING
- AEROSPACE ENGINEERING
- CHEMICAL ENGINEERING
- CIVIL ENGINEERING
- ELECTRICAL ENGINEERING
- ELECTROMAGNETIC ENGINEERING
- EMBEDDED SOFTWARE ENGINEERING

- INDUSTRIAL ENGINEERING
- MANUFACTURING ENGINEERING
- MATERIAL SCIENCE ENGINEERING
- MECHANICAL ENGINEERING
- OPTICS
- PAYLOADS
- PHYSICS

- PROPULSION
- RELIABILITY MAINTAINABILITY TESTABILITY ENGINEERING
- SOFTWARE ENGINEERING
- STRUCTURES
- SYSTEMS ENGINEERING

Apply at: boeing.com/collegecareers – click on “get hired”

To view the available jobs at each location and to apply, visit: boeing.com/employment. Security clearance requirements are indicated in the position listings. U.S. citizenship is necessary for all positions requiring a security clearance. Boeing is an equal opportunity employer supporting diversity in the workplace.

Boeing is about ideas and the possibilities they offer. And while some of the ideas we develop are extremely sensitive, their importance to the nation is one of our most powerful attractions for new talent. In this advertising execution from Boeing's ongoing "Epic" recruitment campaign, we share the importance of the work we do and the exciting opportunities available here.