

# Frontiers

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## ROARING SUCCESS

The EA-18G Growler makes its first public appearance and takes its initial flight. Here's why this new aircraft is important to Boeing and its customer.

### HEAVY DUTY 18

'Fab' has role on **special 747**

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### COME TOGETHER 22

Japan Apache: Tech + people

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### STAR POWER 26

Satellite business aims high



IN THE ARTS, WE FIND OUR WINGS.



 **BOEING**  
Forever New Frontiers

*This ad, the third in a new series from the company's portfolio of community ads, reinforces Boeing's support of the arts, which help enrich and enlighten the lives of people worldwide. These ads are published in support of arts-related events.*



**ON THE COVER:** In the skies above the St. Louis area, the EA-18G Growler takes to the air for the first time.

Photo by Kevin Flynn

# Frontiers

## Boeing Frontiers' design evolves

With this edition, *Boeing Frontiers* introduces a new front cover banner, or nameplate. This new design, which represents the latest step in the design evolution of *Boeing Frontiers*, brings the magazine into alignment with Boeing's brand standards.

To learn more about the Boeing brand, including what the brand stands for and how to present it properly, visit the Boeing Brand Center at <http://brandcenter.web.boeing.com> on the Boeing Web.



PETER GEORGE PHOTO

**COVER  
STORY**

# GROWL TIME **12**

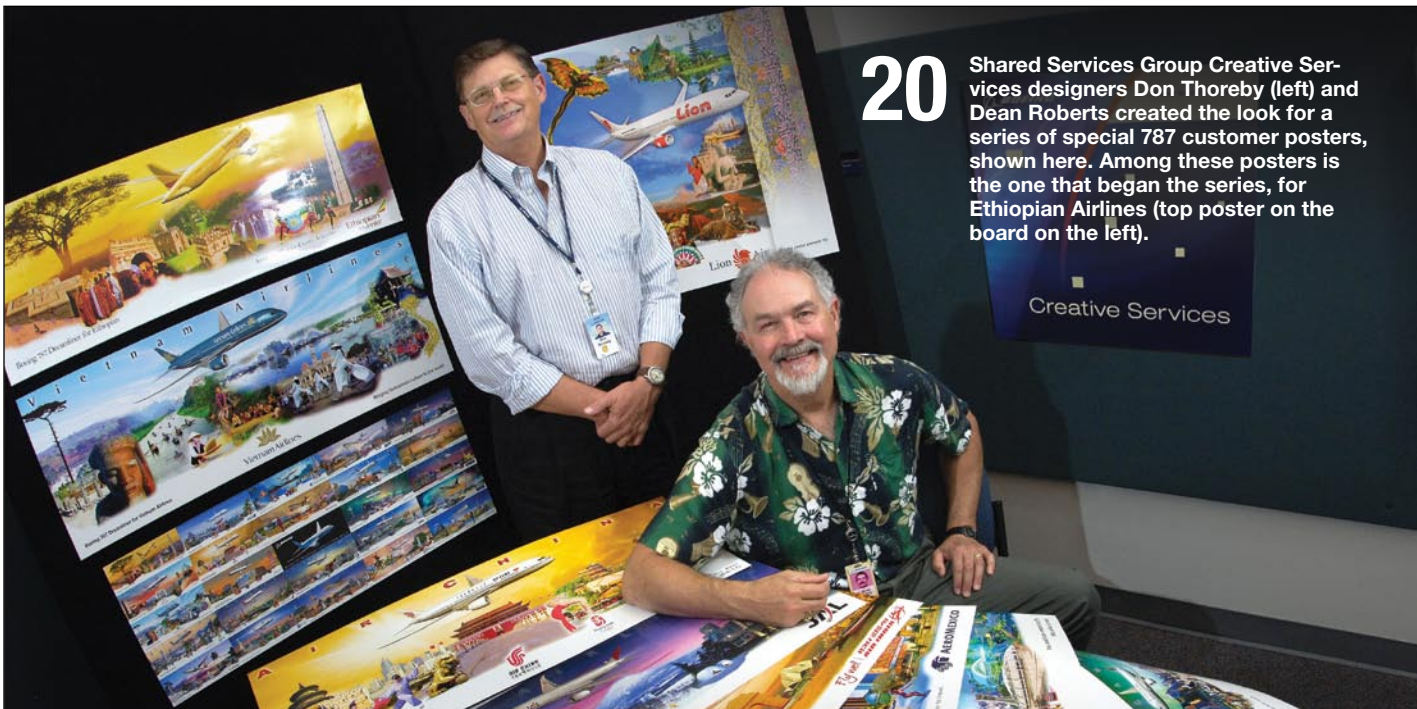
The EA-18G Growler (above) last month was unveiled to Boeing employees and VIPs and made its first flight. Here's why this new electronic attack aircraft is important to Boeing—and its customer, the U.S. Navy.

**STRONG  
SIGNALS**

**26** With recent business and technical achievements to its credit, Boeing's Satellite Development Center is looking to maintain its position as an aggressive competitor in the satellite industry. Here's a look at this segment of Space & Intelligence Systems, a part of Integrated Defense Systems.

**FEATURE  
STORY**





**20** Shared Services Group Creative Services designers Don Thoreby (left) and Dean Roberts created the look for a series of special 787 customer posters, shown here. Among these posters is the one that began the series, for Ethiopian Airlines (top poster on the board on the left).

MARILYN LOCKHART PHOTO

## COMMERCIAL AIRPLANES

### Future hinges on this work

**18** Auburn Tooling Services, a part of Boeing Fabrication, produced the main swing-zone hinges for the 747 Large Cargo Freighter. This critical complex work demonstrates how Fab applies innovation and technical excellence to produce short-flow specialty parts that support new-product development across Commercial Airplanes.

### A sound idea

**21** Teammates on the 777 line in Everett, Wash., have found a “note”-worthy way to boost morale: playing music together. Not only do participants get good vibes from the experience, the activity also makes use of work-related concepts such as teamwork, responsibility and reliability.

## PEOPLE

### Keep it clean

**28** While in Kuwait, Jerry Wilson, a product-support specialist, noticed a potential safety hazard in vehicles carrying the Boeing-developed Avenger mobile, short-range air-defense system. His sharp eye and extra effort ensured these battle-bound vehicles would help warfighters do their job as safely as possible.

## INTEGRATED DEFENSE SYSTEMS

### People and technology

**22** No doubt, the cultures of Japan and Mesa, Ariz., are different. But members of the Japan Apache team, which hail from both locations, recognized how respecting cultural differences and working to build personal connections helps lead to program success.

### Looking good

**23** The St. Louis Paint Shop implemented improvements to the process of applying customer-specific marks to aircraft. The next step: spreading these improvements to other IDS paint facilities.

### Moving ahead

**24** The first of 452 new CH-47F Chinook heavy-transport helicopters rolled out of the Boeing factory in Philadelphia this summer. The helicopter features improvements that reduce operating and support costs while extending the useful life of the Chinook.

### More room to work in

**25** After a four-year break, construction on the International Space Station was set to resume with the late-August launch of Space Shuttle *Atlantis*. Here’s a look at Boeing-built components slated to be added to the station.

## INSIDE

**5** Leadership Message  
**6** Letters

**7** Notebook  
**8** Historical Perspective

**30** Milestones  
**32** Industry Wrap

**33** Around Boeing  
**34** Tech Talk

# Development Process Excellence focuses on tech investments

## Jim Jamieson

Senior vice president of Engineering, Operations & Technology, The Boeing Company

Boeing companywide sponsor, Development Process Excellence initiative

We can all be proud of our performance over the past year. We have achieved a record backlog of business and we are well positioned for future growth—but only if we continue to become more efficient and effective in every aspect of our business.

That's what the Boeing initiatives are all about, including the Development Process Excellence initiative, which I sponsor and Nan Bouchard leads.

Our focus in this initiative is to improve the efficiency and effectiveness of development programs across Boeing and to ensure that our technology investments are focused on providing the right technologies at the right time to maintain our competitive edge today and in the future.

Toward these objectives, we are working with the business units, functional groups and other initiative leaders to

- Find opportunities where synergy can be achieved in our Research & Development investments across the enterprise.
- Identify best practices and lean process improvements for R&D, engineering, operations, program management and supplier management that can be replicated across the business units to help them achieve their business goals.
- Optimize the cost of lab and test services.
- Establish specific goals and metrics for DPE and monitor progress toward them.
- Serve as an enterprise resource for DPE.

We currently have three teams working on these challenges.

The **Enterprise Technology Team** is focused on maximizing the leverage of our R&D investments by ensuring they support both the near- and long-term strategies of the business units and avoid duplication of effort. We also want to make sure that whatever advanced technologies and processes we develop or acquire are replicated across as many programs as possible.

Examples include friction-stir welding, a more efficient and effective method for joining metal sheets than traditional welding. This technology, refined by Phantom Works with company funds, was first used on Delta rockets but is now used by the C-17 and 747F programs—and will be used by the 787 program—to save cycle time and cost and improve quality. In addition, there's *Flex Track*, a low-cost automated drilling process developed by Commercial Airplanes. It's now being used to build F-15 center and aft fuselage sections.



PHOTO BY VICTOR POWELL (POWELL PHOTOGRAPHY INC., CHICAGO)

## Jim Jamieson

Senior vice president of Engineering, Operations & Technology, The Boeing Company

Boeing companywide sponsor, Development Process Excellence initiative

The **Product Development and Large Scale Integration Team** is focused on identifying program management, engineering, supplier management and lean best practices—and establishing their consistent use by programs across the enterprise to ensure excellent cost and schedule control, as well as product quality.

To do this, the team is looking at various programs across the enterprise to learn more about their best practices and lessons learned. The team will share these findings with other program managers to help improve their programs' efficiency, reduce performance variation and seamlessly communicate program risk. They are finding a wealth of internal best practices to share and also will be benchmarking external best practices.

In conjunction with both of these teams, the **Lab and Test Asset Team** is focused on analyzing Boeing's lab and test assets and how they—as well as outside assets—can be used to ensure our program requirements can be met in the most efficient and effective ways possible. Over the past several months, the team has been preparing a plan based upon successes of internal and external lab consolidations over the past 15 years.

Pursuing these challenges is a long-term effort. But in the process of achieving them we will be helping Boeing save significant investment dollars each year and better positioning it for future competition and growth. And that's how we will continue to keep performing even better than we have in the past. ■



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## LETTERS

### Sim city

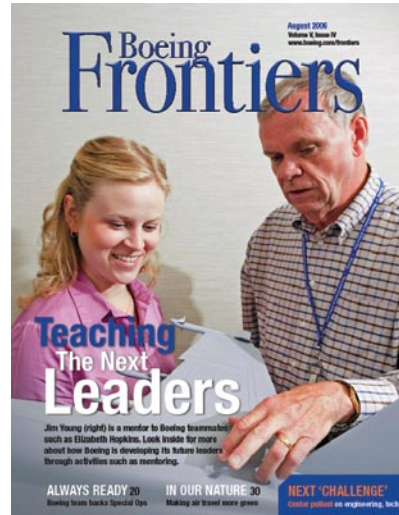
Your article "Simulating success" (July 2006, Page 36) talks about the exciting world of product-focused simulations. Yes, you acknowledged that this article doesn't cover all simulation and modeling work being done at Boeing. But I have a concern that Boeing's business process simulation capability isn't growing fast enough to meet our needs or the industry's expectations.

Let's look at our business environment. It's becoming more complex with corporate integration of support services, site functions, program needs, customer requirements and needs, and information systems. We also recognize that we will be losing expertise as many of our experienced employees retire.

Integrated Defense Systems is attempting to manage this complexity by assigning its experts from different disciplines to standardize processes, information systems, policies, and requirements across IDS. But we are guessing at the projected outcome of our decisions: I've seen some pretty creative (or worse) qualitative cost-benefit presentations. The true test is: For every dollar spent on business or process improvement, what's the cost reduction to the customer (through product-focused simu-

**"I have a concern that Boeing's business process simulation capability isn't growing fast enough to meet our needs or industry's expectations."**

—Kitty Samaniego, Mesa, Ariz.



potentially more robust, agile and predictable.

Being Boeing means we continue to explore new products and technologies—and better ways of providing those products and technologies. Business Process Simulation is the methodology for future business management. We shouldn't wait too long to get on board and exploit this capability.

—Kitty Samaniego  
Mesa, Ariz.

lations) or the additional profit to the shareholders (through business- or process-focused simulations)?

Now is the time we should be building a capability for business process simulations. Now is the time to extract the intelligence and experience we soon will be losing. It will take time for us to integrate that knowledge with our new information system architecture to produce lasting knowledge via model(s) of our business. With that knowledge, we will be ex-

### Corrections and clarifications

- The legends for the stock charts on Page 37 of the August issue were reversed.
- The photo on Pages 16 and 17 of the August issue was taken by Tim Stake.
- In "Created by unseen hands" (June 2006, Page 19), the lighting component mentioned in the article was the first production part in laser-sintered metal on an FAA-certified aircraft.

### Classics, indeed

I thoroughly enjoyed your article on the 50th anniversary of the KC-135 tanker (July 2006, Page 8). A few months ago, in front of a KC-135 we were modifying, Kirk Keffler and I were having the same discussion that the article began with—about how it's a treat to see a classic 1957 car and how the KC-135 dates back to the same era. This photo of a KC-135 and a 1957 Chevrolet (right) was our attempt at putting it in perspective.

—Mark McConnell  
Wichita, Kan.



### Letters guidelines

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

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

## SNAPSHOT

**JOLLY GOOD SHOW** The Bell Boeing V-22 Osprey flies over Big Ben in London as it heads to the Farnborough International Airshow in July.

SHELDON COHEN/BELL HELICOPTER PHOTO



### QUOTABLE

**W**hat Boeing did here conveys to me how seriously the company is committed to truly reforming.”

—Sen. John McCain (R-Ariz.), in an Aug. 1 Senate Armed Services Committee hearing, about Boeing’s decision to forgo claiming a tax deduction on payments related to settlement of investigations by the U.S. Justice Dept.

**I**flew 17 hours from my home village just to tell Alan Mulally thank you, because you’re going to make me a millionaire.”

—Rusdi Kirana, president-director of Lion Air, about Boeing Commercial Airplanes’ president and CEO, in the Aug. 9 *Seattle Post-Intelligencer*. Kirana spoke at the unveiling ceremony of the 737-900ER (Extended Range) airplane, for which Lion Air is the launch customer.

**I**f I didn’t believe it was combat-ready, I wouldn’t send it.”

—Lt. Gen. John Castellaw, U.S. Marine Corps deputy commandant for aviation, about the decision to deploy the Bell Boeing V-22 Osprey to combat in Iraq, in the Aug. 4 *Defense Daily*

### IAM PROMOTIONS

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

### ETHICS QUESTIONS?

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



# Extended term of service

KC-10 turns 25; introduced widebody tanker/cargo concept



Boeing archives photos

The first 25 KC-10s were delivered in an eye-catching white and blue paint scheme. The KC-10 fleet switched to a less-conspicuous gray after the aircraft began supporting operations in potential combat areas.





Silhouetted against the rising sun, the first KC-10A refuels a Boeing B-52 bomber during a 1981 test flight over Edwards Air Force Base, Calif. The smaller aircraft in the background at right is a McDonnell Douglas F-4 Phantom II fighter, which served as a chase plane.

By LARRY MERRITT

One fall morning 25 years ago, a U.S. Air Force tanker from Barksdale Air Force Base, La., refueled a B-52 bomber high above the Gulf of Mexico. It was the first operational squadron mission for the Air Force's new advanced tanker/cargo aircraft, the KC-10A Extender.

Built in Long Beach, Calif., by McDonnell Douglas, now part of Boeing, the KC-10 was based on the commercial DC-10 Series 30 Convertible Freighter. The KC-10, which this year celebrates its 25th year of service, continues a 70-year tradition of DC airliners donning military paint.

The idea of a widebody commercial aircraft that could double as a military tanker and heavy-cargo transport originated in 1972. Using the first Boeing 747 fitted with a flying boom, the Air Force carried out a series of refueling trials. The tests proved jumbo jets would not only make excellent tankers to augment the KC-135 fleet but also could supplement C-5 and C-141 transports in the airlift role. The need for such an aircraft grew in 1975 when Air Force planners considered how to meet global commitments in future conflicts, should overseas refueling stops become off-limits to U.S. military cargo planes.

At first the Air Force considered buying a combination of 747s and DC-10s. But with billions of dollars trimmed from the defense

budget, the Air Force could select only one.

In 1977, it was announced that a military version of the DC-10 would carry out the new tanker/cargo mission. Officials cited price, life-cycle costs and maintainability as key selection criteria. Another factor was size: Smaller than the 747, the DC-10 could operate from more airports.

Entering operational service in October 1981, the KC-10 offered some distinct advantages. It was the first aerial tanker designed with two independent refueling systems, a flying boom and a hose-and-drogue, and thus could refuel aircraft using either

**The KC-10 was nicknamed 'Extender,' and its performance showed the moniker fit well.**

system on a single mission. Aerial refueling operators liked the KC-10 because their job was less fatiguing on long flights. Unlike earlier tankers, in which they had to lie prone for refueling, operators performed their tasks in the KC-10 while seated in an air-conditioned compartment.

The KC-10 was nicknamed "Extender," and the aircraft's performance showed the moniker fit well. In February 1985, a KC-10 made a nonstop, unrefueled flight of 8,982 miles (14,155 kilometers) from Saudi Arabia to California. In addition, the KC-10 played

a key role in some of the longest fighter deployments ever made up to that time. These included the flight of two Royal Australian Air Force F/A-18 Hornets some 7,700 miles (12,400 kilometers) nonstop from California to Australia, and the movement of six U.S. Air Force F-15 Eagles 8,100 miles (13,000 kilometers) from Japan to Florida.

The first 25 KC-10s sported a white paint scheme with a broad blue stripe running the length of the fuselage. But after taking part in operations in potential combat areas, the gleaming paint job proved problematic. As one Air Force officer put it, "It sticks out like a sore thumb." So the remaining 35 flew in a less-conspicuous gray.

During Operation Desert Storm in 1991, in addition to conducting refueling missions, KC-10s moved thousands of tons of cargo and thousands of troops in support of the Persian Gulf buildup. They consistently achieved mission readiness rates above 95 percent, one of the highest of any coalition aircraft.

KC-10s went on to play a prominent role in the NATO air campaign in the Balkans and in the ongoing global war on terrorism. As part of operations Enduring Freedom and Iraqi Freedom, KC-10s have flown more than 1,400 refueling and cargo missions.

Boeing continues to support the KC-10 tanker fleet by providing maintenance, logistics support, repair and modification services, as well as aircrew training. ■

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# Data point [to point]

## Landmark study shows air travel liberalization helps global economies

By DEBBY ARKELL

Free trade in aviation is becoming more widely accepted. Government regulation of the air travel markets must be a thing of the past, right?

Not so. It's true that the trend towards reducing regulation of air travel markets is becoming more prevalent. Yet thousands of country-pair markets continue to operate under restrictive, bilateral air service agreements that keep people from going where they want to go, when they want to go.

That may be changing, as a recent, first-of-its-kind study indicates. It provides solid, quantifiable data confirming the benefits of liberalizing air travel markets. The Economic Impact of Air Service Liberalization study (<http://www.boeing.com/commercial/liberalization>), cosponsored by Boeing and 11 industry groups, demonstrates that liberalizing air service agreements increases air travel, which in turn directly—and substantially—boosts economies. The study also underscores why liberalization and point-to-point travel are important to Boeing Commercial Airplanes' strategies.

"Many studies have been done by many

firms about the contribution of aviation to individual world economies. What's been produced here is a massively complex computer model that predicts the economic impact of air service changes between countries," said Jon Ash, president of Inter/ISTAS-ga<sup>2</sup>, the firm that authored the study.

According to the study, deregulating just 320 of the 2,000 country pairs in the database is estimated to result in 24.1 million new jobs worldwide and to generate an additional \$490 billion in gross domestic product. In addition, the study estimates liberalization of bilateral air service agreements between countries typically results in traffic growth of 12 to 50 percent or more.

"The data substantiating this [economic gain] is a powerful tool for government agencies around the world as they negotiate new agreements," said Kathryn Scott, BCA's International Policy director.

Scott said feedback from the study so far has been positive. The U.S. Department of Transportation said the study is a "benchmark."

The study's message also is encouraging for Boeing. Liberalization is at the heart of Commercial Airplanes' strategy, which is based on the premise that industry growth historically has been achieved by offering greater frequencies and more nonstop routes. And that's exactly what the study validates: Liberalization increases demand for greater frequencies to more locales.

The interactive tools that emerged as a

result of the study will help Boeing better understand how liberalization affects regional air travel markets as well. The information also may be useful as Boeing updates its current market outlook, said Ricky Mack, BCA Future Market director.

"The results have validated our past and current data and trends," he said. "With these new tools, we will now be able to get better forecasts going forward. And with better forecast data, we can better understand future market forces and design and market our products accordingly as liberalization continues."

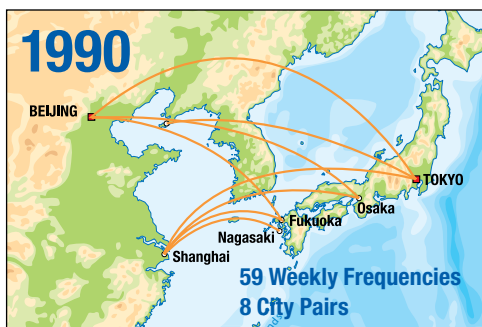
Boeing now can predict aviation trends as well as trade and other global factors, quantifying country by country. This affords even greater detailed customer knowledge and the ability to anticipate and understand changing customer needs worldwide.

The study also provides an important takeaway for Boeing employees, Scott said. In the past, people have always believed the economics related to gross domestic product drive demand for air travel. "But we're trying to let people see the other side of the picture," she said. "Air travel can—and does—drive GDP. So what we do here at Boeing every day is more than just selling or building airplanes. What we do at Commercial Airplanes is crucial to the global economy."

Ultimately, Boeing hopes the study will drive more liberalization, economic expansion and jobs around the globe.

"Ideally, the end result would be that we'd see more air service liberalized," Scott said. "This study by itself won't do that, but it is a valuable part of shaping the market, and it is adding voices to the call to change government policies worldwide." ■

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Here's an example of the air service liberalization trend. As shown above, only eight city pairs had nonstop service between China and Japan in 1990. By 2006, because of increased air travel and competition—and a subsequent liberalized air services agreement—the number of city pairs served has increased more than six times. At the same time, weekly frequencies increased nearly ninefold, from 59 to 522.





ISTOCK PHOTO



## Microinequities: How little things can hurt

In this fast-paced, e-enabled, gadget-filled, multitasking world, your odds of inadvertently offending someone are higher than ever before. These small, careless snubs have even been given a name: microinequities.

During a diversity awareness workshop at its recent leadership conference, the Boeing Safety, Health and Environmental Affairs organization learned what many other Boeing employees who have attended microinequities workshops have learned: avoiding microinequities isn't always easy. The workshop was hosted by SHEA Director Rich Noviello.

Here are some tips on how you can adjust your communication style to build and maintain productive relationships.

- Show that you value a co-worker's thoughts. Give that person your undivided attention, and don't "multitask" when meeting with a colleague.
- Watch your body language. Don't look distracted or roll your eyes during a conversation.
- Don't ignore people. Try to answer e-mail and telephone calls in a timely manner.
- Try to maintain a positive attitude. Microinequities are more likely to happen when you are in a negative mood.
- Understand the limits of technology. Face-to-face communication is multisensory, but e-mail doesn't let you see body language or hear voice intonations.
- Be particularly thoughtful when communicating across cultures. That can mean not only individuals from other countries or ethnic backgrounds, but also from other work sites. Cultural differences can lead to communications problems and misunderstandings.
- Speak up if you experience frequent microinequities. Be tactful—but be specific.

To learn more about microinequities, contact your local Diversity manager.



MARIAN LOCKHART PHOTO

## MEET THE 737'S NEW FAMILY MEMBER

Boeing employees, customers and other guests celebrated the unveiling of the new 737-900ER (Extended Range) airplane last month at the Renton, Wash., manufacturing site. Lion Air President-Director Rusdi Kirana, Executive Vice President of Airplane Production Carolyn Corvi, and 737 Vice President and General Manager Mark Jenkins were featured speakers, but the star of the show was the 737-900ER.

"Maximizing the unprecedented economic advantages of the 737-900ER is the key to our future growth as we expand our routes and add new destinations within our growing market," said Kirana. "We look forward to introducing the 737-900ER into Lion Air's fleet and to our growing base of customers."

Lion Air is the launch customer for the new 737 airplane. Other customers that have ordered it include GE Commercial Aviation Services, Sky Airlines, Continental Airlines and SpiceJet. The 737-900ER increases the 737 family's range and seat capability, and it shares the same industry-leading reliability of the world's most successful airplane family.

## Updated look at Boeing history now at Boeing Stores

Boeing Stores this month will start selling an updated edition of the book *Boeing: The First Century*.

The new edition of the history of Boeing, titled *Boeing: The First Century & Beyond*, features four new chapters that cover topics such as the rise of Airbus as a competitor and the emergence of the 787 Dreamliner. These chapters augment the story of Boeing's history from its founding in 1916. The book was written by Eugene Bauer, who served Boeing in engineering, sales and customer support roles before his retirement in 1988.

In addition to being sold through Boeing Stores, *Boeing: The First Century & Beyond* is available through retail bookstores. It's also available online at [www.boeingstore.com](http://www.boeingstore.com).



# New dog in the fight

EA-18G Growler, Navy's newest electronic attack aircraft, completes first flight



The first EA-18G Growler, designated EA-1, is shown on the Boeing ramp after the rollout ceremony on Aug. 3. The Growler will be flown in St. Louis several times before heading to its new U.S. Navy home at Naval Air Station Patuxent River, Md.

By KATHLEEN COOK

When the U.S. Navy first asked McDonnell Douglas in 1993 to determine the viability of using an F/A-18F airframe to replace the service's current airborne electronic attack aircraft, the EA-6B, no one could be sure the concept would work. Six months later, a handful of employees not only believed it would work, they convinced corporate leadership to invest company funds to prove they were right.

On Aug. 15, that small investment returned big benefits to the Navy and to Boeing, as the Navy's newest weapon, the EA-18G Growler, took its first flight from Lambert Airport in St. Louis. The EA-18G enables warfighters to perform an array of airborne electronic attack missions, operating from either the deck of an aircraft

carrier or land-based fields. Through these capabilities, warfighters can jam, or suppress, enemy radar and communications to protect friendly assets in the air and on the ground.

"When we started, we thought it was an intriguing idea," said Paul Summers, director, Global Strike Systems Integration and "father" of the EA-18G program. "But within six months, we knew it would work. We just needed a chance to prove it. And we did."

"Growler is a model of what a strong, strategic relationship between the Navy and industry can do," said Adm. Michael Mullen, chief of Naval Operations for the U.S. Navy. "By working together, we can and must produce capabilities that will keep our nation secure while keeping faith with the American taxpayer."

Going from an intriguing idea to a real airplane wasn't easy, but Boeing did it—ahead of schedule and within budget. In the world of



## Growler fast facts

**Number of Growlers planned:** 90  
**Number of carrier-based Growler squadrons:** 10 squadrons, five aircraft per squadron  
**Weight (empty):** 33,094 pounds (15,011 kilograms)  
**Max take-off weight:** 66,000 pounds (29,937 kilograms)  
**Max landing weight:** 48,000 pounds (21,772 kilograms)  
**Length of System Development and Demonstration contract:** Six years  
**Cost of System Development and Demonstration contract:** \$1 billion  
**Maximum speed:** Mach 1.6+  
**Maximum number of jamming pods:** 5  
**Total engine thrust:** 44,000 pounds  
**Number of antennas:** 44 assemblies (multiple antennas per assembly) [Super Hornet has 24]  
**Length of wingtip pod:** 10 feet (3 meters)  
**Weight of wingtip pod:** 300 pounds (136 kilograms)  
**Number of possible configurations for transmitters, radomes and antennas:** More than 6  
**Fuel capacity:** 13,940 pounds (6,323 kilograms) of jet fuel  
**Crew:** Two  
**Number of suppliers:** 1,800  
**Year of Initial Operating Capability:** 2009



RON BOOKOUT PHOTO

major development programs, that is rare. Summers said he considered that the team's greatest accomplishment: "We made a promise, and we delivered on that promise. You can't do better than that."

Delivering on that promise has been the cornerstone of the EA-18G program and a legacy inherited from the F/A-18 program, of which it is a part. That ability to deliver goes directly back to the people who work the program, according to Mike Gibbons, the current EA-18G program manager, who joined the team before the contract award.

"The fact that other programs within the aerospace industry have been late or more expensive than original projections is a concept that we, from day one, never bought into. It was simply not acceptable," Gibbons said. "We've taken it as a matter of pride that we're going to execute this program on or ahead of plan and within budget, and we're doing so."

## Jamming 101: A primer on the EA-18G's capabilities

What's the difference between the EA-18G and the F/A-18F Super Hornet?

The EA-18G looks a lot like an F/A-18F, until you notice the pods under its wings and on its wingtips. Those pods, along with new electronic systems and software inside the aircraft, set the Growler apart from other jets and define its primary role in the battlespace—to jam, or suppress, enemy radar and communications in order to protect friendly assets in the air and on the ground.

The Growler can protect multiple aircraft or ground troops on a single mission. Getting that job done involves three steps.

- The Growler locates and analyzes potential radar and communications threats.

To locate and identify the radar and communications threats, the Growler combines data from mission planning with information from onboard sensors and communications devices. Mission planning is a pre-mission operation where the aircrew is briefed on known threats such as locations and types of radars and surface-to-air missile sites, and with the rest of the strike group, plans the mission to address or avoid the threats. The Growler also incorporates a satellite communication device for intelligence gathering.

Unlike the EA-6B Prowler, which currently performs the electronic attack mission, the Growler will enable its aircrew to communicate while jamming.

- The aircrew determines if and how the threats need to be engaged.

The Growler aircrew views gathered information on a color display. The location of potential threats and other critical data can be overlaid on a topographical map or shown in tabular formats with other vital information. Software algorithms that correlate and filter the information help the aircrew analyze the data and make time-critical decisions.

- The Growler neutralizes these threats, clearing the way for the aircraft or ground troops to do their mission.

The Growler neutralizes threats primarily by using the electronic attack jamming pods to "confuse" enemy radars. The jamming pods transmit specific frequencies of electromagnetic interference to blind enemy radars so they cannot see a group of incoming strikers.

Sometimes, the mission or threat requires the enemy site be knocked out with missiles. Since the Growler can carry high-speed anti-radiation missiles in combination with the jamming pods, aircrews have that option at their disposal. The missiles use the enemy radar's own signature to track and destroy the threat.

The Growler's job isn't confined to jamming radars, however. Using its communications countermeasures, the Growler can suppress enemy communications so ground sites cannot communicate with each other. By disrupting the network, it isolates potential threats.

Ultimately, the Growler's primary role is to help the aircraft it flies with or the ground troops it protects perform their missions, and to increase the survivability of the entire sortie. By jamming radars and interrupting communications, it can do exactly that. And because it's a derivative of the Super Hornet, it can fly with other supersonic jets to get the job done quickly and effectively.

—Kathleen Cook



**Top:** Some of the more than 750 people who attended the Growler rollout take a first close look at the new aircraft.

**Bottom:** From left, Boeing executives Jim Albaugh and Chris Chadwick, Adm. Mike Mullen, Vice Adm. Jim Zortman and U.S. Rep. Todd Akin (R-Mo.) take a few minutes at the end of the rollout ceremony to view the EA-18G.



RICHARD RAU PHOTO

RON BOOKOUT PHOTO

high-power jamming pods without interfering with the fly-by-wire flight controls, the displays in the cockpit and the other electronics in the F/A-18. Once again, the Boeing team took a proactive approach to answer the Navy's concerns.

"The Navy and Boeing took an F/A-18 to Naval Air Station Patuxent River, Md., put it in an electromagnetic testing chamber, hung jamming pods on it, radiated it, and proved that the airplane was 'hardened' enough to do this mission," Summers said.

The third major concern was whether the ALQ-99 jamming pods, which were designed for the subsonic EA-6B, could survive in the turbulent undercarriage environment of the Super Hornet wing. To alleviate concerns in this area, Boeing put the jamming pods on its flight-test demonstrator aircraft, F/A-18-F1, and flew the aircraft from Boeing facilities in St. Louis.

"On our first flight, we took the aircraft to 0.9 Mach at 30,000 feet, which was a milestone in itself," Summers said.

#### SYSTEMS INTEGRATION—AND MORE

Successfully demonstrating the concept would work was key to winning the System Development and Demonstration contract in 2003, Summers explained, but there was a lot of work still to be done. The EA-18G program is largely a systems integration challenge, Gibbons said, bringing together several existing programs and technologies to create a new weapon in the Navy's arsenal.

Part of that integration and one of the biggest technological challenges for the program was the ALQ-218 antenna pods, which will be permanently mounted on the wingtips of the EA-18G. On the EA-6B, the antenna pods are mounted on the tail.

The EA-18G team took the hardware for ICAP-III—the Improved Capability III electronics system for airborne electronic attack, of which the ALQ-218 pods are a part—and repackaged it to

*Continued on Page 16*

#### MEETING CHALLENGES

That isn't to say there weren't some big challenges along the way, Summers said. During the development of the concept, Summers recalled the Navy identified several critical risks to any follow-on to the EA-6B, the Navy's current airborne electronic attack platform. Among them: Can a crew of two in an EA-18G perform what a crew of four is currently doing in the EA-6B?

Betty Neill, the EA-18G crew vehicle manager, said Boeing answered that question by hosting more than 500 Navy crew members through EA-18G simulators over a span of 10 years to test, define and refine the concept. "We changed a lot of minds during that process," Neill said. "It was a grassroots effort, really, to bring people in to take a look at what we had, sit in the seat, manipulate the controls and displays, and convince themselves through experience that they would be able to achieve the mission with two aircrew."

Boeing took this idea one step further, developing a simulator it then put inside a tractor trailer and took to various sites around the country. The EA-18G trailer allowed Boeing to reach scores of Navy operators and decision makers who could see for themselves the concept was viable.

Another major question was whether a fighter jet could carry the

DAVE MARTIN PHOTO



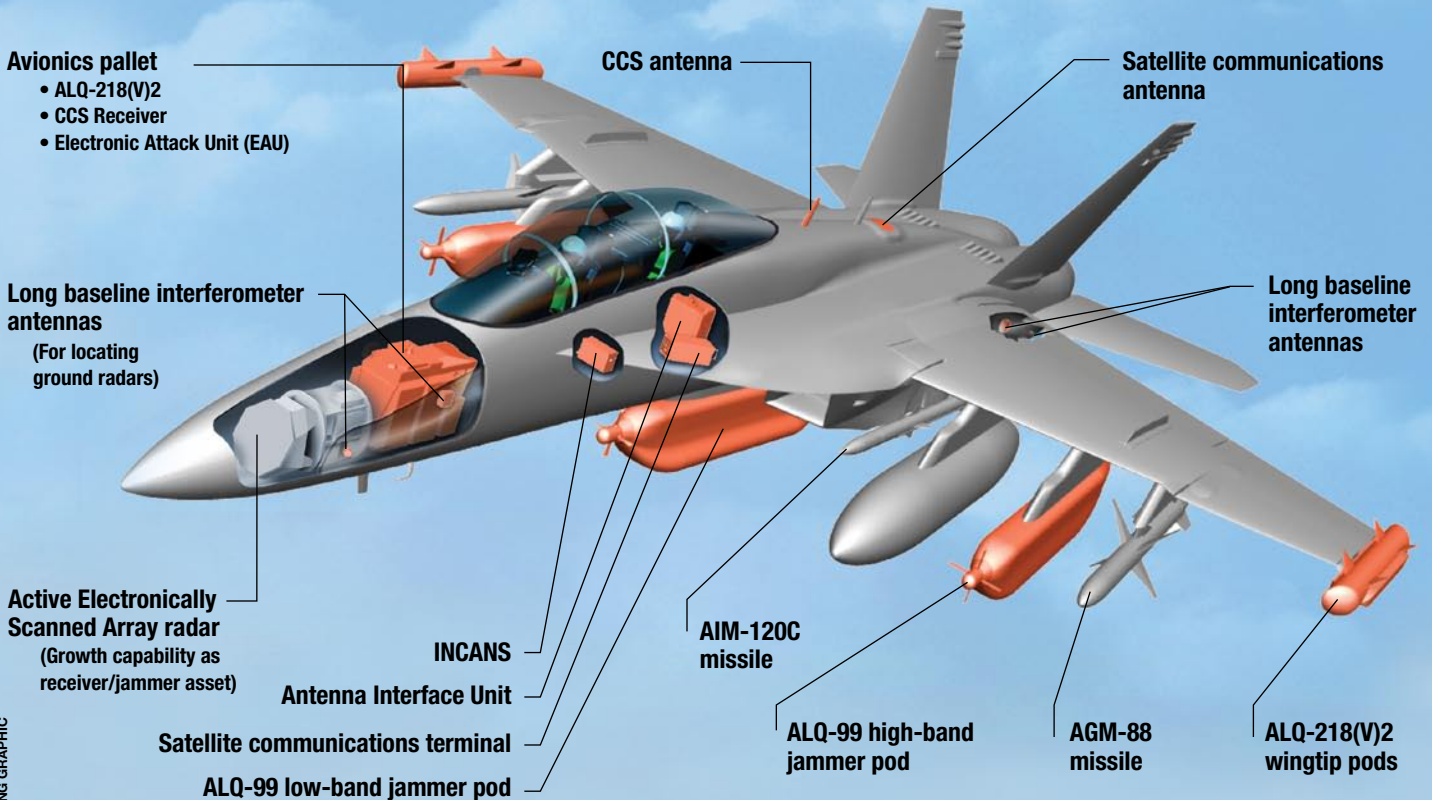
#### One proud father

Paul Summers (left), director of Precision Engagement and Mobility Systems integration for Boeing, probably knows more about the beginnings of the EA-18G than anyone else. He was there when the concept was first proposed and was the leader of a group of six employees who first studied the concept.

Summers explained to *Boeing Frontiers* why this aircraft is significant to Boeing and the U.S. Navy.



# EA-18G: INTEGRATING THE LATEST ELECTRONIC ATTACK TECHNOLOGY



BOEING GRAPHIC

## ALQ-218(V)2 RF Receiver System

- Wideband receiver providing accurate emitter identification and location
- Selective reactive jamming capability

## Interference CANCELLATION System (INCANS)

- Providing UHF communications capability during ALQ-99 jamming
- Significant communication and situational awareness improvement

## ALQ-99 Tactical Jamming Pods

- Proven system already in U.S. Navy inventory
- Ongoing transmitter upgrade program

## Communication Countermeasures Set (CCS)

- Smaller and more capable than USQ-113 with expandable infrastructure
- Transmit function through low-band ALQ-99 jammer pod

### Q: How important is the EA-18G Growler?

**A:** The Growler will be very important to the Navy. The current electronic jamming platforms, the EA-6B Prowlers, are aging rapidly; they need to be replaced, and the G is the perfect choice for a next-generation jamming platform for the Navy. It's part [F/A-18] E and F (model) and it's part G. The vehicle infrastructure will be consistent across all three platforms, which makes this the most economical solution for our customer.

### Q: How would you characterize your contribution to the EA-18G?

**A:** I was once called the "grandfather" of the G. I much prefer to be remembered as the "father" of the G program. It's a great moniker, but no one person can be solely responsible for such a broad-based activity. It takes a dedicated team to make it happen. And we have such a team.

### Q: What event will you remember most about your work on the EA-18G?

**A:** Two events stick out most: The first flight of our F/A-18F1 demonstrator aircraft carrying the ALQ-99 jamming pods. We were standing very close to the runway as the aircraft took off; it was a great vision into the future. The second was when I received a call from the Navy authorizing the start of

the SDD [System Development and Demonstration] program.

### Q: What is most important to meeting cost and schedule commitments?

**A:** We did all the homework up front and spent the time required to make sure we were doing it right. We created a schedule to accommodate the possibility of unexpected events, so if things did happen, we could compensate and still make our critical dates.

### Q: What would you tell the customer about this aircraft?

**A:** I'd tell them they should be proud of this platform because it's going to perform a critical mission for our warfighters. Once this aircraft gets in the fleet they're going to realize it's so flexible, with the electronic attack [jamming] capability, with the sensing capabilities, with the AESA [Active Electronically Scanned Array] radar, with the two-person crew. They're going to realize they can do many more things with this aircraft to expand the scope of its mission. It's going to end up being much more than just a traditional electronic attack platform.

—Kathleen Cook



RICHARD RAU PHOTO

*Continued from Page 14*

meet the unique requirements of the EA-18G, said Kevin Fogarty, the EA-18G chief engineer.

But the EA-18G is not just about integration, Fogarty noted. The EA-18G program was able to enhance some capabilities and to add capabilities not available on the EA-6B. Perhaps the most significant is the Interference Cancellation System. This system will allow EA-18G aircrews to communicate with friendly forces while jamming, something not available today.

To make the aircraft concept real, assembly workers had to take the technology and the various systems and build an airplane—two, actually.

In July 2004, various industry partners began working on their parts of the first aircraft. That October, Boeing workers loaded the first part into a tooling jig at the St. Louis plant to assemble EA-1 and after that, EA-2, the two flight-test aircraft constructed under the System Development and Demonstration program.

While production EA-18Gs will be built on the same production line as F/A-18E/F aircraft, the first two EA-18Gs were partially constructed following established F/A-18 procedures. In May 2005, they were moved to the experimental shop in St. Louis, where a team of specialists from Boeing and its industry partners have worked to modify the jets. The team has strung more than 2,500 feet (762 meters) of radio-frequency (shielded) cables, installed new avionics boxes, tested the systems, installed engines and in a thousand ways created the Navy's newest aircraft.

Virtually every leader on the team said what has made the program so successful has been the teamwork. But what really sets the EA-18G program apart, according to Bob Feldmann, Boeing vice president for the F/A-18 programs, is "executing to plan. The people on the team are having fun doing it, and we're going to give the Navy a product they're going to be very proud to own. That's the definition of success." ■

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RICHARD RAU PHOTO

**Top:** Boeing F/A-18 chief test pilot Ricardo Traven commemorates the first flight of the EA-18G with a special Growler silhouette decal on his helmet visor shield.

**Above:** Boeing flight ramp personnel wait to greet pilot Ricardo Traven (on stairs) and weapon systems officer Rick Junkin as they deplane after a successful first flight.



## St. Louis' take on the EA-18G

Boeing *Frontiers* asked EA-18G team members in St. Louis what the development and first flight of the Growler meant to them.

### Jim Watt Electrician

"I told one of the guys, 'you're not building an airplane; you're making history here.' This is going to do things that have never been done before. Talk about Star Wars, this is pushing the edge."

"It always gives a guy chills when you see something you built, or see something fly, or you see it on television, and you say to your grandkids or children, 'I was part of that; I was in that.' It just makes you feel real good."

### Roger Zepeda Electronics electrician

"If I could talk to the people who will fly this plane, I'd tell them that they can have 100 percent confidence in the aircraft. Just knowing that it's been worked by guys like this (team), it's a quality product. They can have every assurance that it will do the job they need it to do."

### Jerry Henry Technical lead for flight-test instrumentation

"It's important to the Navy that they know we can do this. We can meet cost and schedule and still come in under weight. For an airplane, the most important thing is to be under weight and perform the way it's supposed to perform. So the fact that we did it and we proved we can do it, that's the most impressive thing."

### Roxanne Baker Instrumentation operations engineer

"This is the first project like this I've been on. It was really cool to be here, to be close to the airplane, to walk on the wing. It's why I took this job: to touch the airplane and to get to be around it. I love the hardware side of things."

### Kevin Joost Sheet Metal And Riveter

"We've put a lot of effort into these airplanes, a lot of hours, and I'm just going to be very proud to see this fly."

### Aaron Graber Electrician

"Teamwork is very, very important on this project, from a lot of different angles—from engineering to mechanics, to electricians, to everything combined—to make the final product. It's very team-intensive. The level of dedication has been impressive."

"Watching this aircraft roll out will give me a great sense of accomplishment. It's been labor-intensive, and challenging at times, but the team has taken it step by step, accomplished a series of goals to get to the ultimate goal of rolling out the jet."



At the Boeing site in St. Louis, the EA-18G Growler awaits its chance to take to the air for the first time.

PETER GEORGE PHOTO

### L. J. Moore Flight test engineer

"The most important thing I will take away from this experience is all the lessons I've learned on the shop floor. It's trial by fire down here. I've become a lot more confident and a lot more assertive in getting the job done, and taken the initiative to do things, versus sitting at a desk. When you're there, right next to the airplane and you see the final product, everything hits home a lot more. Seeing an aircrew walk down the hallway makes what you're doing seem a lot more important."

### Robert Price Sheet Metal And Riveter

"This is a state-of-the-art product. Some of the aircrew have come out and looked at the product, and they're as thrilled as we are. I'm glad for them, and I'm glad to see this go from an idea on paper to what it is today."

“We’ve relied on the world’s best talent to design and build the (747 Large Cargo Freighter), and we can all be proud today to see it standing on the tarmac,” said Scott Strode, 787 vice president of Airplane Development and Production, at the Aug. 16 rollout of the LCF. Employees of Boeing Fabrication are part of the global team who worked on this unique airplane.



BOEING PHOTO

# 787 hinges on Fab's success

## Unit fulfills strategic mission for 747 LCF

By DEBORAH BANTA DUSTMAN

It was a challenging mission that an emergent parts manufacturing business thrives on.

So said Jeff Krueger, Boeing Auburn Tooling Services manager, based in Au-

burn, Wash. A primary provider of tooling to the company, ATS was asked to manufacture production parts. Not just any production parts, but main swing-zone hinges for the 747 Large Cargo Freighter (LCF). The main swing-zone hinge is a highly complex machined component designed to enable the entire tail section of the airplane to open for loading and unloading of major composite fuselage and wing structures built by program suppliers across the globe for transport to 787 final assembly in Everett, Wash.

Excited about the opportunity to support new product development, ATS invested countless hours planning and coordinating with Engineering, Manufacturing and suppliers. Once the large stainless steel forgings were received, each was probed on a five-axis machine to create a digital model so the tough material could be optimized for setup, programming and machining approaches. The result was a 90 percent reduction in hinge weight after nearly 1,000 machining hours.

Once complete, the main swing-zone





For example, Integrated AeroStructures, also located in Auburn, features unique stretch-forming capabilities that were used to manufacture the extended “brow” section of the LCF. The brow is the part of the airplane just behind the flight deck that joins to the enlarged upper fuselage and makes the freighter ideal for shipping big 787 Dreamliner sections.

The first 747 Large Cargo Freighter is

expected to arrive in the Puget Sound region of Washington state this summer to begin certification flight testing prior to re-entry into service in 2007.

Surely, the brows on Fab folks and others who built this unique airplane will show expressions of sheer delight, pride and amazement as they watch it land for the first time. ■

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### **They’re doing a Fab job**

Employees of Boeing Fabrication, Commercial Airplanes’ largest supplier, continue to fulfill their strategic mission to enable new product development for programs such as the 747 Large Cargo Freighter by focusing on critical, complex, short-flow specialty parts production. Manufacturing business units that are building components and assemblies for the 747 LCF include

#### **Boeing Auburn, Auburn, Wash.**

- Auburn Machining. Frames, intermediate hinges, door ramp, latches and pull hooks
- Auburn Tooling Services. Swing-zone main hinges
- Emergent Manufacturing Facility. Emergent work
- Integrated AeroStructures. Brow skins, splices, doublers, and transition-zone stringers
- Tube, Duct & Reservoir Center. Tubes, ducts and reservoirs

#### **Boeing Everett, Everett, Wash.**

- Interiors Responsibility Center. Stowage bins, ceilings, sidewalls and liners
- Electrical Systems Responsibility Center. Electrical panels and wire bundles

#### **Boeing Kent, Kent, Wash.**

- Community Manufacturing Partnership. Miscellaneous small assemblies

**Boeing Auburn Tooling Services produced the main hinges (above) for the 747 Large Cargo Freighter’s tail section. The facility thrives on complex work such as this, said Jeff Krueger, Auburn Tooling Services manager.**

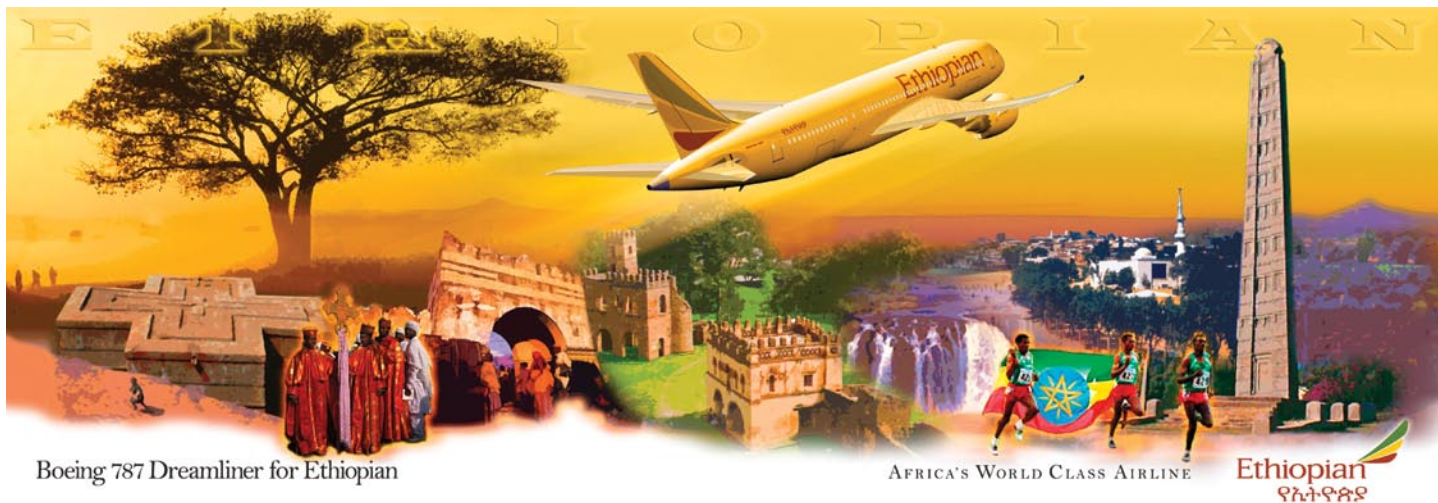
hinges were sent—on schedule—to the modification and maintenance hangar at Chiang Kai-Shek International Airport in Taipei, Taiwan, for installation on the LCF by Evergreen Aviation Technologies Corporation, a joint venture of EVA Air and General Electric.

Completion of LCF work by ATS typifies how Commercial Airplanes relies upon its largest supplier, Boeing Fabrication, for critical, complex, short-flow specialty parts production to enable new-product development. This work requires innovation and technical excellence to meet myriad challenges inherent in Commercial Airplanes’ global manufacturing business model.

Beyond Auburn Tooling, the LCF Program turned to multiple Boeing Fabrication manufacturing business units to provide specialty parts within a tight schedule.



**The 747 Large Cargo Freighter represents Boeing’s commitment to new production-system methods on the 787 program. The LCF will transport large sections of the 787 airplane from partners around the world to 787 final assembly in Everett, Wash. It’s the first time Boeing jetliner production will rely primarily on airplanes for delivery of components.**



Boeing 787 Dreamliner for Ethiopian

AFRICA'S WORLD CLASS AIRLINE

Ethiopian  
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# Worth another look

## How 787 model livery appeared on posters

By DAWSALEE GRIFFIN

It's not every day that an airline CEO is moved to tears. But that's what happened when Ethiopian Airlines CEO Ato Girma Wake received a 787 model bearing a special livery representing the history and culture of Ethiopia.

"There is a lot of emotion involved in the sales process," said Ihssane Mounir, Commercial Airplane's International Sales director. "We learn so much about our clients' culture and history along the way and this was a great opportunity to show our appreciation for a very good Boeing customer."

The Airline Marketing Services group in Commercial Airplanes led the effort to develop the design. Its staff members specialize in using their knowledge of Boeing's airline customers to help the airlines design market-

ing campaigns, promotional materials and corporate identity programs to promote their Boeing products.

What was different about this request, however, was that it focused on aspects of the airline's home country. Previous custom designs have focused primarily on the airline's logo and livery. Indeed, Wake liked the design so much he asked Boeing to look into creating the livery on a full-size airplane and reproducing it as a poster the carrier could use at travel agencies.

Patty Roberts, Regional Marketing director—Africa and South Asia, who worked on the model livery, said the team took the montage and developed it into a poster using more historical and cultural elements, including Ethiopia's famous long-distance runners.

The design's appeal was further validated when Ethiopia's Consul General in Seattle asked to use the poster in a brochure promoting Western investment in Ethiopia.

"We are so proud of the graphical elements in the 787 poster," Wake said. ■

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A series of Boeing-made posters honors the home nations of 787 airline customers such as Ethiopian Airlines (top), as well as (above) LOT Polish Airlines, Air Canada and ANA (All Nippon Airways).

## Poster program spreads to other 787 customers

A special livery created for a model airplane has led to a poster program for all 787 customers.

Ethiopian Airlines CEO Ato Girma Wake received a 787 model sporting a special livery that evoked the history and culture of Ethiopia. He liked the design so much that he asked Boeing to look into reproducing it in posters Ethiopian Airlines could use at travel agencies.

Consequently, Rob Pollack, vice president of Brand and Market Positioning for Commercial Airplanes, suggested expanding the concept to include all 787 customers.

"It was a unique opportunity to change from the typical airline business focus and show our customers how much we appreciate them and their culture and history," said Pollack. "It also shows our employees how global our business really is."

With agreement and funding from the 787 program, Patty Roberts, Regional Marketing director—Africa and South Asia, tapped Boeing Shared Services Group Creative Services to design a template for the poster series. Don Thoreby, art director/designer, created the templates, while designer Dean Roberts created the poster montages. They worked closely with Sales, the customer airline and Patty Roberts to choose images reflecting the history and culture of each airline and country and those easily recognizable to Western visitors.

"It was a challenge to stay away from stereotypes and create unique posters celebrating each of the 787 customers," said Thoreby.

"The poster series has been very popular with the airlines who have adapted elements for use in ads, on billboards, on luggage tags, in brochures and on annual reports," said Patty Roberts.

—Dawsalee Griffin





Members of the 777 line have formed a band in a morale-boosting music effort to connect with team building. Band members include (clockwise, from far left) Maureen Howard, Rey Moralez, Bill Bowman, Rebecca Arnold, Roger Todd, Rodger Noble, Dan Sayson, Dan Coleman, Anthony Magno and Dean Johnson.

GAILE HANUSA PHOTO

# Hitting a high note

777 line members ‘band’ together in effort to boost team morale

By SCOTT LEFEBER

When morale teams began forming to promote team engagement in the Everett, Wash., factory, Dan Coleman had an idea he couldn’t resist. Coleman, a 777 wing line mechanic, began developing a band room in the 777 factory area. His objective was to connect music with team building and ultimately boost morale.

“Music has always been a part of my life,” Coleman said. “It’s a great way to escape from the pressures and stress of daily life, and connect with people.”

After 777 management approved Coleman’s idea, the band room took off. Coleman’s morale team, which consists of 777 mechanics and support personnel, started buying equipment with funds contributed by employees, decorating the room and

spreading the word to fellow employees.

“I brought in one amplifier and cranked it up, and people started coming out of the woodwork,” Coleman said with a smile.

Now the band room is just part of the normal workday for many 777 wing line employees.

“I love coming to the band room on my lunch breaks,” said Maureen Howard, a second-shift 777 wing mechanic. “This program gets people together that may have never said ‘hi’ to each other.”

The 777 wing morale team was developed more than two years ago with the intent of bringing a more energetic and engaging atmosphere into the factory. The team consists of first- and second-shift mechanics and support personnel that work in the 777 factory.

“The employees have really taken the band room to the next level,” said Darin Hein, 777 wing line manager. “It’s been a definite morale boost for anyone interested in playing music.”

777 management encouraged employees to create programs that would truly engage their teams. Team members said the entire

morale program has been a great success. It’s created new relationships and been a great team-building activity, members said.

“Performing with co-workers in the band room or on the factory floor is very similar,” said Bill Bowman, a 777 team leader and 26-year Boeing employee. “I’ve gained from coming to the room. I always leave with less stress and a better attitude.”

The room has grown into a popular lunch-time attraction. The music connection blends into the work environment, team members said.

“Our team communication has improved because of our music bond,” said Rebecca Arnold, an office administrator. “It’s been a great team-building experience because it requires everyone to rely on each other to perform in synch.”

Performing music requires many of the same work-related actions, such as concentration, responsibility and dependability. When 777 team members perform in the band room, their connection as teammates extends beyond the factory floor and into personal relationships.

“Music is the language of all nations,” said Coleman. “We’re all here together doing the best job we can, so we might as well have fun doing it.” Added Arnold: “I never imagined doing something like this at work. It has really opened up relationships and brought our team closer together.” ■

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# Technology—and people

## Japan Apache team demonstrates benefits of respect for differences

By LISA DUNBAR

People do business not with corporations, institutions or governments—but with people. And with people come differences in language, communication style and culture.

Boeing's Japan Apache team knows how beneficial it's been to recognize and respect those differences and to overcome the social barriers that inevitably exist when cultures

come together. Boeing has had a long-standing cooperative relationship with Japan. But to the members of the Apache team based in the dry, hot desert city of Mesa, Ariz., it seemed a daunting task to sell AH-64D Apache Longbow helicopters to a country with a culture so different than their own.

"In terms of language differences alone, it was challenging," said John Lewis, manager of the Boeing Japan Technical Assistance Team. "But, in the end, both sides got their points across."

The Japan Apache program has become another bright spot for Boeing—with an agreement for up to 13 Apache Longbows. Fuji Heavy Industries, Boeing's teammate on the program, delivered the first two helicopters to Japan early this year, signaling

a new era in capabilities for the Japanese Ground Self Defense Force.

The Japan Defense Agency selected FHI to produce the AH-64D Apache Longbows, which include unique requirements for Japan. FHI is producing the aircraft under license from Boeing, which is supporting systems integration and aircraft production.

But beyond the delivery of metal, there were intangible benefits to merging the culturally diverse teams. Members of the Japan Apache team forged relationships that will

**Japan Apache Program Manager Patricia Carson meets with Capt. Seiji Saho, a pilot with the Japan Ground Self Defense Force.**

benefit the program for years to come. And effective communications efforts by Boeing and FHI leaders have resulted in Japanese acquisition reform.

"The bonds created when Boeing and Japanese engineers and test pilots worked together were fundamental to the program's success, particularly in the area of training and information transfer," said Patricia Carson, Japan Apache program manager.

Nine Japanese engineers worked alongside 19 Boeing engineers in Mesa for nearly two years. Their task was to learn from and work with Boeing avionics and software mentors to integrate a radio, as well as implement changes to the Japan Apache using Boeing processes so they could maintain the software when they returned to Japan.

To foster positive relationships and teamwork, Boeing employees included their Japanese counterparts and their families in as many after-hours activities as possible.

"Japanese people do not readily express themselves in public," said Ryoichi Horikawa, branch manager of FHI's Mesa office. "I think the after-hours socializing helped Japanese engineers feel comfortable enough to frankly ask questions about their work, make suggestions and express opinions without any worry of embarrassment."

**"Both sides got their points across."**

—John Lewis, Boeing Japan Technical Assistance Team manager, about language differences among Japan Apache members

Challenges also emerged on the flight line, where Rich Lee, chief engineering test pilot in Mesa, had less than two months to train Japanese pilots on the Apache. Carson's idea for a solution: Bring in Japanese pilot Yoshi Hirano early and have him fly as a Boeing-authorized test pilot on many flights that would normally be Boeing-only crew. Lee said Hirano trained for an entire year, as opposed to the normal two-month block, and gained a much deeper understanding of the aircraft. "When a second Japanese pilot came on board for training, Yoshi was then able to help train him," Lee said.

The teamwork went beyond Mesa. Carson said Boeing program leaders were working closely with the Japanese government and the U.S. embassy in Japan. "We kept the embassy continually apprised so when the two governments spoke, everyone was on the same page," she said. ■

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MIKE GOETTINGS PHOTO





DWIGHT SINGLETON PHOTO

During final paint, F/A-18 engine cavity heat release screens are protected from paint overspray. Dennis Green, Boeing St. Louis spray painter, is roller applying paint to match the surrounding area.

# Paint shop is on a roll

An improvement idea spreads to other sites —and supports Lean+

By KATHERINE SOPRANOS

When a Boeing St. Louis paint shop team rolled out an idea, it dramatically changed how a defense aircraft is painted. It also introduced improved methods to other Integrated Defense Systems locations.

The IDS St. Louis Paint Shop applies aircraft- and customer-specific marks such as squadron logos, insignias or warning stripes on aircraft such as an F/A-18 or F-15. In the past, for one aircraft this marking process took many days for prep work and paint. Several years ago, the team studied and tested ways to improve the process, and then successfully incorporated better,

more efficient techniques that shaved production time.

“This team took the initiative to work together and make a difference,” said Steve Jacques, IDS vice president of Manufacturing. “They’ve improved their processes and shortened cycle times, plus they’ve reduced costs and inventory. Because of their Lean efforts over the years, we have a much stronger process that benefits both IDS and our customers.”

Previously, the marking process involved hours of preparation that included hand-measuring plane components and using metal templates. Similarly to painting a room in a house, areas of the aircraft were masked off and a paper or plastic covering was placed over the aircraft to avoid paint overspray. While the paint was applied, other painters would have to stop work because their areas on the aircraft were no longer accessible. They also would have to leave the room to avoid flyaway paint.

Now, most markings are created via computer, and work flow is no longer interrupted. Teamed with the St. Louis Sign Shop, the paint shop uses a Gerber Technology system that cuts the markers out of a high-tech maskant (sticker), including built-in “locators.” These locators match up with physical features of the airplane, and position the markings precisely, without the need for metal templates. Once the maskants are applied, the paint is simply rolled on.

“When I first heard of this new method, I thought it was silly,” said Jerry Maguire, an IDS spray painter. “But after trying it, it’s great. I’ve been happily using it ever since.”

“The roller technique reduced the time to lay out markings from two days to one,” said Stan Bozarth, IDS Paint Shop final paint manager. Also, the team cut costs by reducing wasted paint from overspray and the number of consumables used.

Dwight Singleton, IDS Paint Shop process control engineer, has worked in the St. Louis paint shop for 32 years and attests to the positive change. “Everyone in the paint shop has progressed along with technology and change and embraced it,” he said. “When a new method comes along, it’s always questioned, but we have this ‘let’s try it’ attitude. When it works, then it becomes a way of life.”

Bozarth and Singleton have been traveling to other IDS sites to teach employees the improved techniques. What started as the brainpower of the St. Louis paint shop team now is the IDS business standard. Indeed, sharing a process improvement idea with other sites across Boeing supports the companywide Lean+ growth and productivity initiative.

“The simplest solution is oftentimes the best solution,” Bozarth said. “Trust your colleagues and their ideas.” ■

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“This team took the initiative to work together and make a difference.”

—Steve Jacques,  
IDS Manufacturing vice president

# The next chapter

## CH-47F Chinook rollout marks latest stage of helicopter's long history

By DONNA MCGINLEY

**B**oeing Rotorcraft Systems in Philadelphia rolled out the first of 452 new CH-47F Chinook heavy-transport helicopters early this summer in support of the Army Cargo Helicopter Modernization Program.

The CH-47—celebrating its 44th year of production this month—transports troops, supplies, weapons and other cargo in combat and features a newly designed, modernized airframe and an advanced digital cockpit. The airframe includes modern manufacturing techniques where single-piece machined components replace built-up sheet metal structures. The new components reduce operating and support costs while improving the structural integrity of the aircraft, extending the overall useful life of the Chinook.

A CH-47D Chinook flyover at the rollout ceremony highlighted the aircraft's lift capability by carrying a sling-loaded "Hum-

**"I could not be more proud to be associated with this great aircraft."**

—Jack Dougherty, Chinook director

vee" vehicle under the aircraft. Powered by two 4,868-horsepower Honeywell engines, the new CH-47F can reach speeds greater than 175 mph and transport payloads weighing more than 21,000 pounds. The aircraft has a mission radius of more than 400 miles (640 kilometers). Its unique tandem rotor configuration enables the Chinook to operate in conditions other helicopters can't.

"The CH-47F will give us an enhanced capability to conduct air assaults and deliver critical supplies to our soldiers as we prosecute this war on terrorism and remain on the offensive," said Col. Warren Phipps, 101st Combat Aviation Brigade commander for

the U.S. Army. "This is truly a great day for the Army, Army Aviation, and most of all our soldiers. This delivery marks the beginning of a long production run that is a keystone in Army Aviation's transformation."

Chinook director Jack Dougherty said few events have brought him more pleasure than this rollout, since it commemorates the start of a new chapter in the Chinook's long history. "I could not be more proud to be associated with this great aircraft," he said.

The new model Chinook will benefit soldiers in the battlefield. Its advanced avionics feature improved situational awareness for flight crews with an advanced digital map display and a data transfer system for storing preflight and mission data. Additionally, the Digital Advanced Flight Control system

replaces a legacy analog system.

"Chinooks are recognized around the world for their unique design, but more importantly for their capability to carry people and supplies into areas unreachable by other means," Dougherty said. "It is now the longest-running continuous production program in the history of The Boeing Company, outstripping every commercial jetliner and military aircraft the company has ever built."

Chinooks have been sold to 16 nations. The largest users are the U.S. Army and the United Kingdom's Royal Air Force. A commercial model, the Boeing 234 Chinook, is used worldwide for logging, construction, fighting forest fires and supporting petroleum exploration operations. ■

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FRED TROILO PHOTO



**Boeing employees in Philadelphia roll out to the flight ramp the first of 452 new CH-47F Chinook heavy-transport helicopters. The aircraft is part of the U.S. Army Cargo Helicopter Modernization Program.**





Elijah Walker (from left), Kyle Fears and Max Santiago, Boeing Checkout, Assembly & Payload Processing Services technicians, help guide one of six batteries for the P4 truss onto a stand in the Space Station Processing Facility at Kennedy Space Center, Fla. Fresh batteries were installed on the truss before launch.

NASA PHOTO

# Back to work

## ISS assembly resumes with Boeing-built truss

By Ed MEMI

For the first time in four years, construction on the International Space Station is set to resume, and Boeing-built products are leading the way to expand the size of the orbital structure and further the science needed for long-duration space flight.

Following Space Shuttle *Discovery's* near-perfect return to flight in July, Boeing employees are now eager to get the port-three-and-port-four (P3/P4) integrated truss segment installed on the Space Station. Space Shuttle *Atlantis*, which is carrying the P3/P4 segment, was scheduled to launch from Kennedy Space Center, Fla., during a launch window that opened Aug. 27 (after *Boeing Frontiers* went to press).

The 45-by-15-foot aluminum truss is part of the structural framework of the station that houses the space outpost's power, data and temperature control systems. The

P4 element contains a set of power-producing solar arrays. Eventually, this truss will span 300 feet and contain four sets of solar arrays—two sets of which will be on orbit following this mission. These arrays will produce enough power to support a crew of six, allowing experiments exploring how to live and work in space for long periods, critical to the United States' plans to return to the moon and journey to Mars someday.

On Earth, the P3/P4 segment weighs almost 35,000 pounds. But it will be weightless on orbit, allowing the astronauts to remove the segment from *Atlantis'* payload bay using the shuttle's remote arm and hand it off to the station's remote arm. The astronauts then will maneuver the segment into place before attaching it to the Port 1 truss segment.

"While waiting to launch P3/P4, we've been diligent in maintaining the flight hardware to ensure the vehicle's mechanical and electrical systems work as designed when they reach the station," said Chuck Hardison, Boeing ISS site manager at Kennedy Space Center. "The entire team is excited about resuming assembly operations."

The ISS travels around the earth every 90 minutes at an altitude of about 220 miles (350 kilometers). For about 30 minutes it's in the earth's shadow; batteries inside P4 provide power during that time. Since P3 and P4 were delivered to KSC in 1999 and 2000, Boeing replaced the batteries (which last about eight to 10 years) in 2005. Boeing engineers also worked with NASA and Lockheed Martin to ensure the solar array wings, which are folded up accordion style into two long boxes for launch, would not stick together when deployed.

The Boeing team at Huntington Beach, Calif., designed P3. Boeing Rocketdyne Power and Propulsion (now Pratt & Whitney Rocketdyne) in Canoga Park, Calif., designed P4. Assembly of P3 and P4 in Tulsa, Okla., started in 1997. The two segments were later joined together at Kennedy Space Center.

Boeing became the ISS' prime contractor in 1993 and built many of the U.S. elements. Boeing now is responsible for sustaining engineering, integrations, the operations element and development of the truss systems and most of the onboard mechanical systems. The ISS, when completed in 2010, will be equivalent to a five-bedroom house, weigh almost a million pounds (454,000 kilograms) and be as long as a U.S. football field, including the end zones. ■

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BOB FERGUSON PHOTO

Spacecraft engineers at the Satellite Development Center in El Segundo, Calif., prepare a Boeing-built 601 spacecraft for testing in a thermal vacuum chamber designed to replicate the harsh extremes of the space environment. Every Boeing satellite is tested at extremes ranging from -250 to 320 degrees Fahrenheit.

### A look at SDC's activity

Even a cursory look inside the million-square-foot Satellite Development Center in El Segundo, Calif., is impressive, if not overwhelming.

Straight ahead, you glimpse a coterie of smock-clad technicians tending to some of the most complex satellites ever built. Once deployed to Earth orbit, many of these spacecraft will enable millions of people around the world to exchange voice, data and images with ease.

A glance down the cavernous high bay captures another satellite being readied for thermal-vacuum testing, which simulates the spacecraft's harsh operating environment 22,300 miles (35,900 kilometers) above Earth. And not far away, 157-foot-long solar panels (48 meters), built by Boeing subsidiary Spectrolab Inc., stand poised to convert sunlight into energy for still another spacecraft.

These scenes are found nowhere else at Boeing; the 5,400-employee SDC is the company's primary satellite manufacturing facility.

Instantaneous global communication service, direct-to-home television, vital military links, life-saving weather monitoring—the SDC, anchored by 43 years of experience in designing and building space-based assets, enables all these capabilities.

—Joel R. Nelson

# Aiming High

## Industry recovery, new pacts and technology improvements spur optimism for Boeing's satellite biz

By JOEL R. NELSON

**R**ecent contract wins. Program successes. Ongoing technical innovation.

These achievements of Boeing's Satellite Development Center—of IDS Space & Intelligence Systems—fuel strong optimism the center will continue to be an aggressive competitor in the recovering satellite industry. The buzz of activity that permeates the



factory in El Segundo, Calif., reflects this sense of confidence.

The S&IS team is executing 10 satellite orders for nine customers, including the U.S. Air Force, New Skies Satellites of The Netherlands, and the Malaysian concern MEASAT (Malaysia–East Asia Satellite system). S&IS also helps design and build space-based systems for several U.S. national security customers.

“We’ve stabilized our performance, we’re focused on making money with good business practices, and we see tremendous opportunities across all our markets,” said Charles Toups, S&IS vice president of Engineering.

### EARLY TRACTION IN 2006

S&IS got off to a fast start this year. In January, it recorded its largest contract in nine years: an agreement to build three satellites that will form the backbone of Mobile Satellite Ventures’ North American mobile communications system. In February, Boeing received authorization to begin work on the fourth spacecraft in the Wideband Gap-filler Satellite system, a multispacecraft fleet that will provide next-generation communications to U.S. and allied warfighters.

Then in May, a Boeing Delta IV rocket launched into Earth orbit the first of three next-generation U.S. weather satellites (GOES-N) built at the Satellite Development Center (see Page 29 of the July 2006 *Boeing Frontiers*). And in June, the Air Force ordered another three Global Positioning System satellites.

### CONTRIBUTING ACROSS BOEING

Along with serving its own wide-ranging customer base, S&IS delivers vital support to programs across the company. “A lot of people across the company have helped us, so we’re eager to give back by leveraging our expertise and best practices into their work,” Toups said. This work includes

- Helping define the Transformational Satellite Communications System, which will provide high-capacity, Internet-like connectivity to military forces.
- Assuming responsibility for delivering 12 satellites for the Global Positioning System IIF constellation, continuing a Boeing GPS heritage that dates to 1974.
- Providing support to NASA’s Orion spacecraft, the successor to the Space Shuttle, for which Boeing is part of a team performing developmental studies. S&IS digital technology experts invented a flexible processor that controls nine spacecraft subsystems, including navigation, proximity detection and communications.
- Developing radio frequency converters and electronics for the Family of Advanced Beyond Line-of-Sight Terminals initiative, which will provide protected communications for the U.S. military.

### LEAN+ DRIVING IMPROVEMENTS

Buoyed by this momentum, S&IS is aggressively seeking to expand its satellite business.

The enterprise is applying Lean+ and Critical Chain Project Management—a method for efficiently managing equipment, personnel, and other program resources—across its Engineering and support functions as well as on the factory floor.

“Lean and CCPM were huge factors in engaging our employees in improving our operations and making us competitive for the Mobile Satellite Ventures contract,” Toups said. “We expect them to drive even more improvements that will position us well for future opportunities.”

Lean+ and CCPM have paid off in improved program execution. For example, the cost of rework, repair and scrap has declined by two-thirds since 2002. Cycle times for building a number of key spacecraft components have shown steady improvement, and the



JEFF LOFTIN PHOTO

**Boeing 702 satellites, like the one pictured here inside Boeing’s 60-foot High Bay in El Segundo, Calif., undergo final processing during this last stage of assembly and test. Once launched, these satellites will operate from geostationary orbit 22,300 miles above the equator.**

delivery schedule for a satellite that will expand high-definition television service across the United States was significantly shortened this year.

“Several commercial and government customers have commented on how well we’re doing,” Toups said. Also validating its improvement efforts: The Satellite Development Center has delivered improved financial results over the past several quarters.

### NETWORK SOLUTIONS

Those efficiencies allow the center to fulfill its mission of providing networked solutions.

“Our customers look to us to create total systems solutions—a network-enabled approach in which satellites interact with a variety of other assets—that deliver critical information, in real time, to a variety of commercial, military and civil environments,” Toups said.

The Satellite Development Center draws upon some unique capabilities in carrying out this mission. One of them is digital signal processing technology, which allows satellites to route multiple signals quickly and efficiently. The facility has been developing and improving this technology since the late 1970s; it’s one of S&IS’ core competencies in government and commercial markets.

“S&IS is the world leader in building very-large-scale digital signal processors for satellites,” said Brian Clebowicz of the S&IS Digital Electronics organization. “No one else makes as many digital signal processors or as many that are highly complex.” ■

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# Keep the wheels moving

## Huntsville employee knows what ‘clean’ means on battlefield

BY AMY REAGAN

Some of us love our cars. We wash and wax the outside until it gleams, and fanatically clean out the cookie crumbs every night. But on the battlefield an ultra-clean vehicle is not a fetish. It can be a matter of life or death.

For vehicles on the battlefield, “clean” means more than “free from dirt.” It also means “in optimum working order.” Boeing Product Support Specialist Jerry Wilson knows what clean means when it comes to battle-bound Humvee vehicles carrying the Avenger, the U.S. Army’s premier mobile, short-range air-defense system. As the Avenger’s prime systems integrator, Boeing integrates the Avenger on the Humvee.

Last year, in Kuwait, Wilson led a team to install gun kits on eight Avengers and en-

sure the vehicles were in good working order. This year, he returned to Kuwait on a team assigned to reset those same Avengers. A reset is basically cleaning the vehicle and repairing or replacing damaged or missing parts. Wilson said even though they were electronically functional, the vehicles were in dire need of a good cleaning.

Besides shoveling mud and ammunition from the inside of the vehicles, team members added new seats, replaced worn-out components and loaded software onto the vehicles’ computer systems.

During the reset process, Wilson noticed a potential safety hazard. Avengers have remote control units that can control the weapons system from 50 meters (160 feet) away. The units typically are mounted on the floor inside the Avenger, but in these eight vehicles, they had been moved to accommodate air conditioning units and were no longer secured. Encountering bumpy roads or coming under enemy fire, the Avengers’ unsecured remote control units would be a serious safety hazard.

To fix the problem, Wilson, with help from a local support team, reworked the brackets

**Jerry Wilson, an Integrated Missile Defense product-support specialist, works to reset an Avenger in Kuwait.**

and installed them so that the remote control units were secure but left adequate space for the air conditioning units. Wilson didn’t leave until he was satisfied the vehicles were “clean” in every sense of the word.

“This was an effort that doesn’t necessarily make the headlines,” said Phil Hillman, Avenger/Force Protection program manager. “Jerry caught a problem that could easily have been ignored, chose not to ignore it, and in the end provided a top-notch vehicle for warfighters to do their job as safely as possible.”

For his efforts, Wilson was named the June 2006 Integrated Missile Defense Star of the Month—an award given to Huntsville, Ala., employees who provide outstanding support for the Integrated Missile Defense program and its customers.

And Wilson’s response to the recognition? “Just part of the job,” he said. ■

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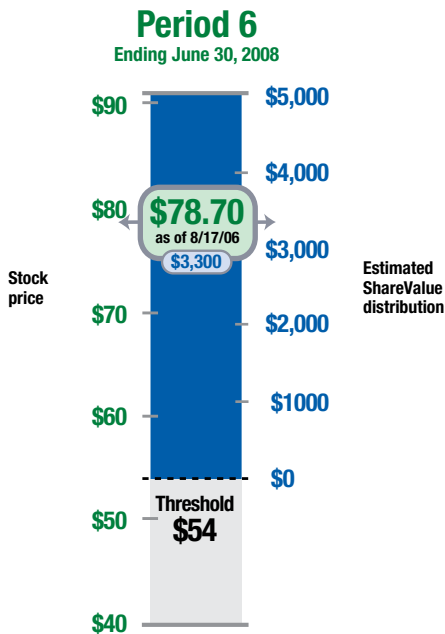
## Boeing stock, ShareValue Trust performance

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. Each period lasts four years (except Period 1, which expired in 1998 and covered two years). The program is currently in Periods 6 and 7.

For each fund period, the value of the trust that exceeds 3 percent annual growth is distributed to eligible participants in the form of stock (with partial shares in cash). Participants on non-U.S. payrolls will receive cash in lieu of stock. The trust investment value can grow in two ways: when the market value of Boeing stock increases over the long term, and when shares are added to the trust because dividends have been reinvested.

The estimated Period 6 price threshold is \$54. At press time, the Period 7 threshold was not available.



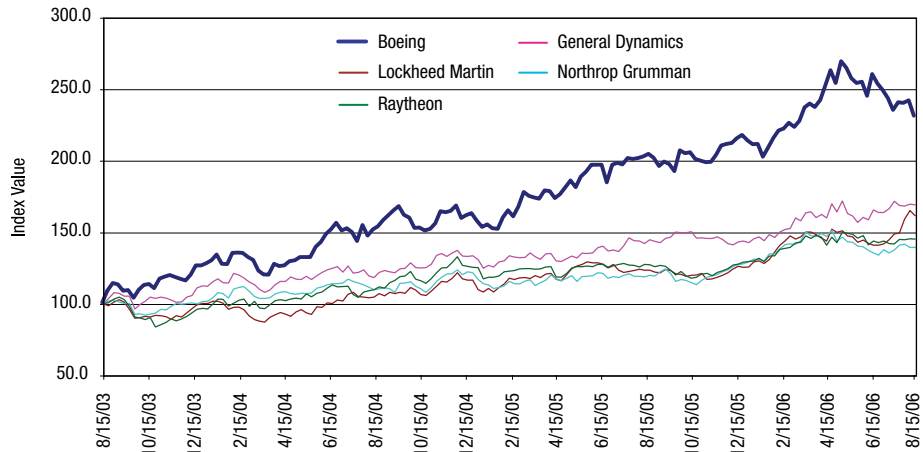
The above graph shows an estimate of what a “full 4-year participant” ShareValue Trust distribution (pretax) would be for Period 6 if the end-of-period average share price was the same as the recent price shown.

- Distributions are prorated based on the number of months an individual is eligible.
- 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.

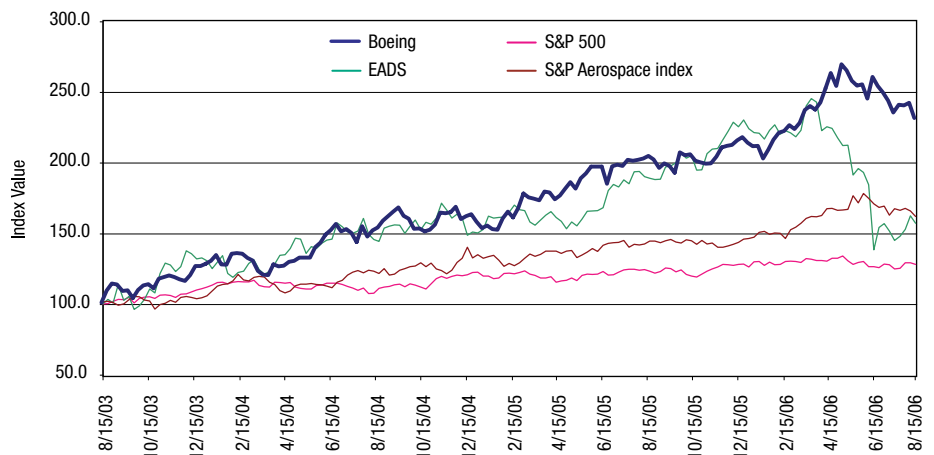
## STOCK WATCH

The chart below shows the stock price of Boeing compared to other aerospace companies, the S&P 500 index and the S&P 500 Aerospace and Defense index. Prices/values are plotted as an index number. The base date for these prices/values is Aug. 15, 2003, which generates three years of data. The prices/values on that date equal 100. In other words, an index of 120 represents a 20 percent improvement over the price/value on the base date. Each data point represents the end of a trading week.

### Boeing vs. U.S.-based competitors (3-year)



### Boeing vs. stock indexes and foreign competitors (3-year)



### Comparisons:

4-week, 52-week

	Price/value as of 8/11/06	Four-week comparison		52-week comparison	
		Price/value as of 7/14/06	Percent change	Price/value as of 08/12/05	Percent change
<b>BOEING</b>	<b>75.96</b>	<b>77.25</b>	<b>-1.7%</b>	<b>66.54</b>	<b>14.2%</b>
<b>U.S. COMPETITORS</b>					
General Dynamics	67.63	68.61	-1.4%	56.80	19.1%
Lockheed Martin	81.82	75.30	8.7%	62.45	31.0%
Northrop Grumman	64.75	63.97	1.2%	55.19	17.3%
Raytheon	45.01	43.94	2.4%	39.52	13.9%
<b>FOREIGN COMPETITORS</b>					
EADS *	22.50	20.75	8.4%	27.22	-17.3%
<b>U.S. STOCK INDEXES</b>					
S&P 500	1266.74	1236.20	2.5%	1230.39	3.0%
S&P 500 Aerospace and Defense Index	333.50	330.65	0.9%	295.70	12.8%

\* Price in Euros

# SERVICE AWARDS:

Boeing recognizes the following employees in September for their years of service.

## 50 Years

Anthony Corpus  
Ralph Dick  
Kenneth Eichorn  
John Fitzgerald  
George Schlie

## 45 Years

Terrance Collier  
James Farley  
Antoinette Hauenstein  
James Henderson  
Woo Lee  
Pamela Mottes  
Gerald Raniszkeski  
Charles Watson

## 40 Years

Vladimir Basica  
Bo Bjurman  
Janet Bothe  
John Brigulio  
Richard Butcher  
Lewis Byrne  
Gilbert Cerise  
Andre Chapdelaine  
Paulette Douglas  
Alan Freed  
Jerry Glover  
Darin Groll  
Kenneth Houston  
Raymond Howe  
John Iversen  
Richard Jauer  
Forrester Johnson  
Gene Jordan  
Dennis Kidder  
Ray Killbreath  
Wayne Laing  
Ora Luke  
Markele Machado  
Ernest Macias  
Edward Malone  
Raymond Martin  
Charles Murphy  
Gerald Nissen  
Kristi Patterson  
Luana Pearson  
Eusebio Pena  
Raymond Peth  
Forrest Pinger  
Michael Pope  
Raymond Pritchett  
Donald Roberts  
William Ross  
Walter Schmale  
Kenneth Smith  
Charles Snow  
Thomas Suter  
Lynn Takashima  
Gerald Taylor  
James Taylor  
Walter Trost  
Jimmy Vanauken  
Gary Vieth  
Joseph Wallin  
Linda Weldon  
David Yee

## 35 Years

Michael Anderson  
Richard Blake  
Maaouia Bouazza  
Stephen Bowe  
Norman Boyden  
John Csigas  
David Deamer  
Edward Draper  
Kerry Forschler  
Robert Frantz  
Richard Hemming  
Dorothy Hill  
Calvin Jue  
Ronald Kay  
Dennis Kudrna  
Albert La Mere  
Quinciano Mendoza  
Linda Miller  
Matthew Rainey  
Veranne Ramos  
Lois Robinson  
Sharon Robinson  
Frances Roy  
Michael Sandoval  
Barbara Simbler  
Charles Smith  
Barry Taft  
Jerry Thornell  
Leonard Tran  
George Vaughan  
Paul Waldfogel  
Glenn Yoshihara

## 30 Years

Shaun Allahyari  
Ronald Allen  
Jerry Amrine  
Margaret Andert  
Elesa Asher  
Ronald Barrett  
Richard Beck  
Michael Benne  
Judith Berghuis  
Craig Betzina  
Benjamin Blair  
Daniel Blanchard  
Alan Bloom  
James Bolognue  
Charles Castleberry  
Robert Cebula  
James Chase  
Michael Cheshier  
Mark Clinton  
William Conrad  
Douglas Cox  
Mark Degraaf  
Linda Diaz  
George Eakins  
Gregory Ebert  
Cheri Egli  
Cynthia Emberton  
John Epstein  
Michael Estes  
Michael Fisher  
Lenora Fitzgerald  
Gary Flowers  
Kevin Flynn  
Guerdon Frame  
Paul Gallaway

Michael Garner  
Robert Gilman  
Cheryl Giovenco  
Patrick Goertzen  
Steven Goo  
Kenneth Goodwin  
Edward Granlund  
John Groenenboom  
Charles Haberlach  
David Haskell  
Gerald Heydon  
Anthony Hicks  
Murray Hines  
Alan Hochhalter  
Yvonne Holley  
Lloyd Holloway  
John Honeywell  
Ronald Horton  
Clifford Huebner  
Elizabeth Huffman-Parry  
Paul Isford  
Shirley Jarman  
James Jensen  
Gilbert Jernigan  
Karl Johnston  
Jill Katayama  
John Kearnes  
Jerry Kidder  
Richard Klep  
Laurie Knott  
Thomas Lavery  
Leslie Letterman  
Kimberly Liebig  
Joseph Lyons  
Alan Mayeda  
Beverly McCallum  
John McMasters  
Donna McWaters  
Danny Miller  
Steven Mueller  
Irene Nadeau  
Paul Nash  
Cathryne Overstreet  
Gail Parrish  
Jack Patraszewski  
Kimberly Pontius  
David Richart  
Stephen Rodriguez  
Morris Rusch  
Julius Sadilek  
Kenneth Schmalbeck  
Craig Scott  
Lyle Scott  
Charles Sheldon  
Courtney Skoien  
Gary Swanson  
Louis Swayne  
Nancy Tellian  
David Thole  
Steven Thomas  
Todd Thompson  
Garry Totman  
Glenn Vail  
Anna Villegas  
John Vonhatten  
Kenneth Wahlin  
Gerod Wattier  
Thomas Welch  
David Winter  
Thomas Yanak

Michael Yeager  
Thomas Yeager  
Matthew Zollner

## 25 Years

Thomas Albertson  
Gerald Allmaras  
Anna Alvarez  
Stephen Amorosi  
John Anderson  
Richard Anderson  
David Arnold  
Nancy Auerswald  
Audrey Aymonin  
Susan Baker  
Paul Baldrige  
Kevin Balmforth  
John Balzer  
Kenneth Barber  
Catherine Barido  
Maria Barnwell  
Patrick Barracks  
Catherine Bates  
Chris Bauman  
Daniel Beres  
Larry Black  
Steven Blomquist  
Mark Blondin  
Wanda Bonhage  
Jeffrey Bouquet  
Robert Boyd  
Rick Bright  
Sharlene Bright  
Catherine Brown  
E.J. Brown  
Howard Bryant  
Stephen Burchett  
Cheryl Calandro  
Denise Callander  
Michael Campbell  
Douglas Carbaugh  
Jonathan Carey-Voris  
Kathryn Chalfan  
Virginia Champion  
Gail Chapman  
Yongja Chen  
Rachel Cherian  
Charles Chey  
Larry Churchwell  
Donna Cisco  
Ronald Clinkenbeard  
Scott Collier  
Stephen Collier  
Bernard Conlon  
Phyllis Conner  
Beverley Cooper  
Myra Cordero  
Kevin Cowling  
Gary Crabtree  
Michael Crawford  
Dennis Cupitt  
Emanuel Curcio  
Steven Daubert  
Kimert Declue  
Keith Dennis  
Todd Dobson  
Jerry Dodds  
Thomas Dotd  
Peter Doman  
Fernando Dones

Alex Duke  
Grover Duncan  
Dzung Duong  
Tall Ellis  
James Engelson  
James Engrisse  
Thomas Evatt  
Leslie Fader  
Jerry Fear  
John Feldmann  
Bradley Fey  
Steven Fischer  
Sandy Fisher  
Richard Flood  
Patricia Ford  
Jan Fortier  
Gary Foss  
Stephen Gabosch  
Douglas Gaj  
Brian Gallagher  
Steven Garr  
Markland Gates  
Gerard Genovese  
Natividad Gil  
Tibet Giray  
Michael Gisondi  
Carol Gist  
Marilyn Glenn  
Ralph Goad  
Dexter Godzik  
Jesse Goldbaum  
Kristen Goodin  
Randy Gregory  
Terje Gudmestad  
Keith Guillot  
John Gulbranson  
Michael Guntorius  
Mark Guttenplan  
Gary Habich  
Jeffrey Hagopian  
Jeffrey Hall  
Marion Hampton  
Charles Hanson  
David Harper  
Glenn Harris  
Brian Hartford  
Michelle Hawkins  
Salome Hawkins  
Gregory Heath  
Rita Heneghan  
Kathleen Hensley  
Lawrence Hernandez  
Kenneth Herndon  
Dale Hight  
Harris Hinnant  
Rita Hitt  
Alex Hixenbaugh  
Jean Hodell  
Jeffrey Holland  
Russell Holt  
Kevin Housen  
Linda Howell  
Waneta Huckaby  
Scot Ishino  
Donald Joeckel  
Larry Johnson  
Donald Jones  
Donald Juhl  
Thomas Kain  
Richard Kaneshiro  
Andris Karklins  
Carol Keeler  
Jon Kelley

Joseph Kelly  
Thomas Kempland  
Norman Killian  
Gerald Kinder  
Duane Kolstad  
David Kozy  
Claudia Kucharek  
Arnie Kvarnberg  
Samuel Kwok  
Brian Lachapelle  
Beatrice Laird  
Robert Landry  
Cesar Larin  
John Latham  
David Leach  
Bradford Leibbrand  
Luis Leon  
James Li  
Robert Longworth  
Mark Lovegren  
Anita Lucich  
Glenn Lyles  
Kevin Macquinn  
Dennis Mahmood  
Rosanne Malone  
Armando Martinez  
Gabriel Martinez  
Roberto Martinez  
Millanito Masayon  
John Masters  
Gabriel Mata  
Deryle Matthews  
Darwin Mattingly  
Terrell McClain  
Daniel McCormack  
Michael McCullough  
Janice McDaniel  
Joseph McNeish  
William Meessen  
Stuart Melvin  
Carlos Mendoza  
Robert Menzel  
Roderick Mercer  
Clay Merrill  
Diana Meusch  
Julia Meyer  
Mark Miklos  
Rick Miller  
Ted Miyagishima  
Frederick Moble  
Alcide Montgomery  
Richard Morad  
Carlos Moran  
Ivan Morgan  
Dennis Morris  
Jeffery Morrow  
Douglas Mueller  
Alex Munoz  
David Nagel  
Amy Nakata  
Nhon Ngo  
Dennis O'Fallon  
Robert Olson  
Michael Orsi  
Donald Oss  
Steven Panetta  
Charles Park  
Michael Parks  
Margaret Pascoe  
Fred Passler  
Peri Payton  
Russell Pearce  
Joseph Peck



Mark Pelton  
Sharon Peterson  
Drew Phillips  
Dale Pitt  
Gary Pochurek  
David Pogorzelski  
George Potter  
Gregory Potts  
Patti Pruett  
Richard Razo  
David Reardon  
Robert Reckenwald  
Michael Reese  
Steven Reis  
Michael Reynolds  
Edward Rice  
Edwin Rice  
Jeffrey Rich

John Richardson  
Rebecca Roelle  
Jeffrey Rogers  
Susan Ross  
Brenda Rosson  
James Ruckle  
Elena Runyan  
Michael Sander  
Janet Sanders  
Nancy Savage  
Robert Schmidt  
John Schmitz  
David Schneider  
Mark Schuetz  
Mark Schultz  
Randolph Scott  
Michael Scoville  
Michelle Seel

Steven Shanker  
Richard Shepard  
Rudy Shimada  
Daniel Simmons  
Wade Simmons  
Gary Skeavington  
Tina Skelley  
James Smith  
Kim Smith  
Mark Smith  
Yvonne Smith  
Garry Smuin  
Clifford Sonsteng  
Juanita Sova  
Deborah Spadoni  
Reginald Spates  
Calvin Spencer  
Carole Stalcup

David Stankowicz  
Victor Starkovich  
Timothy Steimel  
Linda Steward  
William Stien  
Linda Summers  
Arthur Szency  
Arthur Takemiya  
Pamela Tanner  
James Taylor  
Patrick Taylor  
Edward Terneus  
Charles Thigpen  
Laura Thompson  
Hana Tong  
Scott Toyoda  
John Tracy  
Rhonda Tyler

Jo Valentine  
Ronald Valentine  
Timothy Vinopal  
Verl Vogel  
Donald Vossenkemper  
Mel Walker  
Mark Walsh  
Frederick Walt  
Joseph Waters  
Mark Watson  
Russell Weaver  
Joel Webber  
Glenn Webster  
Christopher Weiler  
Robert Weiss  
Richard White  
Phillip Whitehead  
Robert Wightman

Gregory Wilder  
Phillip Williamson  
Thomas Witsch  
Philip Winn  
Robert Wolf  
Michael Wong  
Patricia Woodward  
Ralph Wright  
Christopher Yang  
Patti Young  
David Yousko  
Zaid Zahroun  
Stanley Zola  
William Zylstra

## RETIREMENTS:

The following employees retired in July from  
The Boeing Company.

Donald Adams, 32 Years  
John Adamski, 45 Years  
Dennis Alexander, 21 Years  
Carl Allen, 36 Years  
Robert Allen, 43 Years  
Victor Altobano, 24 Years  
David Anderson, 27 Years  
Darro Angelini, 29 Years  
Charles Auble, 20 Years  
Barbara Austin, 18 Years  
George Baker, 26 Years  
John Barnes, 19 Years  
Karen Bell, 18 Years  
Mary Benjamin, 31 Years  
Janna Bennett, 25 Years  
Donald Berg, 26 Years  
Dennis Beyma, 8 Years  
Francis Bick, 17 Years  
Marc Bitler, 24 Years  
Dennis Blackburn, 36 Years  
William Bockhorst, 23 Years  
Evert Bondurant, 24 Years  
Eldon Boxx, 30 Years  
William Brunner, 16 Years  
Thomas Buchanan, 18 Years  
Robert Buchholz, 36 Years  
Virginia Buck, 24 Years  
Richard Bymers, 40 Years  
Wray Calahan, 20 Years  
Carrie Campbell, 25 Years  
Pamela Carmona, 36 Years  
Michael Cesarano, 28 Years  
Chak Chie, 15 Years  
Tony Chinn, 29 Years  
James Chou, 32 Years  
Michael Clark, 40 Years  
Paul Clavio, 32 Years  
John Clouse, 40 Years  
Rosa Cortez, 30 Years  
Billy Cromer, 20 Years  
Michael Cruickshank, 39 Years  
Thomas Cummings, 42 Years  
Brenda Dahle, 27 Years  
Robert Dangaran, 41 Years  
Richard Davies, 25 Years  
Norman Demers, 33 Years  
James Devlin, 40 Years

Shelia Dickerson, 20 Years  
Peter Disantis, 35 Years  
Gary Dumas, 23 Years  
Charles Echols, 40 Years  
James Edenfield, 27 Years  
Joseph Elliott, 31 Years  
Edwin Evers, 26 Years  
Paul Fadon, 27 Years  
Quintin Fagerlie, 44 Years  
Michael Ferluga, 32 Years  
Larry Ferman, 26 Years  
Carolyn Field, 9 Years  
Ralph Fisher, 25 Years  
Barbara Foley, 31 Years  
Lois Foy, 20 Years  
John Fry, 24 Years  
Barbara Gabanek, 10 Years  
James Gano, 33 Years  
Hans-Peter Gantz, 40 Years  
Lavanira Geisler, 18 Years  
Glen George, 40 Years  
Walter Gillette, 39 Years  
Patrick Gilligan, 20 Years  
Gary Glasscock, 35 Years  
Leonard Gnojewski, 41 Years  
Franklin Goodrich, 18 Years  
John Grap, 30 Years  
Richard Green, 28 Years  
Charles Greene, 18 Years  
Lowell Gregg, 18 Years  
Thomas Griffith, 20 Years  
William Grun, 42 Years  
Gregory Gwash, 9 Years  
Kenneth Hall, 6 Years  
David Hamilton, 28 Years  
Marva Hansen, 20 Years  
Lawson Hart, 40 Years  
Clyde Haynes, 28 Years  
Delmar Haynes, 28 Years  
Virginia Hennessee, 40 Years  
Ronald Hess, 40 Years  
Robert Hill, 26 Years  
Paul Hinton, 6 Years  
Robert Hoard, 25 Years  
Daniel Hoffman, 27 Years  
Richard Holman, 22 Years  
Brian Huss, 33 Years

Arlis Hust, 38 Years  
Henry Jacobsen, 28 Years  
Mahesh Jain, 26 Years  
Rushton James, 19 Years  
Michael Jimerson, 43 Years  
David Johnston, 27 Years  
David Jones, 30 Years  
Bruce Jorgenson, 32 Years  
Kenneth Kawado, 40 Years  
Dorothy Kaye, 10 Years  
John Kazelis, 30 Years  
John Kelleher, 43 Years  
Linda Kelleher, 30 Years  
William Key, 20 Years  
Donald Kilgore, 20 Years  
Thomas Klebau, 38 Years  
Rochelle Kochin, 15 Years  
Ernest Kochis, 20 Years  
Carole Koehne, 16 Years  
Edward Koelling, 25 Years  
Glen George, 40 Years  
Charles Kupperman, 6 Years  
Clarence Kyte, 13 Years  
Felicia La Rosa, 25 Years  
Pamela Labrie, 27 Years  
Daniel Lacey, 27 Years  
Andrea Lackman, 41 Years  
Billy Lackman, 37 Years  
Stephen Lafflam, 21 Years  
Gary Lafflam, 27 Years  
William Landwehr, 26 Years  
James Lawrence, 23 Years  
Walter Lawson, 22 Years  
Larry Lee, 28 Years  
Patrick Leonard, 26 Years  
Hugh Lindsey, 20 Years  
William Long, 7 Years  
Tiajuana Love, 31 Years  
Danny Manis, 19 Years  
Freddie Manuel, 28 Years  
Joseph Marko, 28 Years  
Christine Martens, 32 Years  
Gerald Martian, 34 Years  
James Martin, 25 Years  
John Maschmeier, 44 Years  
Judy Mashore, 25 Years  
Clifford Matteson, 23 Years

Arvin Matz, 27 Years  
William McConnell, 30 Years  
Charles McCormack, 15 Years  
Terence McMillan, 31 Years  
Carol Meadors, 17 Years  
Leslie Meeks, 37 Years  
Thomas Melody, 20 Years  
Charles Michal, 19 Years  
Ronald Miller, 44 Years  
Lawrence Mitchell, 26 Years  
Bahmand Momtaz, 11 Years  
Billie Moore, 40 Years  
David Moore, 40 Years  
Donald Moore, 17 Years  
Lewis Morales, 18 Years  
Jonathan Moyer, 36 Years  
Gary Muehrer, 43 Years  
Raymond Muramoto, 40 Years  
Raymond Narleski, 13 Years  
Edward Nash, 17 Years  
Brian Stanley Neilson, 19 Years  
Gary Nelson, 33 Years  
Anthony Nguyen, 25 Years  
Elaine Noble, 19 Years  
Victoria Nunn, 33 Years  
Donald O'Connor, 20 Years  
Phyllis O'Neil, 22 Years  
Emma Obal, 26 Years  
Raymond Ognissanti, 36 Years  
Rodney Ollman, 24 Years  
Dennis Owens, 33 Years  
Katherine Pacaud, 27 Years  
Han Pang, 17 Years  
Jeffrey Peace, 27 Years  
Wallace Peal, 43 Years  
James Pearce, 40 Years  
Larry Peimann, 42 Years  
Joe Penn, 22 Years  
Thomas Peters, 28 Years  
Arthur Peyster, 33 Years  
Paul Pierce, 15 Years  
Billy Pitts, 23 Years  
Edward Polzin, 37 Years  
Dale Pool, 16 Years  
William Price, 15 Years  
Anthony Puglisi, 27 Years  
Ruby Quallsgray, 23 Years  
Bonnie Queen, 19 Years  
James Raynovic, 13 Years  
Steven Reno, 40 Years  
Troy Richardson, 31 Years

Jeffrey Robens, 37 Years  
Martin Rose, 18 Years  
Perry Rose, 35 Years  
Chikai Sakaguchi, 21 Years  
Gerald Sakaguchi, 20 Years  
Stephen Sauve, 33 Years  
Donald Scelzo, 23 Years  
Gary Schaeffer, 32 Years  
Robert Schappell, 20 Years  
Jane Scott, 19 Years  
Richard Seale, 33 Years  
Steven Seay, 40 Years  
David Shea, 10 Years  
Ronald Sheffler, 20 Years  
Edward Shell, 38 Years  
Mary Shell, 21 Years  
Gary Shepler, 32 Years  
Ollie Sherman, 33 Years  
Robert Shigeno, 42 Years  
Marlene Shively, 19 Years  
Maurice Sias, 20 Years  
Delfin Silva, 41 Years  
Carol Simpson, 26 Years  
Vincent Sipes, 13 Years  
Sherrad Sirmans, 37 Years  
James Smart, 36 Years  
Allen Smith, 40 Years  
Charles Smith, 16 Years  
Christine Smith, 20 Years  
Jerry Smith, 7 Years  
John Smith, 35 Years  
Sandra Sperbeck, 34 Years  
John Steele, 32 Years  
John Steele, 25 Years  
James Stivers, 32 Years  
John Tanner, 9 Years  
Norma Tantico, 27 Years  
Fred Tarnay, 8 Years  
Shirley Thompson, 25 Years  
Thomas Thwaites, 22 Years  
Sharon Tracy, 8 Years  
Beverly Veach, 19 Years  
Margaret Verbeck, 18 Years  
Samuel Viquelia, 22 Years  
William Walkama, 21 Years  
Barbara Wallace, 12 Years  
Michael Webber, 9 Years  
John Weir, 27 Years  
Linda Weissmann, 23 Years  
James Welte, 33 Years  
Samuel West, 40 Years

Jo Wharton, 18 Years  
William Whelan, 18 Years  
Stephen Whisman, 30 Years  
Judith Wiese, 27 Years  
James Williams, 31 Years  
Wendell Wilson, 28 Years  
Steven Woletz, 22 Years  
Robert Woodling, 40 Years  
David Wright, 28 Years  
Lawrence Wyman, 19 Years  
Robert Yingling, 24 Years

## IN MEMORIAM

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

- John Africano**, engineer/manager; service date Dec. 3, 1990; died July 27.
- Allen Avina**, facilities project administrator; service date Feb. 6, 1984; died July 20.
- Curtis Bain**, inspector; service date Nov. 6, 1986; died July 27.
- Victor Chen**, engineer/scientist; service date Nov. 11, 1987; died Aug. 6.
- Jayne Coffey**, logistics specialist; service date Sept. 19, 1988; died Aug. 19.
- Anthony Falcone**, engineer/scientist; service date June 4, 1986; died July 23.
- Katherine Fickes**, business & planning analyst; service date July 3, 1966; died July 20.
- Patrick Green**, mechanic; service date May 17, 1999; died July 31.
- Daniel Loveless**, electrician; service date Jan. 31, 1977; died July 27.
- Frank Marin**, engineer/scientist; service date June 11, 1990; died July 13.
- Jeffrey Meredith**, procurement field representative; service date June 6, 1989; died Aug. 17.
- Leon Nearing**, Development Man. Tooling; service date Jan. 2, 1985; died July 19.
- Frances Payne**, experimental plastics; service date July 31, 1978; died July 15.
- Betty Risher**, systems analyst; service date June 16, 1997; died July 29.
- Richard Robinson**, engineer/scientist; service date May 24, 1982; died Aug. 1.
- Patricia Schille**, office administrator; service date April 8, 1997; died June 18.
- Thomas South**, mechanic; service date Jan. 8, 1983; died Aug. 14.
- Larry Stockum**, engineer/scientist; service date June 1, 1977; died Aug. 9.



ISTOCK PHOTO

**Demand for private-jet services in the United Kingdom jumped last month after implementation of tighter security measures at airports.**

## NEW U.K. SECURITY RULES BOOST DEMAND FOR EXEC JET SERVICE

Executive-jet companies in the United Kingdom said demand rose after last month's terror scare and the resulting airport security measures. According to a *Financial Times* report, the boost, which took place in what's traditionally the slowest part of the year for airplane charters, was spurred by executives seeking private-jet services for vacations. That higher demand took place despite private-jet service being more expensive than commercial air travel.

Chris Leach, managing director of Air Charter Service, told the *Financial Times* that business at this company is double what it normally is in August. "If you've got the resource of a few thousand pounds to avoid the zoo [of airports], you're going to use that resource," he told the newspaper.

Despite this increased demand, some executive-jet industry representatives warned against expecting the jump to become permanent. "To say this is a dramatic increase that will go on forever is probably over-egging the pudding a little bit," said Judith Morton, managing director of SkyJet International, in the report.

## LOCKHEED MARTIN EYES UNMANNED COMBAT AIRCRAFT BUSINESS

Lockheed Martin last month unveiled plans for a variety of future unmanned combat aircraft.

According to the newsletter *Defense Daily*, Lockheed Martin presented ideas for aircraft such as an unmanned combat aerial vehicle variant of the F-35 Joint Strike Fighter. Plans for these vehicles represent "our way to get back into the unmanned systems business," said Frank Mauro, director of unmanned aerial vehicle programs at Lockheed Martin's Advanced Development Programs unit, otherwise known as the Skunk Works, in the *Defense Daily* report.

The first project could be the pilotless F-35. In operation, manned F-35s would control up to four unmanned combat aerial vehicles through an aerial wireless Internet setup, Mauro said in the *Defense Daily* report. Other vehicles Lockheed discussed include a fan-in-wing vertical take-off and landing aircraft known as the Various, a morphing-wing Hunter-Killer and a hypersonic "deep strike" aircraft called the Falcon. These developments follow the July unveiling of its Polecat high-altitude unmanned aerial vehicle.

## CALENDAR OF EVENTS

- Sept. 12-15:** World Airline Entertainment Association 27th Annual Conference & Exhibition. Miami. See [www.waea.org/events/conference/2006/indexmain.htm](http://www.waea.org/events/conference/2006/indexmain.htm)
- Sept. 17-19:** Routes. The World Route Development Forum will conduct its 12th annual conference. Dubai, United Arab Emirates. See [www.routesonline.com](http://www.routesonline.com)
- Sept. 18-20:** SpeedNews Seventh Annual Aviation Industry Suppliers Conference. Toulouse, France. See [www.speednews.com/Conference/euroconference.html](http://www.speednews.com/Conference/euroconference.html)
- Sept. 20-24:** Africa Aerospace and Defence Exhibition. Waterkloof Airbase, South Africa. See [www.aadexpo.co.za](http://www.aadexpo.co.za)
- Sept. 20-24:** 2006 Air Carriers Purchasing Conference. San Francisco. See [www.acpc.com](http://www.acpc.com)
- Sept. 27-28:** Aero-Engine Expo 2006. London. See [www.aviationindustrygroup.com/index.cfm?pg=93](http://www.aviationindustrygroup.com/index.cfm?pg=93)
- Oct. 17-19:** National Business Aviation Association 59th Annual Meeting & Convention. Orlando, Fla. See [www.nbaa.org](http://www.nbaa.org)
- Oct. 24-26:** 8th International Dependency Structure Matrix Conference. Seattle. See [www.boeing.com/ids/dsm06conf](http://www.boeing.com/ids/dsm06conf)
- Oct. 25-27:** Cargo Facts 2006. Miami Beach, Fla. See [www.cargofacts.com](http://www.cargofacts.com)
- Nov. 5-7:** SpeedNews 11th Annual Regional & Corporate Aviation Industry Suppliers Conference. Indian Wells, Calif. See [www.speednews.com/Conference/regionalconference.html](http://www.speednews.com/Conference/regionalconference.html)

*Boeing Frontiers* assembles the above listings for the convenience of its readers only, and they do not constitute an endorsement by The Boeing Company. Times, dates and subject matter are subject to change or cancellation. If you have any items you wish *Frontiers* to consider for the Calendar, please e-mail them to [boeingfrontiers@boeing.com](mailto:boeingfrontiers@boeing.com), or send them by regular mail to *Boeing Frontiers* magazine, 100 N. Riverside, MC: 5003-0983, Chicago, IL 60606-1596.



# AROUND BOEING

## MAIN-DECK CARGO DOOR INSTALLED ON JAPAN TANKER #1

KC-767 Tanker employees at the Integrated Defense Systems site in Wichita, Kan., installed the main-deck cargo door on the Japan #1 Tanker last month. This marks a major milestone in the modification of the first tanker slated for delivery to the Japan Air Self Defense Force.

Tanker employees removed all cradles and holding fixtures prior to installing the main-deck cargo door. According to Art Burden, 767 operations manager, the airplane is placed on cradles early in the modification sequence to facilitate major structure removals and to prevent the aircraft from moving during modification. The next phase of modification, Burden said, is finalizing systems and electrical installations, to allow power-on and hangar operations.

## AIR NEW ZEALAND SIGNS ON FOR NEW SERVICE OFFERINGS

Boeing will supply a comprehensive component-exchange program and a separate but interconnected prognostic airplane health monitoring system to Air New Zealand, Boeing said last month.

Boeing's Component Services Program gives airlines fast access to airplane components while significantly reducing costs. By joining this program, Air New Zealand will save up to 30 percent of the inventory, repair and administrative costs on its eight 777-200ERs (Extended Range). These 777s will be monitored by Boeing's Airplane Health Management system, which will also track the airline's eight 747s. AHM provides airlines with real-time mainte-

nance information that can be used to address potential problems before they force airplanes out of service.

## SEA LAUNCH LIFTS KOREASAT #5 TO ORBIT

Sea Launch Company successfully delivered the Koreasat 5 communications satellite to geosynchronous transfer orbit on Aug. 21.

A Zenit-3SL vehicle lifted off from the Odyssey Launch Platform in the equatorial Pacific. All systems performed nominally during the flight, and a ground station in Fucino, Italy, acquired the first signal from the satellite shortly after spacecraft separation.

This launch is the fourth successful mission of 2006 for Sea Launch, whose four international partners include Boeing. Sea Launch has two more missions planned for this year.

## AERO MAGAZINE RETURNING

Boeing Commercial Airplanes is bringing back *Aero* magazine in response to a customer-support survey conducted last year. The publication provides technical information to help customers operate their Boeing fleets efficiently and increase their awareness of Boeing products and services.

The magazine will be published quarterly, beginning in the fourth quarter of 2006, and will be distributed to operators of Boeing commercial airplanes. It also will be available on the World Wide Web. Boeing employees can watch for details in Boeing News Now when the first issue comes out later this month. ■



## Allen Award winners commemorated

The winners of the 2006 William Allen Awards—presented to employees who have made outstanding contributions to their communities through volunteer service—were honored at a July 26 ceremony at Corporate Offices in Chicago. The annual award is named after William Allen, Boeing president from 1945 to 1968. Posing with this year's eight winners were Allen's daughters Dorothy Penrose (front row, left) and Nancy Silvernale (front row, right). Between Penrose and Silvernale is award winner Dennis Cajili, with his pet therapy dog Riley. The other award winners are: (back row, from center to right) Bernie McBryan, Ted Jones, Bob Seiple; (middle row, from far left) Richard Havner, Kelly Lawrence, Thomas Zermeno, Patricia Trout. Winners of the Allen Award, Boeing's highest non-job-related honor, each receive a plaque, a medallion and a \$5,000 donation to the eligible charity of their choice.



**Bernard Sklanka (left) and Joel Tuss position near-field acoustical holography sensor assemblies for an August 2005 Boeing 777 Quiet Technology Demonstrator 2 Airplane test flight.**

BOB FERGIJON PHOTO

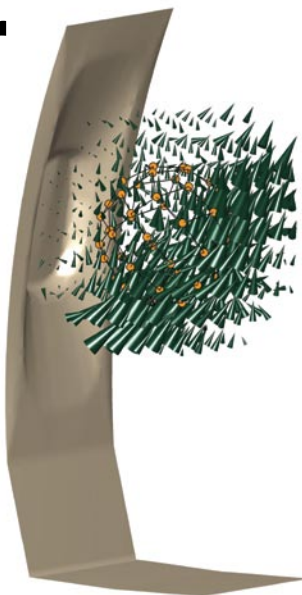
# Supertools for supersleuths

By WALTER POLT

We owe our quiet, easy conversations onboard Boeing planes to “sound detectives.” These engineers now are getting 3-D “noise cameras” to stalk yet-unsolved mysteries.

The trick is to pinpoint noise *origins*. Two Boeing engineers spied a technology seven years ago called near-field acoustical holography (NAH)—arrays of microphones hooked to computers and monitors—for close-up sound surveillance with pictures. At the Boeing Aero/Noise/Propulsion Laboratory in Seattle, Bernard Sklanka and Joel Tuss, senior specialist engineers of the Test Methods & Technology group and the Dynamic Data Systems group, respectively, took the initiative to reinvent NAH for airplanes. Their quest: “Get every scrap of noise” out of airplanes by fingering the real culprits, the sound sources; support Boeing’s quest for the world’s quietest airplanes; and increase Boeing competitiveness.

BERNARD SKLANKA GRAPHIC



**This 3-D reconstruction shows a sound field on the Boeing 777 Quiet Technology Demonstrator 2 test airplane flight last year. Orange dots represent the “listener”: a spherical array of near-field acoustical holography microphones. The longer green cones indicate louder noise. Here they revealed the loudest sounds were not coming from the window but from the sidewall—most likely the air-return grill at its base—and were heading upward and toward the center of the cabin.**

Boeing gave NAH a go-ahead, and the noise operatives found strategic partners in and outside of Boeing (such as NASA and the U.S. Naval Research Laboratory). Results: They modeled a low-cost production-version spherical sensor array on a NASA prototype. By 2004 they were flight-testing new tools on a NASA plane; and last year they were characterizing the sound fields inside the Boeing 777 Quiet Technology Demonstrator 2 (see Page 42 of the March 2006 *Boeing Frontiers* and Page 22 of the December 2005/January 2006 *Challenge*).

Noise clue collecting from stem to stern is helping solve long-term puzzles—“buzz saw” (a tone heard in forward airplane sections when the tips of engine fan blades go supersonic, including takeoff) and “shock cell” (a noise in certain rear areas of bigger planes), for example. Also last year, NAH scrutiny of noise-insulation effectiveness on board a Boeing 737 helped uncover secrets critical to redistributing the insulation—and shedding weight and cost.

With an investment this year of \$320,000, the lab will package its newly developed tools for use by other Boeing groups. And it will continue to refine them. For example, it’s looking to link a spherical array with a laptop. “You could ‘rove’ it on board an airplane, change experiments on the fly, see what happens—and interpret the results in real time,” Tuss said.

“And because flight-testing time on the new 787 airplane will be brief,” he added, “we’ve got to make our tools fast and efficient, and effective”—to achieve a “dream-like stillness” on the plane to match its open cabin architecture and variable lighting.

Finally, the team will create new tools. In laboratory wind-tunnel tests they plan to plunge into the unknowns of jet noise, positioning webs of sensors directly in the cone-shaped roar of sound that fans out behind engines. “And we get new suggestions we hadn’t thought of,” Sklanka said, “like using NAH to detect air leaks when airplane cabins are pressurized in the factory.”

NAH systems are just what Boeing “supersleuths” need now; it’s elementary, my dear Watson. ■

walter.j.polt@boeing.com

## HOW IT WORKS

Near-field acoustical holography can take many shapes and report data in many ways. For example, a beach-ball-sized spherical arrangement of microphones can sample noises at any seat position on an airplane. And in much the same way a camera captures the intricacies of light and color, the sphere captures a 3-D image of variations in the volume, pitch and direction, or “flow,” in the sound field around it. Microphone data from the

sphere are processed using sophisticated algorithms to “pick out sounds, and in finely tuned 3-D pictures or animations point to their sources,” said Bernard Sklanka, lead of the Noise area in the Boeing Test Methods and Technology Group. “Plus, they show exactly where else in the airplane the sounds are headed.”



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IN THE ARTS, WE FIND OUR WINGS.

 **BOEING**  
Forever New Frontiers

*This ad, the fourth in a new series from the company's portfolio of community ads, reinforces Boeing's support of the arts, which help enrich and enlighten the lives of people worldwide. These ads are published in support of arts-related events.*



**A CELEBRATION OF READINESS, IN SILVER AND GOLD.**



We're proud to salute the United States Air Force on two remarkable milestones: the 25th anniversary of the KC-10 and 50th anniversary of the KC-135. These two aircraft, both built and sustained by Boeing, remain the cornerstone of America's strategic refueling capability. Their enduring performance and continued readiness is a testament to the commitment of their crews and all who support them.



*This new Integrated Defense Systems print ad celebrates the 25th anniversary of the KC-10 and the 50th anniversary of the KC-135 – tankers built and supported by Boeing. The ad salutes these major milestones and highlights Boeing's contribution to the readiness and long-lasting value of these platforms. The ad will appear in targeted publications including Air Force Magazine, Air Force Times and Defense News.*