

# Frontiers

[www.boeing.com/frontiers](http://www.boeing.com/frontiers)



LOOKING **FORWARD**



Where's the commercial-airplane market heading?  
The just-updated Current Market Outlook  
provides Boeing's forecast for the next 20 years.





MADE WITH JAPAN

日本の未来と安全を守るためのパートナーシップ。  
F15Jの製造プログラムほどこれを真事に具現化したものはないでしょう。  
1978年、ボーイングと三菱重工はF15Jの日本国内生産の  
ライセンス契約を交わし、セントルイスと名古屋にあるプロジェクトの  
拠点でコラボレーションしてきました。  
このプログラムを支えてきたのは、三菱重工をはじめとする日本企業数百家。  
これまでに数多くのF15Jが日本政府に納入されています。  
日本の未来と安全を守る。ボーイングと日本企業のパートナーシップ。  
その絆はますます深く、確かなものになりつつあります。  
さあ、一歩にすごいこと。

 **BOEING**

*"Rock Garden" is the third in a new series of advertisements reinforcing Boeing's partnership with Japan, a relationship that began more than 50 years ago. "Rock Garden" highlights Boeing's collaboration with Mitsubishi Heavy Industries on the production of the F-15J. The ad currently is running in Japanese publications including Nikkei Business, WING, Nikkei Shimbun, President and Toyo Keizai.*



ON THE COVER: COVER ART BY BRANDON LUONG; WINDOW PHOTO BY ANTHONY PONTON.



ED TURNER/BOEING

# COVER STORY

## WHERE WE'RE GOING | 12

Commercial Airplanes has just released its latest Current Market Outlook. This annual report gives Boeing's view of the next 20 years in the commercial-airplane business. Among the findings in this newest version: The category of twin-aisle airplanes, which includes the 787 Dreamliner (above), represents the largest segment of airplanes, in terms of investment.

# FEATURE STORY

## In it together | 40

Boeing's long-lasting relationship with Japan is strengthening as the nation's partners play an integral part of the company's future. Here's a look at how this relationship is evolving. Also in this package: Meet some of the many employees whose work in building relationships with their Japanese counterparts is helping fortify the Boeing-Japan partnership.

## Getting the job done 24/7 | 20

A group of Boeing employees perform an essential role in Boeing's support to its airline customers. The group is ready at a moment's notice to go wherever a Boeing airplane is damaged.

## Rolling out the *green* carpet | 24

Boeing turned heads at this year's Farnborough International Airshow. But it wasn't the typical product display creating all the buzz. Step inside Boeing's Technology & Environment display to see what everyone was talking about.

## Built on a history of success | 27

Boeing's HH-47 aircraft brings innovative and state-of-the-art advances to an already successful and battle-proven platform. The HH-47 will bring the largest cabin size, highest operating altitude, lowest downwash velocity and most lift capacity to provide the U.S. Air Force's CSAR-X crews with enhanced flexibility for the most demanding missions.

## Trading places | 28

Boeing and the UK Ministry of Defence partnered in an exchange program called "secondment." The two participants in this exchange reflected on their experiences and explain what they've learned, as their term with the other party nears the end.



**24** At this year's Farnborough International Airshow, Boeing presented a striking exhibit that showcased the innovative technologies the company is pursuing to help reduce aviation's impact on the environment. BRAD MITCHELL/BOEING

## The name says it all | 33

Boeing Military Aircraft President Chris Chadwick talks about the significance of the recent name change of Precision Engagement and Mobility Systems.

## Behind-the-scenes business partner | 34

Boeing Shared Services Group operates behind the scenes to ensure success across the company. The group now seeks to improve its own productivity by incorporating Lean+, Internal Services Productivity, and other improvement principles to drive down cost and increase productivity.

## An important engagement | 36

An engaged work force is an important element to any business's success. Hear first hand from employees and managers how some groups have embraced this concept and learn tips and tools for making it work for your group.

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*Letters to the Editor will return next month.*



# Future success depends upon creating value as **‘One Boeing’**

## Shep Hill

President, Boeing International

**P**ast performance is no guarantee of future returns.” This caveat warns investors there is no guarantee that past successes will be replicated in the future. While this phrase typically describes financial funds and investments, this caution also applies to the global marketplace.

We are privileged to have customers, partners, suppliers and employees in 90 countries. Nearly 90 percent of Commercial Airplanes’ backlog comes from customers outside the United States, while Integrated Defense Systems has a goal to increase its international revenue from 13 percent to 20 percent.

Today’s changing global business environment presents Boeing with challenges and opportunities. Customer expectations and country aspirations grow every day. International customers want us to provide solutions to support their plans, while the countries where we operate want us to add economic, technological and social value. They also expect a long-term commitment and a mutually beneficial partnership.

Building a stronger local presence in key international markets has always been a Boeing focus, but that momentum has increased. Our international leaders are developing long-term relationships with government decision makers, industry and the media, as well as the people in the communities where our employees live and work. The goal is simple: Create mutual value.

Operating as “One Boeing” is critical to meeting these expectations. The Boeing portfolio of products, services and intellectual capital, especially our people, is a competitive advantage we must leverage to the fullest. Our ability to focus and utilize the talents, capabilities and relationships of BCA, IDS, Boeing Capital Corporation and corporate functions provides competitive differentiation that’s an absolute imperative in today’s global marketplace.

One Company, One Voice, One Objective—keys to our future success!

This edition of *Boeing Frontiers* takes an in-depth look at the just-released update of Boeing’s Current Market Outlook, as well as the company’s activity in building partnerships in Japan. CMO numbers underscore the tremendous international growth potential we have as a company over the next 20 years, and success in Japan highlights our one-company approach to doing business.

Boeing has sold products and services to Japan for more than 75 years, and simultaneously developed long-term business partnerships with the country’s manufacturing, aviation and defense sectors. It’s a relationship that clearly demonstrates the mutual value Boeing and Japan share, creating a win-win arrangement that benefits all of us. ■



**“Our ability to focus and utilize the talents, capabilities and relationships of BCA, IDS, Boeing Capital Corporation and corporate functions provides competitive differentiation that’s an absolute imperative in today’s global marketplace.”**



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# CALENDAR

**Sept. 9–11:** American Institute of Aeronautics and Astronautics' Space 2008 Conference and Exhibition. San Diego. See [www.aiaa.org](http://www.aiaa.org)

**Sept. 9–11:** World Airline Entertainment Association 29th Annual Conference & Exhibition. Long Beach, Calif. See [www.waea.org/events/conference/2008](http://www.waea.org/events/conference/2008)

**Sept. 15–17:** Cargo Facts 2008. Miami. See [www.cargofacts.com](http://www.cargofacts.com)

**Sept. 17–21:** Africa Aerospace and Defence Exhibition. Cape Town, South Africa. See [www.aadexpo.co.za](http://www.aadexpo.co.za)

**Sept. 23:** Aviation Week Green Aviation forum. Madrid, Spain. See [www.aviationweek.com/forums/greenmain.htm](http://www.aviationweek.com/forums/greenmain.htm)

**Oct. 1–5:** Japan International Aerospace Exhibition 2008. Yokohama, Japan. See [www.japanaerospace.jp](http://www.japanaerospace.jp)

**Oct. 6–8:** National Business Aviation Association 61st Annual Meeting & Convention. Orlando, Fla. See [www.nbaa.org](http://www.nbaa.org)

**Oct. 22–23:** Aircraft & Engine Finance & Leasing Conference USA. Las Vegas, Nev. See [www.aviationindustrygroup.com](http://www.aviationindustrygroup.com)

**Oct. 29–30:** Aircraft & Engine Finance & Leasing Conference USA. Las Vegas, Nev. See [www.aviationindustrygroup.com](http://www.aviationindustrygroup.com)

**Nov. 5–6:** 2nd Annual Aircraft Valuation & Investment Conference. Dublin, Ireland. See [www.aviationindustrygroup.com](http://www.aviationindustrygroup.com)

**Nov. 5–7:** SpeedNews 13th Annual Regional & Business Aviation Industry Suppliers Conference. Indian Wells, Calif. See [www.speednews.com/ConferenceInfo.aspx?conferenceID=23](http://www.speednews.com/ConferenceInfo.aspx?conferenceID=23)

**Nov. 17–20:** National Defense Industrial Association's 8th Annual CMMI Technology Conference and User Group. Denver. See [www.ndia.org](http://www.ndia.org)

**Nov. 19–20:** Aviation, the Environment & Emissions Trading Conference. Brussels, Belgium. See [www.aviationindustrygroup.com](http://www.aviationindustrygroup.com)

**Nov. 26–27:** 9th Annual Managing Aircraft Maintenance Costs Conference. Budapest, Hungary. See [www.aviationindustrygroup.com](http://www.aviationindustrygroup.com)

**Feb. 22–26:** IDEX 2009. This marks the ninth occurrence of the biennial Middle East defense conference and exhibition. Abu Dhabi, United Arab Emirates. See [www.idex2009.com](http://www.idex2009.com)

**March 10–15:** Australian International Airshow and Aerospace & Defence Exposition. Geelong, Australia. See [www.airshow.net.au](http://www.airshow.net.au)

**May 6–7:** Airline Purchasing Expo 2009. London. See [www.aviationindustrygroup.com](http://www.aviationindustrygroup.com)

**June 15–21:** Paris Air Show. Paris. See [www.paris-air-show.com](http://www.paris-air-show.com)

## ST. LOUIS ELECTRONICS RECYCLING EVENT SET

Boeing Employees for Environmental Protection (BEEP), a Boeing-sponsored club in St. Louis, will conduct an electronics recycling collection event on Sept. 11.

Unwanted electronic equipment can be dropped off from 7 a.m. to 9 a.m. and from 2:30 p.m. to 4:30 p.m. at either the 270G parking lot (across Campus Parkway from the 270 building) in St. Louis or the 505H parking lot in St. Charles, Mo. Please note that a Boeing employee badge is required to reach the St. Charles dropoff location—but not for the St. Louis dropoff.

BEEP is partnering with Web Innovations and Technical Services (WITS), a St. Louis-based nonprofit corporation that specializes in reuse and recycling of electronic equipment, for this event. WITS charges a donation of \$10 for each television and \$5 for each monitor, laptop and microwave oven; all other electronics items are taken for free. Please note that this event is for personal items only—and not for Boeing-owned equipment. WITS cannot accept anything with a Boeing property sticker.

BEEP and WITS conduct collections in March, June and September. For more information about BEEP, visit <http://beep.stl.mo.boeing.com/aboutBEEP.jsp> on the Boeing intranet. To learn more about WITS, visit [www.witsinc.org](http://www.witsinc.org).





# SNAPSHOT

## IT DON'T MEAN A THING IF IT AIN'T GOT THAT SWING

Employees at Boeing's Everett, Wash., factory watch landing-gear swing tests on the first 787 Dreamliner. The tests replicate the extension and retraction of the landing gear as it would function during a regular flight. The evaluation marks the start of a series of tests that verify the correct functionality of the landing gear. GAIL HANUSA/BOEING

## QUOTABLES

**“If you had one of these on the battlefield, there is no place that the enemy is safe to hide.”**

— Gary Fitzmire, vice president and program director for Boeing Directed Energy Systems, about the Advanced Tactical Laser, in the Aug. 16 *New York Daily News*. Boeing in August tested the ATL for the first time

**“We are very fortunate that across the board we have the world’s most efficient aircraft.”**

— Randy Tinseth, vice president, Marketing for Commercial Airplanes, on the growing importance of fuel efficiency in airline fleets, at a news conference in Tokyo, in a July 30 Associated Press report

**“International interest in the combat-proven Super Hornet continues to increase.”**

— Bob Gower, F/A-18 and EA-18 Programs vice president, about Boeing offering its F/A-18E/F Super Hornet to the Brazilian Air Force for Brazil's F-X2 fighter competition, in the Aug. 19 *Defense Daily*

### IAM PROMOTIONS

No promotions listed for periods ending July 25 and Aug. 1, 8, 15 and 22.

### 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>



## Designed as a nuclear-capable, carrier-based attack aircraft, the versatile Vigilante transitioned into a premier high-speed reconnaissance platform

By ERIK SIMONSEN

**F**ifty years ago, on Aug. 31, 1958, a sleek, futuristic-looking aircraft swept over the Ohio terrain. Riding on twin glowing afterburners, Dick Wenzel, chief test pilot of North American Aviation's Columbus Division, gently guided the control stick of the impressive YA3J Vigilante. The first flight of the prototype of this aircraft, considered advanced for its time, would mark the prelude of a new era in aerial reconnaissance.

The program was initiated two years earlier, on Aug. 29, 1956, when NAA was awarded a U.S. Navy contract to produce two YA3J all-weather attack systems. After successfully completing flight testing, several A3Js were transferred from Columbus to NAA's Palmdale, Calif., facility and Naval Air Station China Lake, Calif., to begin weapons certification. The team knew from prior experience that releasing weapons at high airspeeds resulted in extensive separation problems. To negate this, the Mach 2-capable A3J incorporated a unique linear bomb bay between the engines that ejected ordnance rearward. The Vigilante was equipped with the new Low Altitude Bombing System to execute this attack maneuver.

Carrier qualifications commenced during July 1960 aboard the USS Saratoga.

Meanwhile, at Edwards Air Force Base, Calif., a glimpse of the Vigilante's future performance was revealed on Dec. 13, 1960, when the second prototype achieved a new world record with a zoom-climb to an altitude of 91,451 feet (27,874 meters) carrying a payload of 2,402.62 pounds (1,000 kilograms).

Shortly after operational deployment to the USS Enterprise Carrier Strike Group in August 1962, the U.S. Department of Defense established new standardized tri-service military aircraft designations, and subsequently the A3J became the A-5. Concurrently, as dictated by a new Pentagon strategy, the Navy was shifting its strategic nuclear-deterrent role to submarine-launched ballistic missiles. With the A-5's nuclear attack mission ebbing away, NAA began accelerating the development of its photo reconnaissance, or "recce," variant. NAA management had anticipated a possible mission shift and was flight testing the YA-5C prototype, which evolved into the RA-5C.

With its potent airframe now sporting a new "canoe" fairing attached to the underside of the fuselage, the revamped RA-5C made its first flight on June 30, 1962. The fairing housed photo-optical and infrared cameras, Electronic Intelligence (ELINT) and Side-Looking Airborne Radar systems that included the capability to transmit real-time secure mission telemetry to the carrier for immediate interpretation. Another noticeable modification, running nearly the length of the upper fuselage, was an added "humpback" that contained extra fuel tanks to improve range. Along with drop tanks on the wing, the Vigilante now had a range of 2,000 miles (3,300 kilometers).

### COMBAT SERVICE

Operating with the 7th Fleet Carrier Air Wing from June 1964 through January 1973, the RA-5C served with distinction in Southeast Asia. Its mission was to carry out the airborne segment of the fleetwide Inte-

An airborne



During December 1975 this RA-5C from Fleet Squadron RVAH-6 was on temporary assignment at Naval Air Station Key West, Fla. The Vigilante evolved from an attack aircraft to a reconnaissance platform. ERIK SIMONSEN

grated Operational Intelligence Systems. Although combat losses were considered high, it was not due to aircraft performance. The all-weather “recce” mission was extremely hazardous; it included predictable post-strike photo-reconnaissance missions when the aircraft and its crews were vulnerable to opposing anti-aircraft artillery and surface-to-air missiles. Vigilantes also conducted ELINT missions.

A total of 156 Vigilantes, including two prototypes, were produced at the Columbus Division, and 122 of these were either manufactured as RA-5Cs or A-5s rebuilt to that standard. The production line was briefly reopened in 1968 and produced 36 units. The aircraft remained in service for 21 years before its retirement in 1979.

The Vigilante stands as a tribute to the Boeing heritage company of Rockwell International and its people. Throughout its evolution from North American Aviation to Rockwell International, the company’s operating standards remained intact. These included setting a course to exceed the customer’s requirements; not cutting corners; engineering with agility; adjusting for changing mission requirements; and building a platform with the ability to assimilate new technology as it evolved. ■

*erik.simonsen@boeing.com*



## RA-5C Vigilante: Tale of the tape

<b>Crew:</b> 2 (pilot, navigator)	<b>Wingspan:</b> 53 feet (16.15 meters)
<b>Maximum speed:</b> 1,385 mph (2,230 km/h)	<b>Height:</b> 19 feet (5.79 meters)
<b>Service ceiling:</b> 52,100 feet (15,900 meters)	<b>Empty weight:</b> 37,500 pounds (17,009 kilograms)
<b>Range:</b> 2,000 miles (3,300 km)	<b>Maximum weight:</b> 79,588 pounds (36,094 kilograms)
<b>Length:</b> 76.6 feet (23.32 meters)	

the eye

# for detail

## Ahead of its time

Here’s a list of “firsts” and advanced features of the Vigilante.

- First production use of HUD (Heads-Up Display) in cockpit
- First production use of fly-by-wire control system
- First variable engine air inlet using horizontal ramp geometry
- First multimode monopulse radar with terrain avoidance (to 100 feet/30.48 meters altitude)
- First Navigation/Bombing system (an automatic “hands-off” system for locating and attacking targets) with inertial auto-navigator coupled to the radar
- Production use of aluminum lithium alloy in aircraft construction
- Single-piece wing skins machined from aluminum-lithium alloy
- One-piece, bird-proof, Mach 2 capable windscreen, made of stretched acrylic
- Slot-deflector spoilers for roll control, eliminating conventional ailerons
- Application of H-11 hot work tool steel in machined fuselage frames
- Enhanced reinforced steel in the landing gear, for extra strength and anti-corrosive properties



# 'I feel great!'

How the Mayo Clinic Health Assessment helped an employee improve her health



JIM ANDERSON/BOEING

Last fall Bezzette Travis completed the Mayo Clinic Health Assessment and realized that she needed to eat better. Despite being very active, she had struggled to keep extra pounds off after the birth of her now-grown children.

Having tried many diets over the years, Travis, a lead integration security specialist in the Puget Sound region, was looking for a solution she could maintain for the rest of her life. She also wanted to learn more about nutrition and ways to avoid conditions, such as diabetes, high blood pressure and cancer, that members of her family have struggled with. Lifestyle coaching from Mayo Clinic provided the solution.

After completing the Health Assessment, Travis received information about the lifestyle coaching program. She was intrigued be-

cause of Mayo Clinic's strong reputation but noted, "I thought it would be the most boring experience." However, toward the end of her six months of coaching, Travis said she knew she'd miss the coaching sessions. "I found myself wishing I had more time," she said.

Travis received a phone call scheduled at her convenience about every two weeks from the same nutrition coach. During the first call, her coach took an inventory of what she ate and asked about her family history. "My coach asked questions, but did not invade my privacy," Travis said. She also felt her coach really listened: "She didn't tell me what to do. She said, 'What is it that you want to accomplish?'"

The tips Travis received touched on preparing healthy meals, reading food labels, shopping for healthy foods and choosing healthy

options when eating out. At the end of each call, she received information to review—and found Mayo's handbook on nutrition particularly helpful.

Today, Travis has transformed how she eats, asks for healthy food alternatives when dining out, weighs 40 pounds less (and is still losing weight), looks younger and no longer suffers from knee discomfort.

"I feel great! And, the only thing it cost me was my time. It was time I spent learning about nutrition and being healthy," she said.

If you have questions about this article or want to share your personal wellness success story, e-mail [Wellness@pss.boeing.com](mailto:Wellness@pss.boeing.com). ■

## How healthy are you?

Take the Mayo Clinic Health Assessment on [www.BoeingWellness.com](http://www.BoeingWellness.com) and find out. Plus, receive a \$50 gift card when you take the Health Assessment by Nov. 30.

Whether you're considering taking the Mayo Clinic Health Assessment for the first time or you've taken it before, it's an excellent opportunity to gauge the general condition of your health and identify ways to improve it. Or you may confirm that you're right on track and leading a healthy lifestyle.

**When you take the Health Assessment, you receive:**

- A tailored action plan
- Tools and resources to manage your health
- FREE healthy lifestyle coaching
- \$50 gift card

**Who's eligible for the \$50 gift card and free healthy lifestyle coaching?**

- Boeing employees
- U.S.-based subsidiary employees\*
- Boeing employee spouses or same-gender domestic partners enrolled in a Boeing health plan
- U.S.-based subsidiary employee spouses or same-gender domestic partners enrolled in a Boeing health plan\*
- International subsidiary employees

*\* Except in some circumstances where the subsidiary maintains its own health plans.*

# Home improvement

## Bathroom addition planned for growing crew of International Space Station

By Ed MEMI

**W**hat growing family wouldn't appreciate adding another bathroom to their home?

That feeling holds true for the crew of astronauts manning the International Space Station, hundreds of miles above Earth. To accommodate a crew that will grow next year from three members to six, a new bathroom addition is in the works.

The bathroom, called a Waste and Hygiene Compartment (WHC), provides an area for personal hygiene and includes a toilet installed in a refrigerator-sized payload rack. The 900-pound (408-kilogram) rack will be delivered to the station via Space Shuttle *Endeavour* on mission STS-126 sometime after Nov. 10. It will be temporarily installed into the Boeing-built U.S. Destiny laboratory module for about a year until the Node 3 module (with space for eight racks) arrives.

Boeing is the prime contractor for the ISS and a major subcontractor to United Space Alliance, the space shuttle operations contractor. Boeing also is responsible for readying all payloads flying into space through its Checkout, Assembly and Payload Processing Services contract with NASA.

"Using the bathroom in zero gravity is a far cry from using a bathroom on Earth," said Boeing project manager Dennis McClain.

The WHC system will be tied into the Regenerative Environmental Control and Life Support Water Recovery System that processes urine and condensate into potable water. By recycling, the system will reduce dependence on Earth resupply by cutting the amount of water and consumables needed to be launched by about 15,000 pounds, or 6,800 kilograms, a year.

Steve Grasso (left) and Don Vosgien, Boeing payload processing technicians at Kennedy Space Center, Fla., prepare a new bathroom for the International Space Station for launch on the Space Shuttle *Endeavour* STS-126 mission this fall.

ROBERT BEARY/INDYNE



Although the toilet was produced by the Russian Rocket Space Corporation Energia, a Boeing Huntsville, Ala., team led by WHC project manager Brad Korb designed and manufactured the WHC, with Boeing Houston employees providing project oversight and integration support.

"It has been a great team effort between Boeing, NASA and our Russian colleagues and other suppliers. It took a lot of hard work to get to where we are today, and the WHC is critical to our plans for a six-person crew next year," said Dan Hartman, NASA ISS vehicle manager.

The WHC will arrive on station about 90 percent complete, with the remaining assembly to be performed on board. There will be a period of testing to ensure the system is operating properly before full use. ■

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## Kudos for Boeing-sponsored films

Two Boeing-supported movies recently achieved new heights of recognition.

"Operation Homecoming: Writing the Wartime Experience," a documentary that aired on PBS in April 2007 as part of the America at a Crossroads series, was nominated for three News and Documentary Emmy Awards. In this film, soldiers share their wartime experiences, and families relate how they deal with the stress of having a family member serve in dangerous situations. The 29th Annual News and Documentary Emmy Awards will be presented Sept. 22.

The Operation Homecoming initiative was made possible by support from Boeing, which has helped the National Endowment of the Arts bring numerous quality arts and arts education programs to U.S. military communities domestically and overseas.

Meanwhile, the worldwide audience for the IMAX-format movie, "Fighter Pilot: Operation Red Flag," recently topped 150 million, according to K2 Communications, which produced and distributes the film. "Fighter Pilot: Operation Red Flag," underwritten by Boeing, is about an F-15 fighter pilot as he chronicles his participation in a simulated air war designed to improve pilot performance in combat.

"We're proud of the work and appreciative of Boeing's participation as underwriter," said Stephen Low, the film's producer and director.

—Kevin Smith



By DAWSALEE GRIFFIN

**P**redicting the future is a risky business. No matter how much detailed background research is done, the results are still an educated guess. Despite this, Commercial Airplanes has been studying the future of the commercial aviation market and sharing its outlook for more than 40 years.

Each year, the business unit's Market Analysis group produces the Current Market Outlook (CMO), a report that offers a 20-year look-ahead at the commercial aviation market. According to Mike Warner, senior manager of Market Analysis, the outlook is Boeing's baseline view of the market and how the company thinks it will perform over the next two decades. With the recent release of the newly updated CMO, employees can read the same analysis that Boeing uses to develop its long-term business and marketing strategy. Among the revelations in this year's report are:

- Since older airplanes are less economically viable as fuel costs rise, replacement airplanes make up a larger portion of future deliveries than was previously predicted.
- Strong growth in China, India, the Middle East and other emerging markets will lead to more-balanced airplane demand worldwide.
- The world will need 29,400 airplanes, valued at \$3.2 trillion, over the next 20 years.

"The Current Market Outlook has not only set the standard as the most accurate industry forecast, it's also something we do at Boeing that's truly critical to our future as an industry leader" said Randy Tinseth, vice president, Marketing, Commercial Airplanes. "The CMO helps us shape our strategy, it provides key input to our long-range business plan, and it produces data and analysis that's crucial to our planning and study activities with customers throughout the year."

#### COLLECTING THE DATA

The CMO is updated and released each summer just before the Farnborough and Paris air shows. In addition to forecasting markets and economic conditions, the initial report provides details by region and by airplane type (single-aisle, twin-aisle, regional jet, very large airplanes) for both the passenger and cargo markets. Later, usually in September, Commercial Airplanes publishes a comprehensive forecast with much more detailed discussion, data and charts. Then the process of reviewing the year's events and collecting new data begins all over again.

*(Continued on Page 14)*

# Meet your new Current Market Outlook

What's in store for the next 20 years of the global jetliner market? The just-released version of this annual Boeing report offers the company's forecast

GRAPHIC: BRANDON LUONG; PHOTO: SHUTTERSTOCK

# What to know FROM THE CMO

Here are some important findings from the new Current Market Outlook.

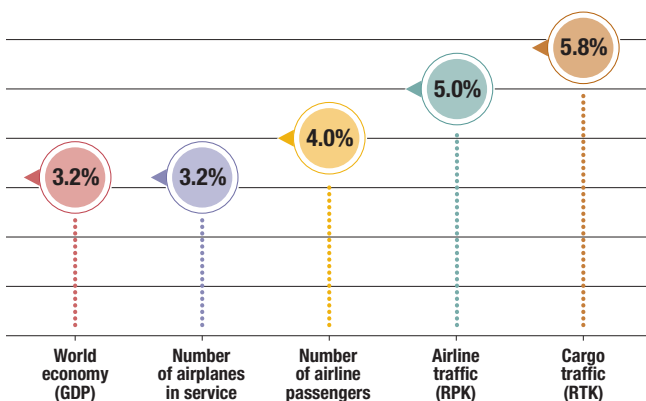
- Over the next 20 years, global air travel will continue to **grow 5 percent annually**, driven by economic growth, world trade, tourism, new airplane capabilities and market liberalization.
- Boeing forecasts a demand for **29,400 airplanes, valued at \$3.2 trillion**, over the next 20 years. Here's how the four product categories look.
  - 747 and larger: 980 units, \$290 billion market value: A small but significant market
  - Twin-aisle airplanes: 6,750 units, \$1.47 trillion: The largest segment by investment
  - Single-aisle airplanes: 19,160 units, \$1.36 trillion: The largest segment by units
  - Regional jets: 2,510 units, \$80 billion: This segment declines as airlines move up to larger airplanes, in light of capacity, economic and environmental constraints.
- Over the next 20 years, the world's **airplane fleet will grow to 35,800 units** from 19,000 today. This marks an annual increase of 3.2 percent per year—the same as the estimated economic growth rate.
- Replacement airplanes make up a **larger portion of future deliveries** than was projected in the previous forecast (43 percent, up from 36 percent) as older airplanes become less economically viable when fuel costs rise.
- Strong growth in China, India, the Middle East and other emerging markets will lead toward a **more balanced airplane demand worldwide**.
- Thanks to recent strong years, more than 30 percent of the forecast is **already in the backlog** of airplane manufacturers.

## It all starts WITH GDP

Many factors drive air transport, but the most fundamental one is economic activity. As economies grow, so do the demands for air travel and air cargo. According to the Current Market Outlook, the world's gross domestic product to increase 3.2 percent annually over the next 20 years—and various metrics relating to air transport will follow suit.

### MARKET GROWTH RATES

2007–2027





Months before the CMO forecast is published, the six-member Market Analysis team begins collecting the data it will use to form the basis for its conclusions.

According to Anthony Ponton, regional director of market analysis, it's essential that team members thoroughly understand today's state of the market, including current travel trends, the world airline fleet and how it is being used, the age of the fleet, airline growth potentials and strategies, and world and regional economic forecasts. The current market state forms the baseline against which emerging trends and issues are viewed and measured to identify future demands for products and services.

The team gathers and analyzes general information from industry-standard sources such as the Official Airline Guide, aircraft utilization databases and databases of orders, deliveries and backlog. The team consults industry experts, both inside and outside the company, about the current and future market environment.

The team reviews all of the world's airplanes with more than 30 seats, to understand where and how they're being used—airline schedules, short versus long haul, and between what regions and city pairs. To complete the analysis of the world airline system, the team factors in unscheduled services (such as charter flights), which add an additional 10 percent or so of traffic.

Other staff in Marketing and Sales have constant access to the latest market information and provide valuable input about the future direction of the airline business. This gives the analysis team insight on how these airlines may grow within regions, networks and even between important city pairs.

At the same time, team members also look at travel patterns, including a route-by-route analysis to understand current traffic patterns using all possible combinations of information (for example, airplane size, length of route, frequency).

Emergent issues and trends also are reflected in the report, which is one reason the CMO is released just before the air show. However, the focus in the CMO is on what the long-term impact may be, according to Ponton. "The world forecast is really based on an understanding of future travel needs," he said.

**WHO USES THE CMO**

Although the CMO presentation and book are aimed at external audiences such as

media members, financial analysts, airlines and suppliers, the background data and conclusions also are used widely within Boeing. "It's the only place where we summarize all the different market numbers in a form that is easy to understand," said Ponton.

Warner agreed that although the most visible parts of the CMO are the book, the Web site ([www.boeing.com/cmo](http://www.boeing.com/cmo)) and public presentations, the most important use for the forecast and its supporting data is internal. Boeing bases its long-term business planning and marketing strategy on this look at the demand for air travel and the resulting products and services needed over the long term.

"The bottom line, what the forecast is really all about, is how people travel and how Boeing can make that better," Tinseth said. ■

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**REGIONAL HOTSPOTS**

**World total: 29,400 new airplane deliveries**

Projected new airplane deliveries by region, and the total market value of these airplanes



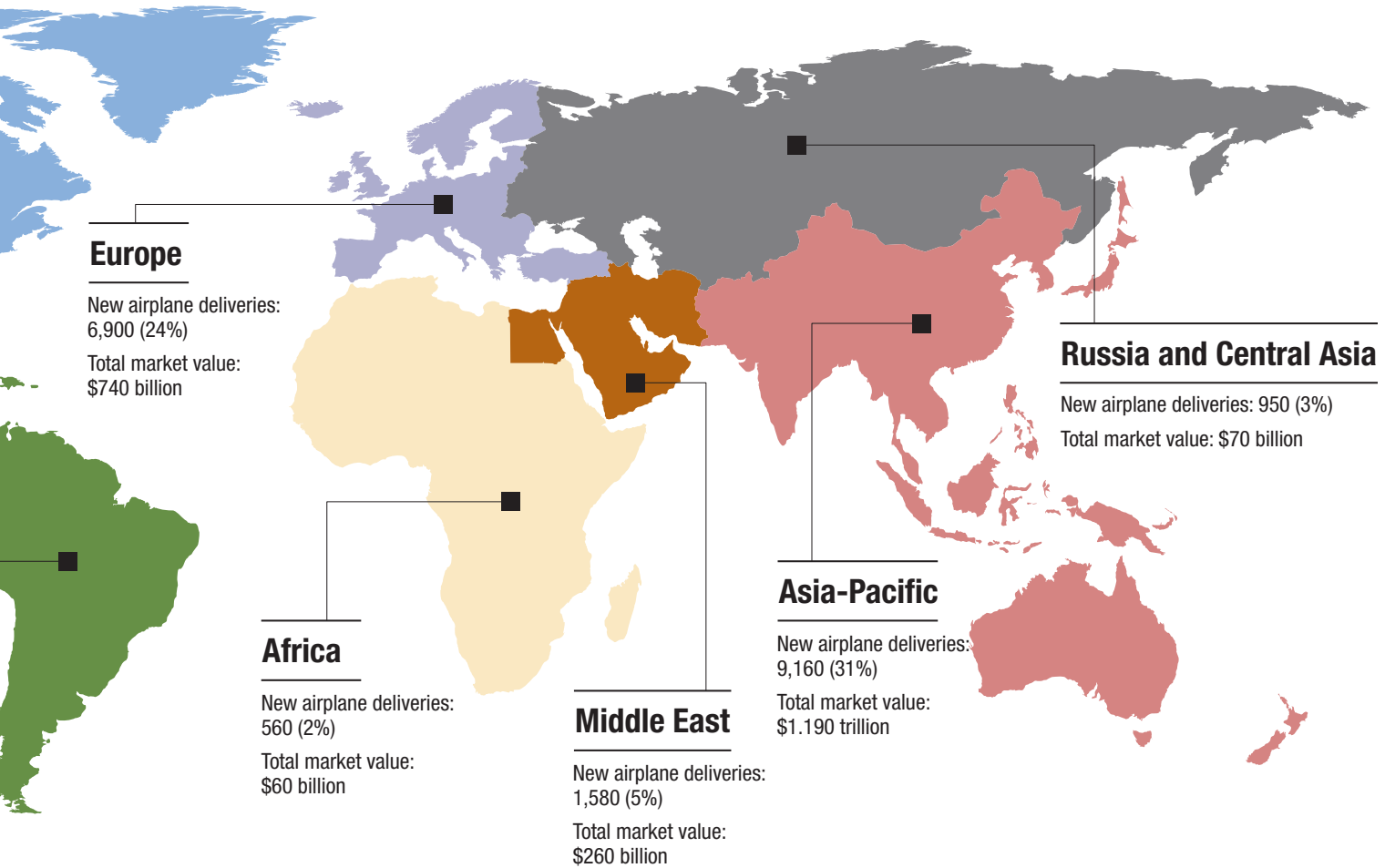
Balanced global DEMAND

Geographic distribution of future deliveries is more evenly dispersed across the world than it's been in the past. What's the leading region in terms of both airplanes needed and market value of these units? Asia-Pacific.



SHUTTERSTOCK

eries, \$3.2 trillion total market value





# Where WE'RE GOING

A look at growth in worldwide air travel patterns

## CHANGE IN WORLDWIDE AIR TRAVEL PATTERNS

Region	Revenue passenger-kilometers 2007*	Revenue passenger-kilometers 2027*	Annual percentage change, 2007-2027
Within China	210	1,156	8.9%
Asia-Pacific, including China	783	3,058	7.0%
Within Latin America	120	441	6.7%
Asia-Pacific, excluding China	573	1,902	6.2%
Middle East to Asia-Pacific	93	282	5.7%
Europe to Asia-Pacific	307	921	5.7%
Transpacific	251	750	5.6%
Africa to Europe	122	350	5.4%
Within and to Russia and Central Asia	132	370	5.3%
North America to Latin America	182	469	4.8%
Europe to Latin America	163	411	4.7%
North Atlantic	418	1,040	4.7%
Within Europe	631	1,259	3.5%
Within North America	1,017	1,750	2.8%

\* In billions of revenue passenger kilometers



GRAPHICS: BRANDON LUONG

# Airline passenger traffic within and between regions in 2007 and 2027, and annual growth rates during this span

How to read this chart:

To see the projections of airline passenger traffic in 2007 and 2027, as well as the annual growth rates during this span, locate the square where the row and column of the regions of interest intersect.

Each square has three figures:

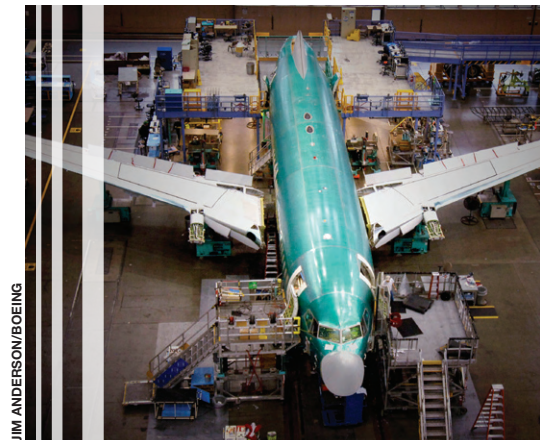
The **black** number represents airline passenger traffic, in billions of revenue passenger-kilometers, in 2007.

The **blue** number represents airline passenger traffic, in billions of revenue passenger-kilometers, in 2027.

The **brown** number represents the annual percentage growth rate during this period.

For instance, traffic between Africa and Asia-Pacific is projected to rise from 6 billion RPKs in 2007 to 20 billion RPKs in 2027. That jump represents a 7.3 percent annual growth rate.

	Africa	Latin America	Middle East	Europe	North America	Asia-Pacific
Asia-Pacific	6 20 7.3%	5 11 9.4%	90 280 5.7%	310 920 5.7%	250 750 5.6%	780 3,060 7.0%
North America	8 20 5.4%	180 470 4.8%	30 90 5.9%	420 1,040 4.7%	1,020 1,750 2.8%	
Europe	120 350 5.4%	160 410 4.7%	160 270 4.9%	630 1,260 3.5%		
Middle East	20 60 6.1%	— — —	40 120 5.7%			
Latin America	3 6 5.6%	120 440 6.7%				
Africa	30 100 5.6%					



JIM ANDERSON/BOEING

## Backlog and THE CMO

The Current Market Outlook provides a thorough outlook on the next 20 years of the commercial aviation business. But comparing its numbers with Commercial Airplanes' backlog offers market analysts valuable insight on the future potential of regions.

For example, the forecast for the North America market—8,550 new airplanes needed in this timespan—is surprisingly large, according to Anthony Ponton, regional director of Market Analysis. Ponton explained that although many North American airlines haven't recently been in a position to buy new airplanes, at some point they will have to replace their older, less-efficient airplanes.

Boeing and Airbus currently have record backlogs. Understanding the connection between the backlogs and demand forecasts is important. Boeing's 2008 CMO forecast for a demand for 29,400 planes over the next 20 years generated some skepticism, according to Mike Warner, senior manager of Market Analysis. "However," Warner said, "nearly a third of those planes are already in the backlog." Understanding that fact helps industry observers—and CMO readers—put the numbers in better perspective.

—Dawsalee Griffin



# Space to CARRY MORE

According to the CMO, cargo traffic is projected to triple. To satisfy this growth, there will be more cargo jetliners, and there will be more big airplanes. The world's freighter fleet will be largely renewed by 2027, thanks mainly to conversions.

## CARGO MARKET, BY THE NUMBERS

### 605 billion

Number of revenue-tonne kilometers of air cargo projected for 2027. That mark is more than triple the 2007 traffic level of 200 billion RTKs

### 3,890

Number of cargo airplanes projected for the world's 2027 fleet. That represents a doubling of the 2007 fleet of 1,950 airplanes

### 64

Percentage of the 2027 fleet to be made up of widebody airplanes, up from 61 percent in 2007

### 14

Percentage of freighters in service in 2027 that are part of today's fleet (530 of 3,890)

### 64

Percentage of freighters in the world's 2027 freighter fleet to be comprised of new conversions (2,500 of 3,890)

## Load masters

How the projected freighter fleet of 2027 will be composed, in number of airplanes by category.

Size category	End of 2007	-	Removed from service	+	Converted to freighter	+	New deliveries 2008 to 2027	=	End of 2027
Large (more than 80 tonnes)*	500	-	260	+	460	+	640	=	1,340
Medium (40 to 80 tonnes)	690	-	450	+	100	+	210	=	1,160
Standard body (less than 45 tonnes)	760	-	710	+	1,330	+	10	=	1,390
<b>Total freighter</b>	<b>1,950</b>	-	<b>1,420</b>	+	<b>2,500</b>	+	<b>860</b>	=	<b>3,890</b>

\* Large passenger and large freighter categories differ.

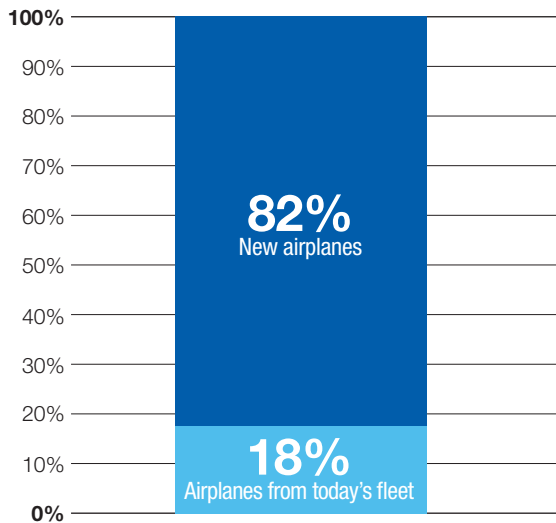


# Continuous improvements IN AIR TRANSPORT

Like any good business forecast, the Current Market Outlook takes into account challenges that the industry faces. According to the CMO, noteworthy future challenges that the aviation industry faces include continuing to improve the environmental performance of airplanes, and relieving airspace and airport congestion.

As a result, the CMO projects that for the world's fleet of 35,800 airplanes in 2027, only 18 percent will be made up of airplanes that exist today. The remaining 82 percent will include airplanes that have yet to be built.

Because airplanes will continue to provide improved performance thanks to future technologies, the great majority of the airplane fleet in 2027 will be made up of airplanes that are better for the environment, passengers and airlines.



GRAPHIC: BRANDON LUONG; PHOTO: SHUTTERSTOCK



## How accurate IS THE CMO?

Each year's CMO update uses the best available information to ensure optimal accuracy. Although there have been surprises along the way—such as the impact of the rise of low-cost carriers on the travel market—overall, the CMO projections have been very close.

“If you go back 20 years and look at what [we] forecast,” said Mike Warner, senior manager of Market Analysis, “you’ll see we are conservative and tend to underestimate all the markets but one. We have consistently overestimated demand for the largest airplanes.”

Anthony Ponton, regional director of Market Analysis, said they’ve also been tracking the 2000-2019 market forecast to see how accurate it has been. Nearly halfway through, the overall forecast numbers are very close: It called for 22,300 airplanes, and orders from 2000 to July 2008 totaled 13,800. The forecast was slightly low for single-aisle and twin-aisle airplanes and slightly high for the smallest and largest airplanes (see chart at right).

The goal is to make the material more objective, relevant and accurate with each edition of the CMO. Improved tools offer more time to understand the market forces and will, ultimately, make the forecast even more accurate.

—Dawsalee Griffin

## The 2000 CMO: HOW IT'S FARED

How the product forecast in the 2000 Current Market Outlook compares to actual orders since then.

### PERCENTAGE SHARE OF TOTAL FLEET TAKEN BY EACH PRODUCT CATEGORY

	2000 Current Market Outlook (2000-2019)	Net orders, 2000-present
747 and larger	5%	3%
Twin-aisle airplanes	21%	23%
Single-aisle airplanes	55%	59%
Regional jets	19%	15%
<b>Total units</b>	<b>22,300 predicted</b>	<b>13,800</b>



# Whatever it takes

Boeing's Airplane-On-Ground Operations teammates go anywhere, do just about anything to get customers' airplanes back in the sky

By DAN IVANIS

**W**hen the phone rang last Christmas Eve, Mike Carpenter had a pretty good idea what was in store. There was a damaged Boeing airplane somewhere in the world, and soon he would be traveling to wherever it was to assess the damage and put a team together to get it back in the air.

As a manager in Boeing's Airplane-On-Ground (AOG) Operations, Carpenter's phone rings year-round with such calls. AOG workers will tell you that airplanes don't get holidays off, and the mechanics who put them back together rarely do either. AOG teams spend days, weeks, even months at locations around the world, working 12-hour shifts, seven days a week. Because of the nature of the work, teammates often travel on short notice and stay until the job is done.

Yet the work they perform is essential to Boeing's role in supporting the operations of its airline customers—which rely on Boeing airplanes to transport passengers and cargo. And that's why Carpenter knew a trip was imminent—even if it was Christmas Eve.


"I don't think I've ever missed a Christmas at home, but I've missed nearly every Thanksgiving since I joined AOG in 1996," said Carpenter, who spent nine years as an AOG mechanic before becoming a manager. "It is just part of the job—one of the tradeoffs."

## OFF TO FRANCE

Normally, Carpenter would be on a plane the day of the call, or the next day at the latest. But his flight to the incident site—Charles de Gaulle Airport, outside Paris—wasn't until Dec. 26 due to delays in obtaining necessary airport security passes. Joining him on the flight were three AOG specialists—members of a survey team who would help assess the damage and begin putting together estimates, lists and plans to fix the airplane as quickly and efficiently as possible.

AOG Operations, which is part of Commercial Aviation Services within Commercial Airplanes, specializes in returning customers' Boeing 7-series or MD-series airplanes to revenue service, wherever they happen to be. AOG Operations centers are located in Everett, Wash. (specializing in twin-aisle 7-series airplanes), Renton, Wash. (single-aisle 7-series) and Long Beach, Calif. (MD-series). The sites regularly loan employees back and forth, depending on needs and availability.

When Carpenter, who is based in Everett, and his team arrived in Paris, they got a first-hand look at the damage. A 767-300 was inadvertently backed into a blast fence by a tow tug operator. The airplane sustained heavy damage to the rear section where the vertical tail fin and horizontal stabilizer are joined to the fuselage. Three skins and numer-



Boeing AOG Operations mechanics rejoin the 48 Section to the 46 Section on the damaged 767-300.

RICK TURNBAUGH/BOEING



ous fuselage stringers and frames needed to be removed and replaced. In addition, the pressure dome, a circular structure nearly 20 feet (6 meters) in diameter located at the aft end of the passenger cabin, had been punctured. The dome, a key component in the pressurization of the cabin, would have to be replaced.

**‘HOT BUNKING’ AVOIDED**

Along with assessing the damage to the airplane, the survey team also evaluates logistics, including what facilities are available for performing repairs and the proximity of accommodations for the AOG team. For this particular job the logistics were pretty straightforward: Hangar space was available and Paris offers a wealth of hotels and restaurants. The biggest hurdle was transporting the new pressure dome to the repair site, due to its size. That required hiring a Russian-built Antonov An-124 cargo plane, which could not land at Charles de Gaulle Airport because of noise restrictions. The plane landed at a different airport and its cargo was trucked to the repair site.

“That was a logistics challenge for our planning group, but relatively tame compared to some of the things we go through,” Carpenter said. Depending on the location and facilities available at the site of a disabled airplane, AOG teams often have to set up makeshift “hangars” or tents to perform their work. Although most AOG jobs have relatively easy access to hotels and restaurants, AOG teams tell stories about sleeping in tents or “hot bunking” in former jail cells at an airport where a plane was being repaired. (Hot bunking is where workers on different shifts use the same bed.)

**“There’s nothing else like fixing a broken airplane, giving it back to the customer and watching it fly away. We can fix just about anything.”**

—Sam Norwood, Airplane-On-Ground electrician

Logistics are an essential part of the equation when AOG managers such as Carpenter put together repair estimates for the customer. AOG service is a competitive business and customers consider quality, cost and time when deciding who to hire to get their airplane back in the air.

“We have to be very efficient,” Carpenter said. “Customers know we will provide them with quality and get the job done on time, but if someone else charges a fraction of the price less, they’ll certainly get the customer’s attention.”

In this case, the survey team returned to its Everett office on Dec. 30 and started putting together the estimate and plan—which included a team of 36 people staying on site for up to 20 days. Both were accepted quickly by the customer. While planners and mechanics developed packing lists of tools and parts, Carpenter started lining up his team.

“Because of the nature of the work, AOG mechanics have a multitude of skills,” Carpenter said. “Still, you always need a solid core of experience for the specific job you are going to, and you also have to take into consideration the other repairs going on.”

Depending on availability of parts and other logistics issues, AOG jobs can begin the same day the customer signs the contract, a week later or even months later. The 767 worker got under way in mid-February.

“I’ve had jobs where I came into work in the morning and was asked to fly out that afternoon,” said Bernie Dalien, a Renton-based AOG mechanic who was loaned out to help in Paris. “Other times you might know a week or two in advance.”

**CAMARADERIE ON THE ROAD**

Once the AOG teams arrive at the scene of the repair, they split into two shifts—12 hours on, 12 hours off, seven days a week. There is a 30-minute crossover at the end of each shift for information sharing and handing-off work.

“There is camaraderie with these guys when you are on the road,” said Fred Chadwick, an Everett-based AOG mechanic who recently accepted a management position with the 787 program. “It is definitely a band of brothers. You miss the family and the family functions, but you are with your extended family in another way.”

Although the travel to exotic locations seems alluring, AOG mechanics get very little opportunity for sightseeing.

“I’ve been doing this for 18 years and I’ve probably made 100 trips. I’ve probably had 30 days off during those trips,” said Craig Oppedal, an AOG manager. “Sometimes you get to see the sights, but you better do it in a hurry.”

Tom Niemi, an Everett-based AOG mechanic for the past 11 years, has had his wife join him on a couple assignments. “We got to ride around the pyramids in Egypt on camels, and that is something we never would have done if not for this job,” he said. “Days off are rare, though. Mostly it is just work.”

Although the reasons for joining and sticking with AOG work are as varied as the people who do the job, several main themes are apparent: the variety of work, variety of locations and the teamwork that gets the job done.

“There’s nothing else like fixing a broken airplane, giving it back to the customer and watching it fly away,” said Sam Norwood, an Everett-based AOG electrician. “We can fix just about anything.”



**AOG mechanic Fred Chadwick takes a break to survey the situation.**

RICK TURNBAUGH/BOEING



In France, the major hurdle in fixing the 767 involved removing the vertical tail fin and pulling the aft section of the plane away from the rest of the fuselage so the damaged pressure dome could be removed and the new one installed. Then, of course, everything had to be put back together.

"I'd been through that operation on 777s twice before," Dalien said. "Everything has to be very precise. Everything is measured, re-measured and measured again. Planes are built to stay together, not come apart. We are there to fix things, and not make them worse. When you start adjusting loads by pulling things apart, if things aren't supported properly they can break or bend."

The measurements were right on. Repairs proceeded on schedule and the airplane was handed over to the customer and returned to revenue service according to Carpenter's original estimate.

"For this group, it was just another day 'at the office,'" Norwood said. "We do our job very well—we do it right the first time, and we're proud when we leave. That's just the way it is."

Most AOG members don't get to see the airplane they've worked on fly away. As work winds down they are sent home, where they support factory or flight line operations, or move on to the next AOG assignment.

AOG managers such as Carpenter stay with the airplane until the end, making sure the customer is completely satisfied. Then they return to their base where they document lessons learned and other issues that may help the next remote repair be performed more efficiently—and, of course, to wait for their phone to ring again. ■

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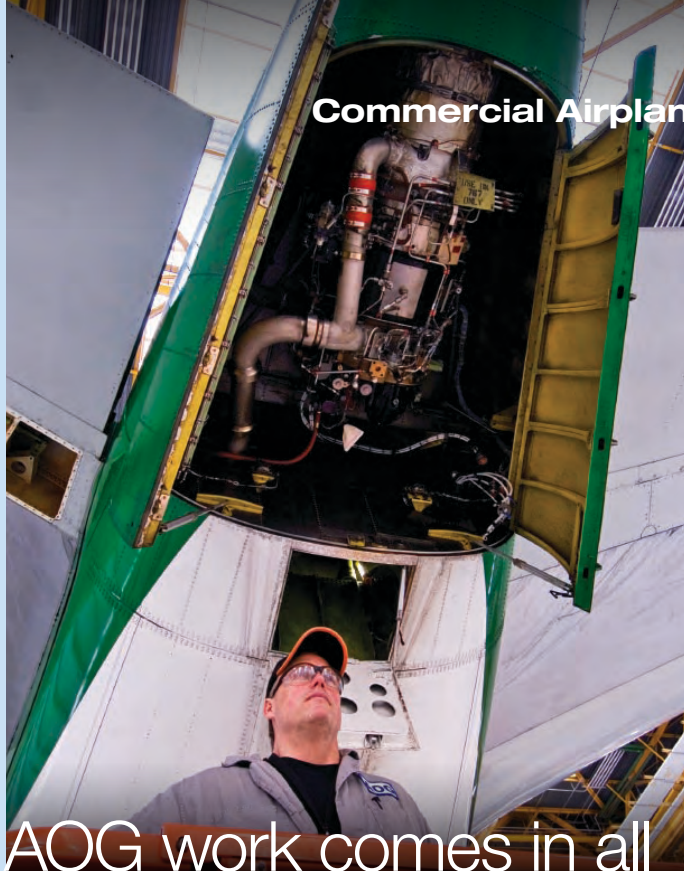
## AOG on TV

The remote Airplane-On-Ground repair referred to in this article was chronicled by a video team from the U.S. cable TV network National Geographic Channel. That report will air as a segment on the network's series "World's Toughest Fixes." The episode is scheduled to make its debut Sept. 28 at 9 p.m. Eastern Time. Check local listings and <http://channel.nationalgeographic.com> for show times and repeat airings.



First-shift AOG employees get a special message from their second-shift colleagues before loading the new pressure dome on the airplane. RICK TURNBAUGH/BOEING





## AOG work comes in all shapes and sizes

There's no prescription for Airplane-On-Ground jobs. They can last anywhere from a few hours to several months. They can take place halfway around the world or on the other side of the factory. Airplane damage can be near-catastrophic or relatively minor.

AOG teammates are prepared for anything.

"That is one of the great things about this job: It is always different," said Fred Chadwick, a 14-year AOG mechanic in Everett, Wash., who recently accepted a management position with the 787 program. "One day I might be helping route clamp wires and the next day I might help do a bunch of sealing. The versatility and diversity are the great parts of this job."

Sometimes customers turn to Boeing AOG Operations for expertise alone.

"A lot of our jobs are technical assistance only," said Mike Carpenter, an Everett, Wash.-based AOG manager. "We'll send a team of people to show the customer how to do something. Their people do the work and we act as teachers and consultants."

Boeing's most famous AOG assignment took place in New Delhi in 1988. Unofficially referred to as "Mission Impossible," a 747 airplane aborted takeoff and ran off the end of the runway, plowing through 1,000 yards (914 meters) of thick mud before finally coming to a stop. As much as 70 percent of the airplane needed repair or replacement, and 127 mechanics, planners, engineers, and quality inspectors were dispatched to New Delhi. Another 2,000 team members supported the three-month effort from Everett, Wash.

A 10-minute video about the job, titled "Mission Impossible," inspired Craig Oppedal to join AOG. "There were a lot of people working together and it was dirty work," said Oppedal, an AOG manager. "I've always been interested in other cultures, so I figured I would fit in well."

The video is available to Boeing employees through Boeing Library and Learning Center Services by visiting <http://catalog.web.boeing.com> on the Boeing intranet.

—Dan Iwanis



## Absent in body, but not spirit

Airplane-On-Ground team members often spend days, weeks, even months away from their families, sometimes with little or no notice. It's a part of their jobs they deal with in different ways.

Bernie Dalien, a Renton, Wash.-based AOG mechanic, said modern technology has been a big help in staying connected with his family. "With my laptop, a webcam and the Internet, I can talk to my family face-to-face. That has made a tremendous difference," he said. "If there are issues at home and I need to talk to one of my kids and be Dad, I can do it now and it means a little more when you can see one another."

"Several years ago someone gave me advice that has served me well," said Sam Norwood, an Everett, Wash.-based AOG electrician. "When I get back to my family I have to remember that I am the stranger. They have been functioning without me and I have to integrate myself back into their lives—not the other way around."

—Dan Iwanis

**PHOTOS: (Left)** AOG electrician Craig Oppedal reconnects the wiring to the auxiliary power unit and prepares for functional test. **(Right)** AOG jobs can require teammates to put in an enormous amount of work seven days a week. Here, mechanics grab a much-needed nap during lunch break in the midst of their 12-hour shift.

RICK TURNBAUGH/BOEING



# Farnborough's green scene

Boeing's display on environmental innovation and technology turns heads at air show



energy  
Biofuels

BY KATHRINE BECK

**B**oeing's technology exhibit was a star attraction at this year's Farnborough International Airshow in the United Kingdom, capturing the interest of customers, suppliers, media, government officials and competitors.

"It created a real buzz," said Commercial Airplanes Managing Director of Environmental Strategy Billy Glover. "We had several people asking about it and wanting to visit."

The exhibit combined stunning colors and graphics, sound, working demonstrations and interactive touch screens to showcase the innovative technologies Boeing is pursuing to help reduce aviation's impact on the environment. To complement the display, Boeing subject matter experts were on hand to explain the technology and answer questions.

Here's a look at some of the concepts presented in the display.

**Biofuels:** You wouldn't think a 75-gallon (284-liter) tank showing algae at various stages of growth would be called a "star attraction" at a major air show. Yet that's how a July 17 *New York Times* article referred to the tank, which was part of Boeing's display. The tank showed Boeing's efforts on discovering ways to make biofuel out of the oily aquatic plants.

The exhibit featured other sources of sustainable jet biofuel, including babassu, a Brazilian tree; halophytes, grasses that grow in saline habitats; switchgrass, a hardy grass that grows in deserts; and jatropha, a globally distributed tropical plant. None of them are used for food, contribute to deforestation or create competition for arable land.

"We see a real possibility to create sustainable biofuels that we can drop into our current aircraft without modification," said Glover.

**Continuous innovation:** Another display featured models of in-production Boeing commercial airplanes behind a glass timeline wall. Visitors got to walk through Boeing history while learning that since the beginning of the jet age 50 years ago, large commercial jets' fuel burn and carbon dioxide emissions have declined by 70 percent.

Silla Maizey, head of Corporate Responsibility for British Airways, said the exhibit showed the "incredible work being done by Boeing—with and for the industry—in a truly engaging and informative way."

**Airspace efficiency:** The air traffic system display told a complex story with striking amber-colored glass forms, interactive touch-screen displays and audio of air traffic radio chatter. The message: Increasing air traffic efficiency in all phases of flight, including takeoff and landing, and eliminating airplanes stuck in holding patterns, significantly saves fuel and lowers emissions. Multiple screens contrasted advanced or "tailored" arrivals with conventional, less-fuel-efficient ones.



**PHOTOS:**

Attendees marveled at the environment and technology display at this year's Farnborough International Airshow. Among the themes the exhibit touched were biofuels and energy.

BIOFUELS AND ENERGY GRAPHICS: PAUL HAVERLY  
PHOTOS: BRAD MITCHELL/BOEING

**Fuel cell and energy harvesting:** The renewable energy display featured working models of devices for harnessing energy from an airplane in flight to produce power for onboard use. Potential environmental benefits include reducing bulky wiring and other items that add weight and increase fuel consumption.

Visitors could watch as thermoelectric energy, which can be generated by the temperature difference between the exterior and interior of an airplane, was used to darken a cabin window, eliminating the need for window shades.

Electrodynamic energy was represented by a button that, when pressed, generates a pulse of electricity that can send radio signals.

A video also showcased the successful first flight of the Boeing-backed Fuel Cell Demonstrator aircraft earlier this year in Spain (see Page 44 of the May 2008 *Boeing Frontiers*). A fuel cell is an electrochemical device that converts hydrogen into electricity. Water and heat are its only exhaust. The actual Fuel Cell Demonstrator airplane was on static display on the airfield, where visitors could ask questions of Boeing experts José-Enrique Román and Nieves Lapeña of the Boeing Research and Technology Center in Madrid.

Another portion of the display featured a 0.4-inch-square (1-centimeter-square) solar cell and an accompanying 197-inch-square (500-centimeter-square) concentrating mirror that multiplies the solar cell's power. The solar technology comes from Boeing subsidiary Spectrolab, which holds the world record for the most efficient solar cell and is adapting its on-orbit products for terrestrial power generation (see Page 30 of the November 2007 *Boeing Frontiers*).

"A lot of people were surprised to learn that Boeing makes the world's best solar cells and that we were bringing our space technology back down to Earth," said mechanical engineer Brad Mitchell, Associate Technical Fellow at the Commercial Airplanes Systems Concept Center.

**Noise reduction:** A working model of the back half of a 777 engine dominated the noise reduction display. Visitors could feel air coming out of microjets, which reduce engine noise by modifying the interface of airstreams from and around the engine, and learned about variable-area fan and chevron core nozzle technologies.

Shape memory alloys (SMA), which include metallic materials that change shape when heated, then return to their original shape when cooled, can be used in engines to reduce noise. An interactive model demonstrated an SMA wire coiling and moving a weight when heated, and SMA elements integrated into a fan nozzle, allowing it to open and close as needed.

Touch-screen maps showed noise footprints of different Boeing jetliners at specific airports. Older models were much noisier; technological breakthroughs have reduced noise-footprint areas by about 90 percent compared with first-generation commercial jet airplanes.

"The power of the exhibit was that it was interactive and allowed people to experience technology and talk to the experts," said Laura Henderson, Commercial Airplanes Brand and Market Positioning. "It made it all real."

The team, led by Commercial Airplanes Marketing, is looking at ways to repackage and repurpose the exhibit materials for use in other venues and regions. ■

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# Tops in ETOPS

## 777 is the new leader in extended operations

BY LAUREN PENNING

If you've taken a transoceanic flight in a 777, you might not be aware of the certification that lets this jetliner serve these long-haul trips more efficiently.

The certification is for extended operations, or ETOPS flights, and allows an airplane to fly more directly to its final destination without the requirement to be as close to alternate airports. ETOPS flights, typically flown over an ocean, allow airplanes to fly more than 60

for the 777, described this milestone as “a validation of the architecture and concept of the 777 as a long-range and intercontinental airplane.”

The journey to being the leading ETOPS airplane began years before this milestone was achieved. Boeing designed the 777 to be “ETOPS out of the box”—that is, certified for 180-minute extended operations the day it entered service.

“Since the 777 was designed as a long-range airplane, it needed to fly these extended, transoceanic flights immediately. Otherwise it would have been difficult to market to our customers,” said Leverkuhn. Accordingly, Boeing worked closely with the FAA to create

grew, “airlines gained the flexibility to plan route structures the way they wanted,” said Daryl Heinzerling, ETOPS statistics focal for Commercial Airplanes. “We sell more airplanes because they can do what airlines need.”

According to Boeing representatives, carriers wanted airplanes to cross the North Pacific between Asia and North America. Because twin-engine airplanes use less fuel and require less maintenance, the 777 now flies more of these routes, often over polar regions, than the previous undisputed leader, the 747.

In 2007, the FAA, with cooperation from other regulatory agencies, industry experts and airlines, established new rules for ETOPS: According to Leverkuhn, “ETOPS is no longer a special certification but included in the way airplanes are now designed. This is in part because of the experience and ground work laid by the 777.”

Heinzerling and Leverkuhn are both look-

**EVA Air's 777-300ER (extended range) routinely conducts ETOPS, or extended operations, flights over the North Pacific between Asia and North America. The 777 now makes more ETOPS flights than any other airplane. TIM STAKE/BOEING**



minutes (at single-engine cruise speed) from the nearest alternate airport; and three- and four-engine airplanes more than 180 minutes (at one-engine-inoperative cruise speed) from the nearest airport.

The 777 now leads the market in performing ETOPS flights. In early 2008, the 777 flew an average of 17,000 ETOPS flights per month. That rate puts it ahead of the 767, which had held the record for 23 years and was the first jetliner approved for 180-minute operations by the U.S. Federal Aviation Administration.

### PRIDE IN THE ACHIEVEMENT

The 777 team takes pride in this achievement. Keith Leverkuhn, chief project engineer

a rigorous and unprecedented test program to validate the reliability of the airplane, including 1,000 test flights dedicated to ETOPS validation, Leverkuhn added.

Boeing also worked directly with suppliers, customers and international regulatory agencies to certify the 777 for ETOPS before the delivery of the first airplane to United Airlines in 1995. In fact, the 777's inaugural revenue flight was an ETOPS flight from London to Washington, D.C. This was a significant milestone considering “in the early days of ETOPS, other models were required to remain on more restricted routes until they demonstrated reliability for one to two years,” said Leverkuhn.

As the available range from airports

ing forward to what's next for the 777 program and future Boeing airplanes. One of those ideas is the work the 777 program is doing to gain higher ETOPS certification limits for flights up to 240 minutes from airports.

“It's no accident that Boeing airplanes have been leading the industry in ETOPS flights for the past quarter-century,” Heinzerling said. “The company has worked very hard over the years to design, test and validate airplanes that safely provide these capabilities for our customers.” ■

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# Ready to go... *again*

## Boeing confident its HH-47 remains best solution for U.S. Air Force's combat search and rescue needs

By JENNA McMULLIN

**A**s it awaits the forthcoming decision on the U.S. Air Force's Combat Search and Rescue (CSAR-X) aircraft contract award, the Boeing Rotorcraft team remains confident that its HH-47 aircraft provides the best-value solution for meeting the customer's needs.

CSAR-X is an initiative to replace the U.S. Air Force's existing combat search-and-rescue aircraft with 141 new helicopters featuring a modernized, more capable platform. Boeing is offering the HH-47, which builds on the achievements of the Chinook—an aircraft with 46 years of combat service as well as search, rescue and humanitarian missions worldwide.

The Air Force originally selected Boeing for the \$10 billion contract in November 2006. However, the Government Accountability Office sustained competitor protests on the calculation of life-cycle costs. The re-opened competition allowed competitors, including Boeing, to adjust their proposals. The contract award decision is expected by the end of October.

The HH-47 is an advanced derivative of the Chinook helicopter. It offers the benefits of the Army's CH-47 and the Special Operation Command's MH-47 with minor upgrades in order to fulfill the Air Force's CSAR mission needs at low risk. With the largest cabin size, highest operating altitude, lowest downwash velocity and most lift capacity of all competitors, the HH-47 provides CSAR crews with enhanced flexibility for demanding missions.

"We are proud of the lineage of the H-47 platform," said Rick Lemaster, HH-47 program manager. "Countless lives have been saved thanks to the Chinook's decades of service in war, humanitarian aid, disaster relief and firefighting."

U.S. warfighters who have had experience with the newest models of the Chinook vouch for this aircraft's capabilities.

"This aircraft is light-years ahead in flight-management systems compared with our older aircraft," said Col. Patrick Tierney, commander, 4th Combat Aviation Brigade, 4th Infantry Division based at Fort Hood, Texas.

The CH-47F was certified combat-ready in July 2007. Tierney's unit deployed to Iraq in June 2008, making it the first CH-47F unit to operate the aircraft in combat. The unit reported the aircraft excelled in every way, from achieving an exceptional operational readiness rate to providing the crews increased situational awareness and improved safety features.

Boeing Rotorcraft representatives dispute critics' claims that because the HH-47 is based on an aircraft that's more than 40 years old, it won't be technologically advanced. "The Chinook's achievements in



The HH-47, Boeing's entrant in the U.S. Air Force's Combat Search and Rescue (CSAR-X) aircraft contract award, features technologies that give the pilot vital information needed during a rescue scenario.

GRAPHIC BY JOE NAUJOKAS/BOEING

ongoing combat operations in Iraq and Afghanistan demonstrate the evolution of the H-47 platform throughout its 40-plus years in worldwide operations," said Chuck Allen, vice president and general manager, Rotorcraft Systems. "The notion that the HH-47 is a dated helicopter is absolutely laughable. You can't ignore the innovation and state-of-the-art advances made in battlespace mapping, threat suppression, net-centric operations and just plain performance."

Also feeding Rotorcraft Systems' confidence in this competition is the aircraft's suitability to the search-and-rescue mission.

According to Mark Ballew, a retired career Army Chinook pilot and now a senior manager in Tandem Rotor Systems, the tandem rotor aircraft provides numerous advantages over a single rotor aircraft, including greater stability in high winds, less dependence on wind direction, a larger center of gravity, and speed. In fact, the Chinook is the fastest helicopter in the Army inventory. All power in the Chinook goes towards lift, which allows the helicopter to operate at altitudes above 14,000 feet (4,270 meters) with a payload of 3,000 pounds (1,360 kilograms).

"The H-47 is clearly the best platform for the search-and-rescue mission because it is the best platform for high altitude or high wind missions. If you think about it, most rescues occur in the mountains or during extreme weather conditions," Ballew said.

"I have never been in a scenario where a Chinook couldn't handle the mission," said Lt. Col. Walter Bradley of the 158th Aviation Regiment during deployments to Pakistan and Afghanistan. ■

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Matt Vance has been working for the UK Ministry of Defence since March 2007.

ED TURNER/BOEING



# Life on the other side

How's Boeing viewed by a customer? What's it like to work for that customer? Here's a look.

**E**ditor's note: Boeing employee Matt Vance and Simon Harwood of the United Kingdom Ministry of Defence have been participating in an exchange, known as a "secondment" in the United Kingdom, over the past two years (see Page 24 of the March 2007 Boeing Frontiers). As Harwood wrapped up his assignment in June and Vance nears the end of his in the first quarter of 2009, Marc Sklar of the Frontiers staff asked them to share with Boeing employees lessons they've learned about the customer/supplier relationship.

**To: My fellow Boeing employees**  
**From: Matt Vance (on assignment to the UK Ministry of Defence)**  
**Re: Bottom line—customer respect!**

I'm the first U.S. defense contractor who's been permitted to second (pronounced "s-kond," which is a more formal word for "loan" or "exchange") into the UK Ministry of Defence. My MOD assignment has been a 180-degree change from my work at Boeing. For 20 years I've been a supplier on the defense and commercial sides of Boeing. As a

participant in this exchange, I am a customer—the MOD. Specifically, I am working for the MOD's Deputy Director for Science within the Command Control and Information Infrastructure (CCII) directorate. The directorate has responsibility for all CCII decisions across the MOD.

Two experiences have made me see the difference between being the supplier versus being the customer—and understand the value of listening to and respecting the customer. The first was when the MOD participated in three marketing and sales meetings with suppliers. It was illuminating, as well as disappointing, to observe how all three companies were unclear in their motives and objectives, especially considering the substantial time they had spent with their customer.

The second experience was a meeting with a hand-picked supplier consortium. We were bluntly told by the lead vendor that our key idea was "just plain wrong." My MOD colleagues and I were surprised and offended and felt disrespected by the vendor. The experience gave me a deeper appreciation for the customer's

voice. In addition, it was a vivid reminder that if you disagree with the customer, it should be handled discreetly and professionally.

In another case, after we, the customer, made the effort to travel to the supplier's location, the supplier openly challenged the direction the MOD had chosen. As you can imagine, this reinforced to me what we hear so often at Boeing: Listen to our customers, respect their time and perspectives, be clear with your objective and ensure a cordial dialog.

I've been treated well by my hosts. I have been badged as a British civil servant, not as a foreign contractor. I'm accepted by the teams that I support and the teams that I'm a member of; however, I do not sound like a Brit—yet. Though lately, many people who meet me here in the United Kingdom ask if I'm Canadian, so some change must be happening!

What I've also taken away from my experience is a broadened respect for diverse perspectives and ways of doing things. Diversity will always contribute to a superior product or solution. I'll be quicker to listen than comment and not so quick to judge. Bottom line:

customer respect! All things considered, isn't business done first with people we trust and respect?

**To: Boeing employees**  
**From: Simon Harwood, UK Ministry of Defence**  
**Re: An outsider's look at Boeing—from the inside**

I know these are overused idioms, but ... my two years at Boeing have flown by—probably because time flies when you're having fun.

What a wonderful culture Boeing has fostered! I'm glad to have been part of it. I've learned a lot that will help me when I return to my work at the UK Ministry of Defence and have a few suggestions that could make Boeing an even greater company.

The idea behind the interchange program that I've participated in is the exchange of staff, skills and ideas between the UK Civil Service and other sectors of the economy. Participants experience what it's like to work in a different environment and culture and see how challenges are met in a non-government organization.

It has been very interesting to see how Boeing responds to customers. Based on my work with the Analysis, Modeling, Simulation and Experimentation group, working with customers to examine their needs, I think industry (not just Boeing) has some way to go in providing answers and solutions that are focused on delivering the ability to carry out an activity—as opposed to system- or platform-specific answers. Thankfully, groups like the AMSE organization will be able to provide such answers in years to come.

From my experience of being the supplier (at Boeing) rather than a customer, I've come to the conclusion that the customer is not always right, and the supplier does not always have the answer. Thus, we need to listen to each other carefully and make suggestions respectfully. Another suggestion: Don't wait for the RFP. Take the bull head-on. I am pleased to see some of the work Phantom Works and Advanced Systems are doing in this area, but we need more.

As I now leave industry and return to the customer community, I have two thoughts for the defense and aerospace industry at large:

- Recognizing that compliance with the

International Trade and Arms Regulations is a must, industry needs to significantly improve how it works within ITAR when dealing with U.S. allies.

- An examination is needed of the industry's skills base. There are not enough big-picture people. Also, industry needs to look at age groups. For instance, where are the young people?

Boeing—I'm glad to see—is taking an active role in addressing these challenges.

There are a number of things that make me sad to return to the United Kingdom. It's not just that the temperature in Southern California never seems to drop below 55 degrees Fahrenheit (13 Celsius) and that gas in the United Kingdom is about \$10 a gallon. It's that I feel so at home with the Boeing family. Boeing has a wonderful work environment. There are so many opportunities for Boeing employees to advance and better themselves. And, it seems that Boeing realizes that people work to live, not live to work. This is not the philosophy in many work environments.

Thank you for making my stay so enjoyable and productive! ■

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Simon Harwood (right), a UK Ministry of Defence employee, recently completed his “secondment,” or exchange program, with Boeing. He is joined at the delivery ceremony for the 6th UK C-17 by Nigel Beresford, Boeing UK C-17 program manager, and Royal Air Force Wing Commander Simon Edwards. TONY ROMERO/BOEING



# Testing.



## St. Louis group resolves issues to ensure quality of military aircraft

By KATHY COOK

There's many a slip 'twixt the cup and the lip. So says the old English proverb. And so it is between the time one of Boeing's sophisticated military planes is constructed and the time it first flies.

"It's rare that an aircraft doesn't have some squawks, or issues, that need be resolved before first flight," said Don Rogers, Flight Operations superintendent in St. Louis, where the F-15, F/A-18, EA-18G and T-45 are built. "You can't just build a plane and deliver it. There are lots of things to test, check, even double- and triple-check after a plane is assembled and before it's safe and ready to perform hard-core military missions."

A group in St. Louis—comprised of teams from Ramp Operations and Flight Operations—is dedicated to ensuring that all the squawks are discovered and resolved in the factory, long before a plane is released for first flight. The work they do is behind the scenes, but it's critical when it comes to ensuring performance and safety for Boeing's military jets.

"Delivery timelines are important, but safety has to be our top priority," said Sherlin Lovett, T-45 Goshawk Flight Ramp Operations manager. "Of course that includes flight safety, but it also means safe performance of our jobs on the ground. The testing we do can be dangerous, so strict adherence to safety procedures is always on our minds."

Prior to first flight, there are five tests the group performs for the aircraft built in St. Louis. Each of the following tests is performed as many times and as long as is needed to ensure everything's perfect before the plane leaves the ground.

**Compass calibration:** Each aircraft has a manual compass in it. Matt Gerner calls it a pilot's last hope. "If instrumentation fails and all you have are your engines running, you can still get home using this compass," said Gerner, the Flight Ramp operations manager for F/A-18. The test team verifies that the compass settings are accurate. They tow

the aircraft out to the tarmac and position it on a compass painted on the concrete. This painted-on image indicates true magnetic north and other key points on the compass. They line the jet up along the north-south line, and then check that the aircraft's compass points north. If it's not right on, a new compass is ordered and tested. It's a basic test, but an important one.

**GPS calibration:** The team also tests an aircraft's Global Positioning System to make sure it communicates properly with GPS satellites. The GPS allows the airplane to know where it is globally, which is critical in completing a mission and returning to base.

**Fuel calibration:** The aircraft have fuel bladders—large balloon-like structures that hold fuel within the wings and fuselage. The team verifies that the system doesn't leak, and that the valves for transferring fuel from the bladders to the engine work. On the T-45, they check to see that the manual fuel quantity gauges work and verify the accuracy of the fuel "bingo," an alarm a pilot can set to go off when the fuel level drops to a certain point.

**Engine setup:** A tiny scrap of metal can ruin a million-dollar engine. So before engine setup can begin, a check for foreign objects must be completed. On the F-15, the inlets that allow air to be pulled into the jet engine move, so an inlet shake is performed to release any debris that could be sucked into the engine. Also, the walls and floors of the building in which the plane is housed for engine setup are washed down.

Engine setup and engine runs are completed in the hush house, so called because of the 3-foot-thick walls and heavy doors that hush the roar of the engine being tested. The aircraft is brought in and tied down. Engine setup generally begins with a dry cycle in which the motor spins without fuel to get lubricating oil moving throughout the engine. Because the engines have likely been sitting for a while, they need to be adequately lubricated and checked for leaks before being fired up. Engine setups also allow the team to check, among other things, electronics and environmental control systems.

# testing



**Preflight prep:** After engine setup and a trip to the paint shop, preflight preparation, or prep, takes place. Preflight checks—both avionic and mechanical—are intricate inspections of the aircraft, beginning at the tip of the nose and moving aft, by mechanics, specialty inspectors and others. Once Boeing completes a 24-page inspection, a release sheet is prepared, indicating the aircraft is ready for the customer’s inspection. Once the customer says a plane is ready to fly, it’s towed outside for flight. For F/A-18 and T-45 aircraft, one last step—taking fuel samples to check for contaminants—is completed before a jet is turned over to the flight office.

The jet is almost ready for first flight. But the final arbiter of whether a jet is ready to fly is the pilot. And before the pilot climbs into the cockpit, he or she will also perform a walk-around inspection to look for any issues, such as excessive free play in the ailerons (control surfaces) of the jet. Pilots then check electrical systems, avionics displays and gauges. And of course, they make sure the engine starts up promptly.

## OFF AND FLYING

And then, it’s off to the skies! But the tests don’t end after the aircraft leaves the ground. The Boeing team also performs recovery, or postlanding, operations, which include brake checks and correction of any issues discovered by the crew during flight.

“It’s time-consuming, it’s extensive, it can be exhausting,” said F-15 Flight Ramp Operations Manager Jim Woelich, of the testing process. “But, it’s worth it when you think that men and women of the armed forces—those who are safeguarding our freedom—are entrusting their lives to these planes. It’s a job worth doing well.” ■

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## PHOTOS

From far left: Nondestructive testing inspector Anne Ford works on an F/A-18E; electricians Dave Gordon (left) and Tom Steel disconnect the tow bar from an F-15K moved to the ramp area; flight mechanic Dan Schwartz (left) and flight inspector Cliff Chandler check out the canopy of a T-45C Goshawk; flight mechanic Keith Pisetta (right) reviews a flight checklist with Boeing pilot Steve Schmidt before a test flight of a T-45C; flight inspector Dave Wallace (in cockpit) talks to flight operations mechanic Scott Marlett during the check-out of an F/A-18F; flight mechanic Dan Straeter works on the canopy of an F-15K. RON BOOKOUT/BOEING

**“You can’t just build a plane and deliver it. There are lots of things to test, check, even double- and triple-check after a plane is assembled and before it’s safe and ready to perform hard-core military missions.”**

—Don Rogers, Flight Operations superintendent, St. Louis



# Good, better, best

Pat Finneran, vice president of Program Management & Business Excellence for Integrated Defense Systems, speaks to Boeing leaders at a Program Managers Workshop during this past summer at the Boeing Leadership Center in St. Louis.

RON BOOKOUT/BOEING

After 10 years, program management best practices have proven their worth

By DIANA EASTMAN

It was 1998, the year of Harry Potter, Google . . . and the rollout of Boeing's program management best practices. OK, maybe the best practices haven't experienced the same fanfare as the wizard and the search engine. But at the world's largest aerospace company, this set of management strategies for planning and executing successful programs has proven essential to improving performance.

The best practices came about after the late-1990s merger of Boeing and McDonnell Douglas, when senior leaders tasked a team to assess high-performing programs and deliver a consistent, one-company approach to managing the company's programs.

"We wanted a set of robust processes that would yield repeatable, predictable results," said Pat Finneran, vice president of Program Management & Business Excellence for Integrated Defense Systems.

That team identified management strategies from several programs—including 747, 777, C-17 Globemaster III, F/A-18 Hornet and Delta II—to be the basis for best practices. Over the past decade, the best practices have been updated annually to reflect new approaches and lessons learned. Today, the eight best practices (see box at right) document 134 attributes and actions that can be applied to programs of all sizes and at each phase of a program's life cycle.

"The best practices give you the abil-

ity to avoid typical problems, deal with difficult situations, drive continuous improvement and generally be more effective," said Lou Mancini, vice president and general manager of Commercial Aviation Services for Commercial Airplanes.

During the past decade, application of the best practices has made good programs better and helped weak ones get stronger. For example, implementing the best practices from day one helped the EA-18G Growler team get off to a flying start and deliver the first airborne electronic attack aircraft to the U.S. Navy ahead of schedule. And the Boeing-led Ground-based Midcourse Defense System team increased its emphasis on the best practices to meet changing and challenging requirements from the U.S. Missile Defense Agency. Accordingly, their performance led to high customer satisfaction and a multiyear, follow-on contract that runs through 2013.

Although they represent the best of Boeing, the best practices offer no guarantee for high performance. "Program management is an art, not a science," said Mancini. "You also need to be a good leader, live the leadership attributes and create a culture in which all members of your team can succeed."

For more information on program management best practices, visit the Boeing Program Management Web site at <https://pm.web.boeing.com> on the Boeing intranet. ■

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## Time-tested practices

Here are the eight program-management best practices.

**Business Offer:** Understand customer, regulatory and other requirements. Prepare executable and profitable proposals and contract changes.

**Create and Review Business Plan:** Set strategic objectives and measure progress throughout the life of the program.

**Organization:** Develop a product-based organizational structure with clearly documented team responsibilities.

**Supplier Integration:** Establish and maintain a collaborative working environment with suppliers from the earliest stage through program end.

**Program Execution and Control:** Use a formal concept of operations to manage technical, quality, schedule, cost and other activities.

**Risk, Issue and Opportunity Management:** Use an integrated method to capture opportunities and mitigate or correct risks and issues.

**Help Needed and Independent Review:** Promote a culture of open communication and continuous improvement.

**Program Communication:** Develop and maintain strong relationships with internal and external stakeholders.

# What's in a name?

For Boeing Military Aircraft, it means everything—including strong, simple conveyance of the Boeing brand

By KATHY COOK

The Integrated Defense Systems business unit Precision Engagement and Mobility Systems recently was renamed Boeing Military Aircraft. *Boeing Frontiers* sat down with BMA President Chris Chadwick to discuss the significance of the name change.

**Q: What's the primary reason for the name Military Aircraft?**

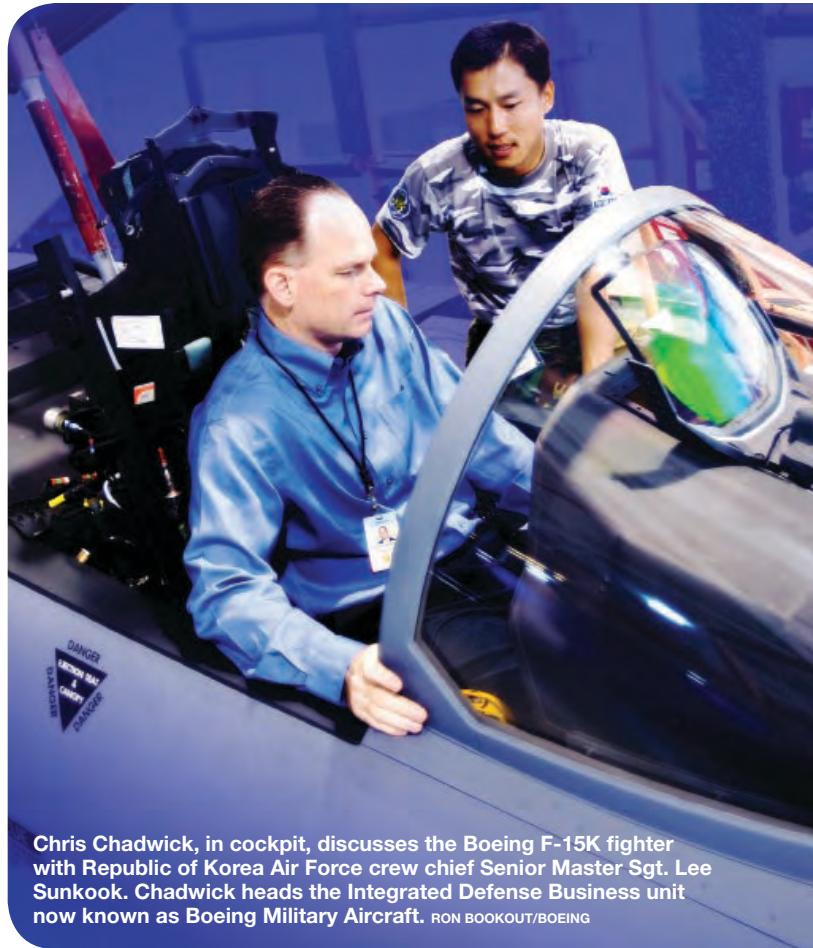
**A:** If I could make one important distinction, it's Boeing Military Aircraft. Boeing is an iconic brand that is recognized and respected worldwide. As the international market continues to open—a window of opportunity is emerging, the likes of which we haven't seen for quite some time—it's not the Integrated Defense Systems brand or the Commercial Airplanes brand but the Boeing brand that will open many doors for us. The new name—Boeing Military Aircraft—is clear and straightforward; it sends a strong message to the customer and the market that Boeing is one company working together for the long term to meet the requirements of our military customers worldwide.

**Q: In choosing this name, what consideration was given to the fact that a significant part of BMA is weapons, including those that may not be used exclusively on aircraft?**

**A:** It is true weapons is not reflected in the name. However, the weapons component (approximately 7 percent of our business) remains a linchpin to future success. The significance of the weapons business has been conveyed in several ways recently. First, key elements of the weapons programs within Networks & Space Systems recently merged with the Boeing Military Aircraft weapons business. Also, the cover story in your last edition (see Page 12 of the August 2008 *Boeing Frontiers*) clearly communicated our long-term commitment to providing our military customer weapons of the highest quality and capability. So, the short answer is: the weapons business remains a critical part of our defense business.

**Q: Tanker programs are now separate, reporting directly to IDS president and CEO Jim Albaugh. Was this move related to the recent protest and rebid of the U.S. Air Force tanker contract?**

**A:** In essence, the Tanker Program is what Boeing is all about. It's not about IDS, it's not about BCA, it's about how "one Boeing" can create growth opportunities and provide unique customer solutions in a challenging market segment. The move was designed to leverage all the resources IDS can bring to bear in this important competition, and to ensure a working-together approach with BCA that will be unmatched by our competition. At the same time, Boeing Military Aircraft will con-



Chris Chadwick, in cockpit, discusses the Boeing F-15K fighter with Republic of Korea Air Force crew chief Senior Master Sgt. Lee Sunkook. Chadwick heads the Integrated Defense Business unit now known as Boeing Military Aircraft. RON BOOKOUT/BOEING

tinue to own and be responsible for the day-to-day execution of International Tanker Programs (for Japan and Italy). Upon winning the Tanker Program, a logical scenario would be to bring the program back under BMA.

**Q: What else is different?**

**A:** Our vision and mission remain the same; but there are two organizational changes in addition to the relocation of the Tanker Program.

Global Mobility Systems, consisting mainly of the C-17 Program, will report directly to me through Jean Chamberlin. I hope this conveys to employees how critically important this business is. The BMA leadership team will work with Jean and her team to find a way to keep the C-17 Program going for the long term.

We've also acquired Insitu, a progressive company that specializes in airborne unmanned systems. We are excited about this acquisition and hope to grow a solid unmanned systems business within a market approaching \$100 billion. We also want to fold Insitu's entrepreneurial spirit into the BMA culture to make us more flexible, innovative and adaptive to the changing market. ■

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Shared Services Group President Tim Copes said SSG's work behind the scenes allows its business partners to focus on their core businesses. BOB FERGUSON/BOEING

A portrait of Tim Copes, Shared Services Group President, looking directly at the camera. He is wearing a dark suit jacket over a light-colored shirt. The background is a blurred blue and green pattern.

# Partners in productivity

SSG contributes to Boeing competitiveness by providing effective services at affordable cost

By DEBBY ARKELL

In Boeing's drive toward growth and productivity, you may not think the Shared Services Group could have much of an impact. But think again.

Over the past 10 years, Shared Services—a multibillion dollar functional unit that provides common internal services across Boeing's global enterprise—has reduced the company's infrastructure costs by approximately \$1 billion. And, with ongoing Lean+, Internal Services Productivity and other improvement efforts under way throughout the organization, in many ways SSG is just getting started.

"The improvements we make directly contribute to the company's profitability and its ability to research, develop and deliver the products and services it needs for the future," said SSG President Tim Copes. "SSG can be a competitive discriminator. The company is counting on us."

Indeed, the mission of Shared Services is to "enable Boeing competitiveness by providing effective services at an affordable cost." Since

taking the helm of Shared Services 16 months ago, Copes has been rallying his 9,000-person team around this idea.

"We want our team to think with the end-user of our services in mind, and we are emphasizing our strategy—which is to develop and engage our people, improve our services and how we deliver them, and achieve operational excellence in all areas of our business," he said. "In the past, we haven't always had this unified focus. The exciting thing is that our team understands the challenge and is eager to help."

## PRODUCTIVITY ENABLER

Like Boeing's business units, Shared Services uses the Boeing Management Model as its guide. Within the model, Copes said SSG clearly recognizes its greatest contributions to the company's success are in finding ways to help increase productivity across the enterprise.

"Boeing is an aerospace company. We [SSG] support Commercial Airplanes and Integrated Defense Systems as they work to create the best

**“We must continue to add value and help guide the business units to the most effective service solutions. This is a different way for everyone to think about SSG and its responsibilities.”**

—Tim Copes, SSG president

products at a competitive price for their customers,” Copes said. “Our role really is that of productivity enabler.”

That thought may, at first, seem counterintuitive, since Shared Services is fundamentally an internal cost center. However, SSG is keenly focused on working together with the business units it supports—its “business partners.”

“We must be tightly aligned and integrated with BCA, IDS and other Boeing businesses to be successful and to help them be successful. In this sense, we are very much partners,” Copes said. “We must continue to add value and help guide the business units to the most-effective service solutions. This is a different way for everyone to think about SSG and its responsibilities.”

Shared Services often likens its work to that of a Broadway production, where its employees are the stage hands supporting a successful show. Its work “behind the scenes” allows its business partners to focus on their core businesses and enhance their own productivity as services operate seamlessly, globally and without impact.

One way SSG does this is through economies of scale, such as the leverage it has in purchasing nonproduction equipment and supplies for the Boeing enterprise—namely, all goods and services that aren’t delivered with the company’s products. That extensive list ranges from office supplies and computers to janitorial services, tools and safety glasses. For example, by establishing standards and consolidating contracts, Shared Services saved Boeing more than \$750 million in 2007.

**FOCUSED IMPROVEMENT**

Shared Services has identified three areas it believes will help focus the team and advance its strategies. These involve:

- Improving the quality and delivery of services that currently experience significant defects or impact large numbers of Boeing employees. Shared Services teams are involving Boeing business units extensively in a variety of value-stream mapping activities to gain end-user perspectives and take holistic approaches to the process improvements that will be made. Travel is one such area where business partners say Shared Services can do much more to provide better, more affordable service. There is a significant effort under way to do just that.

“Improving the Boeing travel and expense system and processes is our highest priority,” Copes said. “The travel improvement project in many ways is a pathfinder for many of the improvement approaches we are trying. Today it is too complex, inefficient and costly, and it represents another huge productivity opportunity for Boeing.”

- Using Lean+ tools and principles throughout SSG to achieve productivity and total cost improvements.

“For Shared Services, this focus area is really about putting our own house in order,” Copes said. “The goal on all of our improvements is to apply Lean+ methodologies to drive total cost improvements through the value streams. More efficient service execution will drive down service costs and contribute to Boeing’s bottom line.”

- Developing a standard, sustainable process that will provide facts and data to Boeing business units to help them better understand and optimize their use of SSG services. Again, consider travel. Booking business travel two weeks or more in advance can save business partners a great deal of money. In applying what Shared Services calls a “demand management” approach, Boeing managers and travelers will be able to see the budget impact that their decisions and behaviors have on travel costs. This will allow people to make informed decisions that optimize their dollars spent and services consumed.

“Demand management is the focus area that arguably could have the greatest impact,” Copes said. “The Boeing business units have clearly told us they are hungry for detailed data about their service consumption. It’s Shared Services’ job to develop a robust system to provide that and then actively work with them to manage and optimize consumption.”

Indeed, strong partnerships are at the heart of understanding unique business needs and challenges—and working together efficiently and effectively to deliver effective services at an affordable cost.

Copes acknowledged that it will take a tremendous commitment on the part of all Shared Services employees to make that journey and forge the partnerships that will get them there. “SSG can’t delegate, and we clearly can’t offload cost pressures onto other parts of Boeing,” he said. “SSG and the business units must work together to reduce service costs and advance the business.” ■

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**Shared Services Group each day,  
*by the numbers***

Here's a quick look at some of the activities SSG employees accomplish every workday.

**3,300** Pieces of critical equipment maintained to ensure at least 99 percent uptime

**160,000** Number of employees and visitors Boeing Security validates for entry into facilities

**16,500** Number of parts ordered in support of Boeing Site Services maintenance and construction activities

**\$15.7 million**  
Amount contracted with small and diverse suppliers by SSG Supplier Management

**24,000** Number of miles (38,600 kilometers) driven by the Boeing transportation fleet





B-1B Aircraft Support Systems Senior Manager Mike Vu (from left) discusses automated test-equipment software applications with Mario Miranda and Wailmond Ng, two of Vu's direct reports. Behind them is a B-1B. BOB SCHNEIDER/BOEING

# 'I feel valued'

Here's an explanation of why employee engagement matters to Boeing and its employees—and how some managers are driving this concept

By ROBERT STERLING

**J**udy Koval, a long-time Boeing employee, has seen and felt a huge improvement in recent years, and it has nothing to do with the company's products and services.

Koval, a contract labor administrator in Long Beach, Calif., with Shared Services Group, said her work environment used to have a top-down structure, where there was only one right way to accomplish things. Now, "I have a stake in the things I do everyday. I feel valued and I'm backed completely by my manager. I can't tell you what a difference that makes for me," Koval said. "I see my little world, but my manager helps me see the bigger picture, why that matters, and where I fit in."

The manager whom Koval credits for creating this environment, Fran Plushner, appreciates the accolades but is quick to redirect the praise. "My team knows what they do better than anyone else," said Plushner, a senior manager in Contingent Labor Programs. "The best thing I can do is trust and provide the support to help them be successful, putting as much responsibility into their hands as I can."

Plushner and her fellow managers across Boeing have the ability to affect the concept known as employee engagement, or the way that

employees think and feel about their work. Where there's a high level of engagement, employees feel empowered and trusted to make decisions that they feel best affects the work they do. Not surprisingly, an engaged work force drives business performance (see box on Page 37), as well as employee retention and hiring. To support managers looking to boost the level of their team's engagement, Boeing offers tools that assess the engagement of a manager's team—such as the biennial Employee Survey, which asks questions designed to measure how an employee thinks and feels about Boeing and his/her job—and help that manager take action to improve it.

"When we refer to employee engagement, we're talking more than a scientific model or cost savings," said John Messman, Employee Relations director. "Engagement is a result achieved when we improve how employees think and feel about their leadership, work and work environment. This is all about our people and improving the environment in which they work. Our job, bar none, is to make this something that all our leaders can understand and embrace. The cost of failing is enormous, and employee engagement is arguably the single-most important thing for The Boeing Company to achieve."

## LEADERS MAKE IT HAPPEN

If leadership is key to driving employee engagement, one would expect the Employee Survey scores of Plushner's team to be high. And they are. But Plushner still works closely with her team, setting up meetings to review Employee Survey results to determine how to continue improving. Indeed, Messman emphasized that although the survey lets Boeing employees express their level of engagement, it's only as good as the action leaders take with the results.

According to Julie Acosta, vice president, Leadership Development, leaders must be accountable for creating an environment allowing everyone a chance to grow and develop. That's the difference between being a leader as opposed to a manager: A leader's role is no longer just getting a product or service out the door, but empowering or engaging a team in the business at hand.

One tool to accomplish this and drive engagement is Leaders Teaching Leaders. This concept calls for managers to engage in meaningful discussions with their direct reports by sharing their own personal experiences, as well as learning about employees' challenges and interests and helping them solve problems.

What about managers who see this task as getting in the way of providing the product? "Leaders not only set the tone but also get their people involved in running the business," Acosta said. "Once that happens, a leader has more time to focus on development—and productivity skyrockets."

## ENGAGEMENT AND THE WORK FORCE

For Boeing employees, it's pretty easy to see why a high level of engagement can improve their work environment. Yet engagement plays a role in a deeper work-force-related matter. With the company projecting that 60 percent of its employees will be eligible to retire in 10 years, Boeing faces potential shortfalls in skilled labor. The competition to identify, attract, retain and develop top talent is becoming fierce—particularly in an industry like aerospace, where there's a significant demand for scientific and technical expertise.

Rick Stephens, senior vice president, Human Resources and Administration, said the company cannot afford to fail on its commitment to provide a diverse and engaging work experience. Two significant work-force challenges are generational differences and

diverse ethnic groups, traditionally in the minority, entering the work force in record numbers. Boeing must be ready not only to attract younger and more diverse employees, but to provide an atmosphere that encourages their development. At the same time, Boeing must maintain the invaluable knowledge base of its experienced workers.

"We must do all that it takes to attract and retain the next generation of workers, and, equally important, we must be prepared to handle multiple generations in the workplace," Stephens said. "Our leaders own this responsibility, and they are the ones who'll encourage a more open and trusting environment with frequent face-to-face dialogue and candid discussions."

Stephens said Boeing has an obligation to prepare its leaders and reward them for taking the right action; but leaders themselves must be accountable.

"When employees join the company, they usually arrive full of energy and enthusiasm, and are staunch advocates of their new employer," he said. "It's the experiences afterward that erode their excitement and destroy their engagement. Leaders, particularly on the front line, have a huge responsibility, but more importantly, a critical opportunity to set the tone." ■

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*What are some managers doing to boost engagement? See Page 38*

**Barbara Ballinger (left), Auburn (Wash.) Machining and Emergent Operations Processing Assembly & Kitting manager, works with AMEO teammate Brad Konwent regarding production and programming issues around a 747 Dreamlifter latch fitting.** JIM COLEY/BOEING

## Just the facts

Employees who are not engaged cost the company in productivity and other intangibles. But putting a dollar figure on that disengagement brings the impact to life, and the number is staggering.

In 2004, the Gallup Organization's "Cost of Disengagement" survey estimated that disengaged workers cost the U.S. economy around \$300 billion per year in lost productivity. Meanwhile,



other research determined that the more engaged a company's work force is, the better its productivity:

- In a 2004 study, the Corporate Leadership Council found that employee performance increases up to 20 percent with a highly engaged work force. It also said that employees are 87 percent less likely to leave the organization if offered equivalent employment elsewhere.
- Highly engaged employees increase customer satisfaction by up to 23 percent, according to a 2004 report by human resources consultancy Development Dimensions International.

—Robert Sterling



# Ready... engage!

## What managers are doing to boost engagement

By ROBERT STERLING

**W**hat have leaders who scored highly on the Employee Survey done to create the right environment to engage their teams? Here are a few examples.

### ACTION PLANNING: EASY AS 1-1-3

At an HR meeting late last year, Rick Stephens, senior vice president, Human Resources and Administration, asked attendees to vote on what they thought was the most important area for the HR function to address, based on feedback from the 2007 Employee Survey. The consensus from the group was clear: involving employees more in decisions affecting their work.

According to Stephens, the goal of this effort was to focus the HR function on one key issue across the function. In the past, many action plans pointed in many directions.

But to involve all employees more deeply in the process, HR followed an action planning gameplan known as “1-1-3.” Every HR manager was asked to address the organization’s top issue—involvement in decision-making—plus their top operating group issue and three issues specific to their immediate employee group.

Alan May, vice president of Strategy, Compensation and Benefits, and his team followed suit. With the primary issue of involvement in decision-making established for HR, May met with each of his direct reports, and then the entire team, to involve them as early on as possible.

“Our group really wanted to expand on the same topic as HR,” May said. “To make this work, we all understood we needed to go to our teams, not wait until they came to us.”

From there, May’s leadership team worked with their individual teams to choose three topics: improving personal development plans; examining and using rewards and recognition; and increasing the speed of decision-making.

This plan appears to be driving engagement. On the 2008 Action Survey, the team scored a 94 percent positive rating around how satisfied employees were with action taken on the 2007 Employee Survey results.

“In all, our teams were able to focus their energy on working up to five specific actions, as opposed to spreading themselves across numerous topics,” May said. “We really got all our people involved in finding solutions. This is not at all about me, but about my team and the action-planning process. Now the challenge is to execute on those plans.”

“I am an engineer, so when I began managing, I had to have my hands in everything,” Vu said. “What changed me is when I learned to delegate.”

Vu said it takes trust to delegate, but doing that has improved productivity significantly. Delegating means “granting my team ownership over the process and product” and taking advantage of the team’s diversity, he said.

Mario Miranda, a B-1B Aircraft Support Systems project manager, has worked with Vu for 20 years and has seen things change for the better. “We get opportunities to meet



### E PLURIBUS UNUM

Out of many comes one. In the case of Mike Vu and his B-1B Aircraft Support Systems team in Long Beach, Calif., the diversity and cohesion of the group has created an atmosphere where candid conversation and inclusiveness are the norm, not the exception.

Not surprisingly, the engagement scores for Vu, the senior manager, on the last Employee Survey were extremely high. Vu said his team initially meets without him to discuss Employee Survey results and actions. Afterward, each team member can meet privately with him to discuss things further.

Vu began his Boeing career 25 years ago. He has changed his managing style to give him more time to engage his team.

with Mike in large groups and face to face,” Miranda said. “I often share feedback with Mike that’s not so positive, but am never concerned about making a negative statement. He’ll turn that into something positive, something to improve or grow upon.”

### EMPOWERING, NOT OVERPOWERING

When Commercial Airplanes’ Brad Konwent faced serious operations issues regarding a complex machine, he was confident he could count on his leader for support. Konwent, part of the Auburn Machining and Emergent Operations (AMEO) team in Auburn, Wash., had the knowledge to resolve the issue and the backing of a leader who en-

sured he would be successful.

The situation involved a machine that had been retrofitted with a part that left the machine not functioning and useless for nearly five months—and affected overall productivity.

Enter Barbara Ballinger, AMEO Processing Assembly & Kitting manager. According to Konwent, Ballinger recognized the situation's gravity and understood what needed to happen to remedy the problem.

"Barb started asking us questions immediately about what we needed, and then worked with us to develop a reasonable schedule that fit in with our other jobs," Konwent said. "She allowed me to focus my time and energy on making that machine function properly. She was there to support me, not to micromanage, and we were successful."

Ballinger asked a lot of questions upfront to understand the situation. After that, "I helped Brad set up a schedule and establish priorities, then I cut him loose to do the job," she said.

Ballinger, who scored highly on employee engagement from the 2007 Employee Survey, said she believes strongly in communicating with her employees and encouraging them to come to her with new ideas and suggestions.

"All ideas are of value. The people I work with know they can come to me without risk," she said.

Konwent concurred: "It's as if she has a leadership manual for success that only she has read." ■

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**PHOTO:** Barbara Ballinger (from left) discusses an approach and balance to her team's increasing work statement versus their existing work load with Brad Konwent, part of Auburn Machining and Emergent Operations, and Andrea Olson, Material Processor Requirements Facilitator. JIM COLEY/BOEING

# Get engaged with engagement

Here's a list of resources to help take action and drive employee engagement.

**Kenexa Action Planning Tool.** Lets managers build and track action plans with little effort. It also provides tips to help managers address specific questions that appeared on the Employee Survey. Managers interested in using this tool should contact their HR consultant or ER specialist for access to it.

**Employee Engagement intranet site.** Provides one-stop shopping for all things related to employee engagement. It explains what engagement is, why it's important, and how employees can improve themselves and their teams. See <http://employeeengagement.web.boeing.com>.

**Best Practices Database.** Allows employees to select a companywide question from the Employee Survey and see how other Boeing managers have addressed the issue. The prac-

tices highlighted in this database come from top scoring Boeing managers based on the 2007 Survey. This tool also provides "external" best practices used by other companies. Visit <http://employeeengagement.web.boeing.com/EngagementResources.html> on the Boeing intranet, and click the Engagement Best Practices link at the top of the page.

**Recognition Tips archive.** Offers numerous ways managers can improve engagement. Taken from a Huntington Beach, Calif., recognition challenge. See <http://humanresources.web.boeing.com/index.aspx?com=28&id=47> on the Boeing intranet.

# Engagement, defined

What exact actions constitute employee engagement? According to the human resources consultancy Hewitt Associates, employees are engaged when they demonstrate three primary behaviors. Boeing's 2007 Employee Survey included questions related to these behaviors.

- **Say.** The employee speaks positively about the organization to co-workers, potential employees, and customers.
- **Stay.** The employee has an intense desire to be a member of the organization, despite opportunities to work elsewhere.
- **Strive.** The employee exerts extra effort and exhibits behaviors that contribute to business success (sometimes called "discretionary effort" in research studies).

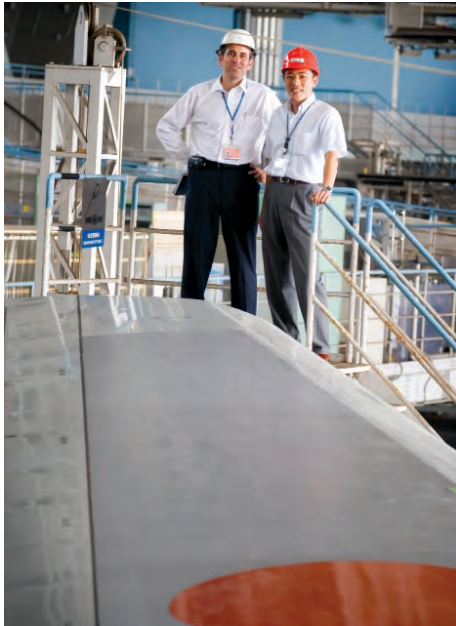


# Toward a com

Boeing's partnership with Japan—a unique market that's home to important customers, the same: The critical role of personal relationships

By MIKE WIEGAND

PHOTOS BY BOB FERGUSON/BOEING



Like many relationships, the Boeing-Japan relationship had humble beginnings, starting in 1953 with the establishment of Boeing International Corp. Boeing hoped to gain a foothold in a promising new market against entrenched competition. The new operation was funded with \$1,000 and staffed by five U.S.-based directors. Yet this initial formal presence in Japan was the beginning of a profound partnership and friendship for both the company and Japan. In the past five decades, Boeing and Japan have made aerospace history together—and are setting the pace for defining the future of the industry.

“Japan has worked with Boeing over the decades on both commercial and defense programs,” said Hirofumi Katase, former director of the aerospace and defense industry division, manufacturing industries bureau at Japan’s Ministry of Economy, Trade and Industry. “Today, Japanese aerospace industry is jointly developing the 787 Dreamliner and Boeing is offering support to Japan’s Mitsubishi Regional Jet program. We have worked together on many defense programs such as Chinook and Tanker.”

Japan’s aviation requirements are unique. As a small island nation with dense population centers and high air-traffic demand, Japanese airlines have the highest flight cycles on some of the densest routes in the industry. Airplanes must be infallibly reliable, exceptionally capable and highly efficient. Maintenance must be impeccable. Top-notch customer support is critical.

Meanwhile, Japan’s defense challenge is formidable. Some of its neighbors are among the world’s ascending economic powers, while others represent security concerns. Accordingly, Japan’s defense objectives combine a strong desire for protection in a complex region, with its

Above: Don Morton (left), a Commercial Airplanes Field Service manager at ANA (All Nippon Airways), stands with an ANA employee at Haneda Airport. Right: The Imperial Palace is in Tokyo, near the Boeing Japan office.

# Common benefit

as well as expertise in industry—is evolving and strengthening. Yet one element remains



aspirations to be a leader in international relief efforts, disaster response and the fight against terrorism.

Boeing recognized early-on that investment in developing exceptional products for this unique market was the only solution. Such development clearly required close partnership with the Japanese in defining requirements and designing commercial airplanes and defense solutions along with the right level of superior customer support. Japan's well-known expertise in process-focused manufacturing and high-quality products made partnering with Japanese industries as suppliers inevitable as well. The relationship deepened and broadened.

Today, Japanese engineering and manufacturing plays a significant role in every single jetliner Boeing builds. Japan's partnership role began with the F-86, then steadily increased on several military programs including the F-4, the F-15 fighter, the Apache attack helicopter and the Chinook heavy-lift helicopter. The extensive collaboration extends to space, telecommunications and many other areas.

Japan is playing an increasingly central role in launching major new programs such as the 787 Dreamliner, the 777 Freighter and the 747-8 Freighter. The Japanese "heavies"—major industrial companies including Mitsubishi Heavy Industries, Kawasaki Heavy Industries, and Fuji

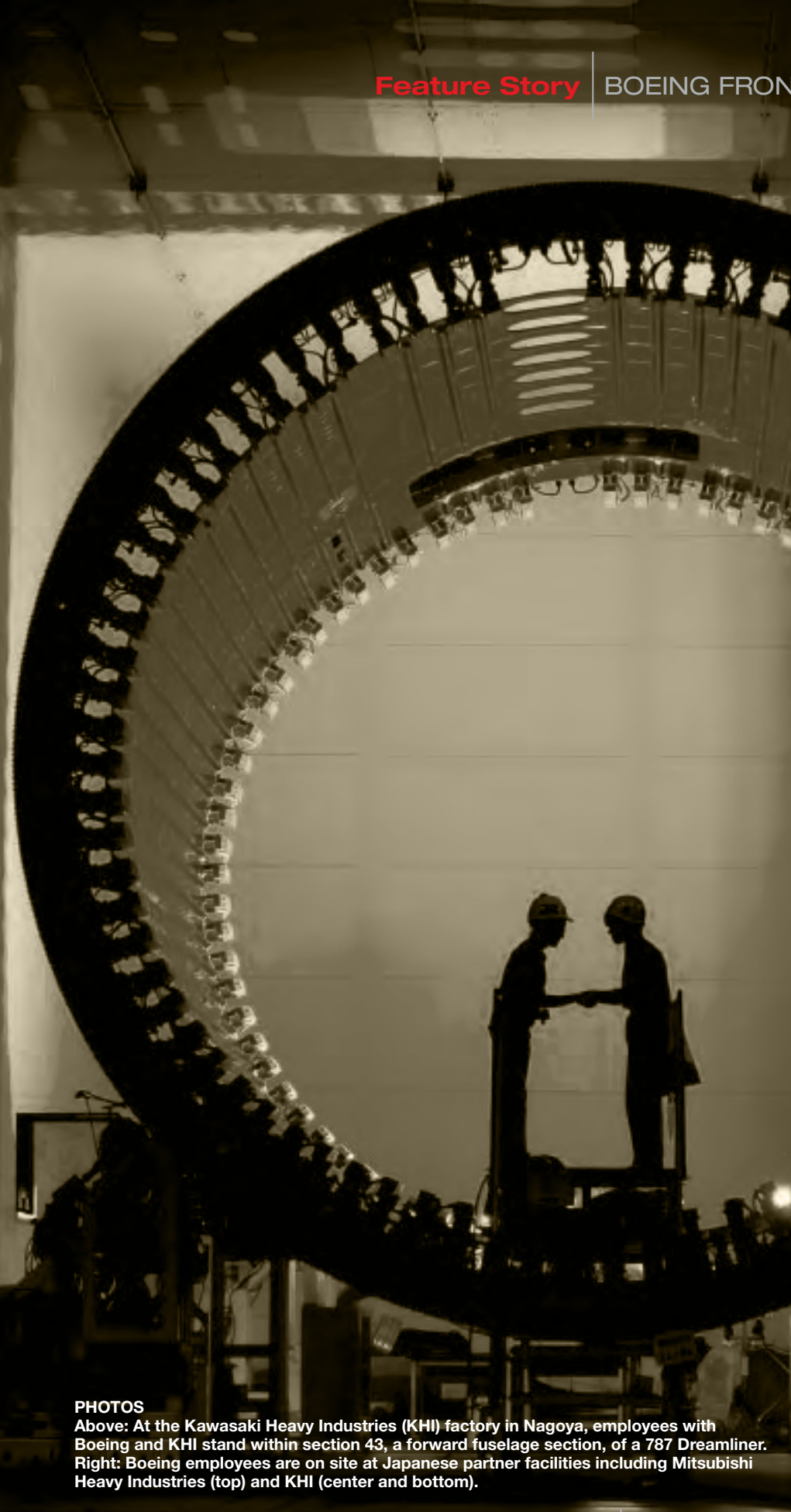
Heavy Industries—produce components almost exclusively for Boeing. The Japanese also launched Commercial Aviation Services' 767-300 Boeing Converted Freighter, Airplane Health Management and Integrated Materials Management programs, as well as the 767 AWACS (Airborne Warning and Control System) program. Japan was also one of the first customers for the KC-767 Tanker. Launching such significant programs from across Boeing businesses is comparable to the role traditionally filled by major U.S. carriers and the U.S. Department of Defense. Japan has also been a primary influence and mentor for Boeing in such key areas as Lean manufacturing and quality improvement.

What began as a customer-courting maneuver by Boeing more than 50 years ago has now evolved into a uniquely close relationship in which Japan is a customer, supplier and risk-sharing partner. The risk-sharing role is an especially significant commitment. In support of the 787 Dreamliner program, for example, Japan has invested billions of dollars over the past several years. Like Boeing, the future of Japan's investment rides on the long-term success of the program.

In addition, all of Integrated Defense Systems' Japan programs involve Japanese industry in some way. Kawasaki Heavy Industries is the direct contractor for the tanker sustainment program, but Boeing works







**PHOTOS**  
 Above: At the Kawasaki Heavy Industries (KHI) factory in Nagoya, employees with Boeing and KHI stand within section 43, a forward fuselage section, of a 787 Dreamliner. Right: Boeing employees are on site at Japanese partner facilities including Mitsubishi Heavy Industries (top) and KHI (center and bottom).

with KHI, Itochu and Japan Airlines to provide support needed. Through Support Systems, IDS provides training and service engineering, parts and components that ensure the Japanese tankers are maintained well.

But the closeness of the Japan-Boeing relationship goes beyond business. It's ultimately founded on a vast and intricate network of personal relationships between thousands of people over several decades. The depth, breadth and extent of these relationships are an integral part of doing business in Japan.

Japan and Boeing have weathered a wide variety of challenges and pressures over the years, and both have benefitted. But the greatest challenges—and opportunities—lie ahead, especially as more nations invest in building aerospace manufacturing capabilities, creating intensified competition.

Strategic international partnerships—like the partnership between Boeing and Japan—will be the key to global competitiveness. Many countries and companies are pursuing international collaboration and global relationships. For some of these competitors, this is relatively new ground. But for Boeing and Japan, it is very familiar territory that's created a competitive edge for the future. ■

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Boeing Japan President Nicole Piasecki, in front of the Imperial Palace in Tokyo, said Boeing and Japan have “progressed from a stage of mutual benefit to strategic interdependence.”

# ‘A formula for success’

What makes Japan important to Boeing—and vice versa?  
Boeing’s top executive in this market explains

BY MIKE WIEGAND

**P**ioneering customers. Innovative technologies. Manufacturing processes that are practically synonymous with quality. These are hallmarks of Japan, which is important to Boeing in myriad ways. Among them: It’s the home of the launch customer of the 787 Dreamliner, as well as one of the first air forces to procure the KC-767 Tanker.

For additional perspective and insight on Boeing in Japan, *Boeing Frontiers* spoke with Nicole Piasecki, president of Boeing Japan.

**Q: Why is Japan so important to Boeing?**

**A:** Japan is uniquely important for many reasons. We’re proud of the 50-plus years we’ve been doing business in Japan and our important achievements. But it’s much more than that—it’s the character and quality of the relationships we’ve built from the ground up during those five decades. It’s the way we’re working together to lead industry innovation and advance aviation. Boeing and Japan each bring different but highly complementary capabilities to our partnerships, and it’s a formula for success.

If you look at Japan and Boeing today, you’ll see that Japan has been assuming a position that until recently was filled mainly by major U.S. carriers or the Department of Defense. In the past few years, they’ve been launch customers for major programs on both the commercial and defense side.

As partners, we’ve progressed from a stage of mutual benefit to strategic interdependence. The world is changing, shrinking. More countries

and companies want a piece of the action. But while competition is increasing, resources are constrained. Whether you’re talking about capital or materials or talent or ideas, the best aerospace player will be the one who can secure those assets. Not everyone will succeed or even survive, and no one can go it alone. Strategic partnerships with the right set of partners are key.

**Q: What makes Japan a good strategic partner?**

**A:** It comes down to the basics of strong partnerships and friendships. We have such a stable, well-developed, deep relationship with Japan. They are among our best customers. Japan’s airlines are our largest wide-body customer, and overall Japan is one of the largest and most profitable commercial markets for us—we have 85 percent of the market share there. Japan also has one of the largest defense budgets in the world, and we’ve collaborated on several key programs, including the space and F-15J/DJ programs. Our Japanese customers make us more globally competitive as they push us hard for more leading-edge products.

In Japan, we also work with some of the world’s best aerospace structures manufacturers. They play a significant production and capital investment role with us—especially with the 787 Dreamliner. We benefit from such risk-sharing and technology access on both the commercial and defense sides of the business.

And as Japan shifts its supply chain to other up-and-coming, low-cost, high-quality suppliers, we’re able to leverage and benefit from



those partners as well. We gain new, top-notch suppliers and potential new customers from these additional relationships.

**Q: What are the advantages for Japan?**

**A:** Japan faces some serious economic and security challenges. Its people live and work in a very complex and rapidly changing part of the world. Many of its neighbors are becoming major economic and military powers in the region.

Japan is wrestling with how best to transform the Japan Ministry of Defense to respond to the changes around them. In addition to a defense build-up to expand mission capabilities, the ministry is undergoing procurement reform. They are working for a much more transparent process, taking some of the decision-making out of the back rooms. This will increase value for money spent, and allow them to take much more of a life-cycle approach to acquiring new aircraft. They understand we are well-positioned to help them respond to their defense challenges with the products, services and expertise such a comprehensive transformation requires.

We also continue to collaborate with Japan

on industry-leading, profitable commercial endeavors. We initially entered Japan to gain access to the market. But over time the relationship has evolved significantly. We've helped them develop their aerospace manufacturing and air-travel industries. Mitsubishi Heavy Industries is developing a regional jet and we have agreed to consult on the development of that airplane, providing selected marketing, development and post-sales expertise. We will benefit in turn as MHI strives to improve design and manufacturing processes for future collaborative aircraft development. Of course, we can't take these benefits for granted. For example, Japan will pursue aircraft projects whether we collaborate with them or not.

**Q: You frequently reference the quality of our relationships in Japan. How were we able to succeed where others have failed?**

**A:** In Japan, we were very fortunate in that we recognized at an early point we needed to understand and honor Japanese culture. We realized relationships for the Japanese develop differently than, for example, in the U.S. It's crucial to respect that, and have the humility to try to earn those relationships and the trust

that goes with them. It's also important to remember these aren't just relationships with people in business—the Japanese government is a powerful and important part of all industrial activity and economic development. So part of relationship building is negotiating these two important spheres of influence in Japan and understanding it's all tied together.

Part of the beauty of our partnership is the relationship has developed and grown at all levels—from the CEO to the factory workers and engineers collaborating together to improve our product. Over the years, we've often brought Japan teams to the U.S. to work with us, and sent Boeing teams to Japan. My first job at Boeing was as a Customer Engineer on the 777. It was amazing for me to watch ANA (All Nippon Airways) and JAL (Japan Airlines) as launch customers provide the kind of operational and maintenance insight they brought to our working together design teams. They made important contributions in creating a better product. The 787 program was no different, with both ANA and JAL taking the lead in defining the requirements for the aircraft and staying close to us the entire way through the process.

Joining up for these kinds of large, innovative, and complex efforts—efforts that involve some risk—makes you closer partners. You come out at the end and it's inspiring to see what you've accomplished together. It's like climbing a mountain together and standing at the summit.

Another thing that's helped us in Japan is our own company culture. We're in such a long-term industry, with products that are in service 30 to 40 years. Designing and manufacturing a single new product takes years. The Boeing culture strongly reflects the nature of the industry. We value patience, respect, experience and loyalty. We approach our challenges methodically, never forgetting the long term. The Japanese culture embraces similar values and a longer-term perspective on developing and honoring relationships.

All that said, our relationship with Japan is like any other deep, complex long-term relationship. There are always challenges.

**Q: What challenges have you faced as the Boeing leader in Japan?**

**A:** I started in this position at the beginning of 2007, and it was mainly a year of responding to specific program challenges and the resulting impact to customers. Even though we've successfully worked together with Japan for many years, there are always new

Boeing Japan President Nicole Piasecki holds a framed display of the ads from Boeing's "Made With Japan" ad campaign. The campaign reinforces Boeing's five-decades-old partnership with Japan.



and sometimes difficult challenges. Last year there were delivery delays on the first Japan KC-767 Tanker, challenges to the long-term affordability of the Japan Apache program due to its unique indigenous structure, and the 787 design and production issues.

We're working hard to restore the trust and confidence of our Japanese friends and customers. We delivered the first two KC-767 Tankers earlier this year. While one was delayed, the other was right on schedule, and our exceptional customer support team has done a great job of showing the Japan Air Self-Defense Force that we stand behind our products. In fact, a tanker conducted a successful contact flight and a fuel passing with an F-15 on Aug. 18. So this outstanding result means these new tankers are moving closer to entering service. And as for the 787, we've been successful in resolving most of the airplane's issues and we're back on track now. I'm very pleased with the great job the 787 team has done in turning things around.

Last year, we also developed and implemented the Japan Enterprise Strategy—a unified “One Boeing” approach to all of our Japan efforts. This year our focus has been on putting together the right team for Boeing Japan, stabilizing the organization, and establishing enterprisewide communication. By next year, I expect us to be focusing more aggressively on growth and future opportunities and working more smoothly together as “One Boeing.”

**Q: Why so much emphasis on the Enterprise Strategy and “One Boeing”?**

**A:** It all comes back to relationships. We've had many instances of Boeing teams from various parts of the business trying to meet with the same Japanese business or government leaders, duplicating efforts or in some cases making conflicting requests. This is not very efficient and it makes it appear that Boeing representatives from defense, commercial, space and the rest of the company don't know what the others are doing—and that we're content to waste the time of our Japanese friends with disjointed, overlapping efforts. We've also had many situations where talented, smart people make assumptions about how to get things done in Japan—based on how business works in the U.S. and elsewhere.

But the Japanese business environment is different, and it's important to tie in with the Boeing people who work in Japan and know the market and culture. That's the best way to ensure success and avoid mistakes that can compromise an opportunity.



The Enterprise Strategy is a way to integrate our efforts and unify our messages. It opens up opportunities to create value. By keeping each other informed and coordinating our efforts, we're better able to leverage all of our Japan relationships. And we will make it much simpler for our valued friends in Japan to do business with us.

But that means everyone must join. *Everyone*. There is no room in 21st century aerospace for silos and turf battles, because the world continues to get more competitive every day. Forget the silos and turf—we're in this together. “One Boeing” is a better way to work and a powerful way for us to lead. It allows us to get the most value out of our collective abilities and resources.

This isn't limited to Boeing people who work in Japan or work on Japan-specific issues or projects. We all need to be aware of what the company does around the world, beyond our specific work location. In some way we all have a connection and impact on our Japan efforts. The more aware and informed we are, the better able we will be to help Boeing succeed—in Japan and around the world. We are all part of a single Boeing. And the more we understand, think and work that way, the more competitive Boeing will be. ■

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**“Part of the beauty of our partnership is the relationship has developed and grown at all levels—from the CEO to the factory workers and engineers collaborating together to improve our product.”**

– Nicole Piasecki, president, Boeing Japan



**PHOTOS:** Japanese carriers Japan Airlines (top) and ANA (All Nippon Airways) (bottom) are strong Boeing airline customers. Meanwhile, at Komaki air base (center), workers review documents for one of the Japan Air Self-Defense Force's KC-767 Tanker.



# For a stronger partnership

Meet some of the many Boeing employees who are building relationships in Japan

**Y**ou've heard the saying that people do business with people, not companies. In Japan, that's not just a saying: It's a way of life. Boeing employees working in Japan have taken that aspect of Japanese culture to heart. Their success at work has come about not merely through their expertise and customer focus, but also through their abilities to nurture and develop relationships with their Japanese partners. It is through these interpersonal relationships that Boeing is able to forge a stronger connection with its Japanese customers and partner companies.

Here's a look at some of the many Boeing people whose relationship-building efforts are strengthening the Boeing-Japan partnership.



## Yasutoshi Masuzawa

One of the hallmarks of the Boeing-Japan relationship is that it is not about one relationship, but many. Yasutoshi Masuzawa has more than 35 years of experience working engineering and marketing for the commercial airplanes business of Boeing (and McDonnell Douglas), and he understands better than most the intricacies and value these relationships represent.

In Japan, the development of business relationships requires patience and stability. "Building respect for each party is critical," said Masuzawa. "People in Japan value the closeness that comes from climbing mountains together and working through the inevitable valleys."

Thus, a short-term view of partnership and the revolving door of staff can work against Boeing in Japan. As employees with Boeing's Japanese partners grow through various assignments, they no doubt will be developing ties with Boeing workers in Japan. "This is where real value begins to emerge," said Masuzawa. "By the time people reach the top of Boeing, airlines or the 'heavies,' it is quite possible a long-time relationship has developed. If you're going to sell billions of dollars of 787s to a customer, you need to have a friend on the other side of the table."

—Mark Hooper

**"Building respect for each party is critical."**

## Michael Merrow

"I've become more people-oriented since being here," said Michael Merrow about the people at his customer's site. He is the Boeing field service representative providing on-site support for the Japan Air Self-Defense Force at their Komaki airbase.

Merrow first worked at the base near Nagoya with JASDF in February 2007. They've purchased four KC-767 Tankers, two of which have been delivered, and his job is to serve as liaison between JASDF and Boeing Engineering, Product Support and Program Management. Initially, he spent about four months with the customer, making sure the manuals were properly translated. He returned a year later when the first two tankers were delivered. Since then, he's been supporting JASDF on scheduled maintenance requirements and its test program.

He said he loves the work. "They approach everything very methodically, and test and test again to make sure everything will work right the first time. They're eager to work, eager to learn new things and great troubleshooters. And they're excited about adding KC-767 Tankers to their fleet."

To build relationships with JASDF counterparts, Merrow said he's learned to adapt to a different business etiquette. Those changes range from offering pleasant greetings to everyone each morning—"In the States I might have been grumpy one day and not greeted everyone," he admitted—to celebrating local festivals with his work partners.


Merrow said he's pleased with how he's developed relationships on the job. "JASDF trusts me and they believe in the work I'm helping them to do," he said. One instance, he recalled, concerned getting work done while awaiting updated tanker manuals: To maintain progress, Merrow issued interim scheduled maintenance tasks and procedures. "At first they were reluctant, but now, JASDF is pleased because it allows them to continue with their maintenance tasks and rigorous test program, while waiting for the updates to be incorporated," he said.

"Michael Merrow works hard with us from early morning until late night to expedite and solve issues of concern," said Capt. Tomoharu Kitagawa of JASDF. "I like him a lot and I wish I could have another five Michaels. We truly work as one team."

—Kathrine Beck

**"I've become more people-oriented since being here."**



A man with dark hair, wearing a white dress shirt and a patterned tie, stands in front of a blurred ANA airplane. The background is a warm, golden light, suggesting an airport setting. The man is looking slightly to the right of the camera with a neutral expression.

**“Building trust is critical, and it’s tough to develop trust via e-mail.”**

## Don Morton

Since business relationships in Japan are often as important as the business itself, Don Morton puts a premium on getting to know his customers. Morton, a Commercial Airplanes Field Service manager in Commercial Aviation Services at ANA (All Nippon Airways), has seen the value of relationship-building during his two Boeing assignments in Japan.

“The impression ANA has of Boeing is strongly influenced by their perception of the Boeing workers here in Japan,” said Morton. “Building trust is critical, and it’s tough to develop trust via e-mail. Building friendships and getting results engenders trust and that trust helps build open communication and teamwork.”

The world of field service has changed over the years, essentially moving the field service reps up the value chain. “Ten years ago, we spent more time distributing paper, which took time but had the benefit of getting daily face-to-face contact with key personnel,” he said. “Today, we’re significantly more automated and questions get distributed directly to the customer in most cases, which frees us to get more proactive in broader, more complex issues.”

Because ANA maintains a large engineering staff to support its fleet—737s, 747s, 767s, and 777s, along with 787 Dreamliners next year—it’s critical for Morton and the seven-member ANA field service team to stay close to the customer. “We work to know employees by name and by face, and we have a structured visitation plan to stay engaged,” he said. “Now that I’ve gotten myself established, they’re willing to brainstorm with me and willing to do things differently than we have in the past. It’s refreshing to see them looking forward and trying new things with us, and strong relationships play a big part in that.”

— Hal Klopper

## Greg Stare

How good a relationship has Greg Stare built with his Japanese partners? He's earned a permanent role on source inspections.

Stare is a quality systems specialist, Program Quality, Philadelphia Rotorcraft, who's worked for six years at the Kawasaki Heavy Industries factory in Gifu. Last winter, Takahio Inotsume, KHI's manager of contracts for the CH-47J/JA program, asked if Boeing would send Stare with the team from Japan on an upcoming inspection of the Philadelphia facility, where sectional parts and components for the helicopters are built. Under this contract, KHI provides Chinook helicopters to the Japan Air Self-Defense Force and the Japan Ground Self-Defense Force under Boeing license.

"Greg-san has a very good understanding of the unique requirements of our customer, the Japanese Ministry of Defense," wrote Inotsume in a February e-mail. Since then, Stare's participation on source inspections has been standard.

"Our Japanese partners and customers feel I understand their way of working and thinking and manufacturing. I respect the way they see things," said Stare, whose role on the trip was to serve as liaison across organizations and cultures. "Gaining someone's trust comes with time, respect, honesty, work ethic and understanding. It's more a combination of interactions over time than one single act."

One thing he's learned about Japanese culture is the high value placed on aesthetics. "How it looks and how it's presented is very important," he said. An issue such as a scratch or a small dent takes on more importance to KHI's Japan Air Self-Defense Force customer. When Stare accompanies the KHI team to Philadelphia, he can explain that importance on their behalf. "They care, and their customer cares," he said.

— Kathrine Beck

**"Our Japanese partners and customers feel I understand their way of working and thinking and manufacturing. I respect the way they see things."**



**“Once I learned the value of providing the time needed for internal discussion, our meetings were more effective.”**

## Erna Pardede

“Bow. Take it with both hands—nothing casual, and bow. Look at the card for a while just to make sure you know the person’s name and title.” Erna Pardede is describing proper Japanese business etiquette for receiving a business card. She works for Commercial Airplanes Supplier Management Field Operations with Boeing business partner Mitsubishi Heavy Industries at its factory in Nagoya. MHI builds wings for the 787 which are then delivered to Everett, Wash., for final assembly.

Pardede’s main task is to lead wing delivery activity from MHI to Boeing for final assembly. The task involves coordination with MHI, Kawasaki Heavy Industries, Spirit AeroSystems’ Tulsa, Okla., site and Boeing Everett—the main owners of the integrated wing product built by MHI. Pardede’s job includes liaising with MHI employees in engineering, manufacturing, quality and business.

Pardede, whose family is of Chinese descent, said knowledge of other Asian cultures is helpful, but she has also learned a lot during her year in Japan. Business decisions there, she said, are made on a team basis, not by individuals. This means planning enough time in a meeting for discussion. “Once I learned the value of providing the time needed for internal discussion, our meetings were more effective,” she said.

Pardede said there is one simple idea behind the cross-cultural communication she practices on the job: “When you treat people with respect, they treat you with respect. It’s important to make sure they understand we are in this program together.”

—Kathrine Beck

**“... our customers in Japan tend to be sophisticated and detail-oriented, and to demand high quality ...”**

## Dai Murakami

Dai Murakami is at the front end of many customer discussions. For the past nine years, as director of Regional Marketing, he has been part of the “core” customer team, working with Sales and Contracts directors. Through his focus on Japan for the past five years and his previous experience as a performance engineer in support of Asia Pacific Sales, he’s developed a good understanding of the Japanese aviation industry.

“I’ve been nearly everywhere in the Asia Pacific region in my previous jobs, and while I can’t really compare airlines, our customers in Japan tend to be sophisticated and detail-oriented, and to demand high quality,” he said.

Because of the tendency in Japanese business to change work assignments periodically, Murakami said his business relationships are continually growing. “I’ve worked with some of my customers for over 10 years, which is a significant chunk of a person’s career,” he said. “It’s been really interesting to work with the same people in many different capacities, and it definitely adds to the depth of the relationships. I’m glad I’ve been able to stay with the same account for so long.”

—Bob Saling



## Yoshi Tanaka

If there's any role at Boeing where building relationships matters, it's business development. That truth isn't lost on Yoshi Tanaka, Integrated Defense Systems' director of International Business Development in Japan. For him, supporting IDS in this market—a focus country for IDS, which sees international business playing a major part in its growth—entails building relationships that eventually involve forging customer desires, needs and limitations into a package that meets everyone's needs. "Cultivating close relationships with the key stakeholders is one of the most important reasons for having a country presence. Mr. Tanaka's primary responsibility is to do just that," said Joe Song, vice president, IDS International Business Development for Asia Pacific.

Yet these business opportunities represent potential for all of Boeing, not merely IDS. By promoting internal coordination among Boeing business units and companywide functions through weekly teleconferences and biannual strategy meetings, both major business units are working together in Japan to execute the One Boeing Japan Enterprise Strategy. That plan is aimed at growing Boeing's business overall and leveraging Commercial Airplanes and IDS for the betterment of Boeing.

"Just look at what we've done to make Japan's KC-767 tankers a success and keep customer satisfaction high," said Tanaka, recalling how IDS Support Systems, Commercial Aviation Services and Japanese carriers ANA and Japan Airlines worked together to locate a necessary part for the Japanese tanker program. "It requires BCA and IDS to work together as a team—and we're doing that daily."

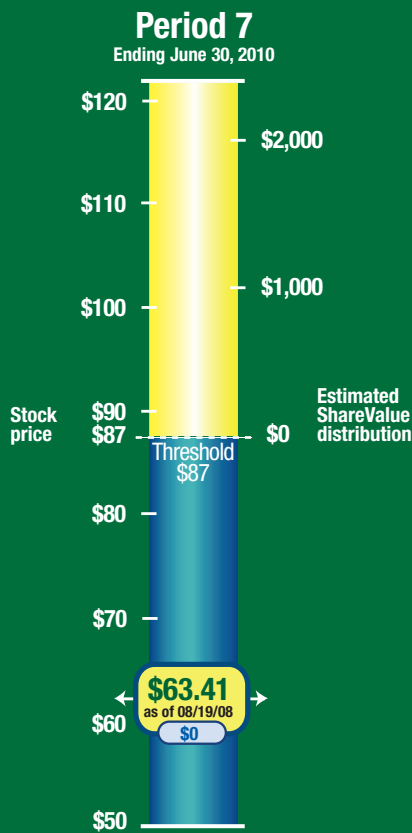
—Hal Klopper

**"It requires BCA and IDS to work together as a team—and we're doing that daily."**

## Boeing stock, ShareValue Trust performance

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

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



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

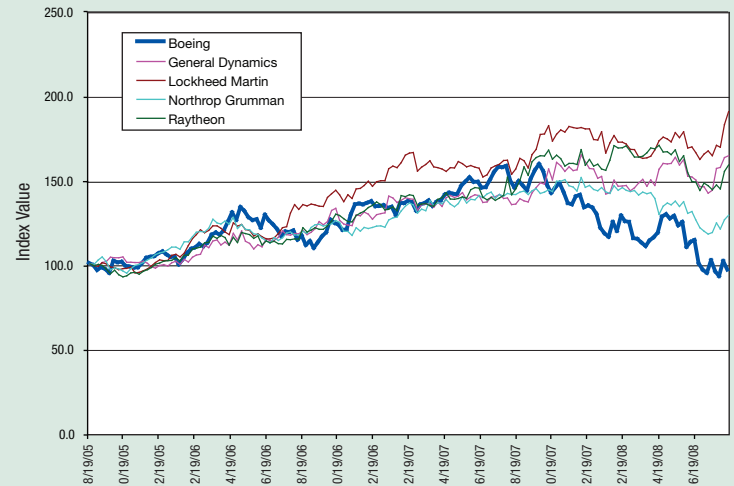
The share price shown is the average of the day’s high and low New York Stock Exchange prices. Updates to participant/employment data will be made periodically.

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

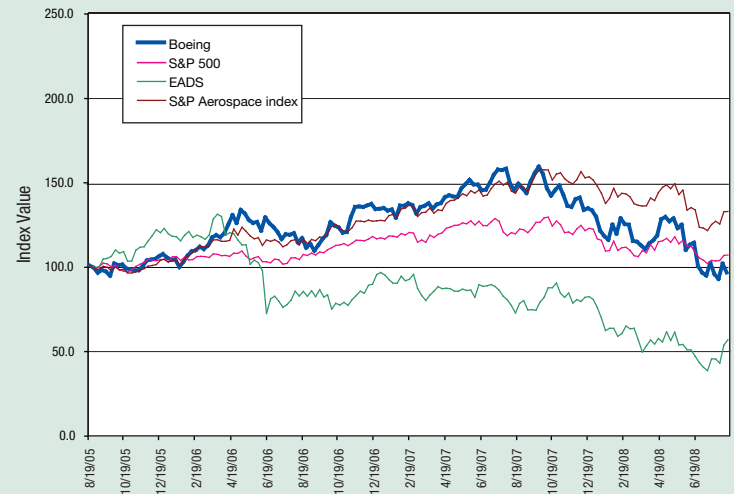
# STOCK WATCH

The chart below shows the stock price of Boeing compared to other aerospace companies, the S&P 500 index and the S&P 500 Aerospace and Defense index. Prices/values are plotted as an index number. The base date for these prices/values is Aug. 19, 2005, which generates three years of data. The prices/values on that date equal 100. In other words, an index of 120 represents a 20 percent improvement over the price/value on the base date. Each data point represents the end of a trading week.

### Boeing vs. U.S.-based competitors



### Boeing vs. stock indexes and international competitors



Comparisons: 4-week, 52-week	Price/value as of 8/15/08	Four-week comparison		52-week comparison	
		Price/value as of 7/18/08	Percent change	Price/value as of 8/17/07	Percent change
<b>BOEING</b>	<b>64.45</b>	<b>68.14</b>	<b>-5.4%</b>	<b>95.93</b>	<b>-32.8%</b>
<b>U.S. COMPETITORS</b>					
General Dynamics	93.41	82.07	13.8%	77.48	20.6%
Lockheed Martin	116.67	100.99	15.5%	96.22	21.3%
Northrop Grumman	71.13	65.65	8.3%	77.72	-8.5%
Raytheon	61.71	56.17	9.9%	56.33	9.6%
<b>INT'L COMPETITORS</b>					
EADS *	15.76	12.80	23.1%	19.87	-20.7%
<b>U.S. STOCK INDEXES</b>					
S&P 500	1298.20	1260.68	3.0%	1445.94	-10.2%
S&P 500 Aerospace and Defense Index	390.46	368.40	6.0%	421.36	-7.3%

\* Price in Euros



## IN MEMORIAM

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

**Stephen Allen**, information technology project management specialist; service date Aug. 29, 1978; died Aug. 8

**William Alverson**, production associate; service date Aug. 18, 1990; died Aug. 3

**Kevin Ash**, project management specialist; service date June 5, 2001; died July 16

**James Bartlett**, product & services manager; service date March 14, 1986; died July 22

**Jerrauld Blanchard**, design & analysis engineer; service date July 7, 1978; died Aug. 3

**Judy Campbell**, office administrator; service date Aug. 25, 2006; died Aug. 16

**Danny Bryden**, design & analysis engineer; service date Jan. 10, 1987; died July 24

**Quang Dao**, tank test repair mechanic; service date June 29, 1997; died July 16

**Raymond Evers**, technical data designer; service date Aug. 21, 1978; died July 20

**Edward Frawley**, supplier program management; service date Jan. 26, 1982; died Aug. 4

**Robert Gillespie**, systems engineer; service date July 29, 1983; died July 16

**Robert Jensen**, expeditor; service date Nov. 2, 1965; died Aug. 10

**Elmer Jackson**, sheet metal assembler & riveter; service date Feb. 24, 1988; died Aug. 15

**Robert Kalan**, writer/editor; service date Aug. 14, 1984; Aug. 5

**Doug Kinneard**, communicator; service date Jan. 17, 1997; died Aug. 17

**Jon Lantz**, painter/sprayer; service date Nov. 11, 1989; died July 15

**Richard Lytle**, motive equipment operator; service date June 6, 1977; died Aug. 15

**Lynn Marshall**, government property management specialist; service date April 9, 1982; died Aug. 5

**Patricia Morisch**, office administrator; service date March 5, 1997; died Aug. 13

**Pablo Rodriguez**, electrical systems assembler/installer; service date Nov. 7, 2001; died Aug. 15

**David Romig**, procurement agent manager; service date Jan. 18, 1972; died Aug. 9

**John Ruane**, inspector; service date May 13, 1988; died July 16

**William Stauffer**, aircraft production mechanic; service date March, 11, 1985; died Aug. 12

**David Sundstrom**, shipping/facilities; service date April 5, 1991; died July 19

**Tommy Tomyn**, general assembler/installer; service date Aug. 23, 1996; died July 25

**Marsha Treat**, project management specialist; service date June 5, 1997; died July 17

# AROUND BOEING

## BOEING SENDS TEACHERS TO SPACE CAMP FOR 17TH YEAR

Boeing recently sponsored more than 90 teachers from 12 countries at the 17th annual Boeing Educators to Space Camp in Huntsville, Ala.

The program seeks to enhance teachers' skills in presenting math, science and technology lessons that will inspire students and help ensure a skilled workforce for a globally competitive technology market. Workshops included simulated space missions and astronaut training. Upon completion of the week-long training, participants received resources to help transfer their knowledge to students.

Since 1992, more than 600 teachers have participated in Space Camp, who in turn have influenced an estimated 30,000 students.

## DELTA GETS BOEING'S 1ST 737 WITH CARBON BRAKES

A late July delivery of a Next-Generation 737-700 to Delta Air Lines marked the entrance into service of new, more-efficient brakes designed for the Next-Generation 737.

The new carbon brakes, supplied by Messier-Bugatti, weigh up to 700 pounds (320 kilograms) less than high-capacity steel brakes for Next-Generation 737s. Reduced airplane weight can help airlines cut their fuel burn and carbon-dioxide emissions. These brakes recently were certified by the U.S. Federal Aviation Administration.

Delta is coupling carbon brakes with drag- and emissions-reducing Blended Winglets (wingtip extensions) to improve efficiency and serve more markets with the 10 737-700s it will receive over the next few years.



## APACHE BLOCK III MAKES FIRST FLIGHT

Gen. Richard Cody, U.S. Army Vice Chief of Staff, who's spent much of his 33-year career in the U.S. Army flying Apache helicopters, kicked off a recent ceremony in Mesa, Ariz.—the home of the Apache—to commemorate the first flight of the upgraded AH-64D Apache Block III with a flight in the new prototype aircraft. "Thank you from the bottom of my heart for what you do here every day for Army Aviation and the warfighters," Cody told production employees. Boeing plans to begin low rate initial production in April 2010 and deliver the first production AH-64D Apache Block III in June 2011. MIKE GOETTINGS/BOEING

Harold Green, a tube fabricator with the Blue Streak Tube Shop at the Los Angeles Distribution Center, marks a tube with a part-number color band. The red band signifies the tube belongs to the fuel system.

MICHAEL GAIL/BOEING

## CAS Material Management—Blue Streak Tube Shop

You'll find us, the members of the "Blue Streak" tube fabrication shop, at the Los Angeles Distribution Center. We're a self-contained build center—with a cross-functional team of part logistics and fabrication specialists—who are part of the Emergent Build Center of Commercial Aviation Services' Material Management organization.

Our job is to meet any requirement for tubes under 1.25 inches (3.17 centimeters) in diameter that the customer may have. These tubes, used in airplane hydraulics, fuel and oxygen systems, are highly configured with bends, radiuses, fittings, collars and other characteristics unique to each tube. Combine this with the robust materials airplane tubes are fabricated from and you have a different challenge with every customer order.

We're better serving our customers by using the best of Boeing's Lean practices to develop scheduling and part pricing. Historically, it's taken us weeks to build parts. But our team is finding ways to build these parts in a fraction of the time. Our goal is to reach a four-hour timeline. Our efforts align with Material Management's four-hour end-to-end vision, from receiving an order to when parts are ready to ship. But more importantly, they'll help Boeing's airline customers get parts much faster—and keep their planes in the air and their expenses down.

To reach this four-hour goal, we laid out a plan to have all raw material, tools, equipment and technical specifications located in a new 50-by-

90 foot work area (15.2 by 27.4 meters), a result of employee ideas incorporated from a 3P (production, preparation, process) Lean event. The machinery in this area is aligned in a sequential manner that replicates the product fabrication flow. The size of this area is Lean: We're using only the area needed to complete our work. The shop's size cuts the travel time to access parts, information and equipment.

The reductions in fabrication cycle processing and cycle time have been significant. Wing Route pipes that previously took four hours to bend are now processed in 36 minutes, an 85 percent improvement.

We're proud to give the Emergent Build Center team a solution to the tube challenge. We, like the rest of the Emergent Build Center, apply the same emphasis on every part to create an exceptional customer experience.

- Tony Aguirre, tube fabricator
- Harold Green, tube fabricator
- Joe Lancaster, receiving manager
- Brian Maida, tube fabricator
- Rory Melton, inventory/warehouseman
- Mike Meraz, team leader
- Candy Smith, procurement





GET YOUR GREATEST IDEAS HEARD. QUIETLY.

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

- AVIONICS – FLIGHT TEST
- COMMUNICATION SYSTEMS – MILSATCOM/  
NETWORK/SATELLITE/WIRELESS
- ELECTRICAL ENGINEERING –  
COMPONENTS
- ELECTRONIC WARFARE
- FINANCE/ACCOUNTING/PLANNING/  
SCHEDULING/ESTIMATING/PRICING/  
EVMS/TAX
- GIS/IMAGERY
- GROUND MISSILE DEFENSE/  
GROUND-BASED MISSILES
- INFORMATION TECHNOLOGY
- MECHANICAL ENGINEERING – EM/  
STRUCTURAL DYNAMIC/THERMAL/STRESS
- MODELING & SIMULATION
- NETWORK ARCHITECT/  
NETWORK SECURITY
- NETWORKING/EMBEDDED/  
WEB/ARCHITECTURE
- PAYLOAD SYSTEMS – SPACECRAFT/  
SATELLITE/AIRCRAFT
- PRODUCT REVIEW ENGINEERING (LIAISON/  
MRB ENGINEERING)
- QUALITY ENGINEERING
- RADAR DESIGN/ANALYSIS
- SIGNAL PROCESSING – SONAR/RADAR/  
DSP/SIGINT SYSTEMS
- SOFTWARE ENGINEERING – REAL-TIME
- SYSTEMS ENGINEERING

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Apply at: [boeing.com/careers](http://boeing.com/careers)

To view a comprehensive listing of all available positions, please visit: [boeing.com/employment](http://boeing.com/employment). Security clearance requirements are indicated in the position listings. U.S. citizenship is necessary for all positions requiring a security clearance. Boeing is an equal opportunity employer supporting diversity in the workplace.

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





MADE WITH JAPAN

ボーイングと日本企業とのパートナーシップは、航空宇宙産業に大きなイノベーションをもたらしました。三菱重工、川崎重工、富士重工とボーイング。その距離と時間、言語や文化の違いを超えて、お互いの知識と技術をリアルタイムで共有する画期的なプログラムによって、航空機の開発と製造技術を飛躍的に発展させたのです。このコラボレーションによって、いま世界が待ち望んでいた夢の次世代旅客機ボーイング787ドリームライナーが飛び立とうとしています。世界が望むものを表現する、ボーイングと日本企業とのパートナーシップ。さあ、一緒にすごいこと。

 **BOEING**

*"Temple Moon" is the second in a new series of advertisements reinforcing Boeing's partnership with Japan, a relationship that began more than 50 years ago. "Temple Moon" highlights Boeing's collaboration with Mitsubishi Heavy Industries, Kawasaki Heavy Industries and Fuji Heavy Industries on the new 787 Dreamliner. The ad currently is running in Japanese publications including Nikkei Business, WING, Nikkei Shimbun, President and Toyo Keizai.*