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JULY 2009 / Volume VIII, Issue III

New wings

ScanEagle leads Boeing future in unmanned airborne systems market

This new Flight International "house" ad has been developed to support a call for entries for the Boeing-sponsored Engineering Student of the Year Award. Part of the renowned Flightglobal Awards, the Boeing Engineering Student of the Year Award recognizes an outstanding student working on aeronautical or space technology. Qualified candidates are encouraged to apply before the September 25 deadline.

On the Cover

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Flying into the future

Innovative unmanned aircraft systems such as ScanEagle, developed by Boeing subsidiary Insitu, are helping Boeing expand in one of the fastest-growing markets in aerospace.

COVER IMAGE: TRAVIS CIELOHA OF INSITU, WITH THE SCANEAGLE UNMANNED AIRCRAFT SYSTEM. CDR DOUG KIEM/U.S. NAVY

PHOTO: SCANEAGLE IN FLIGHT. CDR DOUG KIEM/U.S. NAVY

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Feature story

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Managing the invisible, expertly

Frequency Management Services is responsible for anything at Boeing that uses radio-frequency spectrum, from wireless microphones to intelligent tooling to airplanes and satellites. This Shared Services Group organization's expertise is industry-leading—and a competitive advantage for Boeing.

FEATURE IMAGE: FREQUENCY MANAGEMENT SERVICES ELECTROMAGNETICS TECHNICIAN TIM COOPER (LEFT) WITH SKYTERRA TEST ENGINEER JAMES TAN AT THE BOEING SATELLITE PRODUCTION SITE IN EL SEGUNDO, CALIF.

PHOTO BY PAUL PINNER/BOEING, GLADYS WICKERING/BOEING

City of flight

100 YEARS
PARIS AIR SHOW
LE BOURGET

By Maureen Jenkins
All photos by Ed Turner/Boeing

Industry air shows are all about building and strengthening relationships, and last month's Paris Air Show—which celebrated its 100th anniversary—gave Boeing leaders the chance to do just that.

Delivering a cohesive, one-company strategy, executives from Commercial Airplanes, Integrated Defense Systems and Corporate offices (including Boeing International) spent June 15–18 meeting with key commercial and government and military customers, journalists, analysts, and suppliers at the biennial event. Boeing presented a strong but scaled-back presence, reflecting the tough global economic environment.

During the show, Boeing also highlighted the achievements of the Boeing French Team—a core group of 14 French supplier-partners that support Commercial Airplanes and IDS and add to the company's local presence within France.

Boeing Chairman, President and CEO Jim McNerney (center) greets Philippe Forestier, Dassault Systèmes executive vice president of Global Affairs & Communities, at a Dassault Systèmes–hosted reception for the Boeing French Team. Also pictured (from left): Dassault President and CEO Bernard Charlès, Boeing International President Shep Hill and Boeing France President Yves Galland.

An Air France 777 Freighter lands at Paris–Le Bourget Airport prior to going on static display outside the Boeing Media Chalet at the Paris Air Show. The plane was visited by potential Boeing customers during the weeklong event.

Among the aircraft on display in Paris: the F/A-18F Super Hornet. Boeing Integrated Defense Systems has set a goal of growing international sales to 20 percent by 2013.

Snapshot

UNMANNED WINGMAN

The Boeing AH-64D Apache Block III attack helicopter (top) last month demonstrated an advanced level of unmanned aerial vehicle control, remotely operating the Unmanned Little Bird helicopter (shown with safety pilot aboard) during flight testing over the Arizona desert, receiving real-time video, altering its navigation flight path numerous times and changing its airspeed and altitude. FILE PHOTO: BOB FERGUSON/BOEING

Quotables

"The passenger might not know it, but CAST [the Commercial Aviation Safety Team] has changed how we fly. … Working together we saved a lot of lives and we made a real difference in the efficiency of our system."

– Peggy Gilligan, associate administrator for Aviation Safety, Federal Aviation Administration. See related story on Page 12.

"Our military and government customers have said that protecting vital information networks against cyber-attacks is one of the nation's highest priorities, and Boeing is responding to the call."

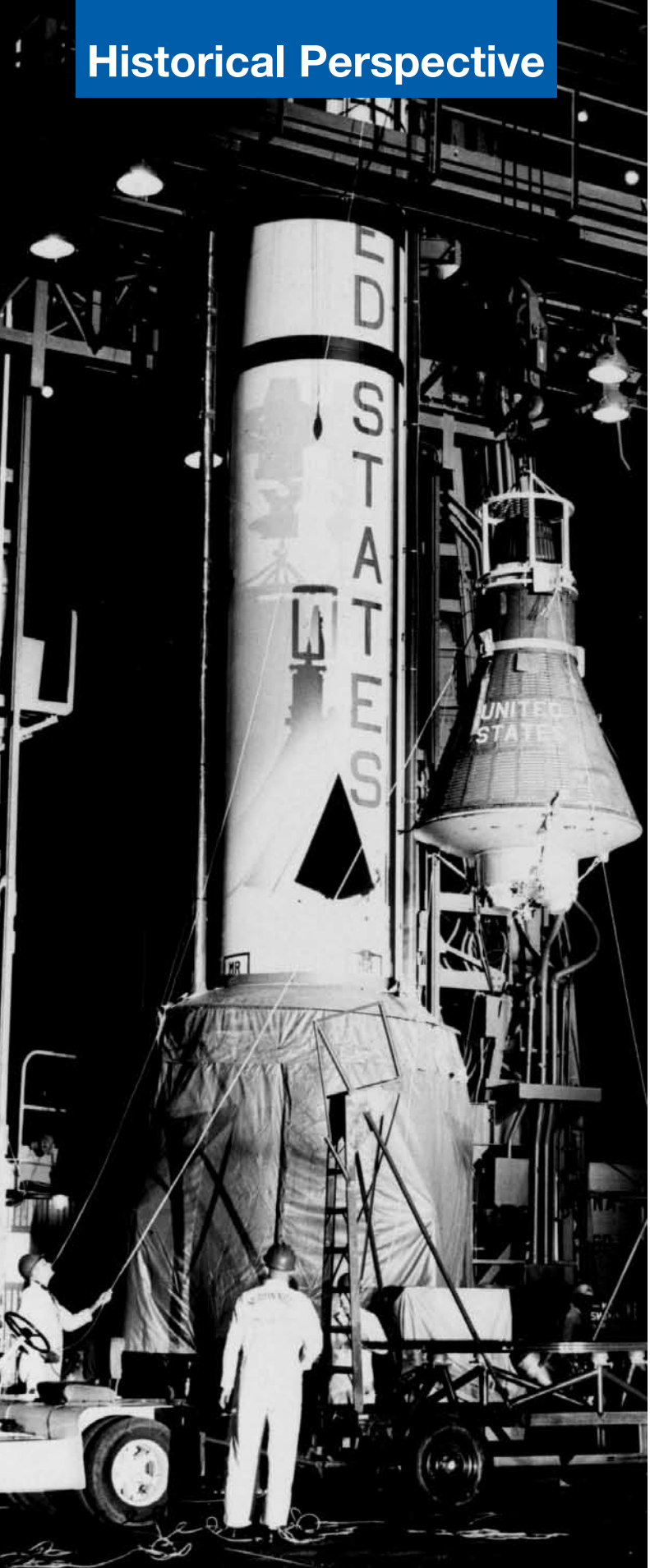
– Integrated Defense Systems President and CEO Jim Albaugh, on a Boeing agreement to acquire eXMeritus Inc., a Fairfax, Va.-based company that provides hardware and software to federal government and law enforcement organizations for sharing information securely across classified and unclassified networks, as quoted by the Associated Press on June 15.

IAM PROMOTIONS

No promotions listed for periods ending May 29 and June 5, 12 and 19.

ETHICS QUESTIONS?

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



Project Mercury:

First step on the way to the moon

By Henry T. Brownlee Jr.

More than 50 years ago, on Oct. 4, 1957, the former Soviet Union's launch of Sputnik shocked the United States and initiated a space race between the two world powers to demonstrate political superiority through technological advancement.

PHOTO: James McDonnell (right) and T. Keith Glennan, the first NASA administrator, discuss the Mercury program using a model of the manned space capsule. BOEING ARCHIVES

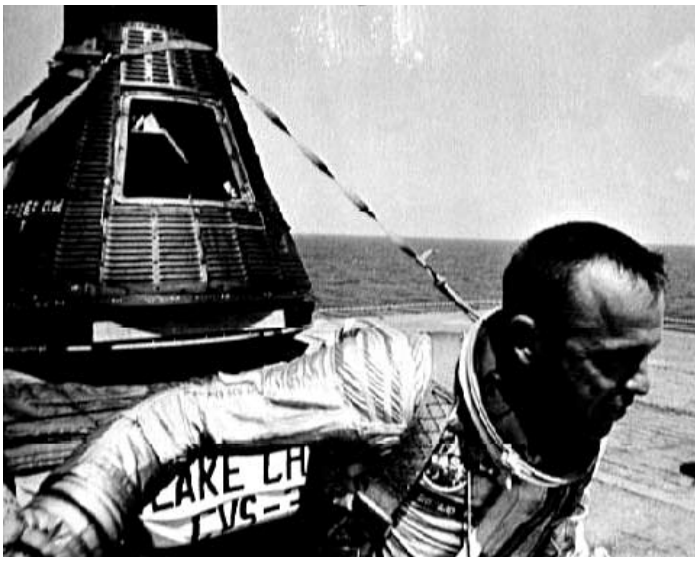
Less than two years later, in February 1959, NASA awarded the prime contract to design, test and build the Project Mercury manned spacecraft to McDonnell Aircraft Corporation (MAC).

Twelve companies, including Boeing predecessor companies MAC, Douglas Aircraft and North American Aviation, submitted proposals. The selection of McDonnell was a carefully guarded secret until the day of the announcement.

Several years before the launch of Sputnik, and before Alan B. Shepard Jr. became the first American to achieve suborbital spaceflight in May 1961, James S. McDonnell, president of MAC, studied placing a human in space.

Indeed, in a May 26, 1957, commencement speech at the Missouri School of Mines and Metallurgy in Rolla, Mo. (now the Missouri University of Science and Technology), McDonnell provided the engineering graduates a speculative timetable for space travel. He thought the United States would not achieve a manned Earth satellite until 1990, and a manned spaceship to land on the moon and return to Earth until 2010. It was in this same speech that McDonnell referenced the dangerous dilemma

PHOTO: McDonnell workers hoist the Freedom 7 capsule onto its Redstone launch vehicle. BOEING ARCHIVES



> "We go into space because whatever mankind must undertake, free men must fully share."
>
> *– John F. Kennedy, president of the United States, in a speech to the U.S. Congress, May 25, 1961*

PHOTO: Astronaut Alan B. Shepard is seen on the deck of the U.S. *Champlain* after the recovery of the Mercury capsule following the United States' first suborbital space flight May 5, 1961. NASA

of the Cold War with its escalating tensions and arms buildup, proposing that the United States "wage peace" through the development of dual-use technologies. "When a chemical rocket motor is developed for a missile, here is a means of propulsion that may be applied in whole or in part to a space vehicle. … And, when ways are found for a fighter pilot to survive high gravitation pulls at hypersonic speeds, this will help some future space pilot survive blastoff in a moonbound rocket," McDonnell said.

This approach, promoting dual-use technology, was a significant factor in his company's being awarded Project Mercury. Although the program's major objective was to achieve manned orbital flight and successful recovery, NASA also required a minimum of new technologies be developed that otherwise might slow the U.S. effort to catch up with the Soviet Union.

Kendall Perkins, former vice president of engineering for MAC, noted the company's selection as Project Mercury prime contractor was "largely a result of having foreseen and having long prepared to meet such a need" and that McDonnell engineering staff "had already laid much of the groundwork and had completed a great deal of the design and advance planning" on a spacecraft capable of orbiting Earth. In fact, McDonnell had used its own money and resources for more than a year working to develop such a spacecraft.

Between 1959 and 1961, McDonnell would work closely with NASA and some 4,000 suppliers and contractors to make Project Mercury a reality. Ultimately, MAC employees would develop and build 20 Mercury spacecraft, two procedural trainers, and ground support and checkout equipment.

The coned-shaped Mercury spacecraft including escape tower measured 28 feet (8.53 meters) tall and 78 inches (1.98 meters) wide and weighed 3,649 pounds (1,655 kilograms) when fully loaded. McDonnell used strong, lightweight materials such as titanium and beryllium to construct the spacecraft.

Multiple safety precautions were incorporated. For example, the spacecraft was designed so it could be operated automatically, manually or by ground control. The spacecraft cabin was equipped with molded, contoured couches that could transfer bodily loads evenly during peak acceleration and deceleration. In addition, although the Mercury spacecraft was equipped with a 100 percent oxygen environment within the cabin, astronauts' spacesuits had a separate oxygen supply.

McDonnell and NASA conducted hundreds of tests on every part of the spacecraft and with various rocket configurations before it was deemed ready for human flight.

Following his historic flight in a Mercury capsule, Shepard visited the McDonnell plant in St. Louis in May 1961 and spoke with employees.

"It has been a great pleasure and a great thrill for me to have worked with such a fine group of people and they have all helped the seven of us [astronauts] in building up our confidence," Shepard said that day. "The No. 7 craft, the one that we used, or Freedom 7 as we chose to call it, performed very well. … It performed well during the automatic phases when it took over by itself and went through various maneuvers and it also performed well when I was handling it."

Following the successful mission and an exhaustive review of the performance of the Project Mercury program, President John F. Kennedy gave a speech before a joint session of Congress noting his decision to send an American to the moon by the end of the decade.

"Space is open to us now, and our eagerness to share its meaning is not governed by the efforts of others. We go into space because whatever mankind must undertake, free men must fully share," said Kennedy. This speech, and the support of the U.S. Congress, led to the successful Gemini and Apollo space programs and, ultimately, to landing humans on the moon (see related story on moon landings on Page 28). ■

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Boeing to deliver first **Super Hornet to Australia**

By Philip Carder

Boeing is scheduled to deliver the first of 24 F/A-18F Super Hornets to the Royal Australian Air Force this month—three months early—making Australia the first nation other than the United States to operate the Super Hornet.

"It's been a remarkable journey getting the first aircraft from the early planning stages to delivery to our RAAF partners," said Carolyn Nichols, Boeing's F/A-18F Super Hornet program manager for Australia. "We knew what the goal was and we went after it." Nichols credited the early delivery to strong teamwork between Boeing, the U.S. Navy, Australia's Defence Materiel Organisation, the Royal Australian Air Force and the Hornet Industry Team.

Bob Gower, F/A-18 and EA-18 programs vice president, believes the RAAF will appreciate the Super Hornet's advanced technologies—including sensors such as the APG-79 Active Electronically Scanned Array radar, which provides aircrews with a completely integrated image of the air, ground and maritime environments. Australia already flies a fleet of 71 upgraded Hornet F/A-18A/B models.

Production of the remaining 23 RAAF Super Hornets, built in St. Louis, will continue through 2011. The aircraft performs a wide spectrum of missions including air superiority, day/night strike with precision-guided weapons, fighter escort, close air support, suppression of enemy air defenses, maritime strike, reconnaissance, tanker and forward air control. ■

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"It's been a remarkable journey getting the first aircraft from the early planning stages to delivery to our RAAF partners."

– Carolyn Nichols, F/A-18F Super Hornet program manager for Australia

PHOTOS: (TOP) Larry Echele, sheet metal assembler and riveter (right) discusses the installation process for a trailing edge flap seal for AF-1, Australia's first Super Hornet, with Carolyn Nichols, Boeing's F/A-18F Super Hornet program manager for Australia, at Boeing Integrated Defense Systems facilities in St. Louis. The first Australian Super Hornet is scheduled to be delivered this month. RON BOOKOUT/BOEING
(RIGHT) The Royal Australian Air Force will be the second operator of the F/A-18F Super Hornet, with plans for a fleet of 24. A U.S. Navy Super Hornet is shown performing flight maneuvers. KEVIN FLYNN/BOEING

Employees help **change TotalAccess**

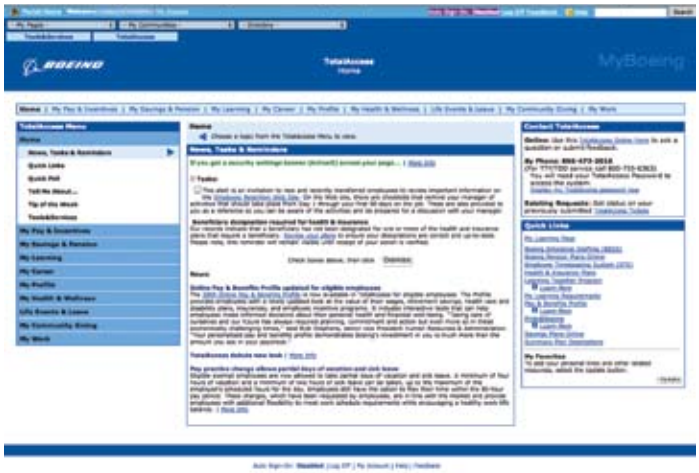

PHOTO: This screen-freeze of the upgraded TotalAccess Web site shows the Home page with News, Tasks and Reminders in the center column. Employees looking for other information can use the new navigation menu on the left side of the page.

If you haven't visited the TotalAccess Web site lately you may be in for a surprise. That is unless you are one of the many employees who had a hand in redesigning the company's Web site for personalized Human Resources, payroll and benefits information.

"The site was always designed to help employees manage their company-related personal information," said Julie Drobny, TotalAccess manager. "But after years of adding new services, TotalAccess was overflowing with information and employees were telling us it was harder for them to quickly find what they were looking for."

Armed with employee feedback, ideas from Boeing Usability engineers and a look at other information-based Web sites, the TotalAccess team created three new designs—and asked employee focus groups what they liked and what they didn't.

What emerged is a revamped TotalAccess site with a cleaner, crisper look, a more intuitive navigation system and more secure presentation.

Taya Cagle, Library Services, noticed there may be an extra click required for some services but appreciates the extra security the new site provides. "My personal information isn't displayed when I initially log in. I like that," she said.

"Our plans are to continue to improve service delivery to employees through TotalAccess," Drobny said. "We will work to make it easy to use, easy to find information and, above all, a secure place for employees to view and manage their personal Boeing-related information."

TotalAccess Web services are available at work on the MyBoeing employee portal and over the Internet through www.boeing.com/express.

– Ron Taylor

New ethics posters **feature employees**

Ethics and Business Conduct, part of the Office of Internal Governance, recently released new posters featuring employees talking about ethical leadership in their own words. "Regardless of job title or location, every employee is a leader when it comes to ethical decision-making," said Mike Mesick, vice president, Ethics and Business Conduct. "That's what we mean when we say 'Leadership Matters' and that's what the employees in the posters represent."

The posters are placed at Boeing sites worldwide and include information on resources for ethics questions or concerns, such as the Boeing Ethics Web site. The posters are part of the company's ethics awareness program and comply with requirements from the U.S. government.

Employees wishing to view all of the posters can check the Ethics Web site at http://ethics.whq.boeing.com/lead/posters/index.html on the Boeing intranet. More posters showing Boeing employees in other U.S. and international locations are planned.

– Ruth Savolaine

PHOTOS BY BOB FERGUSON/BOEING; DESIGN BY LYNN HANKS/BOEING

Safety in numbers

Industry team recognized for improving aviation safety

By Sandy Angers

The Commercial Aviation Safety Team proves there's safety in numbers. As the hypothesis goes, an individual is more likely to be safe when part of a large group. In the case of aviation, safety improves when a large number of people work together.

Here's the proof: The U.S. commercial aviation system is one of the world's safest, due in large part to CAST, an industrywide team. Together, hundreds of representatives from airlines, manufacturers, labor and government have helped reduce the fatal accident rate in the United States by 83 percent from 1998 to 2008, according to industry data.

The team's remarkable achievement was recognized by the National Aeronautic Association in May with the Collier Trophy. The annual award signifies the greatest achievement in aeronautics or astronautics in the United States.

"This couldn't have been possible without the contributions of all our CAST members, observers and technical support staff," said John Hickey, deputy associate administrator of aviation safety for the U.S. Federal Aviation Administration. "The work we've all been doing these past 10 or so years has been rewarding enough, but winning this award is certainly the crowning achievement."

SAFETY STRATEGY TEAM

The foundation for CAST started in 1996 when Charlie Higgins, then vice president of Safety for Boeing, and representatives from the Air Transport Association and Air Line Pilots Association met to set a common safety agenda. From that meeting the Industry Safety Strategy Team was formed.

During that same time, the White House Commission on Aviation Safety and Security challenged government and industry to reduce the fatal accident rate by 80 percent over 10 years, and the National Civil Aviation Review Commission report recommended that the FAA and industry work together to develop an integrated safety plan. The FAA and the Industry Safety Strategy Team joined forces to form CAST in 1997.

"CAST is the single most powerful government and industry collaborative effort I've seen in my 30 years in aviation," said Steve Atkins, vice president of Product Integrity and Functional Excellence for Commercial Airplanes.

"The work we've all been doing these past 10 or so years has been rewarding enough, but winning this award is certainly the crowning achievement."

– John Hickey, deputy associate administrator of aviation safety, Federal Aviation Administration

PHOTO: The Collier Trophy is awarded annually "for the greatest achievement in aeronautics or astronautics in America with respect to improving the performance, efficiency, and safety of air or space vehicles, the value of which has been thoroughly demonstrated by actual use during the preceding year." BOB FERGUSON/BOEING

ANALYZING ACCIDENT DATA

CAST analyzed data from approximately 500 accidents and thousands of safety incidents worldwide. The team focused on the six leading accident categories: controlled flight into terrain (CFIT), approach and landing, loss of control, uncontained engine failures, weather-related and runway incursion.

Paul Russell, chief engineer of Aviation System Safety for Commercial Airplanes, said the team started with CFIT, which at that time was the leading cause of death in airline accidents.

"We formed a joint safety analysis team of about 40 to 50 experts, representing all CAST stakeholders, to identify all the contributing factors of CFIT accidents. Without constraint, the team determined what could be done to eliminate or minimize contributing factors for CFIT accidents," Russell explained.

The result? The team developed 16 safety enhancements—from installing terrain warning systems, enhancing training programs and using standard operating procedures, to increasing the number of instrument landing systems—which were turned over to another team for implementation.

CAST used the same process for the other categories. Of the 70 safety enhancements, 48 have been implemented and 22 are in work, according to Russell.

No one entity or agency funds CAST—it sponsors itself, with member organizations contributing financial and technical support. "The group is self-chartered, self-motivated, self-running and self-financing," Russell said. "CAST has successfully stayed together for three reasons—it's consensus-based, it's achieving results and everyone agrees enhancing aviation safety is a worthy goal."

THE FUTURE OF SAFETY

Although safety efforts have relied on investigating prior accidents to prevent future ones, CAST is evolving to a more predictive approach, examining operational data to identify hidden or emerging patterns and potential conditions before accidents occur. That approach relies on all aviation stakeholders freely sharing and combining data in ways never done before.

One example is a recent study on unwarranted terrain warnings experienced during approaches to some mountainous terrain airports. Although these were harmless individually, there was the very real potential that flight crews could become desensitized and not respond rapidly to a valid warning. One approach identified for investigation was Oakland International Airport in California.

For a complete, comprehensive analysis of the situation, the study combined FAA radar data, airline Flight Operations Quality Assurance data, Aviation Safety Reporting System data, weather data, air traffic control procedures and minimum-vectoring altitude maps. The study identified the contributing factors and developed three safety enhancements that are expected to reduce the false alerts by more than 90 percent. The study is being expanded to other airports throughout the United States.

"If you had asked me three years ago if that kind of data sharing was possible, I would have said 'it'll never happen'—because of the various concerns about data being misused," Russell said. "We've reached a stage where people are willing to participate."

He attributes this shift in thinking to the fact that CAST started slowly, proving over time that concerns about data misuse were unfounded. Most important, sharing the data produced results.

PHOTO: The Commercial Aviation Safety Team has helped reduce the fatal accident rate in the United States by 83 percent over 10 years. Pictured is the air traffic control tower at John F. Kennedy International Airport in New York. ED TURNER/BOEING

"CAST has proved that joint industry and government teams working together to improve safety produces better results than regulatory action alone," said Corky Townsend, Aviation Safety director, Commercial Airplanes, and the Boeing CAST representative.

Added Townsend: "CAST is an amazing cooperative effort, and we are proud that Boeing has been there from the beginning." ■

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Meet the **CAST**

The Commercial Aviation Safety Team (CAST) is a proven concept for industry and government cooperation that has been adopted by the European CAST, the International Helicopter Safety team and the International Civil Aviation Organization Coordinated Development of Operational Safety and Continuing Airworthiness programs in Asia.

Members of CAST include representatives from government, unions and industry.

Government
Federal Aviation Administration, European Aviation Safety Authority, NASA, U.S. Department of Defense

Unions
Air Line Pilots Association, Allied Pilots Association, National Air Traffic Controllers Association

Industry
Aerospace Industries Association of America, Airbus, Air Transport Association of America, The Boeing Company, Flight Safety Foundation, GE Aviation (representing all engine manufacturers), National Air Carrier Association, Regional Airline Association

To learn more, visit the CAST Web site (www.cast-safety.org).

New wings

Boeing's Unmanned Airborne Systems business takes flight with Insitu acquisition

All stories by Doug Cantwell

The era of gargantuan mergers in the defense industry may have passed, but Boeing has continued to target smaller strategic acquisitions to augment Boeing Integrated Defense Systems' portfolio of capabilities. Last year, the company closed on six such deals, bolstering its presence in sectors of the defense market expected to grow faster than others.

One of these acquisitions, a 500-employee high-tech firm called Insitu Inc., developed the diminutive but rugged ScanEagle, a 40-pound (18-kilogram) tactical unmanned aircraft system (UAS) that has quietly logged more than 150,000 service hours keeping watch over coalition forces in Iraq and Afghanistan. Since 2004, Insitu had supplied the 10-foot- (3 meter-) wingspan intelligence, surveillance and reconnaissance (ISR) vehicle to its partner Boeing, which operated it in-theater under service contracts to the U.S. Navy, Marine Expeditionary Force, Special Operations Command, and Australian and Canadian defense forces.

While UASs are trending toward smaller wingspans, worldwide demand for them continues to grow exponentially. "We're looking at a huge UAS market 20 years out," said Vic Sweberg, who heads IDS' new Unmanned Airborne Systems division, announced at last month's Paris Air Show. "Half of IDS revenues could come from unmanned airborne and ground-based systems by then."

Given constrained government budgets and the urgent ISR needs of customers in the United States and internationally, analysts forecast that the market for less costly and logistically simpler UASs such as ScanEagle will continue to surge. "Acquisitions like Insitu are tied to our strategy of becoming more vertically integrated," said IDS President and CEO Jim Albaugh,

PHOTO: An Insitu engineer launches a ScanEagle from a pneumatic catapult at a test facility near Boardman, Ore. ED TURNER/BOEING

PHOTO: Insitu engineers Andy Mack (left) and Wayne Larson prepare to flight-test a prototype of Integrator, a larger, twin-boom derivative of ScanEagle. PETER KUNZ/INSITU

"and also of moving into adjacencies that we think will grow faster than the rest of the defense budget."

UASs are expected to play an increasing role in network-centric operations (NCO) and force projection, which makes it critical that firms with system-of-systems expertise such as Boeing have an internal UAS capability. With Boeing's market-leading command and control portfolio, including the Airborne Warning and Control System (AWACS) and Airborne Early Warning and Control (AEW&C) aircraft, as well as its depth in NCO, a strong UAS presence will fill out the company's networked battle-management offering.

Boeing's unmanned effort eroded after the U.S. Air Force canceled the Lockheed Martin/Boeing DarkStar UAS in 1999 and the company lost the 2007 competition for the U.S. Navy Unmanned Combat Aerial System demonstrator.

The Insitu partnership did not just help reinvigorate Boeing's UAS business. The rapid response to an emergent wartime ISR need helped lay a cohesive groundwork for the new Unmanned Airborne Systems division by requiring Boeing Military Aircraft, Phantom Works and Global Services & Support to collaboratively support ScanEagle.

The acquisition of Insitu has given IDS something more as a UAS provider: a drop-everything, "special-ops" response to customer needs and a highly nimble process for rapid prototyping. "We wanted to have a strong, established position with customers," said Albaugh, "in addition to an internal capability in small, tactical UASs."

ORGANIZING AROUND THE CUSTOMER

When IDS leaders signed the papers in September 2008 to acquire Insitu, the two companies had hammered out an unorthodox operating agreement. Insitu would function as a wholly owned subsidiary of Boeing, retaining its culture as a dressed-down cadre of hands-on scientists, engineers and executives known for wrapping themselves around customer needs.

"They want us to spread our DNA into Boeing, rather than have it flow the other direction," said Steve Nordlund, Insitu vice president for business development. "Boeing leaders have urged us not to change what we're doing. They've encouraged us to view their processes with healthy skepticism, so we don't adopt processes for processes' sake."

So what does Insitu expect to gain as a new Boeing subsidiary? "There are a lot of lessons learned from decades of prototyping and developing that we can tap into," Nordlund said. "If we can get access to all those resources, it will be a huge advantage."

How does he see the future unfolding? "Designing to requirements, which we'll be doing more and more of as a military supplier, is definitely changing the way we develop products," he said. "There's a lot more testing, a ton of documentation and much more depth to the requirements. The question is: Can Insitu conform to that and remain nimble?"

That's where Boeing's wealth of experience in working with U.S. Department of Defense customers and designing to deep requirements comes into play. IDS leaders, in turn, are interested in studying Insitu's way of organizing around the customer and emulating it where possible.

Nordlund added that Insitu's U.S. Navy and Marine Corps customers have said they'll be watching closely, now that the acquisition has gone through, to make sure Insitu doesn't change its responsive ways.

"We like to help define requirements," he said. "To that end, we try to focus on what we call our customer's 'pain.' Is there some capability gap we could fill that would relieve that pain?" Helping customers formulate requirements not only increases their satisfaction but keeps Insitu innovative.

Nordlund cites the early days of Operation Iraqi Freedom in 2003, when the company was called upon to provide urgent ISR support for ground troops who were drawing fire from snipers and dealing with roadside improvised explosive devices. "Because of the way we operate, we were able to put FSRs [field service representatives] and hardware on station within days," said Nordlund. "Our Marine Corps customer, who assumed we would work through the usual acquisition channels, had anticipated it would take five months."

This responsiveness has garnered a wealth of gratitude from ScanEagle's ultimate customers—the soldiers going into harm's way daily. One Marine wrote that on three occasions, the "birds" circling overhead had warned him and his platoon of an ambush. He credited ScanEagle with nothing less than their survival.

A PROTOTYPING ENVIRONMENT

The village of Bingen, Wash., overlooking the waters of the Columbia River Gorge, might seem an unlikely venue for the design and manufacture of high-tech unmanned surveillance aircraft. But you don't hear Insitu employees grumbling about having to live in this scenic recreational area an hour east of Portland, Ore. It was recreation, in fact, that brought technology used in ScanEagle here. The lightweight composite-layup airframes derive from material you find in windsurfer and snowboard manufacture—both established industries in the area since the 1980s.

Mechanical design engineer Calder Hughes has grown fond of the Insitu culture. "This is a true prototyping environment," he said. "We're able to make our own parts as we go. We can figure out quickly where the stumbling blocks are, where we want to put our energy."

> "Designing to requirements, which we'll be doing more and more of as a military supplier, is definitely changing the way we develop products."
>
> *– Steve Nordlund, Insitu vice president for business development*

This fast-track, trial-and-error approach allows engineers to learn quickly—not only about the aerodynamic geometry of a new design but also about the engineering and manufacturing processes they've applied in bringing it to the flight-test phase. "Once we've gotten there," Hughes said, "we can go back in a more deliberate way and apply those processes a second time."

Jaime Mack, senior mechanical engineer and group lead for advanced development, already knew how to lay up fiberglass and do vacuum-bagging when she came to Insitu. She'd been designing high-tech composite sporting equipment for the many windsurfing and snowboarding enthusiasts here.

Mack also appreciates the culture around Insitu. "It's an incredibly creative atmosphere," she said, "and one that's very supportive at the personal level. It's not uncommon to see people walking into [Insitu President and CEO] Steve [Sliwa's] office and laying it on the line if they have a gripe … or pitching him a new idea they've come up with."

Brian Dennis, a senior mechanical design engineer who's been with Insitu since its inception, also came to the firm by way of high-tech recreational equipment—specifically, the formed metallurgy required to make snowboarding boots and bindings.

What's kept him there? "I've had the freedom to develop projects I have ideas for," he said. "If you come up with something new here, you propose it, you make it happen. The culture is driven by enthusiasm: if an idea pops, say on a Sunday evening, I'll call one of my colleagues to chat about it. I feel I have a personal stake in what goes on here." ■

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PHOTOS: A Boeing field service representative and U.S. Marine Corps specialist launch a ScanEagle at the U.S. Army's Yuma Proving Ground, Ariz. JIM ANDERSON/BOEING **(INSET)** Insitu's Calder Hughes, mechanical design engineer (left) and Jaime Mack, senior mechanical engineer and advanced development group lead, remove the fairing from an Integrator. ED TURNER/BOEING

Iraq field service rep diary

"We are a 24/7 operation," said Gerry Camacho, ScanEagle field service theater lead in Iraq, currently on deployment with the U.S. Marine Expeditionary Forces (MEF). "We share living space and work side by side with USMC intelligence assets."

The sprawling can city at Al Asad, affectionately named "The Presidio" after the military base in San Francisco, houses 10,000 people, many of whom are nonmilitary contract employees. Probably because of this, the Presidio has an oddly domestic look and feel. "There's even a huge commissary that looks a lot like your local mall," Hilliard said, "especially when it's decorated for holidays."

Hilliard recalls the not-infrequent "haboobs," or sandstorms. They'd come in like a towering tsunami of orange dust, several hundred feet high and visible for miles, sometimes lasting for eight hours, sometimes for three days. "At least you can see them coming, so you have time to batten down the hatches," he said. In spite of dust masks and the heavy-duty air-conditioning unit that kept his can temperature comfortable, he often awoke in the morning with nose and throat clogged.

Although Hilliard and his mates pulled the ScanEagles in whenever a haboob threatened, he was amazed at their ability to operate in extreme conditions. "The larger unmanned platforms can't take off in a 30-knot wind," he said. "But ScanEagle doesn't take off in the traditional sense, and it will keep flying even when all you can see on the monitor is orange."

PHOTO: Dave Hilliard (foreground), a Boeing field service representative, retrieves a ScanEagle after its capture on the Skyhook system as another haboob (sandstorm) closes in on Al Asad Air Base, Iraq. ERIC MALMGREN/INSITU

The field service representatives (FSRs) provide real-time video to the Marines and security-cleared Iraqi officials. Their customers assign the specific missions, but Boeing FSRs have responsibility for launching, recovering and maintaining the aircraft.

For the most part, ScanEagles support convoys and troop movements, scanning for ambushes and improvised explosive devices, a threat that has proved tough to monitor. The persistent little platform—nearly invisible and inaudible from the ground—also guards oil pipelines and offshore drilling platforms, often targeted by saboteurs.

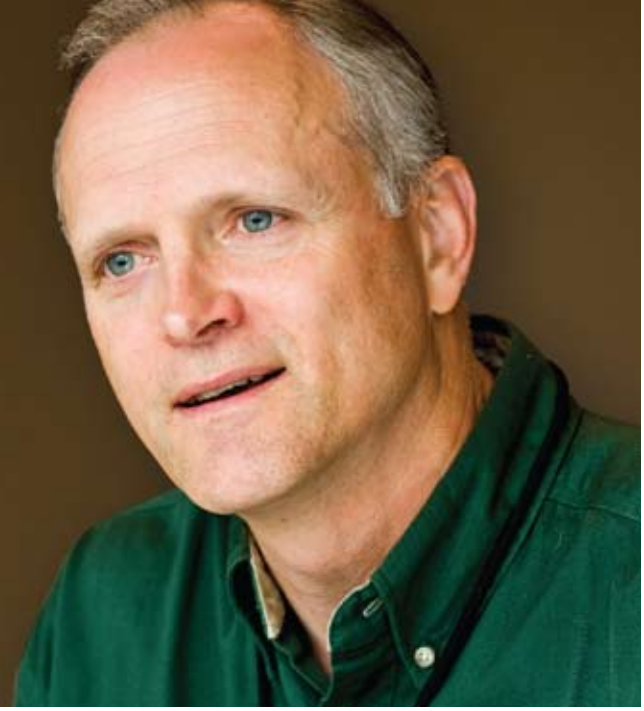
Dave Hilliard, an FSR who has logged two years in Iraq, described life in a "can," or modular metal hut, at Al Asad Air Base. "You and your canmate share a space roughly 8 by 20 feet (2.4 by 6 meters)," he said. "Hundreds of cans are bolted together, forming entire can cities."

VIDEO IS THE PRODUCT

Boeing FSRs have to remind themselves that, as Hilliard put it, "The product is not the airplane; it's the video feed." Their ultimate customers—the battle commanders—have just three requirements of the ScanEagle FSRs, but they're critical ones. "First, that we stay in the air; second, that our product—the sensor output—is available to them on demand; and third, that we keep our operating expenses within their budget parameters."

Customer reviews and informal feedback indicate the FSRs are producing in spades. "Flying thousands of hours of intelligence, surveillance and reconnaissance support in theater, month after month, requires a high degree of organization and teamwork," said Major Dan Griffiths, former officer-in-charge, Marine Unmanned Aerial Vehicle Squadron 1. "The execution of that task falls on the shoulders of the FSRs. Day in and day out, they do whatever it takes to meet requirements."

New Unmanned Airborne Systems division to drive growth



Boeing has many widely scattered enclaves of excellence that contribute to its unmanned aircraft programs, but Integrated Defense Systems leaders saw the need to bring "One Boeing" energy to bear. To that end, they created a new Unmanned Airborne Systems (UAS) division that will draw on the best of IDS' businesses.

Vic Sweberg, who heads the new division, played a major role in acquiring unmanned aerial systems manufacturer Insitu. "It's great to be able to nucleate around something," he said. "Insitu has established a unique and very successful style of engaging customers that gives us entree into some areas of the market we haven't engaged yet."

That style, Sweberg added, "sometimes means meeting critical operational needs immediately and catching up with the paperwork afterwards." When soldiers on the ground in Iraq needed intelligence, surveillance and reconnaissance (ISR) support immediately—not months down the road—Boeing found a way.

The Advanced Boeing Military Aircraft unit collaborated with Insitu to develop ScanEagle to meet specific U.S. Department of Defense requirements. Global Services & Support then stepped in to provide the platforms, operators, ground stations and maintenance on a turnkey basis.

Insitu had noted opportunities in several countries but lacked the global marketing reach and established foreign offices that could open doors in Latin American, European and Asian capitals. That's where Boeing was able to help. Insitu's 2008 international revenues are projected to quadruple in 2009.

The new division will also develop unmanned aerial systems command/control from Airborne Warning and Control System, P-8A, 737 Airborne Early Warning & Control (AEW&C), Apache and other Boeing platforms. In March, a Seattle-based team demonstrated control of three ScanEagles from a Wedgetail AEW&C. In May, a Mesa, Ariz.-based team used an AH-6U Unmanned Little Bird to demonstrate UAS vehicle and sensor control from a Block III Apache.

The Phantom Works arm of the division will further develop Boeing's proprietary common ground-control technology. It will refine its modular, open-architecture system to control many unmanned aerial vehicle types from a single node, minimizing the need for stand-alone ground control.

> "We will strive to intensely satisfy our customers with our products, services, innovations and value. We will be profitable."
>
> *– Vic Sweberg, Unmanned Airborne Systems*

What does Sweberg see as the division's objectives? "We will drive growth by building a healthy UAS business. We will strive to intensely satisfy our customers with our products, services, innovations and value." Last but not least, he said, "We will be profitable."

ISR SERVICES: UAS FIRST RESPONDERS

Essential to the division will be ISR Services. This GS&S organization has provided ScanEagle services to the U.S. Navy, Marines, Special Operations Command and several foreign governments. Under fee-for-service contracts, Boeing assumes the financial risk of deploying and operating the aircraft and ground stations.

Boeing won contracts in 2007 and 2008 totaling a maximum of $312.7 million to continue supplying the Navy and Marine Corps with ScanEagle services. In April, the company inked another service contract with the U.S. Special Operations Command potentially worth $250 million.

"Our ability to leverage across the UAS division, including Insitu, Phantom Works and GS&S, positions us well to offer innovative services through a number of contracting approaches," said Darren Sekiguchi, director of ISR Services. He noted that at its projected rate of expansion, the unmanned aerial systems services market will likely approach $10 billion in a decade.

PHOTO: Vic Sweberg leads Boeing's new Unmanned Airborne Systems organization. The unmanned airborne systems market is projected to approach $10 billion in 10 years. MARIAN LOCKHART/BOEING

Navy calls for bigger payload, more endurance

PHOTO: The Boeing-Insitu team has offered Integrator, a larger and longer-endurance derivative of ScanEagle, as its entry for STUAS, the U.S. Navy and Marine Corps' Small Tactical Unmanned Aerial System/Tier II program. STUAS will call for hundreds—potentially thousands—of aircraft as well as ground equipment, support and training. DAVE SLIWA/INSITU

The bids are in. The Small Tactical Unmanned Aerial System (STUAS)/Tier II competition presents the opportunity to sell hundreds—potentially thousands—of aircraft and associated equipment, support and training to the U.S. Navy and Marine Corps. With the U.S. Air Force likely to place orders as well, STUAS will be one of the largest U.S. procurements of unmanned systems to date.

As service-contract suppliers of the incumbent ScanEagle, Boeing and Insitu face a formidable field of challengers. Because STUAS calls for a larger payload and longer endurance than ScanEagle provides, the team will offer Integrator, a double-boom platform with 15.8-foot (4.8-meter) wingspan and 50-pound (23-kilogram) payload capacity that can stay aloft for 24 hours-plus.

Following Boeing's acquisition of Insitu in September 2008, which was aimed partly at better positioning the two partners to compete for STUAS, other contractors followed suit with partnering agreements or acquisitions. Raytheon teamed with Swift Engineering to bid the Killer Bee UAS. Killer Bee is offered in four incrementally sized variants ranging from a 6.5-foot to 33.2-foot (2- to 10-meter) wingspan that carry substantial payloads due to their blended wing/body design.

AAI, a subsidiary of Textron that has provided larger unmanned aerial vehicles to the U.S. forces, has teamed with Aerosonde Pty Ltd. of Australia to offer the Aerosonde Mk 4 for the STUAS competition. The Mk 4 set a world-record endurance mark for its class of more than 38 hours in 2006.

General Dynamics Armament and Technology Products has partnered with Elbit Systems to bid the Israeli company's Skylark II, a 75-pound (34-kilogram) vehicle with a 14-foot (4.2-meter) wingspan. Skylark II is equipped with an electro-optical/infrared sensor payload, laser illuminator and optional laser designator.

Key discriminators in the competition will include a small launch-and-recovery footprint and a heavy-fuel engine (that burns JP-5 and other kerosene-type fuels used for safety on board Navy vessels). Insitu uses the same Skyhook recovery system for Integrator as for ScanEagle, which provides a minimal, runway-independent footprint and enhanced safety for shipboard deployment.

> "We feel confident that we've submitted an outstanding STUAS proposal, one that supports all of the mission requirements on both the Navy and Marine Corps sides."
>
> *– Steve Sliwa, Insitu president and CEO*

"Along with our Boeing teammates, we reviewed the STUAS Request for Proposal exhaustively," said Insitu President and CEO Steve Sliwa. "We feel confident that we've submitted an outstanding proposal, one that supports all of the mission requirements for both the Navy and Marine Corps." A decision is expected in September.

Family

with the right connections

of Defense's goal of achieving fully network-enabled operations drives this activity, along with broader initiatives to promote interoperability among U.S. services and coalition forces.

"The idea behind our mission-management software is to create an open, nonproprietary system for our customers," said John Hearing, manager of Advanced Unmanned Control Systems. "One station can control multiple vehicles or types of vehicles and then pull the data transmitted by those vehicles onto existing command-and-control system displays."

Developing common mission-management software for unmanned systems advances a wider Boeing effort to meet customers' total information needs. "A battle commander with a number of unmanned systems can generate a tremendous amount of data," Hearing said. "Our challenge is to help him do this affordably, with fewer people, using less bandwidth—while deconflicting the airspace with other manned and unmanned platforms and freeing up his manned assets to do critical missions."

Boeing's strategy for the burgeoning unmanned airborne systems market is to offer a stable of highly evolved, autonomous unmanned systems that incorporate the best capabilities from across the company as well as those of strategic partners. Key to that approach is network-enabling: linking the aircraft together through common mission-management software that allows them to operate effectively in the same network.

"The Boeing line of UASs focuses on the entire system—the vehicle, ground-control station, human systems interface and mission management," said Dave Koopersmith, vice president of Advanced Boeing Military Aircraft. "We're developing and refining software that will cover mission management, mission and sensor planning, communications, and visibility of the vehicle to the operator."

Advanced BMA engineers are writing this software with commonality as their chief objective, so that modification will be needed only to create interfaces for individual platforms. The U.S. Department

A160T ONLY LOOKS LIKE A HELICOPTER

Built for intelligence, surveillance and reconnaissance (ISR) and precision resupply missions, this aerodynamically clean platform employs a unique optimum-speed rigid rotor system to increase fuel economy and endurance. Designed to loiter at 30,000 feet (9,100 meters) for 20 hours, the Hummingbird offers an operating range of 2,250 nautical miles (2,590 miles, or 4,170 kilometers).

The turbine-powered A160T, now formally designated the YMQ-18A, burns heavy fuel (such as JP-5 or other kerosene-based grades). Its power plant, already fielded in commercial manned helicopters, boosts the Hummingbird's operating range to 3,000-plus nautical miles (3,450 miles, or 5,560 kilometers) and its payload to 1,000 pounds (450 kilograms). To date, the

PHOTO: Designed for intelligence, surveillance and reconnaissance and precision resupply missions, the A160T Hummingbird incorporates a turbine engine and adjustable optimum-speed rigid rotor system to boost operating range and payload. KEN GRAEB/BOEING

Phantom Works team has delivered two A160s (with a six-cylinder gasoline engine) and seven A160Ts to the U.S. Naval Air Systems Command for use by the U.S. Special Operations Command.

The Hummingbird can carry day or night long-range optics, a laser rangefinder and target designator, a precision microwave synthetic aperture radar, an electronic intelligence system, a SATCOM link and an electronic countermeasures payload.

PHANTOM RAY: TAKING UCAS INTO THE FUTURE

Starting in late 2008, Phantom Works engineers employed rapid-prototyping techniques to develop an unmanned flying test bed to demonstrate advanced air-system technologies. Based on the fighter-sized X-45C developed for the Joint Unmanned Combat Air Systems (J-UCAS) competition, Phantom Ray will be used to expand that platform's flight envelope and develop such missions as weapons delivery, ISR, suppression of enemy air defenses, electronic attack and autonomous aerial refueling."Boeing is in the unmanned combat air system business—and in a big way," said Darryl Davis, president of Phantom Works. The strategy that has driven Phantom Ray, unveiled in May of this year, is to use internal Boeing funding to refine technologies that can be applied to future tactical aircraft bids. "It's critical that we're able to demonstrate technology readiness for the Pentagon when it articulates its next-generation needs," Davis said.

PHOTO: Based on the fighter-size X-45C airframe, Phantom Ray is being used to rapidly prototype an expanded flight envelope and unmanned combat missions capability. BOEING

UNMANNED LITTLE BIRD

Based on a light-duty commercial helicopter adapted for use as a multi-mission asset by the U.S. Army's Special Operations forces, the AH-6 Little Bird can be configured as a manned or unmanned platform. Unmanned Little Bird (ULB), or AH-6U, has demonstrated effective operation in urban and complex terrain as an ISR platform, a communications relay, and a precision resupply and weapons-delivery vehicle.

PHOTO: The AH-6U Unmanned Little Bird can be configured as an unmanned or manned platform for operations in complex or urban terrain. BOB FERGUSON/BOEING

Since its first autonomous flight in 2004, the ULB has continued to demonstrate unmanned technologies, validating an autonomous flight control system that could be added to other manned aircraft. The Mesa, Ariz.-based program has received unmanned technology development contracts from the U.S. Army, U.S. Marine Corps and France's Ministry of Defense.

HALE AND SOLAREAGLE: STRATEGIC MISSIONS AT STRATOSPHERIC HEIGHTS

Two projects on the Phantom Works drawing board will operate for longer duration at higher altitudes to execute more strategic missions. The High Altitude Long Endurance (HALE) UAS is intended to perform battlefield and border observation, port security and telecommunications at higher stratospheric elevations (65,000-plus feet, or 19,800 meters), staying aloft for seven days or longer on liquid hydrogen fuel-cell propulsion.

GRAPHIC: The High Altitude Long Endurance system, designed to take on border surveillance, port security and telecom missions at 65,000 feet (19,800 meters) and higher, will stay aloft for seven-plus days on liquid hydrogen fuel-cell propulsion. BOEING

SolarEagle, a 300-foot (90-meter) flying wing powered by solar energy, will carry a "pseudo-satellite" payload of up to 1,000 pounds (450 kilograms) in the high stratosphere (above 60,000 feet, or 18,200 meters). Designed to stay aloft for five years and generate a 5-kilowatt power supply, this low-cost platform could provide unprecedented persistence in ISR and communications missions.

‘Silent’ partner

F-15 Silent Eagle adds new capability and flexibility

By Patricia Frost

You might say it’s the strong, silent type. It flies at Mach 2.5 (or 2.5 times the speed of sound). It has the greatest range and payload capability of any fighter today. And it’s “silent”—in the sense that it employs technology that offers stealth capabilities, thereby reducing its detection by radar.

It’s the F-15 Silent Eagle, which Boeing unveiled at a March ceremony in St. Louis. “The aircraft was specifically designed in response to international customers’ need for an aircraft with an increased measure of radar-evading capability without the trade-offs of reduced range and heavy payloads,” said Mark Bass, F-15 program vice president. “They needed it to be affordable, and they needed it quickly.”

It was this tall order that eight Boeing engineers set out to fulfill last September. Six months later they came up with the Silent Eagle ground demonstrator, which is basically the F-15 Strike Eagle plus new components.

> “The aircraft was specifically designed in response to international customers’ need for an aircraft with an increased measure of radar-evading capability …”
>
> *– Mark Bass, Boeing F-15 program vice president*

F-15 Silent Eagle tale of the tape

Length: 63.6 feet (19.4 meters)

Height: 18.5 feet (5.6 meters)

Wingspan: 42.8 feet (13 meters)

Speed: Mach 2.5 class

PHOTO: Canted tails improve aircraft aerodynamic efficiency and help reduce weight. RON BOOKOUT/BOEING

New components include conformal fuel tanks with internal weapons bays, called conformal weapons bays, that have the same aerodynamic shape and aircraft interfaces as the standard conformal fuel tanks of the F-15E. Conformal fuel tanks are additional fuel tanks fitted closely to the profile of an aircraft, which extend either the range of an aircraft or the time on station, with little aerodynamic penalty compared to the same fuel capacity carried in external drop tanks.

Depending on the aircraft's mission, the conformal weapons bays can be swapped for conformal fuel tanks on the flight line. The internal carriage capability minimizes radar signature and significantly increases the pilot's tactical options in combat.

The Silent Eagle also features twin vertical tails canted outward 15 degrees (F-15E tails are vertical). Canted tails provide lift to the rear of the aircraft, which eliminates hundreds of pounds of ballast and increases range by 75 to 100 nautical miles. Also, coatings are applied to various areas of the aircraft that reduce its visibility to radar. A digital electronic warfare system will be added that can detect, jam and defeat enemy air-to-air and surface-to-air threats.

"The Silent Eagle provides forces with a powerful capability to convert a combat-proven, front-line, multi-role fighter aircraft into a silent asset," said Shelley Lavender, vice president and general manager, Global Strike Systems.

The F-15 team is preparing for a flight test with weapons release in the third quarter of 2010. The test will validate the Silent Eagle's internal carriage capability. ■

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PHOTOS: (TOP) The F-15SE internal weapons carriage bay provides added flexibility to customers. RON BOOKOUT/BOEING

(BOTTOM) A U.S. Air Force F-15E Strike Eagle from the 391st Expeditionary Fighter Squadron Bagram Air Base flies over Afghanistan. AARON ALLMON/U.S. AIR FORCE

A proven fighter in more ways than one

The F-15 remains the backbone of the U.S. Air Force with 236 fighters in service. The aircraft has proved itself in Iraq and Afghanistan and since entering service has maintained a ratio of 104 air-to-air kills versus zero losses. It plays an important role in defending U.S. allies around the world. Air forces in Japan, Israel, Korea, Singapore and the Kingdom of Saudi Arabia employ the F-15 to protect their nations. More than 2,000 Boeing jobs are tied to the F-15 in St. Louis. Some 400 suppliers support the program across the globe.

– Patricia Frost

Space maneuvers

Launching a satellite is just the beginning

By Dave Garlick

For the men and women who design, build and test satellites, all hopes ride on those first few fiery moments when the satellite is launched. However, launch is just the beginning. Then comes the work of satellite operations; that is, communicating with the satellite from the moment it's jettisoned from the launch vehicle until it is fully deployed, tested and in the correct orbit. Only then is the satellite ready to be handed over to Boeing's customer.

GRAPHIC: The WGS-2 satellite completed on-orbit testing and was handed over to the U.S. Air Force on June 15.
JIM SANTONI/BOEING

To understand exactly what takes place, consider the recently launched Wideband Global SATCOM (WGS)-2 satellite for the U.S. Air Force. Following the satellite's 44-minute trip to space on April 4 aboard a United Launch Alliance Atlas V rocket, separation of the satellite from the rocket and acquisition of its electronic heartbeat, engineers at Boeing's new Mission Control Center, or MCC, in El Segundo, Calif., took over.

Immediately after separation, WGS-2 is 250 miles (402 kilometers) above the Earth's surface and speeding faster than a bullet at 6.44 miles per second (10.4 kilometers per second). Using precise calculations and split-second timing, engineers at Mission Control gradually raise the orbit using the main thruster mounted on the aft end of the satellite. Fuel is burned in bursts up to 100 minutes long during the 10–14 days it takes to complete this first phase of the trip out to the satellite's geosynchronous orbital work zone.

For the flight, the satellite is deployed, or unfolded, from its compact launch configuration. In a three-day ballet in space that the MCC team performs 100 percent accurately, all of the solar arrays, antennas, sensors and radiator heat panels are deployed in prearranged order. Relatively low-tech, spring-loaded mechanisms and centrifugal force do most of the job. The goal—in the case of the WGS satellite—is for the satellite to unfold smoothly and orient itself so its antennas are pointing toward Earth and its solar arrays are tracking the sun.

Next, another type of thruster takes over for the long haul out to geosynchronous orbit, 22,300 miles (35,900 kilometers) above Earth. The Xenon Ion Propulsion System

PHOTO: (LEFT) In April, the United Launch Alliance Atlas V rocket carried the WGS-2 satellite to space. Following the satellite's separation from the rocket, engineers at Boeing's new Mission Control Center took command. PATRICK CORKERY/UNITED LAUNCH ALLIANCE

PHOTO: Eric Barnett, Wideband Global SATCOM mission director, sits at the controls at the new Boeing Mission Control Center in El Segundo, Calif.
DANA K. REIMER/BOEING

engines use electricity supplied by the solar panels to fire high-speed particles (called ions) of xenon gas out of a thruster, like a micro-sized jet. The engines produce very low levels of thrust, but they are highly fuel-efficient. So efficient, that WGS can carry enough fuel to burn 24 hours a day for 30 days and still have enough for stationkeeping during its 12-year contractual life.

The final stage of the satellite launch process involves in-orbit payload tests to make sure the satellite works as designed. Antennas, the communications payload and electronics are tested to be sure the patterns they project on the Earth's surface are what the designers intended, and that everything is in working order.

In the case of the WGS satellite, the whole process took less than three months from the time the satellite separated from the rocket on April 3 to its handoff to the U.S. Air Force on June 15, ready for many years of service.

But Boeing employees at the MCC didn't have time to pop open bottles of champagne. WGS-3 is waiting to be launched. It is the third of six WGS satellites Boeing is building for the Air Force over the next three years. The $1.8 billion constellation is scheduled to be completed in 2012. ■

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New satellite nerve center

For many U.S. Department of Defense and commercial programs, precision satellite control work is carried out from Boeing's newly built Mission Control Center in El Segundo, Calif.

Chris Cutroneo, flight and controls manager in charge of the MCC, and his team led the redesign of the building. Cutroneo said this new satellite control hub will help ensure there are no failures on the ground that could affect the satellite in orbit. "We planned this building very carefully, from the air conditioning to the cable connectors between our computers and ground stations around the globe," Cutroneo said.

There are multiple customer support rooms where engineers provide dedicated, around-the-clock assistance to individual customers' satellite programs. Rooms can be custom-fit for a particular customer in just a few days. In the past this exchange took weeks.

The center also is extremely flexible for meeting customer needs. Wiring is run through specially designed hatches between the satellite operations rooms and two separate computer server rooms—one for government programs and one for commercial or civil programs. "When we have a government customer mission, we open the hatch, connect up the cables and we're ready to go with our U.S. Department of Defense operations," Cutroneo said. "When it's over, we pull those cables back in, shut the hatch and, with a few minor changes, we're ready for commercial operations."

– Dave Garlick

PHOTOS: (TOP) The new Boeing Mission Control Center in El Segundo, Calif. **DANA K. REIMER/BOEING**

(LEFT) Chris Cutroneo, flight and controls manager in charge of Space and Intelligence Systems' MCC, at the new facility.
SALLY ARISTI/BOEING

Global corporate citizenship refers to the work Boeing does—both as a company and through its employees—to improve the world. This ad illustrates Boeing's commitment to all the teachers who encourage students to learn from the world all around them.

One small step...
40 years ago

Boeing engineer talks with Apollo veterans about moon mission

PHOTOS: (ABOVE) Astronaut Edwin E. "Buzz" Aldrin Jr., Lunar Module (LM) pilot for the first lunar landing mission, is shown on the LM footpad during an Apollo 11 extravehicular activity on the lunar surface. He and astronaut Neil A. Armstrong, commander, descended in the LM *Eagle* to explore the Sea of Tranquility region of the moon while astronaut Michael Collins, Command Module pilot, remained with the *Columbia* Command and Service modules in lunar orbit. **(INSET)** A close-up view of an astronaut's boot-print in the lunar soil. NASA

By Melissa Mathews

When Neil Armstrong first set foot on the moon—40 years ago this summer on the Apollo 11 mission—it was a crowning achievement, and one that would not have been possible without The Boeing Company. Boeing and its heritage firms built nearly every major component that went into that "one small step."

In the words of Robert Gilruth, who then directed NASA's Manned Spacecraft Center, Apollo required "the kind of people who will not permit it to fail." (See related story on Mercury program, Page 8.)

At Cape Kennedy (as NASA's Kennedy Space Center, Fla., was then known), two newly hired Boeing employees were among those who accepted Gilruth's challenge. Norm Buchert took his first job out of engineering school with the space program, and Susan Floyd—just 17 years old when she joined the Gemini and Apollo efforts as a scheduler and data processor—was so inspired by her experiences that she went on to earn multiple degrees in computer science and engineering. Both still work for Boeing: Buchert as Boeing's director of Advanced Engineering for Florida Space Shuttle Operations and Floyd as senior manager of Systems Engineering. Recently, they shared their experiences with Natalie Dixon, a Boeing structural engineer who's working on the International Space Station program, as NASA once again eyes the moon.

PHOTOS: (TOP) Boeing space shuttle engineers and Apollo veterans Norm Buchert and Susan Floyd hold Buchert's Apollo Firing Room jacket from the Saturn rocket days. INDYNE **(ABOVE)** Boeing International Space Station engineer Natalie Dixon, who interviewed Buchert and Floyd. BOB FERGUSON/BOEING **(RIGHT)** Apollo 11 is launched from Kennedy Space Center on July 16, 1969. NASA

How did you come to work on the space program?

Buchert: I had been through five years of engineering school, but had no clue what being an aerospace engineer was all about. I took a summer job as a contractor at Kennedy Space Center, then in 1967 I was hired by North American Aviation [now part of Boeing] to work on the second stage of the Saturn V rocket as a radio-frequency and telemetry engineer.

I was hired on in the morning, and that evening NASA had the Apollo 1 fire, which killed three astronauts training for the first crewed Apollo mission. That shut the program down for about a year. From a new-hire standpoint, that gave me time to learn my new job.

Floyd: My father was the head of aircraft operations for NASA and I became interested in what was going on. I watched Mercury and Gemini and thought, yep, I want to be part of this. This is too good.

In 1966, I went to work for Douglas [now part of Boeing], as a data entry operator on the third stage of the Saturn V rocket. I supported hands-on engineering in a data entry role and reviewed engineering documents. I also met my husband, an electrical engineer and the only single man in that office. I got very interested in engineering and determined I was going to do that.

What's it like to watch Saturn V launch, compared with the space shuttle?

Buchert: If you look at the Saturn rocket, it looks like a skyscraper. You think, there is no way that vehicle is going to fly.

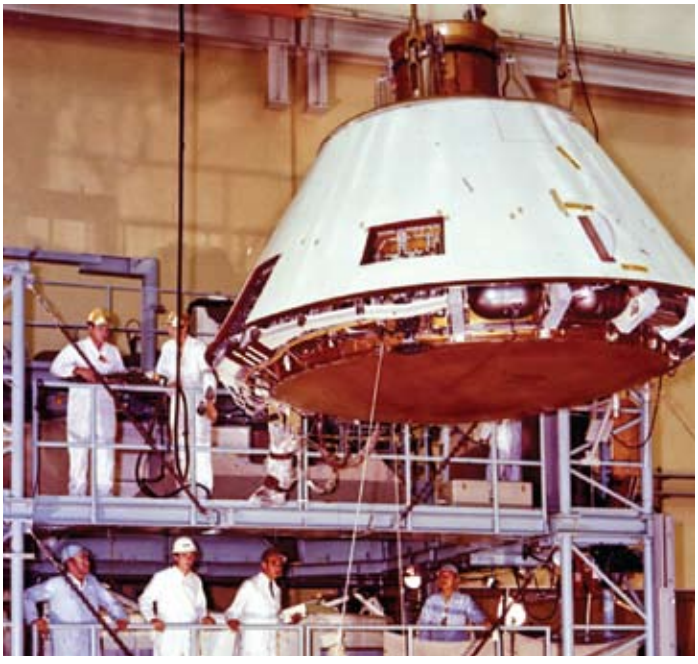
Floyd: My sentiments exactly.

Buchert: When it lights, it sort of sits there and rumbles and grumbles and shakes. When it's going up, you start to hear the extreme staccato, the pulsing. …

Floyd: You're thinking: C'mon, c'mon, you can do it.

What are your memories of Apollo 11?

Floyd: I was at home on maternity leave, lying on the couch



PHOTOS: (TOP) A special Boeing team, at what is now called Kennedy Space Center, monitored launch preparations for Apollo around the clock, ready to react should any emergency arise. **(ABOVE)** Work on Apollo began in the early 1960s. Boeing heritage company North American Aviation assembled the Command and Service modules at its Downey, Calif., plant, with astronauts dropping by to assist with cockpit design and component testing. A separate NAA facility at Seal Beach, Calif., manufactured the Saturn second stage. BOEING ARCHIVES

watching every minute of it while my husband was at Mission Control in Houston. It still makes me cry today. It was so exciting and so unbelievable that we were able to do it. There was such a can-do attitude. … Nothing we couldn't accomplish.

Buchert: My work group was responsible for all the data for the Saturn V second stage. One of my jobs was to be on the console in the "firing room" for launch. Suddenly, we had a loss of data synchronization—we lost data.

I was somehow chosen to go to the launch pad at night to climb inside the inter-stage of the fully tanked fueled vehicle to pull out one of the black boxes to remove and replace. It was almost like a day in Hades. Hydrogen was venting to the burn pond—and when hydrogen gas from a Saturn vehicle vents, it's not minor. The vehicle was groaning. It was alive.

By that point in the launch sequence, all of the protective platforms had been removed. We had no tethers. …

Floyd: Oh, they'd never let you do that today!

Buchert: But the intensity to launch was so great. Nothing was going to stop it.

For the Apollo 11 launch, there were 450 of us in the firing room. All of the contractors were given "ice cream" jackets [similar to the shirts worn by ice cream vendors in the 1950s and '60s] to identify us. We joked a lot about those jackets. I still have mine! And my skinny tie. …

Since I worked on the rocket, once the second stage burned at launch for about six and a half minutes, our job was over. There was a great sense of relief. We were all glued to our TVs for the moon landing, of course, but my team had already celebrated.

Norm mentioned his experience changing out the data box. What are some other differences between then and now?

Floyd: Early on in Apollo, when I was working on the Saturn V third stage, our procedures were not nearly as strict as they are today. We were allowed to use a lot more ingenuity. Once on the late shift, we encountered a problem trying to run a test. The engineer working the problem needed an adhesive material, and he couldn't find any. So he used bubble gum. Today, we'd never be allowed to use bubble gum.

Buchert: Back then, you never heard the word "budget." It was never a consideration. It was all about schedule and safety. We didn't think about 10-hour workdays—that was normal—or working six or seven days a week. The message was, "Get the job done, and get it right."

What has it meant for you to work on the space program for Boeing?

Buchert: In my office on the front door, I have the decal that says, "If it ain't Boeing I ain't going." Looking back and seeing what Boeing did, and the importance of buying into a vibrant space business—that's something that no one else can match.

Floyd: I am a space girl and moved where the contract went. When I told my dad I was going to work for Boeing—he was a World War II pilot and knew their planes—he said, "Girl, you finally got it right!" ■

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Apollo
up close

"Apollo taught us that if you dream something and you've got enough people with the desire, talent and can-do attitude, you can make it happen."

– Mike Lombardi, Boeing historian

Apollo 11 was the fifth crewed mission of the Apollo Program, the third human voyage to the moon and the first to land. Astronauts Neil A. Armstrong and Edwin E. "Buzz" Aldrin Jr. set foot on the lunar surface July 20, 1969, while crewmate Michael Collins piloted the North American Aviation–built Command Module from the moon's orbit.

Boeing built the first-stage of the mammoth Saturn V rocket that launched the Apollo astronauts in New Orleans. The second and third stages were built by heritage companies North American Aviation and McDonnell Douglas in California. The three stages were shipped to Florida to be joined.

Along with all three stages of the Saturn V, Boeing and its heritage firms also built the robotic probes that preceded the manned missions, the Apollo Command and Service modules, as well as the lunar rovers that helped astronauts travel on the moon's surface.

Now that NASA is making plans to return humans to the moon, it is relying on the kind of expertise Boeing brings from Apollo and its successor spaceflight programs, such as the Space Shuttle. Boeing already has been chosen to build the upper stage and complex avionics of the Ares I, the rocket planned to carry astronauts back to the moon as part of the next-generation Constellation Program.

As Boeing historian Mike Lombardi said, "Apollo taught us that if you dream something and you've got enough people with the desire, talent and can-do attitude, you can make it happen. That's what Apollo was all about, and I think that's what Boeing is all about."

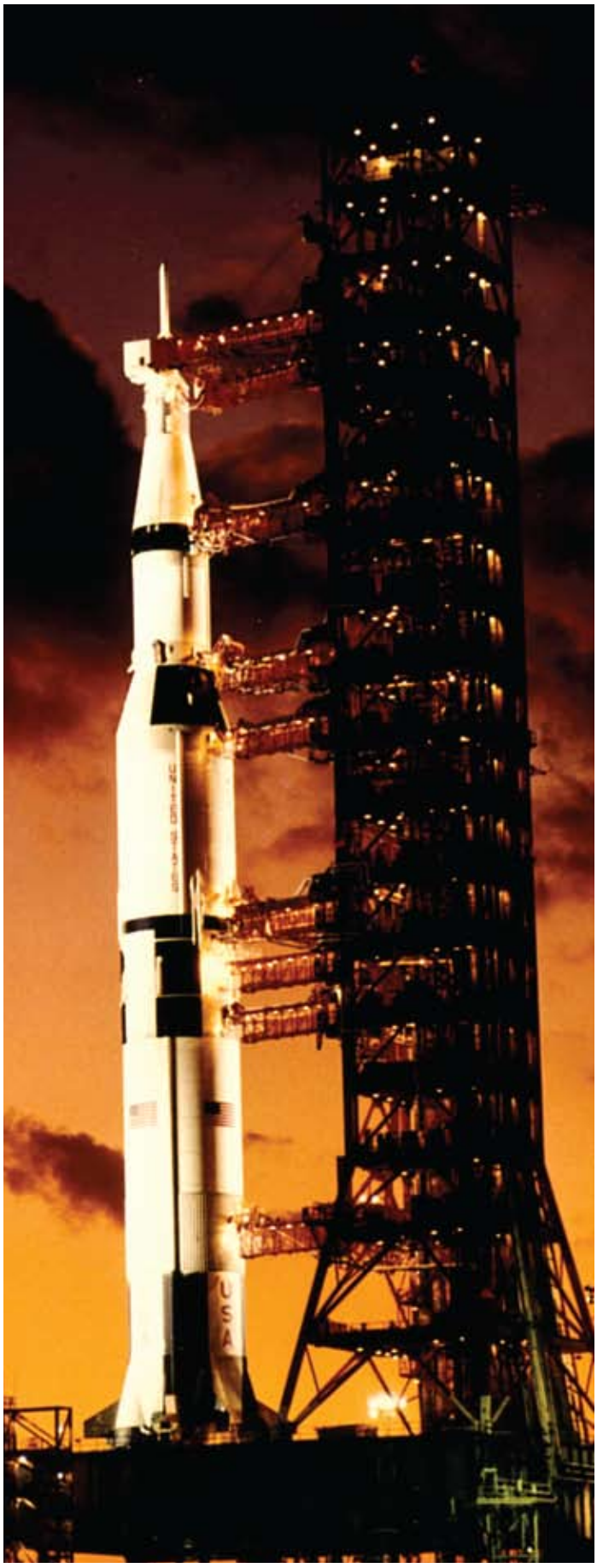
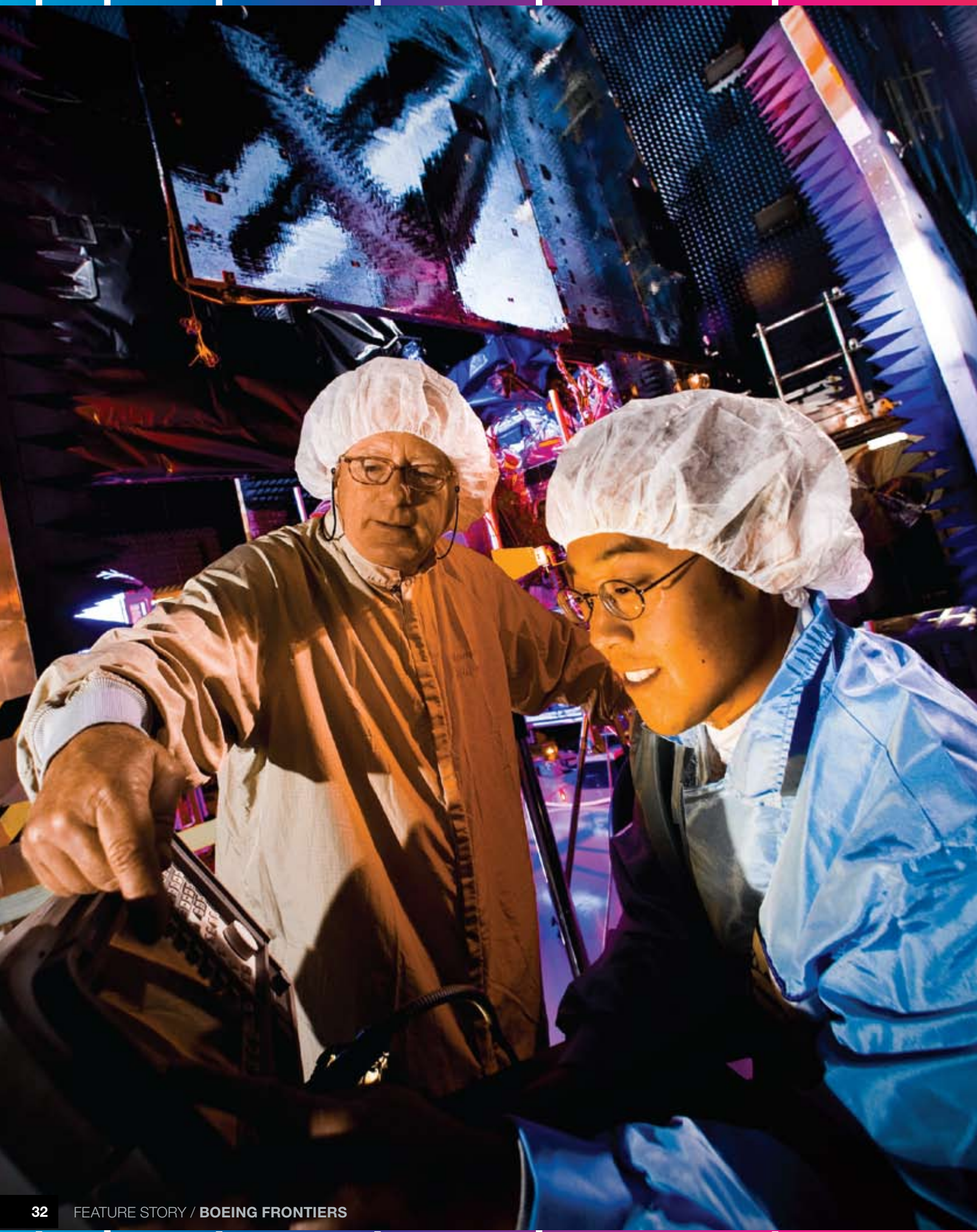


PHOTO: Boeing, McDonnell Douglas and North American Aviation collaborated on the 363-foot- (111-meter-) tall Saturn V rocket that propelled the Apollo spacecraft to the moon in 1969. BOEING



Linking the world

Radio-frequency assets are precious and omnipresent

By Eric Fetters-Walp

Frequency Management Services may be tiny—fewer than three dozen people—but its impact extends throughout Boeing and beyond.

Anything at Boeing that uses radio-frequency (RF) spectrum, from wireless microphones to the next generation of airplanes to satellites, is of concern to Shared Services Group's FMS. The team's tasks vary from the crucial role of representing Boeing on the international radiocommunication regulatory stage to the nitty-gritty of helping departments order the correct two-way radios.

"The rapid pace of technological change in Boeing heightens the company's need to strategically plan for and manage its RF assets and requirements, as well as to preserve and advance its competitive position," said John Herpy, leader of strategy and systems for FMS.

All of FMS' efforts are aimed at making sure Boeing protects a valuable asset—one that it needs to successfully operate and grow. "The company holds licenses to use radio spectrum with an estimated market value of at least $20 billion, and its use could be put in jeopardy if Boeing doesn't operate it in compliance with U.S. and international regulations," said Mohamed El Amin, director of regulatory policy and international spectrum management. Located in London, he leads an international team that promotes and protects Boeing's spectrum interests around the globe.

As Mike Kato, senior manager of FMS, puts it: "We're involved just about everywhere. Spectrum is used on the factory floor, inside the products Boeing makes, on the launch pad and at flight-test ranges. But for all its importance to the company, the role of RF spectrum management is largely unknown."

Which is why FMS wants Boeing employees to know how it can help early on in the development and approval of anything that uses radio frequencies. Too often, the team's assistance in gaining needed regulatory authorizations for RF spectrum use is an afterthought, said Audrey Allison, director of FMS. "We could be helping them at an earlier stage in their schedule, but we can't if we don't know who they are or what they need."

PHOTO: SkyTerra test engineer James Tan (right) reviews data at the Boeing satellite production site in El Segundo, Calif., with Tim Cooper, electromagnetics technician in Frequency Management Services, to ensure a spacecraft's Ku-band antenna is compliant with FCC radio-frequency emission regulations.
PAUL PINNER/BOEING, GLADYS WICKERING/BOEING

PHOTO: Frequency Management Services uses tools like the spectrum analyzer shown here as an integral part of the radio-frequency asset protection and regulatory compliance processes. PAUL PINNER/BOEING, GLADYS WICKERING/BOEING

In the past five years, FMS has established a new Consolidated Frequency Management System, which has helped the team in authorizing the use of RF spectrum and equipment and ensuring the company's compliance in using that spectrum. With the processes to carry out those two missions in place, FMS is focused on its third mission: educating employees on the importance of RF at Boeing.

"We can gain a competitive advantage for the company if we create an environment of collaboration, education and strategic alignment," Herpy said. "We've already begun to see a shift in recognition of the importance of spectrum at Boeing."

Allison said she hopes increased awareness of FMS' missions will lead product teams to consider any RF spectrum issues early on in development. For example, it has worked extensively with the engineering teams on the new 787 Dreamliner, which incorporates a range of wireless-enabled devices not present on previous airplanes, including a wireless system designed

> "We can gain a competitive advantage for the company if we create an environment of collaboration, education and strategic alignment."
>
> *– John Herpy, FMS strategy and systems lead*

to support a range of maintenance activities.

In that case, FMS got involved early in the process. That doesn't always happen, which can lead to delays. "If we have to get an authorization quickly, it's not easy, because the regulatory process can move at a glacial pace," Allison said. Moreover, new technologies Boeing develops may require new spectrum allocations, equipment standards and associated regulatory requirements in common around the world.

FMS' work to raise RF spectrum compliance within Boeing includes its establishment four years ago of the Spectrum Governance Council, which serves as an internal governing and strategy body and includes representatives of all the business units. Outside the company, the team takes an active role in the International Telecommunication Union and its periodic World Radiocommunication Conferences, where global spectrum regulations are discussed and decided. At the last conference two years ago, Allison and other Boeing representatives sought additional spectrum for flight-test operations and unmanned aerial vehicles while improving regulations for satellite systems and defending satellite spectrum from reallocation for other uses.

Regulatory issues in the halls of government or at international conferences may not immediately affect most Boeing employees, but RF compliance is something that everyone should consider. Compliance is everyone's responsibility, said Kato, adding that everyday office items, such as microwave ovens and wireless headsets, can cause interference with Boeing's wireless communications network and essential factory floor operations. Employees should consult the FMS informational Web site at http://cfms.web.boeing.com on the Boeing intranet when they have questions, he said.

"Spectrum is such an essential element of what Boeing is doing," Allison added. "As technology continues to evolve in this direction, access to spectrum is becoming ever more central to our ability to grow and remain competitive." ■

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PHOTO: Joe Cramer, U.S. regional director for regulatory policy and international spectrum management, is shown at the World Radiocommunication Conference in Geneva in 2007. Boeing plays an active role at such conferences to preserve its capability to obtain needed spectrum resources to support current and future products operating around the globe. STAN JENKINS/BOEING

Managing the invisible risk

More and more, wireless technologies are integrating not only into our personal devices but into Boeing facilities, systems and products. As that demand increases, keeping track of the myriad resulting radio waves would seem impossible. Yet, for production environments that rely on wireless, such as the 787 Program, it has become mission critical.

While unseen, the radio waves emitted from the many wireless devices, systems and products in use today clutter the space around us like a busy interstate. And any of those waves in the radio-frequency (RF) spectrum can unintentionally interrupt or be intercepted by devices operating on the same frequency, causing significant issues such as corruption of digitally transmitted data, especially in critical production areas. This type of harmful interference can be avoided with careful coordination with the Frequency Management Services group of Shared Services.

The Federal Communications Commission governs all such RF devices, including those operating in the popular 900 MHz, 2.4 GHz and 5.7 GHz bands. However, many wireless devices currently in use across Boeing operate in what is called the "unlicensed spectrum"—frequencies that are not regulated by the FCC and do not have a licensing requirement.

That keeps Boeing's Unlicensed Radio Operations Committee (UROC) worried—and busy. Frequency Management Services' Spectrum Governance Council chartered the UROC Spectrum Coordinating Committee in 2007. Its job is to reduce risk by identifying the many unlicensed wireless devices and frequencies in use on Boeing property and bring them into compliance.

Last year, UROC's work became a little easier with the introduction of spectrum analyzers. With readouts resembling those of a Star Trek "tricorder," these devices allow technicians to see and analyze the various signals using the unlicensed spectrum. The capability has enabled better spectrum management decisions, reducing risk and improving efficiency along the way.

The UROC team continues to monitor and identify unlicensed wireless technologies and bring them into compliance.

– Kenn Johnson

All on the same wavelength

More than 50 years of radio-frequency spectrum use at Boeing

When one thinks of the contributions made by Boeing to the advancement of flight and aerospace technology, one of the last things that may come to mind are radios and radio frequencies. Yet the development of secure air-to-ground communications and the management of radio frequencies are a critical part of aerospace technology—especially considering the rapid expansion of new technologies aboard defense, space and commercial platforms and our reliance on wireless communications in today's society.

Indeed, management of the airwaves is one more field in which Boeing has been a pioneer and continues to lead the way for the aerospace industry.

Radio communication in airplanes began around the time of World War I. Early ground-to-air communication was unreliable and greatly affected by engine noise and other interference. Also, early communication systems relied on wireless telegraphs that required a radio operator—hardly an option for a single-crew mail plane.

In 1927, William Boeing was starting his own airline, Boeing Air Transport. He quickly saw the need for reliable ground-to-air communication to increase safety and improve airline efficiency.

Fortunately for Boeing a close friend, Thorpe Hiscock, was an avid radio enthusiast. During a dinner conversation with Boeing, Hiscock described his belief that a reliable and practical system of radio communications could be developed for Boeing's new airline.

PHOTO: Thorpe Hiscock developed a reliable and practical system of radio communications for Boeing Air Transport in 1928. BOEING ARCHIVES

Boeing hired Hiscock as the communications engineer for Boeing Air Transport and put him to work on his theory. His work would lead him to be recognized as the inventor of reliable aircraft radios.

In 1928, Hiscock and fellow Boeing engineers packed radio equipment into a truck and went cross-country testing different wavelengths and power settings to discover what would be most effective for short-wave reception and most useful for airline operations. Hiscock then loaded his radio equipment into a Boeing Model 40B and discovered how to shield the radio from interference on board the plane, especially from the engine's ignition system.

PHOTO: Atop the Boeing Flight Test hangar at Boeing Field in Seattle, Boeing Flight Test Radio employees support B-52 flight test operations in 1955. BOEING ARCHIVES

Hiscock worked through a number of challenges, but finally returned to Boeing with an announcement of success. The company took out patents on the radio equipment and enlisted Western Electric to manufacture radio sets for its airplanes.

Other fledgling airlines followed Boeing Air Transport in setting up a cross-country system of radio communications. It soon became evident that coordination was needed to avoid duplication of ground equipment and labor. There also was a need for some form of central administration to oversee the use of the limited number of frequencies that had been made available to airlines through the Federal Radio Commission (known as the Federal Communications Commission today). In order to accomplish these tasks, the FRC chartered Aeronautical

PHOTO: Boeing Air Transport pilot Eddie Allen with the Model 40B used by Thorp Hiscock during the successful test of two-way, ground-to-air radio communications. BOEING ARCHIVES

Radio Incorporated (known as ARINC today) with Boeing's own Thorpe Hiscock as one of the agency's directors, and Boeing one of the stockholders.

The current Boeing organization that manages the airwaves for the company—Frequency Management Services—traces its beginning to a memo dated April 18, 1948. It gave responsibility to coordinate the company's radio work to the Flight Test Equipment Group in order to avoid "the splendid confusion which seems to accompany radio installation and operations" at Boeing.

The group's original charter was to provide ground-to-air communications for flight-test and production aircraft, remote station operation and flight-plan filing, as well as flight-test monitoring and data transmission. The group was also responsible for coordinating station and operator licensing and frequency allocation.

In 1950, the Boeing radio organization was consolidated at the Hangar 1 tower at North Boeing Field in Seattle. In 1954, it was moved to a tower atop the then-new B-52 hangar at the field, 92 feet (28 meters) and 132 steps above the flight-test apron.

The facility, with its array of radio equipment, allowed engineers to collect flight data telemetry that greatly increased the efficiency of flight testing for the B-52 program and all Boeing commercial jet flight-test programs that followed.

In 1984, the Frequency Management organization was officially separated from the Flight Test Radio Group. Today, its challenges include dealing with an exponential increase in the demand for use of the radio-frequency spectrum, along with greater complexity and variety of products and services that depend on control of the airwaves. It also is responsible for the complex political negotiations with international partners, competitors and regulators necessary to secure unfettered global spectrum access that allows Boeing products and operations to perform with precision as they span the globe and reach into space.

– Mike Lombardi

Making waves

787 Dreamliner boasts newest wireless technologies

More than 90 years after radios first flew aboard airplanes to allow air-to-ground communications, radio-enabled technology performs a wide array of functions on modern jetliners.

That's truer than ever on Boeing's newest model, and Commercial Airplanes and Frequency Management Services have worked closely together as the 787 Dreamliner has taken shape. The Boeing 787 Dreamliner offers an innovative wireless maintenance system that allows airline crews to run tests between flights and determine what maintenance is needed while moving around the airplane. The same wireless network is used to provide access to the maintenance documents/manuals and to support airline, aircraft, crew and ramp activities.

"FMS expertise has been invaluable to the Onboard Wireless Integration team and the Systems groups and suppliers we support," said Milad Moss, senior project manager at the Cabin and Network Systems Technology Center in Everett, Wash.

"BCA relied heavily on FMS to help develop an action plan that would enable us to access the required spectrum to support a variety of wireless airplane applications," Moss said.

To implement the action plan, FMS worked with regulatory agencies all over the world. In parts of the globe where spectrum rules are incompatible with Commercial Airplanes' requirements, the FMS team is working to modify those rules.

"As wireless technologies continue to evolve, and the aviation industry demands more wireless systems installed on board aircraft, there will be more opportunities and need for FMS support of [Commercial Airplanes'] projects," she said.

– Eric Fetters-Walp

PHOTO: Milad Moss, senior project manager at the Cabin and Network Systems Technology Center in Everett, Wash., worked with Frequency Management Services on the wireless systems installed in the 787 Dreamliner, seen in the background. GAIL HANUSA/BOEING

Defending the peace with wireless

FMS provides critical support to IDS programs

The watchful eyes and ears of Boeing-built defense satellites and unmanned aerial vehicles would be useless without radio-frequency (RF) spectrum.

Just to operate Integrated Defense Systems' Boeing Broadband SatCom Network, Frequency Management Services maintains 175 spectrum authorizations. Without spectrum licenses, those satellites would be of little value, said Mike Turner, program manager for the Boeing Broadband SatCom Network.

"Our competitive advantages include expert operations personnel, superior engineering talent and a Frequency Management team that ensures we have licenses to operate around the globe," Turner said. "The ongoing work that FMS does to ensure we maintain our operating licenses and to elevate the status of our frequency allocation helps to protect our current service and provides opportunities for Boeing to expand our broadband communication capabilities."

A wide array of sophisticated IDS aircraft and products use RF spectrum for communications, navigation and targeting. For example, FMS supports ScanEagle—an unmanned intelligence, surveillance and reconnaissance system operated by the U.S. Navy and others—by working with Insitu, a wholly owned Boeing subsidiary. (See related story on unmanned aerial systems, Page 14).

"The FMS team plays a business-critical role in furnishing licenses, advice and regulatory compliance material that not only enables Boeing's [unmanned aerial systems] to be operated effectively and efficiently but also helps avoid costly penalties for any transgression of these sometimes very vague and complicated laws," said Jed Sturman, director, Unmanned Airborne Systems Policy & Regulatory Compliance, Phantom Works, IDS.

FMS employees help provide the required access and authorization to operate in RF spectrum used for the ScanEagle's command and control capabilities and to downlink data from multiple onboard sensors, wherever the ScanEagle is operated. Additionally, FMS helps secure the approval and compliance of onboard equipment and the authorization to radiate wireless signals within the continental United States.

PHOTO: Jim McClanahan, Insitu production shop team lead, secures the engine fairing on a ScanEagle, one of many Boeing programs that rely on radio-frequency spectrum. DOUG CANTWELL/BOEING

PHOTO: Frequency Management Services supports the F/A-18 Super Hornet Program, which uses radio-frequency spectrum for testing. RICHARD RAU/BOEING

"Given the finite nature of available RF spectrum, the FMS team does a superb job in providing technical, regulatory and licensing support and advice that assures this connectivity is, wherever possible, available at the right time, in the right form," Sturman added.

The Boeing-built F/A-18 and F-15 jet fighters aren't controlled via radio-transmitted commands like an unmanned aerial vehicle, of course, but RF spectrum is just as crucial to them, said Ron Ridderbos, senior manager of electrophysics at the IDS site in St. Louis. In addition to the numerous systems on board the F/A-18 and F-15 that use RF spectrum, much of the testing done in St. Louis to support delivery of these jets to customers involves RF spectrum. Coordination between FMS and IDS has improved in recent years, Ridderbos said.

"An effort has been made to involve FMS personnel in the avionics development process earlier so that there is a better understanding of requirements and future needs," he said.

"FMS personnel also have been working more closely with the programs by participating in key program meetings. As this focus on partnership between FMS and the programs has evolved, there has been a better understanding of spectrum requirements and the authorization process by program engineers."

As with Boeing's other business units, the coordination of RF spectrum authorizations has become increasingly important for IDS with incorporation of new technologies into its products. "The spectrum available to us and our hardware manufacturers continues to shrink, making effective spectrum management critical," Ridderbos said.

– Eric Fetters-Walp

Advantage: **Wireless**

Strategic use of wireless communications throughout company is critical to success

PHOTO: Sudhakar Shetty, Senior Technical Fellow for Airplane Systems, supports spectrum management. GAIL HANUSA/BOEING

Boeing's wireless computing networks, laser alignment systems for airplane production and emerging uses for radio-frequency (RF) identification tags all have something in common.

They use RF spectrum—meaning Shared Services Group Frequency Management Services has assisted with them.

"Wireless communications have become pervasive throughout Boeing, being applied internally to productivity improvement initiatives, environmental monitoring, intelligent tooling and factory floor communications, and in the products we sell and maintain for our customers," said James Farricker, Senior Technical Fellow and chief engineer for the Boeing Information Technology Computing & Network Organization. "Spectrum management is key to our ability to be able to provide Boeing a competitive advantage."

An important requirement for most of Boeing's electronic equipment—from radios to sensors to target acquisition systems—is that components successfully link to one another to function, Faye Francy said. She leads the Networked Systems Technology Domain, one of eight companywide technology groupings in Boeing's Enterprise Technology Strategy, designed to better integrate and focus Boeing's technology investments. Most of the time, that requires using radio frequencies without significant interference. FMS works to make sure that's possible, she said.

"The Networked Systems domain team has identified spectrum access and optimization as a critical capability for the enterprise, and we are collaborating with the FMS spectrum planning team to ensure we are investing in the right areas to protect the future," Francy said.

Farricker said the FMS team has supported a long list of projects in recent years, from coordinating the use of new 787 testing tools to planning for the introduction of autonomous guided vehicles in the 737 wing factory in Renton, Wash. In such cases, FMS helped early on to identify potential RF conflicts and interference problems. FMS also has helped various groups collaborate in deploying wireless systems throughout Boeing, he said.

Sudhakar Shetty, Senior Technical Fellow at Commercial Airplanes' Airplane Systems, said collaboration with FMS will further increase as wireless communications technology finds more applications across Boeing and its products.

"FMS is uniquely qualified to effectively address this issue at the corporate level to ensure a 'One Boeing' solution without duplications," said Shetty, who leads Commercial Airplanes' global network and wireless research strategies and technologies.

– Eric Fetters-Walp

Up and **running**

Radio system keeps production lines and services operating smoothly

PHOTO: Glenn McEachron, manager of Northwest Radio Services, leads a team that ensures that mission-critical mobile radio communications are online 24/7. ALAN MARTS/BOEING

Glenn McEachron oversees a communications system used by thousands of Boeing employees every day, from firefighters to crane operators sitting hundreds of feet above the Everett, Wash., production floor.

If the radio system were to fail, critical functions across Boeing's Puget Sound–area sites would be disrupted.

"It would actually interrupt airplane production, in addition to things like fire and security and flight-line testing," said McEachron, manager of Boeing's Northwest Radio Services.

McEachron's team, part of Shared Services Group, operates the company's portable and mobile radio network within a 90-mile (145-kilometer) stretch of the Puget Sound region. In that area alone there are 10,000 employee radios using 40 different frequencies to communicate. Northwest Radio Services also assists similar radio networks at other Boeing sites within the United States.

To ensure these systems keep operating effectively and lawfully, the team relies upon Frequency Management Services. "They make it easy for us. They take it upon themselves to renew our licenses and authorize the use of our entire radio system," McEachron said.

FMS currently is helping Northwest Radio Services switch its communications to new frequencies to reduce potential interference with emergency services frequencies. It is a major task that includes physically reprogramming thousands of radios and making sure the transition is performed in compliance with Federal Communications Commission regulations.

FMS plays a key role in ensuring the availability of our Northwest Radio Services' communications network, McEachron said. "They really provide a great deal of education on how to use our radios and frequencies lawfully and compliantly and how to operate without interfering with our communications. We depend on them tremendously."

– Eric Fetters-Walp

Glossary

Frequency Management Services deals with the technical world of radio-frequency (RF) signals and their regulation, which has a jargon all its own. Here are a few of the terms that Boeing employees interacting with FMS need to know:

Authority to Radiate: The government document that grants Boeing the permissions needed to legally radiate an RF signal. This permission is then managed by FMS, which provides an authorization memorandum to the specific user.

Compliance assessment: The process used by FMS to conduct RF spectrum assessments of Boeing sites and RF operations to evaluate regulatory compliance; assess compliance risks and recommend remedies and other corrective actions; and communicate regulations, standards and procedures to Boeing RF users.

Electromagnetic interference: "Harmful interference" and/or interference caused by devices that, intentionally or unintentionally, radiate electromagnetic energy that interrupts, obstructs, or otherwise degrades or limits the effective performance of telecommunications equipment or other electronic equipment within or adjacent to Boeing facilities.

Federal Communications Commission: An independent U.S. government agency reporting directly to Congress. The FCC is responsible for regulating the use of frequencies assigned to nonfederal government users.

International Telecommunication Union: The United Nations agency that coordinates global use of the RF and satellite orbits and establishes worldwide standards for communications systems.

License: The legal permission to radiate RF signals in free space.

National Telecommunications and Information Administration: Part of the U.S. Department of Commerce. NTIA is the U.S. president's principal adviser on telecommunications and information policy issues. It also is responsible for managing the use of U.S. government frequencies.

Radio-frequency spectrum: The portion of the electromagnetic spectrum between 9 kilohertz (kHz) and 400 gigahertz (GHz).

Radio-frequency device or equipment: A term used to describe any device, equipment or system component that's designed to intentionally transmit or receive electromagnetic energy. Although the term specifies "radio," it also includes radar, navigational aids, telemetry, video and other types of electronic equipment used in private, commercial and military communications systems. Typically, all such equipment used at Boeing must be cleared by FMS.

Regulatory compliance: This refers to fulfilling all the legal requirements that govern the use of RF spectrum and all the requirements outlined in Boeing procedures, specifically PRO-3271.

Wiki warehouse

How St. Louis Maintenance employees apply Web 2.0 technology to save costs

By Bill Seil

Two Boeing Shared Services Group Maintenance employees in St. Louis recently responded to a call to reduce costs by exploring the world of Web 2.0 technology. The result: a new online tool that is helping to shrink a budget gap and sparking ideas for new applications across the enterprise.

A "wiki," or collaborative online tool, created and populated by Joe Traversey and Michael Day, allows Site Services employees at Boeing St. Louis to list their excess Boeing-owned inventory—from light bulbs to expensive machinery—on a well-organized Web site. Cataloging these items is no small feat, since many of them are hidden away, and sometimes forgotten, at the huge plant.

Now, instead of immediately ordering new parts or equipment, St. Louis employees check the wiki, called HPWO Shared

What is a **wiki?**

A wiki is a collaborative online tool that allows multiple users to make additions and alterations. It takes advantage of the collective knowledge of interested parties to provide comprehensive information on various subjects. Like blogs, wikis are part of a new collection of online tools often referred to as Web 2.0.

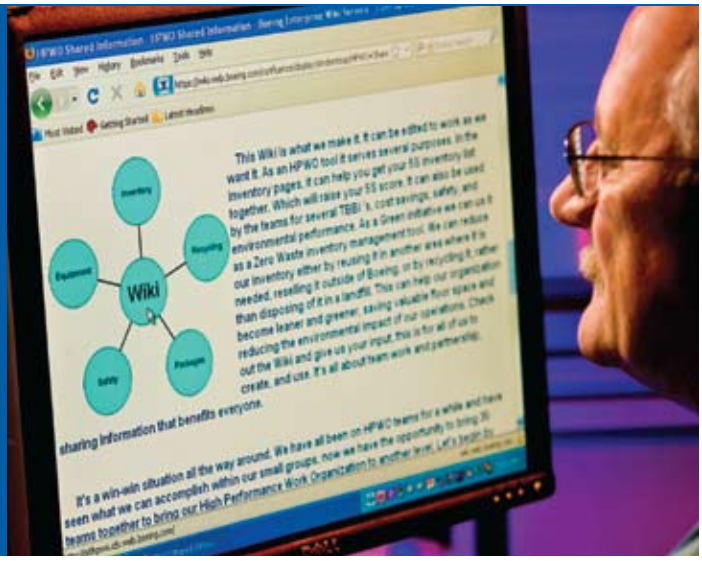

PHOTO: Frank Szwarc, a Maintenance electrician in St. Louis, reads information on the St. Louis Site Services wiki. In addition to listing excess inventory, the HPWO Shared Information wiki stores locations of routinely needed equipment. RON BOOKOUT/BOEING

Information, to see if the items are available from another group. Employees listing items can even insert links to photographs of the equipment they have available. Individuals viewing the site can request an item simply by typing in its name. Some of this now-visible inventory, no longer needed by the company, can be sold to outside businesses.

"It just kind of clicked that a wiki could be applied to the problem of excess inventory," said Traversey, a Maintenance pipe fitter in St. Louis. "Instead of sharing information individually, we could all communicate in a single forum."

While the financial impact of the wiki is still being calculated, the results are impressing management and Finance personnel. Craig Oberle, Business Management manager for Site Services, Midwest Region, estimates that the savings and cost avoidance benefits could exceed $500,000 this year alone.

As use of the tool spreads and becomes more sophisticated, the financial impact will be significantly higher, Oberle said. Maintenance crews are just beginning to enter data on excess equipment. Another feature of the wiki, documenting Maintenance facilities and procedures, will reduce the amount of time needed to complete jobs.

The wiki also will preserve essential information and practices by documenting the knowledge of experienced employees. Maintenance personnel are entering the locations of pumps, valves, electrical breakers and other equipment that Maintenance personnel routinely need to access. Photographs of the equipment also are posted. This allows new employees—or employees helping out from another location—to locate these items without tracking them down on foot.

Day also is excited by the wiki's prospects for making an environmental contribution. As excess inventory is identified and transferred to people who need it, there is less chance it will be thrown out. He said discussion around the wiki has helped to strengthen the group's environmental culture.

PHOTO: Michael Day, left, and Joe Traversey, Maintenance employees in St. Louis Site Services, examine equipment listed on the wiki they developed. RON BOOKOUT/BOEING

"We've got it set up now where nothing useful is likely to go in a Dumpster," he said. "If we can't find a use through the wiki, we're going to send it to Boeing Surplus."

Traversey admits he had little prior knowledge of wikis. He started researching Web 2.0 and online tools after attending a November 2008 all-employee meeting. At that meeting, Steve Gill, St. Louis and St. Charles Site Services director, announced the group was facing a major budget reduction. While management was able to identify more than $15 million in cost reductions, more cuts were needed. Jobs were on the line.

Gill challenged employees, particularly the site's High Performance Work Organizations, to propose ideas to reduce costs. HPWOs are employee engagement teams developed jointly by the company and the International Association of Machinists and Aerospace Workers.

Before stepping forward, Traversey took the idea to his longtime co-worker and friend, Michael Day. Day quickly started working on a concept and soon the two had a workable approach.

"The wiki is basically set up as a common-knowledge database," Day said. "The beauty of it is, anybody can go into it and add or remove information. That's not the case with a traditional database."

Their next step was to take the idea to their first-level management, as well as their colleagues in the HPWOs. They wanted to make sure that the wiki would not conflict with the activities of other groups within the company. When the time came to demonstrate the wiki to Gill, the tool was sufficiently developed to show its potential.

Gill said the wiki, along with other ideas proposed by the HPWOs, are making a major contribution to bringing the St. Louis Site Services budget in line. He said Traversey and Day went beyond their job descriptions to plan and develop the tool.

"They did all this on their own," he said. "All we did was give them a challenge." ■

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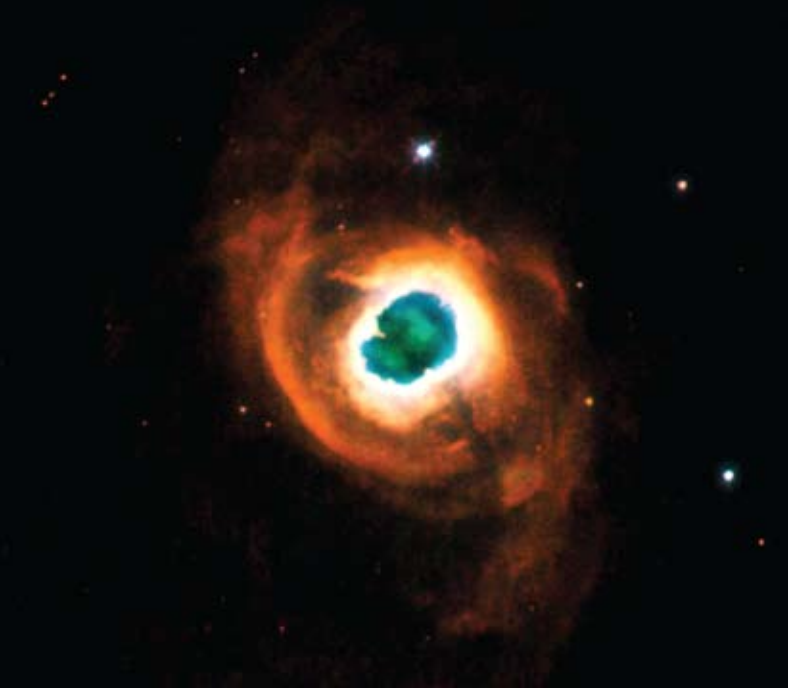


PHOTOS: (LEFT) This planetary nebula, located nearly 4,600 light-years from Earth, was imaged by the Hubble Space Telescope's longest-running optical camera before astronauts replaced it during May's servicing mission. **(RIGHT)** Astronaut Michael Good, STS-125 mission specialist, positioned at the end of Space Shuttle *Atlantis*' remote manipulator system, participates in an extravehicular activity to refurbish and upgrade the Hubble Space Telescope in May. NASA

Star power

Boeing employees support complex Hubble Space Telescope upgrade

By Ed Memi

With the completion of the recent Hubble Space Telescope servicing mission by the Space Shuttle *Atlantis* in late May, the telescope gained 70 times more imaging power and can continue its amazing exploration and imaging of the cosmos through at least 2014.

During the 13-day STS-125 mission, astronauts installed two new science instruments, six gyroscopes and six batteries and replaced or repaired two science instruments that had failed. The telescope now is undergoing calibrations and tests and should be ready for science observations in September. Originally launched in 1990, the large space-based observatory has revolutionized astronomy by providing unprecedented deep and clear views of the universe. This was the fifth and last shuttle servicing mission to the telescope, which is scheduled to be replaced by the James Webb Space Telescope.

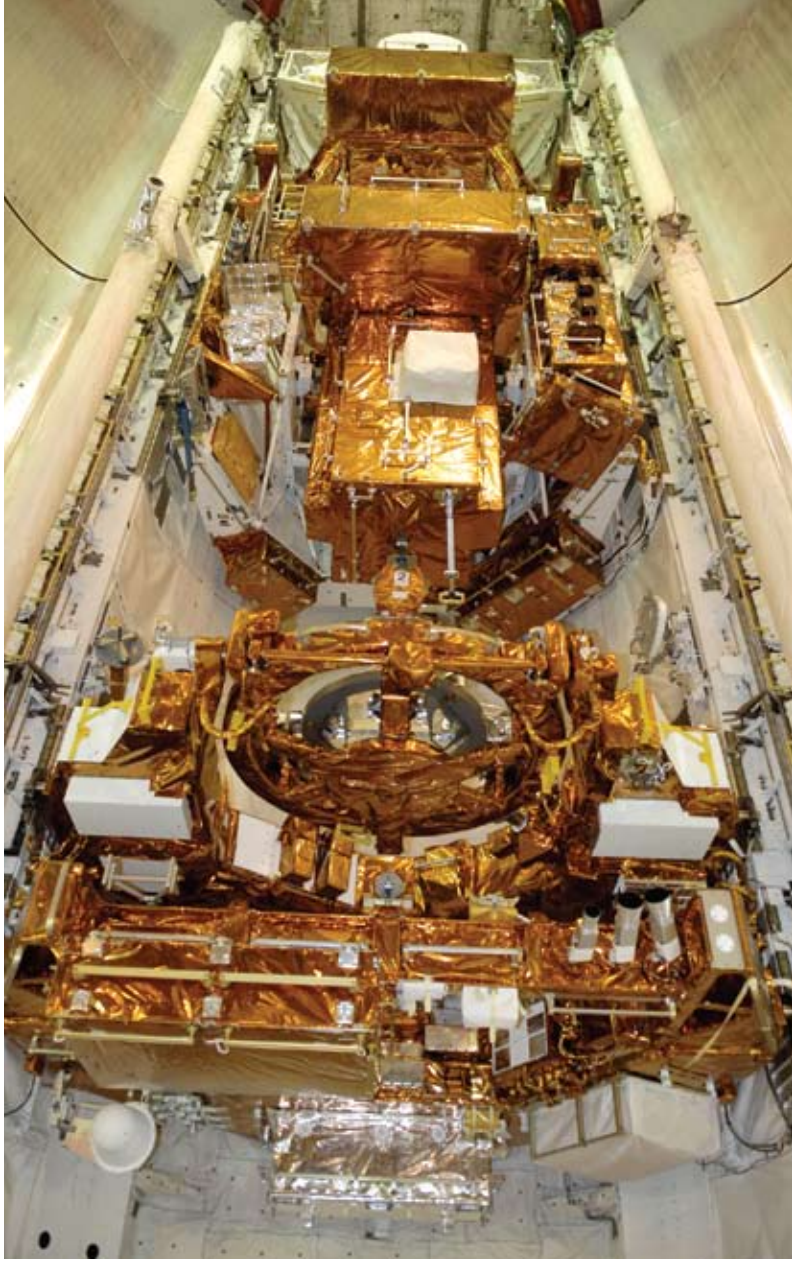
Sharing in the servicing mission's success are Boeing employees who worked to ensure, through proper testing of interfaces and data systems, that the telescope's newly installed science instruments, gyroscopes and batteries would perform flawlessly.

Boeing served as the primary integrator for four "carriers" that contained the hardware and tools for the mission. The carriers each provide multiple power and data hookups—all tested and verified by Boeing—that astronauts used after they grappled Hubble and pulled it into the shuttle's payload bay for repair.

The Boeing team delivered the carriers to the launch pad, maintained them and helped install them in the space shuttle's payload compartment for launch. Boeing engineers also designed exactly how the equipment for the mission would be installed in the payload bay.

Preparing for the servicing mission proved challenging. "Hubble uses pretty much every shuttle interface from power to KU band to X-band [communications]," said Mike Dahm, lead electrical and test engineer. His team spent three days on preflight tests compared with one day for a typical space station mission.

"This was probably the most challenging payload I have



> "This was probably the most challenging payload I have worked on, and it is much different than a space station payload. But Hubble has had such a profound impact on the scientific community that it is neat to be a part of it."
>
> *– David Thompson, Boeing payload lead engineer*

worked on, and it is much different than a space station payload," said David Thompson, a Boeing payload lead engineer. "But Hubble has had such a profound impact on the scientific community that it is neat to be a part of it."

Testing in late April mimicked the planned operation of the carriers, from berthing the telescope in the payload bay to conducting repairs on orbit and eventually releasing the Hubble.

"We have people in the flight deck of the orbiter during this testing, throwing switches and issuing onboard commands as if in orbit," said Kent Pearson, payload test conductor for STS-125.

"We have very complex data streams between the processors on board the payload elements and the space shuttle computers, both of which use different software developed by different people," Dahm said. Boeing also verified the connections that astronauts and ground teams would use during the mission to send data for analysis.

Joe Mounts, a flight software engineer who verifies the payload communications interface to the space shuttle orbiter, compares his work to plugging a telephone into the wall and checking the connection to make sure he can communicate with everyone on the outside. But unlike a phone, the orbiter interfaces to the payloads are highly specialized.

Summing up why he found this particular mission so exciting, Mounts said it's "because of all the science we are going to receive and the amazing pictures Hubble will produce." ■

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PHOTOS: (LEFT) Boeing's Mike Dahm (left), lead electrical engineer, and Joe Mounts, Flight Software, perform the Interface Verification Test in the Launch Control Center at NASA's Kennedy Space Center in Florida. INDYNE **(ABOVE)** Space Shuttle *Atlantis*' payload bay is filled with hardware for the STS-125 mission to service the Hubble Space Telescope in May. Boeing was the primary integrator for the four carriers that contained hardware and tools for the mission. NASA

Boeing Company – **BA**

NYSE: Industrials/Aerospace & Defense

As of 6/19/09

$48.44

Stock snapshot

52-week range:	
52-week high	**$77.80**
52-week low	**$29.05**

International competitors

EADS* – **EAD.PA**

As of 6/19/09	**€11.65**
52-week range:	
52-week high	**€16.68**
52-week low	**€8.12**

**prices in Euros*

U.S. stock indexes

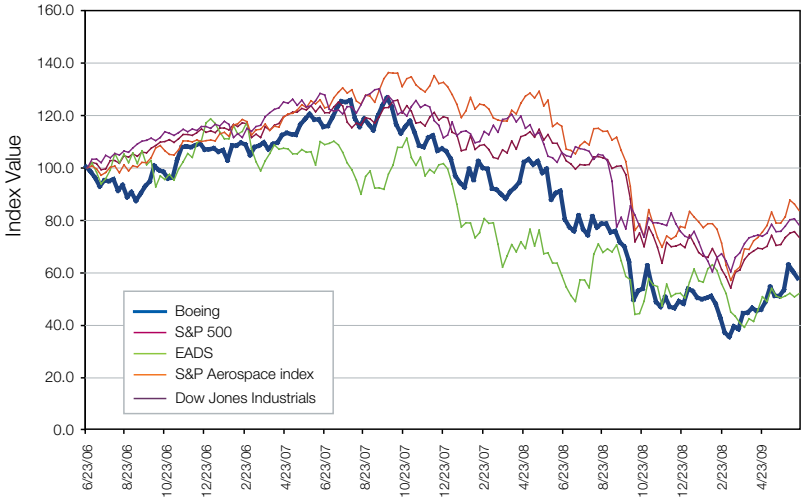
S&P 500	
As of 6/19/09	**921.23**
52-week range:	
52-week high	**1,347.66**
52-week low	**666.79**

S&P 500 Aerospace and Defense Index	
As of 6/19/09	**285.47**
52-week range:	
52-week high	**394.94**
52-week low	**194.13**

Dow Jones Industrials	
As of 6/19/09	**8,539.73**
52-week range:	
52-week high	**12,188.30**
52-week low	**6,440.08**

Stock price chart

The chart below shows the stock price of Boeing compared with other aerospace companies, the S&P 500 index, the S&P 500 Aerospace and Defense Index, and the Dow Jones Industrials. Prices/values are plotted as an index number. The base date for these prices/values is June 23, 2006, which generates three years of data. The prices/values on that date equal 100. In other words, an index of 120 represents a 20 percent improvement over the price/value on the base date. Each data point represents the end of a trading week.



Boeing stock, ShareValue Trust performance

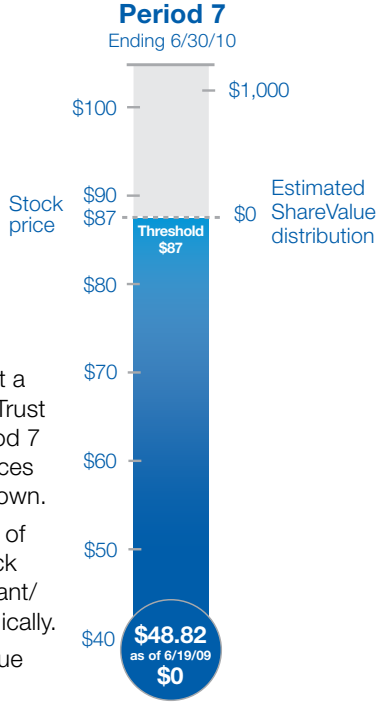
Sharevalue Trust is an employee incentive plan that allows eligible employees to share in the results of their efforts to increase shareholder value over the long term.

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

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

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

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



Milestones

SERVICE AWARDS: Boeing recognizes the following employees in July for their years of service.

50 years

Thomas Johnson
James Walker

45 years

Stephen Budden-bohm
John Gruss
Earl Hamilton
Douglas Huxsol
Joetta Komara
Larry Simpkin
Richard Underwood
Joy Viken

40 years

Jean Berkheiser
Gary Bingaman
Daniel Birkhead
Wilson Blackwell
Thomas Brackey
Rosalie Bradshaw
Jon Chaykowski
Guy Dailey
Lonnie Denney
Walter Dugopolski
Peter Ekrem
Eugene Field
David Findley
John Friebele
Rashad Greiss
David Hambly
Joseph Haney
Russell Hansen
Jimmy Howard
Robert Ingle
Beverly Johnson
Edgar Jones
Weston Lickiss
Steven Lindgren
Kenneth Ma
Michael Mcveigh
Walter Melson
Sharlene Puraty
Carlo Ruelos
Fernando Saenz
Carl Slater
Henry Stahl
Donald Steenrod
Deborah Talley
Robert Thompson
Bruce Welch
David Williams

35 years

Jeffrey Aimar
James Bainter
David Banks
Craig Battles
Clinton Bennett
Michael Blangy
Elmer Blevins
Raymond Borus
Harry Bray
Cynthia Brown
James Chasteen
Antoinette Chavez
Cheryl Chittenden
Larry Chitwood
Arthur Chmura
John Churchwell
Edmund Clapp
Jonathan Cotton
Bruce Csaniz
James Daniels
John Deere
Vincent Eng
Pasquale Evangelista
Robert Ferguson
Susan Fessler
Roger Fleming
John Foster
Diane Freeman
Richard Gibbs
Roger Glathar
Lorree Go
Irvin Granstrom
Bruce Graumann
Michael Griffith
Gervis Handke
Richard Haney
Richard Harris
Randy Harrod
Richard Heitman
Eric Helland
Guy Henderson
Susan Hintmann
Gary Hoff
Calvin Hoshibata
Bruce Howell
Jeffery Hughes
Ronald Jett
Brenda Johnson
Susan Jordan
Timothy Juneau
James Kamischke
Kirby Keller
Thomas Kerr
Timmy Kwan
David Lauenborg
Peter Lee
Albert Liere
John Lind
Diana Lopez
Barry Lovinger
John Mashak
Richard Mattern
Gregory Maulden
Linda McCafferty
Patrick McCollum
Vincent McFaddin
Thomas Mitchell
Alan Miwa
Daniel Morgenroth
Reginald Morris
John Muckerheide
Steven Naylor
Marlys Nelson
Richard Otis
David Patzwald
Deborah Paxhia
William Pearson
Gerald Perkins
Michael Pettit
Harry Pittman
Gregg Porter
Diane Portillo
Ronald Portillo
Michael Pringle
William Pugnetti
Michael Quase
Stanley Rayno
George Rodriguez
Carmin Rosenthal
John Rubalcava
Jack Ruffino
Gary Simpkins
Carolyn Sunde
Dottie Tafesse
David Taylor
Robert Thorson
Richard Tischner
Randall Trathen
Edward Van Every
Susan Vandervaart
Lynnda Walker
Thomas Walther
Willie Watson
James West
James Wheaton
Barbara Wilzen
Joel Winkler

30 years

David Adams
Venus Addy
Sue Allen
Frances Allison
Robert Altman
Bradley Anderson
Dale Anzai
Elizabeth Aponte
John Aresca
Bernard Armendariz
Mary Arnold
Rochellia Arreguine
Lucas Bacha
Darcia Bachmeier
Dennis Baird
Jonathan Baird
Ronnie Baker
Sandra Baker
Kayoomars Balbas
Robert Balthasar
Elizabeth Baltodano
Lavonne Bartel
Kenneth Bartie
Mark Bass
Robert Bayliss
Bruce Beadell
Susan Beam
Stephen Beardsley
Francis Beattie
Gail Beatty
Steven Beatty
Siamak Behroozian
Barry Belcher
Brian Belka
James Bello
Curtis Benner
Doreen Bennewitz
David Berube
Paul Boorman
Michael Bouchard
Bradley Bouma
Diego Bracero
Susan Bradley
Gloria Breslin
Terry Briggs
Darrell Brocious
Ronnie Brock
James Brown
Jay Brown
Marcus Brown
Michael Brown
William Bryant
Ernest Bunch
Bruce Bunin
Karen Byrd
Alan Campbell
Don Campbell
Jeffery Canedy
Elizabeth Cange
Todd Cantrell
William Cantwell
Marilee Capodanno
Ricky Catchings
Valerie Caughlin
Daniel Caven
Tina Cernansky
Frank Cessna
Lawrence Chalmers
Peter Chan
Ru-Chian Chang
Ofelia Chavez
Susan Chew
Phil Chi
Gary Chin
Victor Chin
Robert Chippeaux
Coy Chittenden
Brett Churchill
Ronald Cimmer
Chane Clark
Cynthia Clark
Neal Clark
Larry Coats
Rosamaria Cohen
Cary Collings
Terrence Crowe
John Cunningham
Jose Custodio
Frank David
Edward Davis
Maurine Davis
Robert Deadrick
Michael Dean
Karl Dearing
Krijn Dejonge
Stanley Delducco
Ricardo Dell
Robert Denham
Danny Dever
Patrick Devereaux
Rene Deweese
Michael Didonato
Steven Diorio
Gail Dobberthien
Lani Dodge
Carlos Donato
Bruce Donham
Samuel Dowell
Michael Droker
Jack Dunn
Steven Durick
Kim Durnwirth
Thad Dworkin
Stephen Dwyer
Willie Easton
Wendy Edwards
Randy Egolf
Paul Ellis
Darrell Entenman
Ila Evans-Thompson
Joseph Evers
Mark Extine
Bruce Eyerly
Thomas Falasco
Laurie Farmer
Roland Farrar
Raymond Feeser
Anne Feiertag
Bette Felton
Jack Fergus
John Ferguson
Linda Fetterman
Jack Finch
Timothy Fisher
John Fitzhugh
Jose Flores
Ronald Flores
Rosie Flores
Sonja Floyd
Frances Foster
Gregory Foster
Richard Fowler
Cecelia Frazier
Michael From
Donald Furlong
Diana Furst
Arceli-Angelina Gabriel
Jeffrey Gaffin
Donald Gebhardt
Stephen Gendro
James Gerdes
John Geyer
Kyriakos Gianotas
Mark Gibson
Denise Gilbert
Warren Gillespie
Claude Gilliam
Alan Glasscock
Thomas Gluszek
Frankie Gonsales
Brent Graham
Timothy Grangruth
Carl Granstrom
Bruce Grant
Thomas Gregg
Kiran Grewal
James Guffey
Merideth Guild
Kenneth Haeseler
Julie Hagerman
Brenda Hall
Stuart Hammond
Michael Hannan
Raymond Hansen
William Hardrath
Edward Harris
Robert Harris
Sasha Harsch
Richard Havner
Thomas Helsper
Kimpton Hemsarth
Philip Hendley
Gerald Henneman
Andrew Herdlevar
Michael Hersman
Mark Hilt
William Hoffert
Steven Hollis
Roger Houck
Barbara Hoyt
Michael Hughes
Richard Hunter
Kenneth Huotari
James Iliff
Mary Imperial
Ronald Jacobsen
Neil Jerstad
David Jeschke
Rickey Jimerson
Michael Johnson
Nancy Johnson
Thomas Johnson
Timothy Johnson
Charles Jones
David Jones
Robert Jones
Robert Jones
Stanley Jones
Deborah Jordan
Mark Jurchak
Fe-Ling Kao
Scott Kelley
Rick Kelly
Tonia Knutson
Michael Kompelien
Jean Kope
William Koperek
Steven Koplitz
Craig Koppelman
Michael Krattli
Cary Krivanek
Catherine Kurko
David Kwok
Linn La Roe
Deborah Landry
Diane Lane
David Lange
Eileen Lange
Thomas Largen
Aaron Lawson

Milestones

Steven Lay
Steven Layer
Chere Lee
Daniel Lefranc
Stephen Leong
Giacomo Licciardi
Mark Linquist
Mae Livingston
Michael Lloyd
James Lockert
Jose Lockett
Francis Lokaj
David Lombardy
Sammy Louie
Raymond Lucker
Stewart Lumb
Gregory Lund
Virgil Maas
Russel Mackie
Dirk Maher
Yvonne Malone-Hannans
Teresa Mandsager
Brian Marmon
Charles Marsh
Stephen Marsh
David Martel
Franklin Martin
Fernando Martinez
Daniel Mayer
Lecia Mayhew
John Mazur
Dwight McAfee
Joyce McClain
Thomas McCullough
Mary McGarry
Michael McGonigal
Dennis McKelvin
Robert McLees
Thomas Meehan
Robert Mensinger
David Mercado
Mark Merisko
Gary Merriman
Michael Merritt
Ronald Metz
Joseph Miceli
Michael Mikesell
Johnny Mitchell
Cesar Mizrahi
Kenneth Moe
Richard Monger
Mark Montana
Barbara Montgomery
John Moore
Ronald Morinishi
Monica Morth
Mark Mottle
Frederick Mueller
Donald Mullins
Michael Neilson
Todd Nelp
Michael Nelson
Andrew Newing
Casey Ng
Son Nguyen
Tony Nguyen
Keith Nielsen
Daniel Noteboom
Paul O'Boyle
Timothy O'Hara
Brian Ohman
David Okino
Alexander Oleson
James Opsata
Robert Orlowski
Kenneth Orpitelli
Dwight Oster
Robert Overby
James Ozimek
James Packard
Robert Pagel
Diana Palmer
Robert Palmisano
Frank Panuccio
Coleman Paramore
Chan Park
Chul Park
Will Parkins
David Parkman
Daniel Parsley
Charles Partridge
Francis Patota
Denise Patrick
Dale Pattison
Jerry Patton
Gregory Periard
Robert Perkins
Constantine Peroulias
Carl Petersen
Morris Pham
Jerry Pherigo
Ivan Phillips
David Pinedo
Tomas Pitti
Teresa Polk
Arthur Powell
Bruce Powers
Scott Praast
Julian Prabhu
Paul Pugh
Christian Pullen
John Punashot
Shahram Rahmani
William Ralph
Gloria Ramos
Kenneth Richardson
Randysue Robbins
David Robinett
Judy Roe
John Rothery
James Rowland
Richard Rubbo
Douglas Ruch
Arthur Rusche
Jonathan Russell
Lori Ryan
Angela Savoca
Michael Scheiern
Evelyn Schmitt
Michael Scholz
Kenneth Schulz
Kenneth Schuppan
Gary Seidenstricker
Skip Semenchuk
Douglas Serrill
Raymond Sewell
John Shearer
Kevin Sheely
Yvonne Simms
Richard Skiba
Ronald Slaminko
David Slockbower
Glen Smith
Scott Smith
Wiley Smith
Richard Smolskis
Terri Snowden
Haidar Sobh
Wesley Soper
Dean Sorenson
Shaughn Spreen
Edward Stasiewicz
William Stevens
Michael Stothers
Andrew Strodtbeck
Jarrett Stutzman
John Sullivan
Donald Sung
William Tafs
David Tamer
Robert Tarvin
David Taylor
Stephen Taylor
Robert Thomas
Amy Thompson
Marie Thompson
Daniel Timm
Kathey Toghiyany
Mark Tollan
Jeffrey Tomasin
Patrick Trine
Joy Turnbeaugh
Kenneth Umeda
Arne Utz
Manuel Valdez
Rodney Van Lue
James Vannest
Christopher Varga
Maria Victoria
Jacqueline Vizzoni
Marvin Wagner
Jack Wall
Julee Walsh
Michael Walters
Roger Webber
Stephen Webster
Mark Weller
Paul Wells
Steven Wells
Donald Westhoff
Dianne White
George White
Gerald Whites
Kenneth Wigger
Kristi Wilkinson
Ralph Willison
John Woo
Arthur Wood
Thomas Woods
Carol Woulf-Shaffer
Richard Yaeger
Cindy Yarbrough
Michael Yarwood
Steven Young
Leo Yuknevich
John Zito

25 years

Roger Ackeret
Craig Adams
Ronald Adams
Robert Adkisson
Antoine Alexander
Roy Alford
Dale Allen
Lindbergh Alonzo
David Amirehteshami
Dennis Anderson
Dwayne Anderson
Glen Araki
Dale Ascoli
Dean Ayres
Julien Baldwin
Cindy Balzer
Richard Baniak
Daniel Banker
Raymond Banks
Gary Bara
William Barks
Carl Barner
George Barnes
Ruben Barron
Kevin Baslee
David Baxter
John Baylon
Gareth Beale
Leon Beaver
Roger Beck
Valinda Beck
Kevin Bedynek
Carol Benner
Charles Berg
Alan Bernier
Thomas Binder
Michael Bingle
Cheryl Bitten
Barry Black
Phillip Blackmountain
George Blunt
Raymond Bodenhorn
Leonard Bodziony
Steven Boll
Roger Bowler
Arlen Bradley
Robert Brakke
Kris Brakken
Todd Branin
Mitchell Brannies
Paramjit Brar
David Brazil
Mark Breslich
Andrene Bresnan
James Brewer
Billy Brown
Jeffrey Brown
William Brown
George Bruer
Mike Bryant
Sean Burkland
David Burns
Christopher Busa
Paul Bussa
Gary Cadden
James Caldwell
Steven Calhoun
Fred Calvo
David Carlos
Paul Carpenter
Robert Carter
Kay Castonguay
Clinton Cava
Joseph Chan
Kenneth Chan
David Chandley
Vernon Chee
Carl Chihak
Melvin Ching
Jeremy Chou
Lisa Chow
Terry Christenson
Kenneth Clark
Stephen Clark
Karon Cogswell
Timothy Colligan
Eugene Coogan
David Cook
Thomas Cook
Wesley Cook
Vincent Cooney
Donald Corbett
Randal Corman
James Counsell
Allen Creek
Mark Cunningham
Richard Curran
Rolando Custodio
Shirley Dalpozzo
Teri Daniels
Penny Davis
Wanda Davis
John Decker
David Dell
Michael Delmas
Patricia Dowling
Mark Droegkamp
Clay Dubofsky
Robert Duffy
Darlene Duncan
Maureen Durand
George Durham
Brian Dwyer
Terry Edmonds
David Egaas
Patricia Elhoffer
Kenneth Engelhard
Steven Eslinger
Douglas Everly
Gregory Farmer
Russell Fay
Tony Filippone
David Fischer
David Fischer
Mark Fisher
Kevin Flack
Arthur Flores
Frank Foeller
Eric Ford
Gordon Forsberg
William Forsher
Gerald Frank
Paul Fullmer
Betty Garcia
Faustino Garcia
Joseph Geary
Elizabeth Gelston
Christopher Gibbons
Douglas Gilbert
Daniel Gilbertson
Jesse Gomez
Laura Gomez
Glenn Gosnell
Roger Goss
Katherine Gravendyk
Mark Graves
Randall Grossmann
Thomas Guinner
Martin Haag
Raymond Haddad
Joseph Hagar
Judith Hajek
Dennis Hall
Gerard Hall
David Hamada
John Hamilton
Lisha Haning
Ruth Hansen
Mark Harman
Daniel Harris
Kimberly Harrison
John Hasenpflug
Stephen Hauss
Esther Hayman
Harold Haywood
Diane Heidlebaugh
Gary Heinze
Thomas Helle
Joseph Hendrickson
James Henley
Harry Henshaw
Kenneth Henshaw
Gregory Hill
Math Hipp
Jerry Hobson
Kay Hoeffken
Thomas Hoff
Karen Hoffman
Peter Hoffman
Irva Holder
Alice Holmquist
Dorothy Hubbard
James Huebner
Scott Humphreys
Kenneth Hundt
Cynthia Hutchison
Martin Ingham
Richard Ingram
Ross Isaac
John Iwasaki
Cassandra Jackson
Joann Joe
Bennie Johnson
Brent Johnson
Eric Johnson
Frances Johnson
Robert Johnson
Robert Johnson
Shari Jones
William Judd
Ronald Kalles
Michael Kann
Matthew Kardell
Daniel Kellie

Milestones

Brian Kelly
John Kesselring
Robert Kimball
James Kinder
Lucille Kirschbaum
John Kittlaus
Craig Klunk
William Knight
Stuart Kobata
Gerald Koenig
Paul Koller
Marian Korenkiewicz
Leslie Kortcamp
Zane Kowal
Karen Kremkau
Kendall Krieg
Terrance Lahey
Kirk Landry
Christopher Lane
Gary Langenfeld
John Lapicki
Brian Larson
Craig Larson
Lynette Lawler
Michael Leahy
Carl Leck
Ronald Lee
Sandra Lee
Eric Levin
James Lewis
Hon-Chin Lin
Robert Linehan
Lee Liu
David Livergood
Charles Long
Thomas Mac Donald
Kim Mackey
Russell Malan
David Marcolina
Bret Marks
Marc Martin
Martha Martinez
Rogelio Martinez
Keith Mason
Richard Mayfield
Mitchell McCallister
Aura McClain
Edward McCoy
Kevin McDonald
Kirby McDonald
Kenneth McDowell
Craig McMinn
Paul McPherson
Robert Mead
Carol Medina
Ted Melancon
Michael Metz
Marlene Meyer
James Michel
Howard Miller
James Miller
Laura Miller
Scott Miller
Steven Mintle
Joseph Mirda
William Mitchell
Robert Moffat
Thomas Moore
Martha Mossman
Walter Nakamura
Daniel Nebres
Madalyn Nelson
Rod Nelson
Roger Nelson
Steven Neuwirth
Craig Newell
Carol Nguyen
Son Nguyen
Andrew Nieto
Bentley Northon
Dwight Nunamaker
Marylou Nye
Norman Oakes
Stephanie O'Connell
Anthony Olson
John O'Meara
Ardeshir Ostadazim
Kevin Ostick
David Parcels
Kenneth Parker
Trenton Parks
Randall Patrick
Marvin Patterson
Timothy Patterson
Kevin Pauketat
William Paulson
Jean Pearson
James Peck
Robert Pedraza
Carl Peper
Bettie Perigan
Ottie Perry
Russell Peters
Clifford Petersen
Roger Peterson
Tomas Petrik
Vaughn Pirlo
Thomas Posten
Andrew Price
Frank Prizio
Virginia Quant
Wing Quon
Robert Rader
Timothy Radle
Ramon Ramirez
Shirley Ray
Mary Rearden
Kelly Rehm
Tina Rempel
John Riedl
Karen Riggers
Norman Ring
Ronald Rivers
Patrick Roark
Scott Robins
George Robledo
Bill Rodgers
Kathy Romero
Glen Root
James Rosnow
Robert Ruggeri
Harold Runciman
Donald Rupchock
Carolyn Russell
Emily Ryan
Edgar Sagisi
Paul Salo
William Sanders
Dorothy Sandoval
Timothy Saunders
Steven Sawyer
Terence Sawyer
Mark Schermacher
Joseph Schnoebelen
John Schubert
Brian Scofield
Glenn Seehousz
Mitchell Sestile
James Seyer
Stephen Shannon
David Sharpe
John Shipway
Bryan Shiraishi
Arvin Shmilovich
Dennis Sieting
Daniel Siglin
Jason Siller
Brian Sills
Frank Simkins
John Simon
Vincent Simonetta
Deborah Skilton
Gregory Skruch
Clarence Smith
Dale Smith
Daniel Smith
David Smith
Jeffrey Smith
Kevin Smith
Oliver Smith
James Soash
Julianne Spoto
Kevin Standerfer
Sharon Standish
Cary Steinmetz
Kathryn Stewart
Guy Stratton
Kevin Stumborg
Jen-Yeu Su
Andrew Takamiya
David Talbot
Joseph Taylor
Kenneth Teasley
David Telstad
Timothy Thaler
Gary Thomas
William Thomas
Bernard Thompson
Zachary Thompson
Edward Ticknor
William Tiefenthaler
Karl Timm
Jorge Tizol
Jacqueline Tovar
Clark Travis
Jon Tremblay
Stacy Trunnell
Paul Turnbull
Thomas Turner
Russell Twine
Robert Ulen
Jun Um
Ross Vandeen
Joseph Vannier
Charles Vas
Adriana Vasquez
Martin Vigen
Debra Vinyard
David Vitale
Robin Vogler
Phyllis Volsen
Scott Vredenburg
Tien Vu
Steven Wadley
Clifford Wadlinger
Todd Waitz
Alan Walker
Charles Walker
Willie Walker
Patrick Walsh
Phyllis Walters
Patricia Wang
John Warfield
Daniel Watt
Lonnie Webb
Dave Wehrman
Mark Weyer
Violet Wilkey
Robert Williams
Mark Wilson
Evan Wipf
Michael Wise
Anthony Wissa
Linda Witmer
Susan Woodbury
Daniel Woodcock
Edwin Woodruff
Catherine Yan
Susan Ybarra
Mervyn Yearwood
Jay Yoshinaga
Jeffrey Young
Gene Yusypchuk
Angelo Zarbo
Ann Zuber
Daniel Zwickl

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

Paul Aaron, 27 years
Edward Alden, 20 years
James Anderson, 18 years
Etelvina Arnold, 32 years
June Augustine, 30 years
Denise Ayers, 34 years
Douglas Baker, 37 years
George Baker, 22 years
Richard Barger, 21 years
Frits Bastiaannet, 30 years
Charles Belt, 34 years
Clyde Beson, 25 years
Douglas Bialza, 9 years
Donald Biewer, 19 years
Linda Bigelow, 19 years
Linda Bishop, 34 years
Bradley Bittner, 22 years
Thomas Blanchard, 22 years
Robert Bocek, 45 years
John Boose, 25 years
Philip Bourne, 12 years
Richard Brink, 22 years
Grant Brown, 47 years
Hope Brown, 22 years
James Brunke, 27 years
Phillip Burgess, 31 years
Ted Burkhalter, 22 years
Pamela Cain, 23 years
Anthony Calvello, 41 years
Arthur Calvetti, 29 years
Susan Campbell, 20 years
Robert Carl, 44 years
Frederick Cerkan, 38 years
David Chaffee, 31 years
Michael Chambers, 28 years
Douglas Chapman, 43 years
Sherryol Clack, 21 years
James Clark, 42 years
Patrick Cleary, 31 years
Bennie Collins, 42 years
Michael Cortese, 23 years
Von Cox, 30 years
James Crocco, 20 years
Patrice Crotty, 26 years
Yanping Cui, 19 years
Annetta Curtis, 19 years
Deborah Dahlquist, 31 years
Philip Daniels, 30 years
Frank De Augustine, 30 years
Paul Deesing, 21 years
David Delap, 22 years
Marvin Denney, 21 years
Charles Derykus, 29 years
Anh Diep, 11 years
Colleen Diggs, 30 years
Thomas Dixon, 36 years
Jerry Dodds, 27 years
David Doll, 31 years
David Dotson, 29 years
Martha Douglas, 36 years
Hobert Dupler, 12 years
Lawrence Duram, 16 years
Christopher Eidinger, 35 years
Dennis Elliott, 26 years
Kenneth Elmore, 19 years
Barbara Feltes, 41 years
Richard Ferry, 30 years
Reggie Finders, 43 years
Richard Findley, 10 years
Emery Fitzgerald, 40 years
Colleen Flanagan, 33 years
Julia Fleischer, 21 years

Milestones

John Flick, 21 years
Randy Forrest, 22 years
John Francis, 12 years
Wade Franck, 26 years
Timothy Franks, 29 years
Daniel Gamblin, 27 years
Larry Gardner, 11 years
Mary Gates, 32 years
Jean Gillespie, 30 years
Samuel Glenn, 22 years
Theresa Golden, 25 years
Lee Gotti, 41 years
Douglas Gould, 31 years
Robert Grau, 44 years
Cheryl Gray, 22 years
Gabrielle Green, 31 years
Rebecca Greene, 13 years
Charles Gregory, 13 years
Richard Griffin, 21 years
Michael Haas, 24 years
Cynthia Hallman, 20 years
Mark Hamm, 24 years
Hiram Hampton, 28 years
Harry Hargrove, 20 years
Peter Harmatuk, 7 years
Donald Harper, 35 years
Wayne Harris, 42 years
Sigurd Haugen, 27 years
James Hawkins, 21 years
Peggy Heady, 27 years
Melinda Hearsey, 34 years
Donald Henson, 30 years
John Herpich, 33 years
Michael Higa, 27 years
Alexander Hill, 20 years
Robert Hindy, 33 years
Roger Hogue, 26 years
Nona Holzhauer, 39 years
John Houser, 41 years
Guy Howarth, 20 years
Allen Hsiao, 28 years
Zino Hu, 16 years
Bernard Huber, 51 years
Ruben Huerta, 11 years
Sherman Hughes, 32 years
Robert Huhtala, 30 years
Richard Hyer, 25 years
Rickey Hyler, 35 years
Raymond Irion, 24 years
John Jackson, 31 years
Roland Jacobson, 24 years
Juanfen Jin, 11 years
Carol Johnson, 24 years
Connie Johnson, 20 years
Gloria Johnson, 23 years
Larry Johnson, 27 years
Jerry Jonas, 24 years
David Jones, 29 years
Carol Kalmbach, 19 years
Fred Kambich, 21 years
Diane Kaszycki, 27 years
Charlotte Keeney, 34 years
William Kennedy, 40 years
Myong Ketchum, 30 years
Bruce Kimoto, 44 years
Bernard Kirk, 43 years
Brian Kistner, 4 years
Kenneth Kloeckener, 28 years
David Klotz, 30 years
Bijan Koleini, 31 years
Bert Kopke, 36 years
Thomas Kriegermeier, 41 years
Thomas Kroupa, 17 years
Bruce Krueger, 27 years
Margo Labolle, 31 years
Rhodney Laland, 20 years
Tuyen Lam, 20 years
Joseph Lesmeister, 24 years
Steven Lewis, 29 years
William Lewis, 31 years
Ralph Linderman, 30 years
Douglas Lishka, 18 years
Luther Little, 31 years
Daniel Lowell, 29 years
Gwendolyn Lucas-Barnes, 29 years
Carol Lueke, 39 years
Bruce Marschall, 32 years
Gary Martell, 23 years
Alfred Mascitti, 43 years
Eldonna May, 21 years
Donald McCaffrey, 35 years
Jeffrey McDonald, 30 years
Pearl McDuffie, 25 years
Delroy McLaws, 21 years
William McLean, 23 years
Russell Meador, 47 years
James Medley, 30 years
Mary Meinzenbach, 25 years
Rickie Miller, 20 years
Ronald Miller, 25 years
Timothy Mills, 12 years
Rodney Morrow, 22 years
Maria Munivez, 8 years
Barbara Muscarnera, 33 years
Paul Nash, 32 years
John Neller, 27 years
William Nello, 25 years
Peter Nelson, 28 years
Richard Norwood, 30 years
Robert Nova, 29 years
Vicki Oehrle, 13 years
Deborah Ohare, 36 years
Lynda Olsen, 30 years
Josie Ordonez, 36 years
Dwight Ova, 21 years
Steven Panagos, 29 years
Donald Parcel, 21 years
Yogesh Parikh, 28 years
Horace Patterson, 7 years
Judy Paulson, 23 years
Kenneth Pearl, 29 years
James Pearson, 22 years
Lynn Pelham, 29 years
Adolfo Pena, 8 years
Verl Petersen, 20 years
Richard Peterson, 29 years
Leonard Pietzyk, 10 years
Gloria Pikron, 23 years
Elias Pineda, 35 years
Harold Pippin, 23 years
Dennis Porter, 30 years
Mark Preuss, 29 years
Floyd Price, 22 years
Tommy Pruett, 42 years
Beverly Rafter, 43 years
Carol Rawllins, 20 years
Arnold Rawnsley, 23 years
Kirk Reed, 5 years
Patricia Reilly, 20 years
James Renfro, 42 years
Christian Riddle, 42 years
Paul Riffe, 21 years
Daniel Ritchie, 28 years
Richard Roberts, 47 years
Kenneth Rogers, 30 years
Scott Rook, 33 years
Ian Ross, 22 years
Michael Ryan, 23 years
Janice Sandberg, 27 years
Pamela Sato, 36 years
Wynetta Schaffer, 24 years
Cheryl Schmardebeck, 22 years
William Schrader, 41 years
Elton Schwalm, 34 years
Alan Scott 8 years
Peter Scott, 11 years
William Selfridge, 35 years
Phillip Shaw, 41 years
Rose Sheets, 30 years
Norman Shell, 42 years
David Shields, 30 years
Dora Siegle, 29 years
Elbert Silbaugh, 25 years
Shirley Simmons, 21 years
James Simon, 27 years
Betty Simonson, 26 years
Robert Smith, 35 years
Faith Souza, 35 years
Frank Souza, 43 years
Michael Spring, 21 years
Orrin Stapp, 30 years
Robert Stefaniak, 32 years
Edward Stevens, 14 years
Mark Stevens, 29 years
Teresa Sunday, 24 years
Marlys Szabo, 20 years
Alvin Terada, 39 years
James Testa, 23 years
Don Thomas, 30 years
Buddy Thompson, 25 years
Gary Toyama, 30 years
Ronald Trickey, 27 years
Simeon Tubig, 9 years
Gregory Ulm, 36 years
Andrew Varela, 34 years
Franklin Ventura, 45 years
Thang Vuong, 25 years
William Waldo, 35 years
Michael Walo, 24 years
Keith Warvie, 21 years
Joseph Waters, 27 years
Gregory Watts, 21 years
Kau-Hwa Wei, 19 years
Marilyn Weller, 22 years
Kenneth Wells, 18 years
Florence Whipple, 40 years
Wayne Whitcomb, 18 years
Rodney Whitney, 36 years
Mark Wickstrum, 31 years
Shirlee Wilder, 41 years
David Williams, 20 years
James Williams, 22 years
Susan Williams, 29 years
Gary Wilson, 21 years
James Wilson, 16 years
Lynda Winchell, 42 years
Gregory Witz, 29 years
Robert Wright, 18 years
Thomas Yeager, 32 years

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

Andrew Balk, supplier quality specialist; service date Nov. 8, 1982; died June 1

Valerie Bell, product and services manager; service date May 8, 1978; died May 27

Thomas Blythe, sheet metal assembler; service date Jan. 2, 1985; died May 15

Bao Co, test equipment technician, service date July 6, 1987; died June 6

James Coleman, materials management analyst; service date July 10, 1988; died June 14

Michael Dixon, production integration engineer; service date May 14, 1992; died June 19

William Dressler, network designer; service date April 15, 2005; died May 31

Richard Edwards, systems engineer; service date Sept. 22, 1968; died June 3

Gary Gierczak, project engineer; service date Feb. 3, 1980; died May 18

William Grieshop, test and evaluation lab technician; service date June 24, 1996; died June 4

Jose Grijalva, software engineer; service date Nov. 14, 1998; died May 20

Peter Hamilton, electrical systems assembly installer; service date Nov. 13, 1996; died May 31

Belton Hammon, quality systems specialist; service date Aug. 9, 1989; died May 16

Martin Hansen, machine repair mechanic; service date April 3, 1990; died May 18

Daniel Harter, tube flaring and bead operator; service date Nov. 1, 2000; died May 28

John Hendrickson, product specialist; service date March 29, 2001; died May 15

David Hickman, industrial hygiene and safety specialist; service date Jan. 27, 1975; died June 11

Cory Hubbard, manufacturing technician; service date Aug. 24, 2007; died May 31

Linda Jackson, library specialist; service date April 22, 1981; died May 22

Eric Jouglard, experimental radio-frequency/microwave technician; service date Oct. 2, 1999; died June 10

Mario Lara, manufacturing engineer; service date Oct. 8, 2004; died May 22

Wen Liao, assembly and installation inspector; service date Jan. 7, 1995; died May 24

Ruben Maldonado, test and evaluation engineer; service date Aug. 12, 2005; died May 30

Michael McCabe, firefighter; service date May 11, 1979; died May 15

Christopher McDermott, sheet metal assembler; service date June 17, 2005; died June 18

Ishaque Mehdi, electronic engineering manager; service date Dec. 4, 1962; died June 11

David Ohlsen, fabrication specialist; service date Oct. 14, 2005; died June 9

Robert Pierce, product integration engineering manager; service date May 22, 1983; died May 17

Dennis Polinder, assembler installer, structures; service date April 10, 1997; died May 18

Carol Sanders, engineering multi-skill manager; service date June 20, 1983; died May 26

Robert Senior, confined space monitor; service date Nov. 20, 1987; died May 31

Margaret Sheets, operations program analyst; service date Feb. 23, 1988; died May 21

Pamela Smith, office administrator; service date June 28, 1989; died June 7

Robert Souza, wing integration production team director; service date Nov. 19, 1971; died June 7

Joni Spencer, aircraft sealant mixer; service date Jan. 29, 1986; died June 16

Larice Vandaveer, shot-peening operator; service date Nov. 20, 1996; died May 30

William Vanjura, electrical engineering technical design; service date Oct. 18, 1962; died June 11

Scott Walp, general machinist; service date Jan. 2, 1979; died June 13

Daniel Wasilchen, crane operator hook tender; service date Sept. 5, 1992; died May 29

Charles Wilkinson, maintenance and inspection technician; service date Jan. 22, 1988; died May 19

Charles Wilkinson, maintenance and inspection technician; service date Jan. 22, 1988; died May 19

John Wood, aerodynamics engineer; service date Jan. 14,1980; died June 17

Around Boeing

PHOTO: The wings for the first two 747-8 Freighters are shown on the production line in Everett, Wash. GAIL HANUSA/BOEING

FIRST 747-8 FREIGHTER PASSES HALFWAY MARK

Last month, 747 Program employees completed several milestones for the 747-8 Freighter that's coming together at the Everett, Wash., facility. More than 50 percent of the airplane has been completed and final body join is expected in the third quarter. Workers have assembled the forward and aft fuselage sections, completed the wing stub join and begun engine buildup on the first GEnx-2B engines. "This airplane will provide our customers with the lowest operating costs and best economics of any freighter," said Paul Nuyen, vice president of Manufacturing for the 747 Program.

SHANGRI-LA DIALOGUE: STRESSING THE IMPORTANCE OF ASIA, MIDDLE EAST MARKETS

Representing Boeing at the 8th Shangri-La Dialogue in Singapore, Integrated Defense Systems President and CEO Jim Albaugh, IDS Vice President of International Business Development Mark Kronenberg, Boeing Southeast Asia President Skip Boyce and International Government Relations Vice President Stanley Roth shared their thoughts on the importance of participating in the event.

"I have been coming to Shangri-La for the last seven years and each year it gets better," Albaugh said. "This is an opportunity for me to meet our customers and to listen to premier discussions on defense policy. It allows us to listen to our customers and hear what their concerns are and see how we can meet their needs in the future."

Each year, the world's top decision-makers and thought leaders—including defense ministers, senior government officials, military chiefs, think tanks and academics—come to Singapore to network and discuss current defense and security issues. The U.S. Secretary of Defense has shown strong support for the Shangri-La Dialogue for the past seven years.

According to Kronenberg, there is $70 billion worth of international opportunities that can significantly contribute to the bottom line of IDS. He said Asia, the Indian subcontinent and the Middle East are key international markets for Boeing. The Asia-Pacific region makes up approximately 50 percent of Boeing's international long-range business plan.

BOEING LIBRARY WINS INNOVATION AWARD

The Boeing Library has been honored with the J. Keller Innovations in Technology Award by the Special Libraries Association, an international association of information professionals.

The award honors the program "Building Communities Through Content: Leveraging Technical Expertise Through the Boeing Library," which collects and catalogs the work of top Boeing scientists and engineers and creates gateway pages online for specific work groups, linking them to resources they need from within and outside of Boeing.

Sue Brewsaugh, library manager in Cypress, Calif., said, "We are honored and pleased. It's a validation that the approach we are taking is viewed as the right approach by our profession."

The organization is made up of information resource experts who collect, analyze, evaluate, package and disseminate information to promote accurate decision-making in corporate, academic and government settings.

The winning team members are Diane Brenes, Sue Brewsaugh, Eric Bryan, Margaret Deeds, Joan Dubis, Angela Gillis, Blair Hinz, Robert McAllister, Martha Mori, Karen Robertson, Josh Walters and Mary Whittaker.

Global corporate citizenship refers to the work Boeing does—both as a company and through its employees—to improve the world. This ad illustrates Boeing's commitment to those who help our children develop the skills needed to succeed in school and life.

This new Integrated Defense Systems print ad for Wideband Global SATCOM was developed to position WGS as the most capable alternative in meeting the needs of the warfighter today and most ready to handle the growing demands of tomorrow. The ad will run in select military trade publications.