



Frontiers

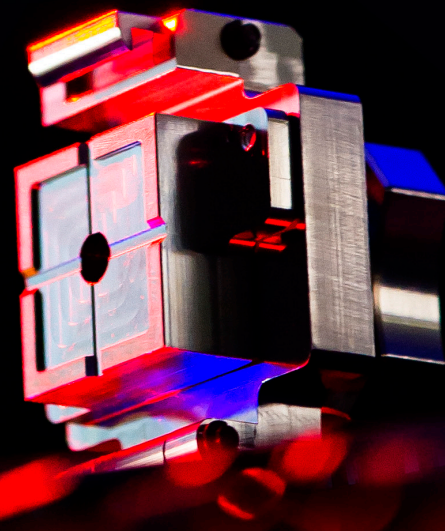
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JULY 2013 / Volume XII, Issue III



SILICON ALLY

Boeing computer chip deters
electronic information attacks





“The ecoDemonstrator is about accelerating technology so that our airplanes can bring people together with a minimal environmental footprint.”

David Akiyama
ecoDemonstrator
Program Manager

CLEANER SKIES AHEAD

Stories of
innovation
at Boeing



www.boeing.com/stories



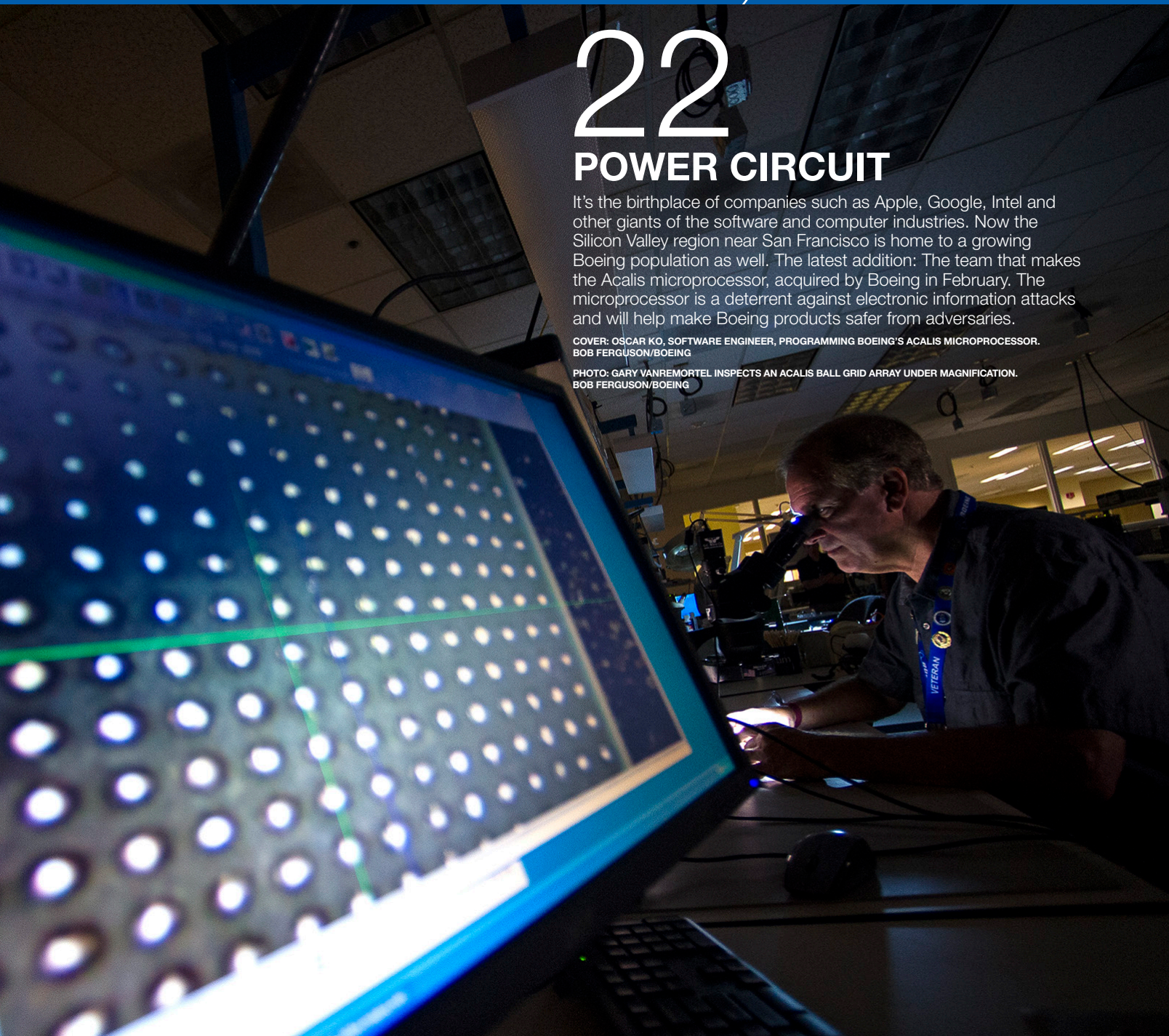
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POWER CIRCUIT

It's the birthplace of companies such as Apple, Google, Intel and other giants of the software and computer industries. Now the Silicon Valley region near San Francisco is home to a growing Boeing population as well. The latest addition: The team that makes the Acalis microprocessor, acquired by Boeing in February. The microprocessor is a deterrent against electronic information attacks and will help make Boeing products safer from adversaries.

COVER: OSCAR KO, SOFTWARE ENGINEER, PROGRAMMING BOEING'S ACALIS MICROPROCESSOR. BOB FERGUSON/BOEING

PHOTO: GARY VANREMORTEL INSPECTS AN ACALIS BALL GRID ARRAY UNDER MAGNIFICATION. BOB FERGUSON/BOEING



AD WATCH

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

Inside cover:



"Cleaner Skies Ahead" is one in a series of innovation stories told by Boeing employees such as David Akiyama. Learn more at www.boeing.com/stories.

Page 6:



This *Flight International* ad features the winners of the Boeing-sponsored Engineering Student of the Year Award. Part of the Flightglobal Achievement Awards, it recognizes outstanding students working to advance aeronautical or space technology.

Pages 14–15:



"Enduring Force," featuring the CH-47 Chinook, is one of several ads in a Boeing Defense, Space & Security campaign highlighting the capabilities Boeing brings to its customers. The ads are running in print and online business, political and trade publications.

Back cover:



Each year, the Boeing Store celebrates Boeing's birthday—and its heritage—in its stores and online. This year, Boeing's 97th anniversary, the stores are featuring the North American F-86 Sabre—on a T-shirt and free collectible pin—as well as the specially priced True Blue merchandise collection. Visit your local store or online at www.boeingstore.com July 15–21.

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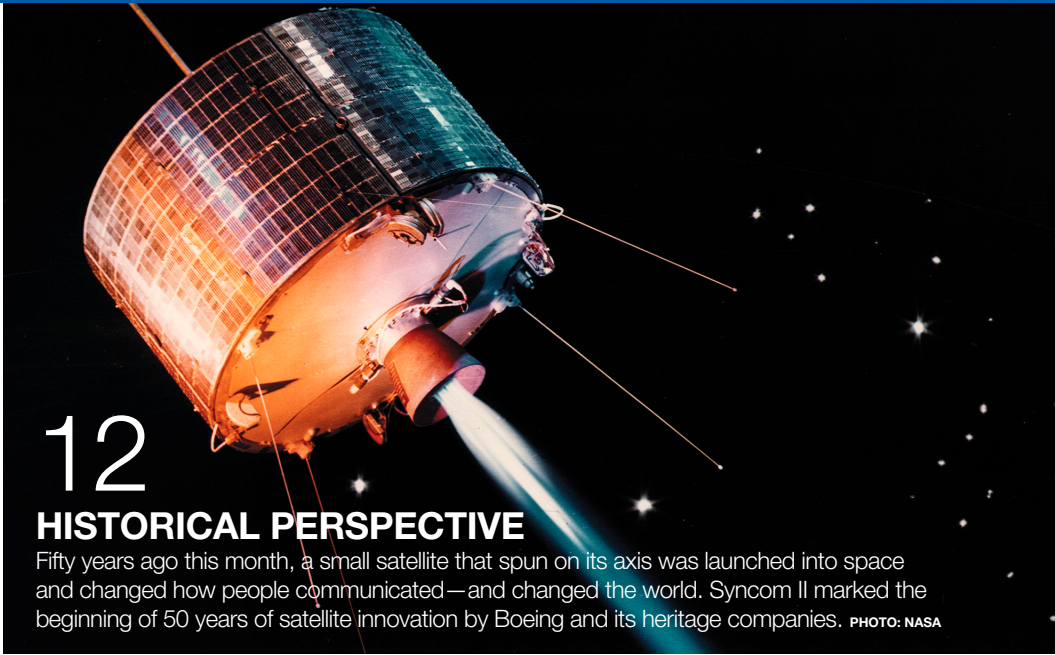
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HISTORICAL PERSPECTIVE**

Fifty years ago this month, a small satellite that spun on its axis was launched into space and changed how people communicated—and changed the world. Syncom II marked the beginning of 50 years of satellite innovation by Boeing and its heritage companies. **PHOTO: NASA**



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PRACTICE MAKES PERFECT**

Launched a year ago, a pilot program to take Boeing's already high quality to the next level has grown into nine Skill Enhancement Centers across the Everett, Wash., factory, where twin-aisle jetliners are assembled. **PHOTO: ED TURNER/BOEING**



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AN ENDURING RELATIONSHIP**

Boeing's relationship with Israel began soon after that nation was founded 65 years ago. Today, companies in Israel supply parts for many Boeing military and commercial products. Boeing is co-developing the Arrow 3 interceptor missile with Israel. **ILLUSTRATION: BOEING**

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LEADERSHIP MESSAGE

Every Boeing employee can help make the company's airplanes and services more attractive and competitive, says Kevin Schemm, vice president and chief financial officer, Boeing Commercial Airplanes. We all play a role in applying Boeing's winning formula: Providing the right products for the right price, he said.

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SPECIAL DELIVERY

Boeing last month delivered the first CH-147F Chinook helicopter to Canada following successful flight testing—and a lot of Boeing teamwork that stretched from Pennsylvania to Arizona. PHOTO: MIKE GOETTINGS/BOEING

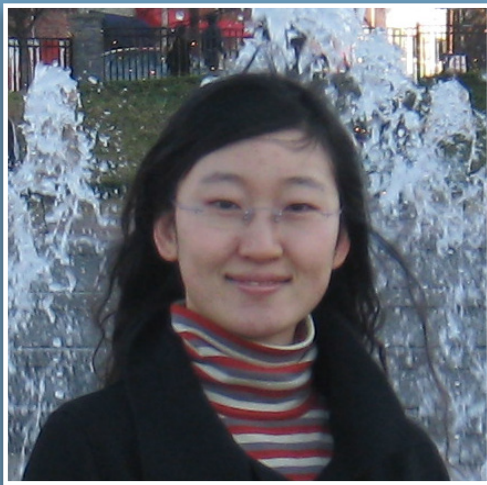
Congratulations



Brent E. Twedde
Boeing Engineering
Student of the Year
Graduate level



Guliz Tokadli
Boeing Engineering
Student of the Year
Undergraduate level



Yan Li
Honorable Mention
Graduate level



Caroline Bryson
Honorable Mention
Undergraduate level



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Awards 2013

Recognizing the outstanding talent of tomorrow, the Boeing Engineering Student of the Year Award is the world's leading competition to recognize students whose work shows the greatest promise, aptitude and dedication in the field of aeronautical or space technology.



www.flightglobal.com/student

A winning formula

All Boeing employees play a powerful role in helping the company succeed

Kevin Schemm

Vice president and chief financial officer,
Boeing Commercial Airplanes



More than 170,000 employees work for Boeing and every one of us can help make our airplanes and our services more innovative and competitive. We all play a role in applying Boeing's winning formula for leading in the marketplace: Providing the right products for the right price.

Getting that formula right helps us win more business, drive profitability and reinvest in new products and services that will allow us to build a bigger, better, stronger Boeing and benefit all of our stakeholders.

In the competitive world we live in, with our customers expecting "more for less," it is critical that we continue to execute and focus on productivity and profitability. Being more efficient in what we do, wherever it happens, reduces overall costs and makes Boeing's products and services more affordable, which helps our sales.

Across Boeing, teams are implementing ways to support affordability efforts, including our companywide Partnering for Success focus, which is enabling us to work as "One Boeing" with our top supplier-partners to bring down the costs of parts and components by improving quality and flow across the supply chain.

Finance is at the center of this effort.

For example, Finance analysts charted the costs of the main landing gear on a 777 and compared them with the cost of a landing gear for the F/A-18 jet fighter and the equivalent part on the C-17 military airlifter. While these aircraft are vastly different, the team was able to strip the part down to its essential components to create a model that allowed for equal comparisons.

This type of analysis and knowledge allows us to better

support the business and provide critical information for our business leaders to make informed, educated decisions and ultimately drive value for The Boeing Company.

Meanwhile, to help engineers reduce the cost of development programs and existing models, Finance estimators are drilling down into each commercial airplane type and model to separate out what Boeing pays for every part or assembly.

The data will provide a road map for engineers, showing them which section of the airplane to focus on first when trying to improve the cost of the design. This information also can help engineers decide which material or part to use on a future airplane.

Once the analysis is completed, it will be made available to teams in Engineering and Supply Chain Management & Operations for use in making design and purchase decisions.

These are just some of the actions that will help us deliver the right products for the right price.

That's the winning formula that each and every one of us can focus on to grow our business. And by doing so, we secure Boeing's leadership position in the aerospace industry for many years to come. ■

PHOTO: KATIE LOMAX/BOEING



FIRE WARN
BELL CUTOUT

MASTER CAUTION
PUSH TO RESET

FLT CONT
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FUEL

ELEC
APU
OVHT/DET

MINS RADIO BARO FPV MRTS IN BARO HPA
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VOR 1 APP VOR MAP VSD RANGE VOR 2
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ADF 1

WXR STA WPT ARPT DATA POS TERR

COURSE
133

A/P FIRST A/T FIRST FMC FIRST TEST

SPEEDBRAKE DO NOT ARM START OUT OF TRIM SPEEDBRAKE ARMED

BELOW G/S P-INHIBIT TAKEOFF CONFIG CABIN ALTITUDE

110.90/133°
DME 1.7
FMC FD

9000

45

29.92 IN

LACKR 800.2z 11.5NM

GS 0 TAS

RANGE 20 TRK 133 MAG

LACKR 800.2z 11.5NM

TERR

104.0 19.6

420 58.8

0.69

22 96 20 0.1

8500 24100

TAXI

FLIGHT CONTROLS
FMC, CDU
STAB TRIM
PA

TOPS, BOTTOM
CHECKED, SET
REVIEWED, SET
ON/OFF
COMPLETE

TAKEOFF GREEN LIGHT ON

BACKGROUND BRIGHT

AFDS FLOOD BRIGHT

TAKEOFF REF 1/2 V/L 118KT VR 121KT V/2 122KT

25K N1 104%
CG 22.5% S.25
--PRE-FLT STATUS--
ROUTE>

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<INDEX

INT REF RTE DEP ARR ATC VNAV
1 FREQ MEN UTIL COMM PROG

MAXimum view

The new 737 MAX flight deck will feature large display screens supplied by Rockwell Collins that provide enhanced visuals to pilots. The flight-deck layout will maintain operational commonality with the Next-Generation 737, but the MAX will have four 9-by-12-inch displays with higher graphics capability. They replace six 8-by-8-inch displays on the current models.

BOEING ILLUSTRATION



“It has revolutionized Marine Corps and Special Operations aviation.”

– U.S. Marine Corps Col. Greg Masiello, joint program manager, V-22 Program Office, U.S. Naval Air Systems Command, following the award of a contract for 92 of the tilt-rotor Osprey, built by Boeing and partner Bell, for the Marine Corps and seven for the U.S. Air Force Special Operations Command. *Boeing News Now*, June 13

“The airplane is tuned to the engine, and the engine tuned to the airplane.”

– Keith Leverkuhn, vice president and general manager of the 737 MAX program, briefing aerospace journalists before the Paris Air Show. He said that the new LEAP-1B engines from CFM International, combined with aerodynamic changes, will make the 737 MAX 13 percent more fuel-efficient than current 737 models. *Puget Sound Business Journal Online*, May 31

“Thanks for making us feel proud every time we see you floating in the air, majestic, defying logic and apparently the laws of gravity.”

– Lt. Col Muñoz, chief of Battalion Helicopter Transport V with the Spanish Army, about Boeing’s Chinook. Spain was the first international customer for the Chinook; the battalion recently celebrated 40 years since its first delivery. *Boeing News Now*, June 6

WHY WE'RE HERE



Aptitude for flight

This Boeing test pilot combines a passion for flight with science

By Candace Barron and photo by Ron Bookout

Joe Felock, a Boeing Test & Evaluation pilot, not only pushes the envelope of Boeing's hottest fighters, but he's also an Associate Technical Fellow with a strong engineering background. In this Frontiers series that profiles employees talking about their jobs, Felock explains what it means to be a significant part of a technical team at Boeing.

In those old, black-and-white newsreel days, a pilot took off in an experimental aircraft not really sure if he was coming back. That was a time when the pilots were the engineers and the engineers were the pilots. They designed, tested and tweaked new methods of flight all at the same time, almost as fast as their airplanes could fly.

We don't wear goggles anymore. And luckily, we don't need long silk scarves to wipe the oil off of them. We've gotten a lot better at designing airplanes, so test flights aren't nearly as dangerous. But even with all the advances we've seen in powered flight, technical aptitude and expertise are as important today to every Boeing test pilot as they were 100 years ago.

I'm a Boeing Test & Evaluation pilot for the F-15, F/A-18 and proprietary programs. So I have been able to satisfy an inner excitement for flying in more than 50 different types of aircraft in more than a hundred different ways at top speeds. I'm also a new member of the Boeing Technical Fellowship, and it feels good to be recognized as a significant part of the technical team. As an engineer, I fulfill my intellectual curiosity and sense of wonder by pushing the laws of science to seemingly defy gravity.

There's no feeling in the world quite like flying an airplane, especially a fighter like the F-15. But even though I spend a good amount of time in a cockpit, I see my role as being more like a translator. I take what the aviators in the field say that they need from the airplane, and I translate that to my fellow engineers who are actually designing all the different parts that go together. We can't design our own pieces of the puzzle in a vacuum; we have to ensure the system works in whole to meet the end user's needs.

I always liked airplanes. My dad flew EC-121s and EC-47s

"I have been able to satisfy an inner excitement for flying in more than 50 different types of aircraft in more than a hundred different ways at top speeds."

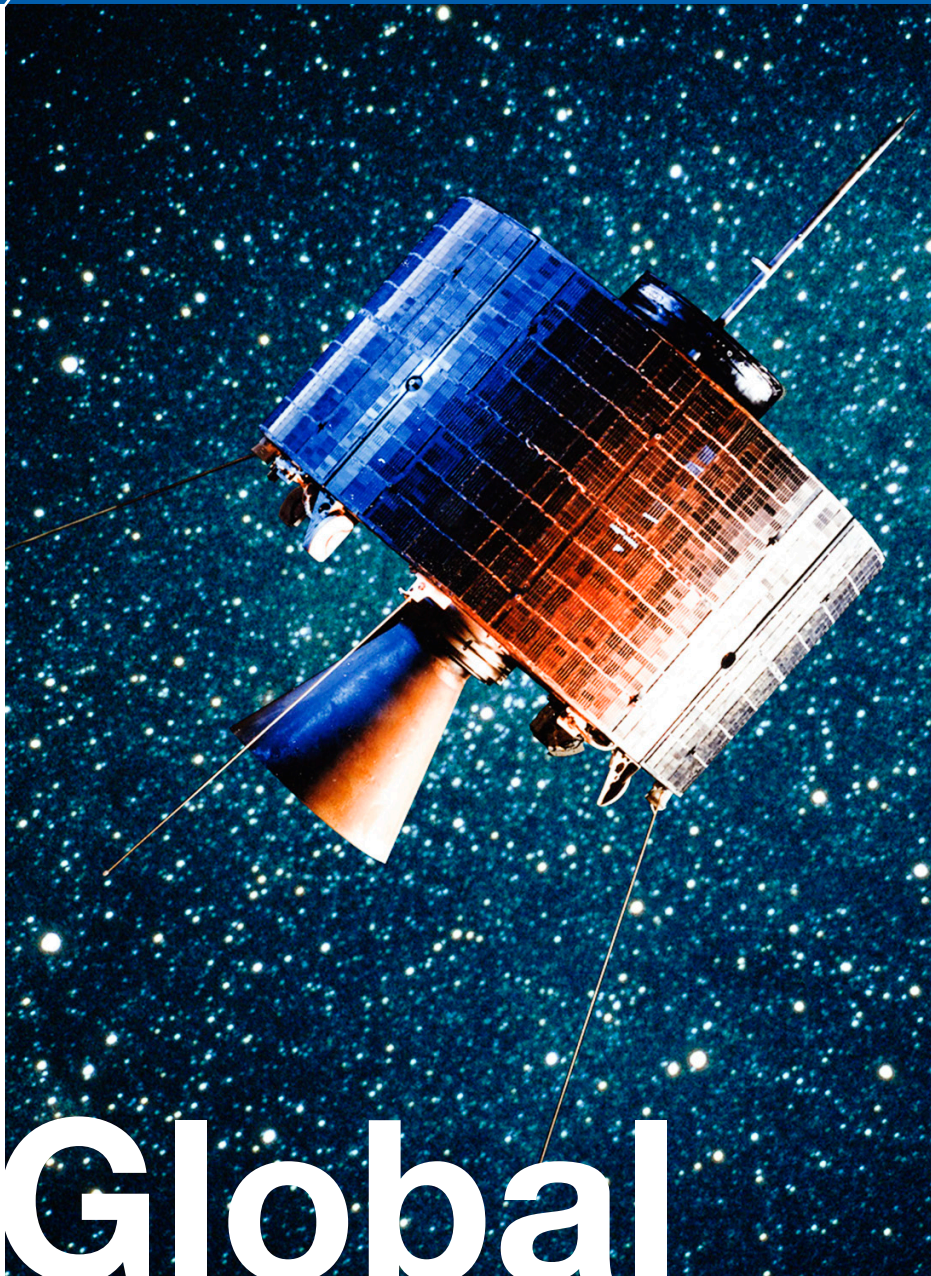
— Joe Felock, Boeing Test & Evaluation pilot

for the U.S. Air Force in Vietnam. He was one of those old-school fliers, and I grew up not really thinking there was any other option for me other than being a pilot like Dad.

Unlike a lot of other aspiring young pilots, though, I had a knack for science and math that made me sort of stick out. And by the time I joined my college ROTC program, the U.S. Air Force had lots of wannabe pilots, but not nearly enough engineers. So I went full-throttle toward an engineering degree. In return, the Air Force offered me a pilot slot, and I became an engineer wannabe who got to fly fighters.

Most pilots simply love to fly. But I'm a bit unusual because I don't fly just for the sake of flying. My sense of satisfaction comes with accomplishing specific technical goals on every test flight. When we're talking about the safety and trust of those aboard and the people who rely on these individuals, nothing is more important to me than making sure all Boeing aircraft work the way they need to. ■

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Global revolutions

Launch of Syncom satellite 50 years ago began a journey that has transformed the world

By Pat McGinnis

At the Paris Air Show in 1961, two Hughes Aircraft Co. scientists went to the top of the Eiffel Tower for a photo op. But not to take pictures of one of the world's great cities.

Instead, it was an opportunity for media to take pictures. The scientists, Harold Rosen and Thomas Hudspeth, were showing off the prototype of a small satellite just a little more than 2 feet (71 centimeters) in diameter.

A cynical spectator at the event is reported to have remarked that the top of the Eiffel Tower was probably as high as the satellite would ever get.

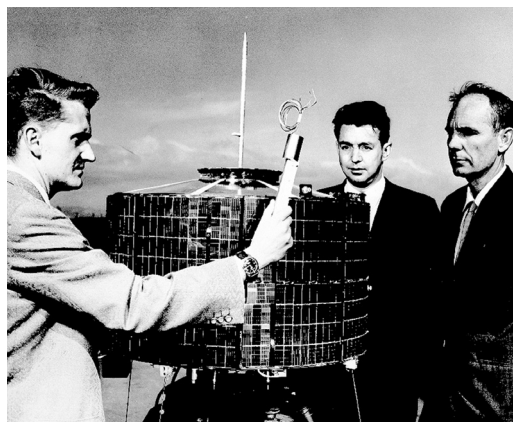
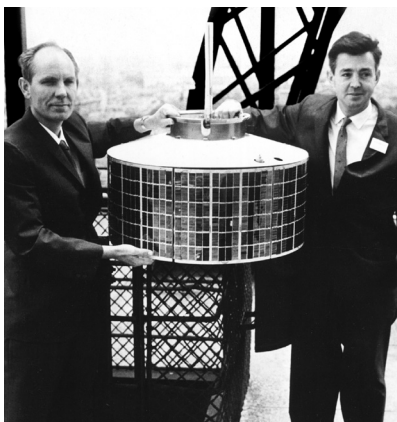
But 50 years ago this month, on July 26, 1963, Syncom II was successfully placed in orbit—and ushered in a new era of global communications using space-based satellites. Today, its descendants make ordinary what would have seemed unimaginable in 1961, from monitoring the weather to providing 24-hour global entertainment. And many of those pioneering satellites have been designed and built by Boeing, whose satellite business has its roots in Hughes Aircraft.

“Syncom started our journey,” Craig Cooning, vice president and general manager of Boeing Space and Intelligence Systems, said during a luncheon address in Paris in 2012.

An engineering prototype of Syncom is on display at Boeing's satellite facility in El Segundo, Calif., the site of a former factory that turned out Nash Rambler cars. In 1961, the auto plant was acquired by Hughes Space and Communications, which Howard Hughes had spun off from his aircraft company. Boeing acquired Hughes Space and Communications in 2000.

Syncom had its beginning at Hughes Aircraft, near Culver City, Calif.

In late 1958, about a year after the launch of Sputnik, the first satellite, Rosen's department head challenged him to find a





“Syncom started our journey.”

— Craig Cooning, vice president and general manager, Boeing Space and Intelligence Systems

new project when one of the company's biggest programs, to develop an advanced radar system, was shelved.

Rosen conferred with several colleagues, including Hudspeth, a communications engineer, who pointed out the sad state of international communications—it was expensive, hard to schedule and transoceanic television was impossible. More important, communications satellites were placed in low Earth orbits, which required huge ground antennas to track them as they passed overhead.

But a well-designed communications satellite in a geostationary orbit around the equator, at 22,238 miles (35,790 kilometers) above Earth and traveling at 6,878 mph (11,070 kilometers per hour), would be synchronized with the speed of Earth's daily rotation. The satellite would remain overhead, a fixed location.

Rosen and Hudspeth, along with another Hughes scientist Donald Williams set about to design just such a satellite—Syncom, short for synchronous communication.

A key design challenge was how to keep the satellite stable in orbit without using a complex system of thrusters that would require lots of onboard fuel and add too much weight. Rosen remembered back to discussions he had in college about the stabilizing dynamics of spin on objects such as a football or artillery shell. Syncom would be designed to spin around its axis.

Williams invented and patented a device that would control the satellite by pulsing a single thruster in synchronism with its spin.

The prototype was ready in the spring of 1961—but without a customer. So Hughes

decided to display the satellite at the Paris Air Show. In August, not long after the air show, Hughes Space and Communications won a \$4 million contract from NASA and the U.S. Defense Department to build three geosynchronous communications satellites.

The first Syncom was launched from Cape Canaveral on Valentine's Day in 1963. All systems were working until the satellite's onboard engine was fired to place Syncom into its final orbit. Syncom was not heard from again.

Syncom II followed in late July. Days later, President John F. Kennedy called Nigerian Prime Minister Abubaker Balewa from the White House. It was the first live two-way satellite telephone call between heads of state.

A year later, Syncom III was placed into geosynchronous orbit over the equator and subsequently broadcast, with the help of Syncom II, live coverage of the 1964 Summer Olympic Games in Tokyo.

During that first year Syncom II was in orbit, NASA conducted public demonstrations of its capabilities. One took place at the Hughes Aircraft plant. “We had a portable terminal, with a soldier at an Army base on the other end,” Rosen would later recall. “My wife said, ‘Hello.’ The soldier said, ‘Hello.’ She dropped the receiver and said, ‘My God, Harold, it works!’”

Indeed. Syncom II had started a global communications revolution.

And it was also the beginning of 50 years of satellite innovation by Boeing and its heritage companies. ■

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PHOTOS: (Opposite page, clockwise from top) The Syncom satellite; Donald Williams, from left, Harold Rosen and Thomas Hudspeth with Syncom; Hudspeth, left, and Rosen with the Syncom prototype atop the Eiffel Tower in 1961. (This page, from left) In late 1963, President John F. Kennedy telephones Nigerian Prime Minister Abubaker Balewa via Syncom II; the 1964 Summer Olympic Games broadcast from Tokyo by Syncom III.

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TODAY TOMORROW BEYOND



Quality time

Skill Enhancement Centers drill down on the finer points of 747 assembly

By Joanna Pickup

Crouched in the belly of a 747-8, Nomer Nazario prepares to drill a hole in a skin panel. Making sure everything is aligned, he takes one last, deep breath before he drills—the hole must be flawless.

But this isn't a one-time event. Structures mechanics such as Nazario drill millions of holes to fasten the skin panels of every 747-8.

"Every hole has to be perfect," said Nazario, 747 structures team leader at the Everett, Wash., factory. "If we find or create a defect, we have to start over and fix it."

Exceptional quality has always been a focus for Boeing and the 747 program. So when employees saw that some jobs weren't hitting the mark the first time, they took action. In the course of a year, they have made consistent progress in improving performance.

The numbers tell the story. Overall quality is up by 40 percent, and some teams have reduced defects by more than 50 percent.

It started with something simple: daily conversations. At the start of every shift, each team reviewed its quality data—how many defects it had produced the day before—then discussed how the team could improve.

"Employees who build our airplanes have one of the toughest jobs in the company—they make our products come together."

— Rick Palmer, senior manager of the Training and Compliance organization for Boeing Commercial Airplanes

"The daily reports helped us focus on how we were doing," said Damian Terrell, 747 structures mechanic and team leader. "Everyone became aware of where we could make the most improvements, and we started taking action to make a difference."

Members of the teams led by Terrell and Nazario pooled their knowledge daily, sharing best practices and tricks of the trade, such as using a different tool or different angle when drilling. But if employees wanted more training and coaching, there were few places they could turn. That is, until the new Skill Enhancement Centers opened.

Launched a year ago as a pilot training

PHOTOS: (Above, from left) The 747 team of structures mechanics includes Shawn Eveland, inspecting his work on the fuselage of a 747-8; Todd Robertson; Jill Jennings, foreground, and Nomer Nazario, helping each other drill holes with precision; Jessica Quach, preparing to drill into the fuselage of a 747-8. (Right) The 747-8 final assembly bay in Everett, Wash. **BOB FERGUSON/BOEING**





“We try to simulate the exact environment of what it’s like to work on the airplane.”

– Charles (Chaz) Tucker, 747 Skill Enhancement Center workplace coach

program with a single piece of scrap skin panel, the program has grown into nine Skill Enhancement Centers across the Everett factory.

“Our employees who build our airplanes have one of the toughest jobs in the company—they make our products come together,” said Rick Palmer, senior manager of the Training and Compliance organization for Boeing Commercial Airplanes. “We saw an opportunity to partner with the manufacturing teams and take our quality to the next level.”

Centers are located next to the production lines for every twin-aisle program, and each center is equipped with prototypes, tools and airplane parts for training. The centers are open to all employees, on all three shifts.

“Our organization is really an extension of the teams we support,” Palmer explained. “We partner with them to make their jobs easier and safer and help improve the quality. Each center is designed to support a specific airplane program, providing each team what they need.”

The centers use scrap parts and panels to replicate each job on the airplane. Because work varies among programs, each center is tailored to the unique production process of corresponding airplanes: Employees on the 747 program practice drilling on large skin panels made of advanced aluminum alloys, while 787 employees attempt new techniques on scrap carbon fiber parts in their own skill center.

“Our goal is to create a real-life practice

environment,” explained Charles (Chaz) Tucker, one of the 747 skill center workplace coaches. “We try to simulate the exact environment of what it’s like to work on the airplane.”

Each center is staffed with several coaches such as Tucker. They are mechanics with decades of experience who now serve as mentors and trainers. With more than 20 years of experience at Boeing, Tucker understands the challenges employees have—and the ideas for improvement they can contribute.

“I’ve been there. I’ve done the job they have, so I can relate to challenges they face,” Tucker said. “Our coaching is tailored to the individual—that can be training, coaching or exploring a new process improvement. It’s all about that partnership.”

Coaches also are members of Employee Involvement teams and Quality Councils. They attend staff meetings and can be found throughout the day on an airplane in the production line.

“We are out there with the teams every day—in meetings, on the airplane,” Tucker said. “We are an integral part of the team.”

Working together is important, said Palmer, who has led the implementation of the Skill Enhancement Centers over the past year. “We are like a tool in their toolbox, and like any toolbox, it needs to be right next to where the work is performed.”

Terrell agreed.

“If we need something, we don’t need to go far,” he said. “I can go down there, practice a few things or share

an idea, and be back on the airplane in just a few minutes.”

Doug Robillard, Quality director for the 747 and 767 programs, said the skill centers reflect Boeing’s focus on investing in and developing its teams as part of a strategy to meet its quality commitments.

“First-time quality enables us to meet customer expectations and regulatory requirements,” he said. “It is expected as part of our culture.”

With additional Skill Enhancement Centers planned for across the Everett site, Palmer is encouraged about the future. “The improvements we’ve seen—and the culture we’re creating with the centers—have been great, but this is only the beginning.” ■

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PHOTOS: (Clockwise from top left) Vinh Nguyen, 747 structures mechanic; Randy Harper, foreground, 747 structures mechanic, and Charles (Chaz) Tucker, 747 Skill Enhancement Center workplace coach; in the 747 training center are structures mechanic Mich Firman, foreground, and Chris Davidson, 747 Skill Enhancement Center workplace coach; Ed Peros, foreground left, and Kyle Lehn, foreground right, assembling the 747-8. **ED TURNER/BOEING**



B-52

AGELESS WONDER

B-52 bomber to be upgraded with advanced computing and communications technology

The Boeing B-52 Stratofortress, known affectionately by those who fly it as BUFF (for Big Ugly Fat Fellow) is one of the longest-serving combat aircraft in aviation history. It has received numerous upgrades over the years to make it even more effective as a long-range bomber that can handle whatever mission might be assigned.

The U.S. Air Force recently awarded Boeing a contract, known as CONECT, to upgrade the Air Force's B-52H fleet. With Boeing support, installation will be performed at Tinker Air Force Base in Oklahoma City. The first CONECT kit is scheduled for delivery to the Air Force in late 2014.

Among other improvements, the upgrade will mean B-52 crews will be able to re-task missions and re-target weapons in flight. CONECT includes a modern computing network with workstations at each crew position and an integrated digital interphone with greater capacity.

"The B-52 has been an amazing

performer throughout history," said Scot Oathout, Boeing B-52 program director. "CONECT builds upon that great design and gives the B-52 crews the tools they need for today's and tomorrow's missions."

When the first of the 8-engine bombers rolled out of Plant 2 in Seattle in March 1954, its systems had less computing power than a modern cellphone. Now, it's about to receive a 21st-century computing and communications suite created by Boeing engineers.

With the new system, Oathout said, B-52 crews will be able to communicate digitally with anybody using several different methods. That includes sending emails and files, and running Windows-based applications. It's a little like going from a 1960s telephone, he said, to current WiFi technology. ■

For more on the B-52 and its amazing longevity, see the March 2011 issue of Frontiers.

PHOTO: A Boeing B-52H bomber from the 96th Expeditionary Bomb Squadron at Barksdale Air Force Base in Louisiana is shown during the "Cope North" air-defense exercise near Guam earlier this year. The exercise involved military aircraft from the United States, Australia and Japan.

JIM HASELTINE/HIGH-G PRODUCTIONS



HIP CHIP

Yes, Boeing is now producing silicon chips—but not for personal computers

By David Sidman and photos by Bob Ferguson

The fighter streaks to its target, pilot and navigator ready to complete their mission. Suddenly, the aircraft is under attack. Incoming “ones and zeros” penetrate the airframe. It’s an electronic attack against the jet’s systems, the enemy seeking to disable or steal critical flight systems information.

It can be as deadly as a missile strike.

In today’s rapidly evolving cyber age, scenarios like this are increasingly possible.

“Whether it’s in the air or down on the ground, an adversary seeks to either acquire our technology or be able to access it electronically so they can then build or reverse-engineer it without having to invest in research and development as we did,” said Chris Wedewer, director of Special Programs within the Global Strike division of Boeing Military Aircraft. “Because of that, our military customers continue to increase security requirements for our products.”

That’s why Boeing, in February, acquired the maker of the Acalis microprocessor. That’s right: Boeing now produces computer chips. But these chips aren’t going in a personal computer any-

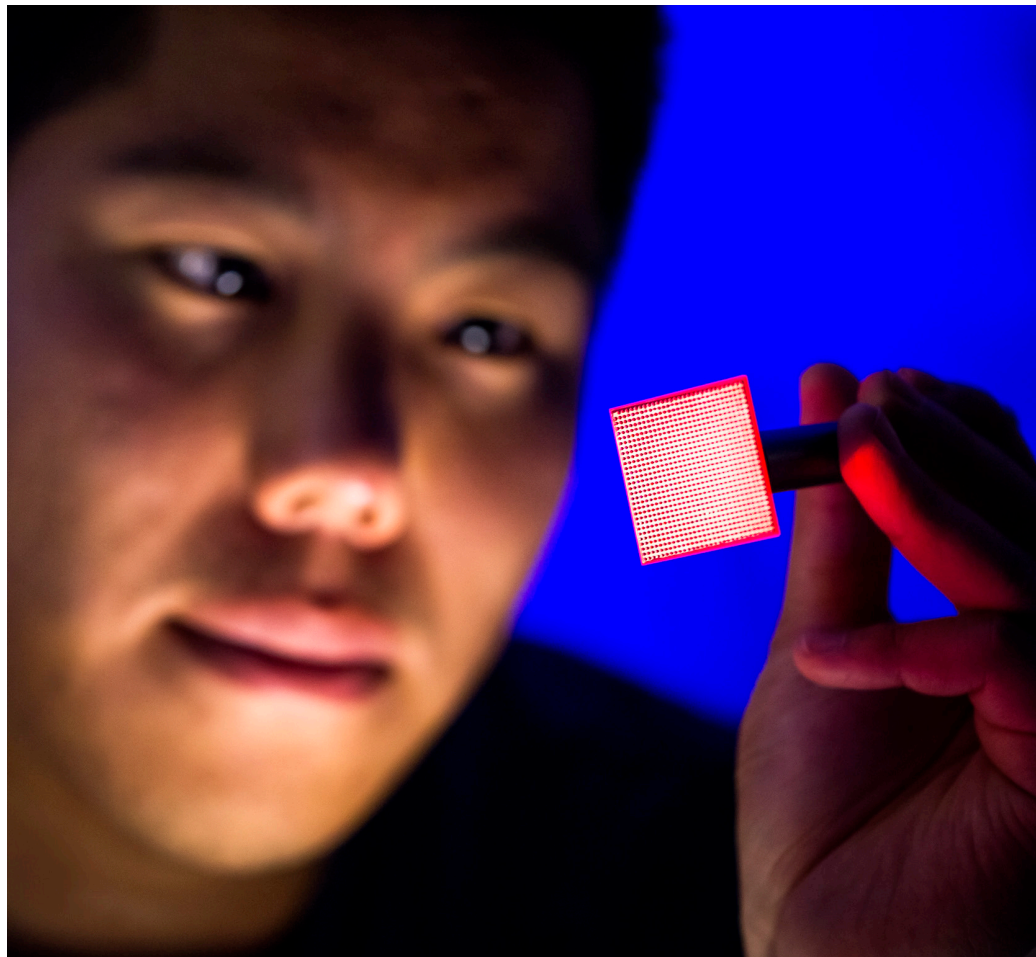
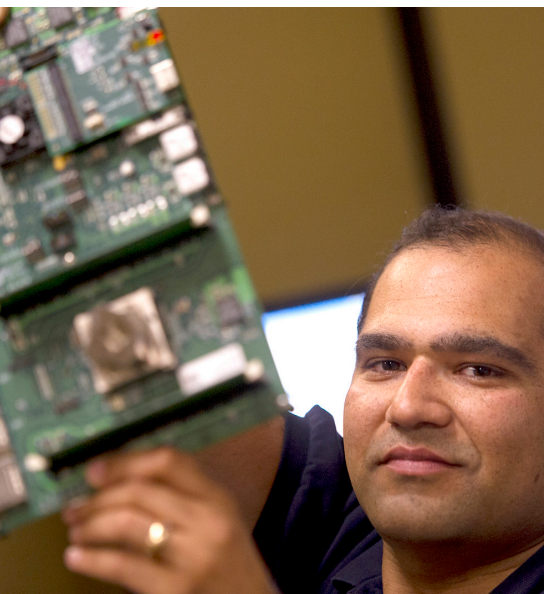
time soon. Acalis and the 40 now-Boeing employees who design and engineer the chips near Silicon Valley in California provide a key deterrent against electronic information attacks. It’s a growing need and requirement from customers around the world.

Boeing Defense, Space & Security is focused on growing revenues globally, and a unique technology such as Acalis furthers that growth, said Debbie Rub, vice president and general manager of Global Strike. “Our strategy is to integrate Acalis into a range of current and future systems as a critical enabler.”

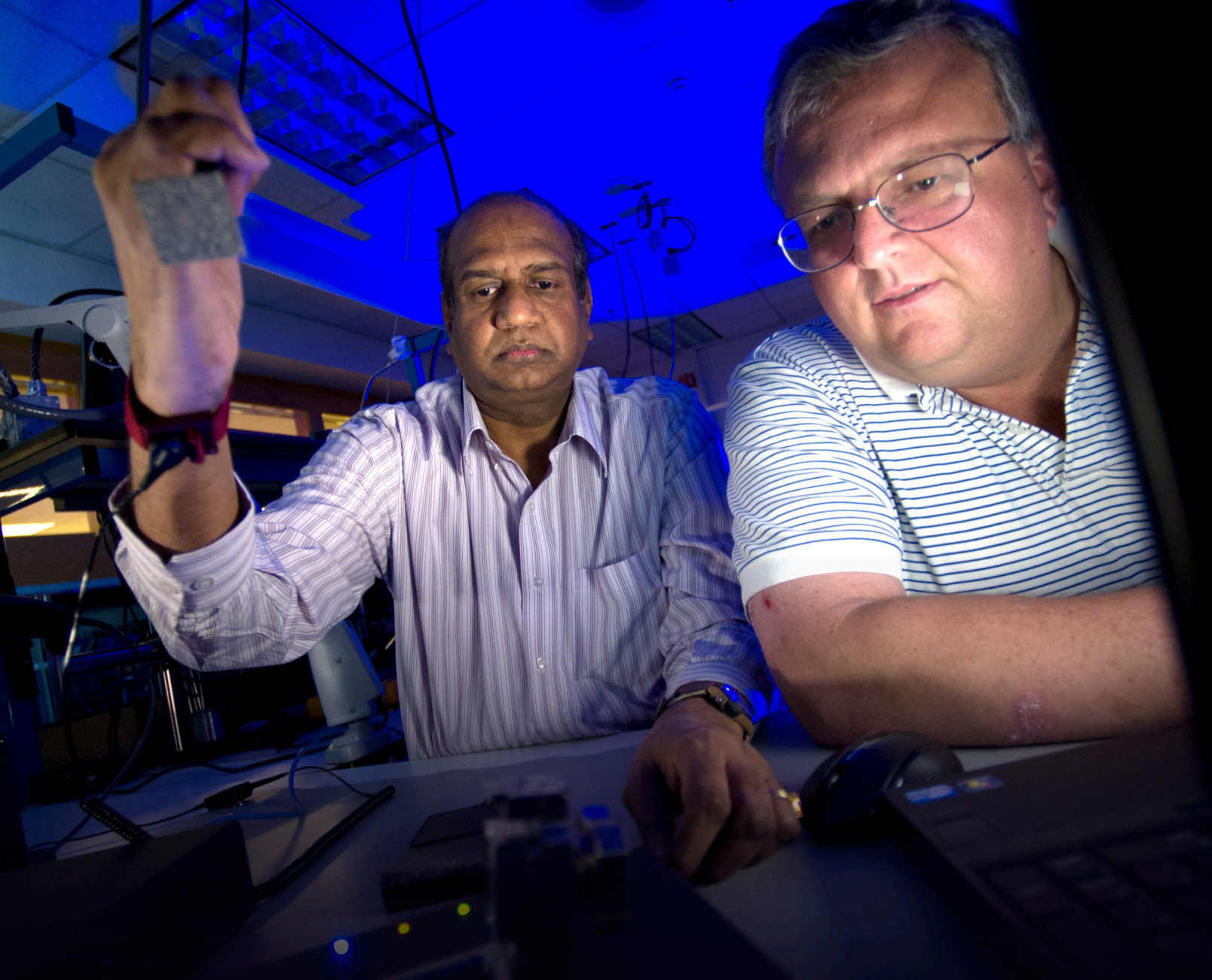
Measuring 31 millimeters by 31 millimeters, or just over an inch long on its sides, the chip weighs a little more than a quarter. Acalis chips are very small at a company where very large—think commercial airplanes, tankers and strike aircraft—is the norm.

“It’s amazing to be a part of ‘big Boeing,’ said Lisa Treat, a staff analyst in Pleasanton, Calif., where the chip is engineered. “I picture the assembly floor when I think of Boeing, and we’re now a part of that, producing a small part—this really tiny microprocessor.”

That tiny microprocessor, also known as a silicon chip, began



PHOTOS (Clockwise from top left): Nimita Taneja, electrical design and analysis engineer, holds a tray of microprocessors; Norm Sitter, software engineer, sets up the configuration tool to test the Acalis microprocessor; Oscar Ko, software engineer, prepares to insert an Acalis chip into the programming station; Rohan Parkhi, software engineer, displays the Acalis evaluation board.



its life even smaller—as a grain of sand. Muhammad Ahmed, an engineer who joined the Acalis team just before it was acquired by Boeing, describes the chip creation process as “taking sand and dirt, which is what silicon is composed of, polishing it, adding some special stuff to it, polishing it again—and then you have a microprocessor chip!”

The “special stuff” is the security software that the chip controls. Like the secret ingredient in a favorite recipe, the inner workings of a secure chip like Acalis can’t be shared. But Jeff King, an Associate Technical Fellow, has an analogy that hits home. “When we think of the security of the products we make at Boeing, think of your home,” he said. “You want to protect your home, so you install a security system. Then you’ll know immediately when someone tries to enter the house or breaks a window. Security in your home and what Acalis does for our products are the same thing: They provide a better understanding and control over your environment.”

Just as the Acalis chip is unique, so, too, is the environment it’s made in—at least from a Boeing perspective. Speak to

members of the Boeing Secure Computing Solutions team, which makes Acalis, and a recurring theme will be heard. Call it the Silicon Valley startup swagger:

“We were a classic San Francisco Bay high-tech startup.”

“We’re innovative and agile.”

“We still have that startup mentality.”

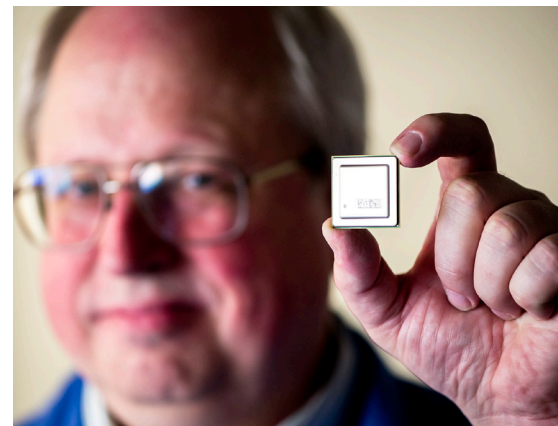
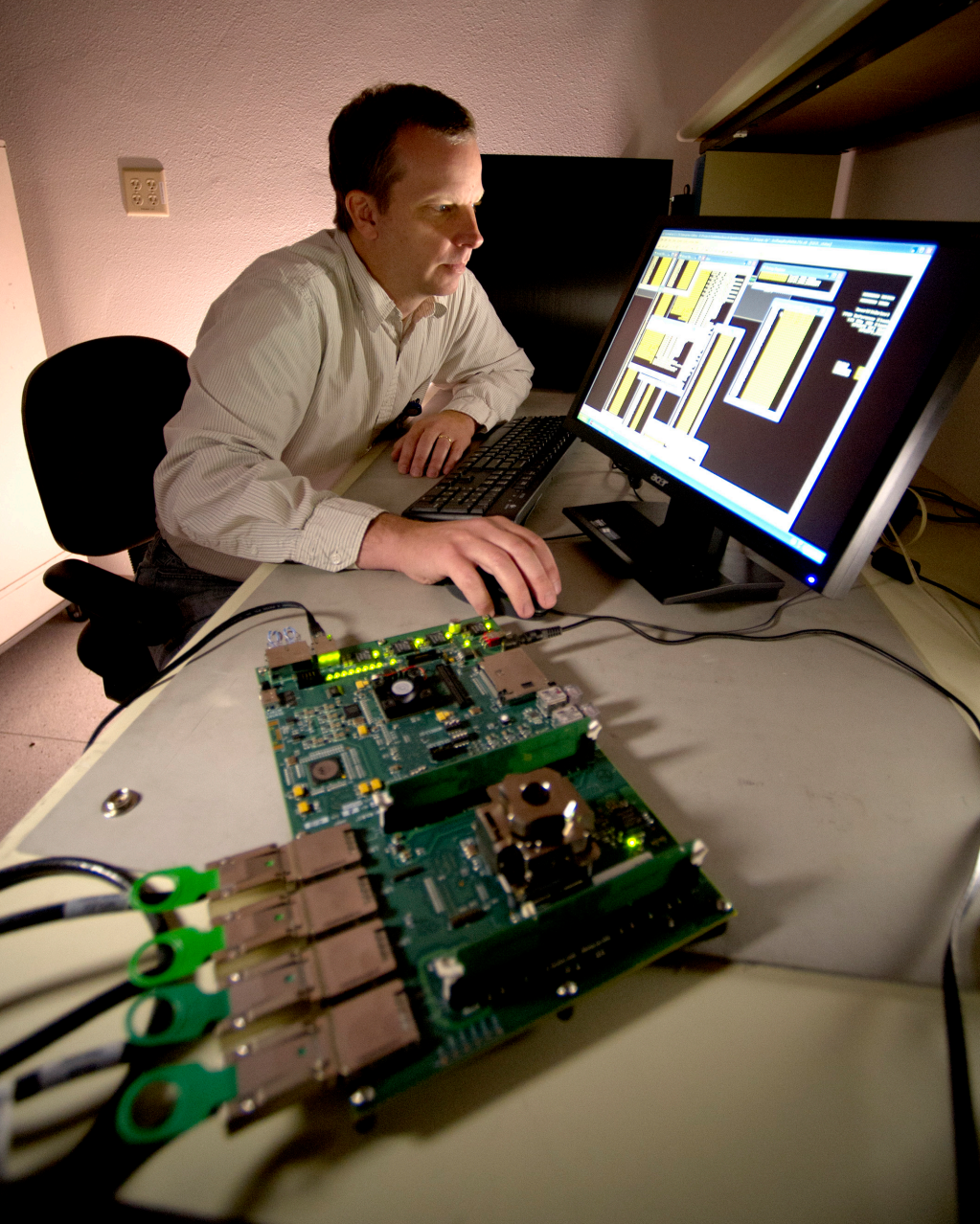
There’s a pride in describing what they accomplished by developing Acalis. “We pioneered a new type of microprocessor, a secure microprocessor,” explained Pat Hays, an Integrated Product Team manager.

That pride becomes personal for Larry Hollingsworth, a retired National Guard senior noncommissioned officer.

“Looking back over the years,” he said, “I can point to technology today that the warfighter never had previously, and now going forward, Acalis can make them better, faster, stronger and more secure.”

As Brad Dyer, Applied Solutions manager, sees it, Acalis’ best days lie ahead: “I believe we’re at the tip of the iceberg for projects at Boeing that are going to be really fun to execute.” ■

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PHOTOS (Clockwise from far left): Software engineers Murty Potharaju, left, and Bob Pizzi insert a chip in the programming station; Jeff Hammond, electrical design and analysis engineer, performs testing; Gary VanRemortel, mechanical engineer, inspects a chip; Paul Lemmon, chief security architect, holds up a single Acalis microprocessor.

BOEING AND SILICON VALLEY

It's the birthplace of companies such as Apple, Google, Intel and many other well-known giants of the software and computer industries. But Silicon Valley, in the southern region of the San Francisco Bay Area of Northern California, is home to a growing Boeing population.

Boeing Network & Space Systems has two subsidiaries in the area: Argon ST in Mountain View and Narus in Sunnyvale. Combined with the Acalis team in Pleasanton, Boeing's presence in one of the world's leading technology hotspots is undeniable.

Each team of Boeing technologists there develops unique capabilities such

as the Acalis chip, the Narus nSystem for data analytics, and the Argon ST sensors and antennas.

"Those kinds of capabilities are a competitive discriminator; they can help set Boeing apart from our competition," said Dewey Houck, vice president and deputy general manager of Electronic & Information Solutions at Boeing Defense, Space & Security. "That's really what the C4ISR strategy seeks to do: Provide our customers with technical solutions that they can't find anywhere else."

C4ISR stands for Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance.

Through a series of acquisitions as well as continued research and development, Houck said, Boeing Defense, Space & Security can now combine its platforms with the software and systems required to seamlessly and securely collect, process, and disseminate information to wherever and whomever needs it.

– David Sidman





Ties that bind

From commercial aircraft to defense, Israel has turned to Boeing since the nation was founded

By Bill Seil

The partnership between Israel and Boeing dates back to the nation's founding 65 years ago when the Israel Air Force began flying the B-17 Flying Fortress.

The inaugural flight of Israel's flagship airline, El Al Israel Airlines, took place in 1948 when a C-54 transport—manufactured by Boeing heritage company

Douglas Aircraft—brought the country's first president home from Geneva. The C-54, which had been borrowed from the Israeli military, was repainted in civilian livery and served as the starting point for El Al's fleet.

In May 1961, El Al received its first 707 jetliner at Boeing Field in Seattle. The following month, the new El Al jet set a record when it flew from New York to Tel Aviv, the longest nonstop commercial flight of a Boeing 707 at that time.

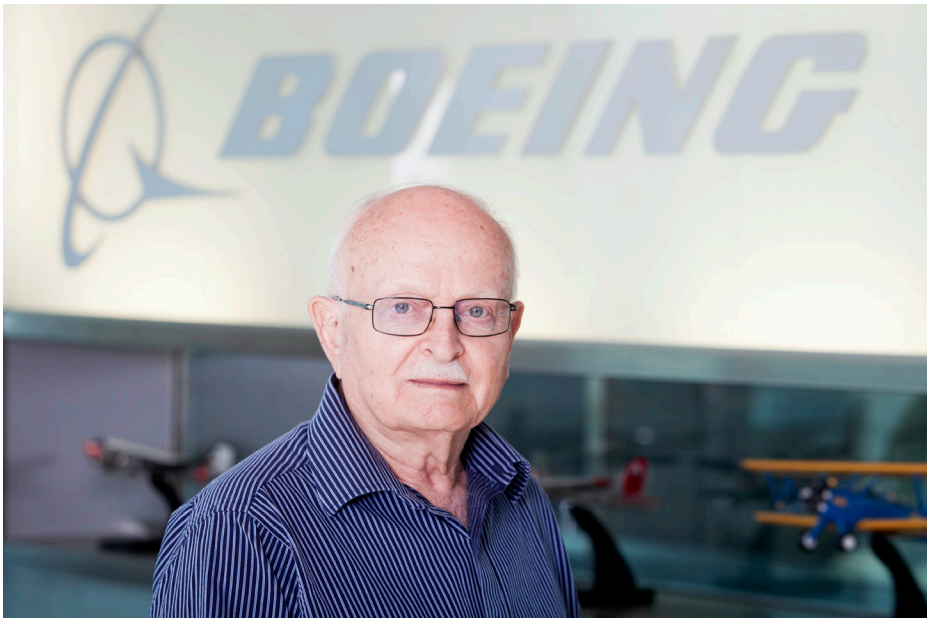
Today, Israel has a modern air force and a successful commercial airline industry. And the country is an important Boeing business partner. Companies in Israel supply Boeing with parts for both its military and commercial programs, including the 787 Dreamliner.

"Our partnership with Israel is both

important and long-standing," said Shep Hill, president, Boeing International, and senior vice president, Business Development and Strategy. "We are proud of our relationship with both the Israel Defense Forces and the nation's airlines. We also have important business partnerships in Israel that support Boeing programs."

Israel, which has a population of less than 8 million people, is a very distinct market with a demand for highly capable

PHOTOS: (Left) Israeli children watch a Boeing KC-135 tanker simulate the refueling of Boeing F-15 fighters during an air show in Tel Aviv in April, marking 65 years since the founding of the nation in 1948. The tanker and fighters are operated by the Israel Air Force. ASSOCIATED PRESS (Above) Jerusalem Old City and Temple Mount at night. SHUTTERSTOCK



The Israel Air Force has a strong international reputation. Its choice of products has strengthened Boeing's international sales.

– *David Ivry, president, Boeing Israel*

PHOTO: ASSOCIATED PRESS





ILLUSTRATION: (This page, far left) Israel's Arrow 3 interceptor missile is being jointly developed with Boeing. **BOEING**

PHOTOS: (Near left) A Boeing F-15 operated by the Israel Air Force. **BOEING** (Opposite page, bottom) Israel will be the first international operator of the Bell Boeing V-22 tilt-rotor aircraft, shown here on a U.S. Marine Corps mission. **CPL. JENNIFER PIRANTE/U.S. MARINE CORPS**

military products, Hill noted. Boeing F-15 jet fighters and Apache helicopters are at the core of the Israel Air Force's fleet. In April, at a news conference in Tel Aviv, the United States and Israel announced that the U.S. will deliver an unspecified number of the Bell Boeing V-22 Osprey tilt-rotor aircraft to Israel, which will make it the first V-22 international operator.

For more than a decade, Boeing and Israel Aerospace Industries (IAI) have shared a partnership for missile defense initiatives, including co-manufacture of Israel's Arrow 2 interceptor. Boeing and IAI are now developing the Arrow 3. Boeing's Huntsville, Ala., facility will play a major role in manufacturing the new interceptor.

"The Israeli defense market is a very important one because of the very discreet and capable systems that Israel requires," Hill said. "Our collaborative development of the Arrow 3 is creating a product that is both essential to Israel's national defense and has global applications that could lead to third-party sales."

David Ivry has served as president of Boeing Israel since 2003. Prior to that, he was Israel's ambassador to the United States and has held leadership positions in both government and industry. He was also a military pilot and served as commander of the Israel Air Force.

"I was qualified in 38 types of airplanes, from the Spitfire to the F-15," Ivry recalled. "In the beginning, we couldn't afford new airplanes so we relied on the secondhand market, including some older models. We all had to pilot a wide range of aircraft."

Boeing Israel, based in Tel Aviv, maintains a staff of both outside and local hires, as well as employees on temporary assignment. Although Boeing has no subsidiary operations in Israel, the team has diverse responsibilities working with commercial and military customers as well as local partners and suppliers.

"Boeing has a very solid reputation here," Ivry said. "Customers have a high regard for our reliability and the quality of our products. Since the beginning of the state, Boeing has been the clear choice of the Israeli military and the nation's airlines."

The Israel Air Force has a strong international reputation, and its choice of Boeing products has strengthened international sales, Ivry noted.

EI AI, which was privatized in 2003, continues to fly an all-Boeing fleet, including 747s, 767s, 777s and Next-Generation 737s. Arkia Israeli Airlines, which operates charter, scheduled domestic and cargo services, is in line to become the first Israel-based carrier to operate the Boeing 787 Dreamliner.

Todd Nelp, vice president, European Sales, Boeing Commercial Airplanes, said Israeli airlines have been excellent longtime partners. But the market is becoming increasingly competitive, with Airbus offering products to replace aging Israeli airplanes.

"Our relationship with both EI AI and Arkia is as strong as it's ever been," Nelp said. "While we still look on it as a favorable market, it is an increasingly challenging market. So we need to maintain our high

level of customer service and work with the airlines to support their fleet replacement and expansion plans."

Israel has a strong technical sector, and Boeing has important business alliances with Israeli companies. For example, Israel Aerospace Industries joins other companies—including Elbit Systems and Rafael Advanced Defense Systems—that contribute technology or manufacture components for a wide range of Boeing defense and commercial products.

Working with Israeli partners has been mutually beneficial.

"What has really impressed me is the technological innovation and speed at which Israelis develop things," said Mira Ricardel, vice president, International Business Development, Boeing Network and Space Systems. "They're also very good at keeping products affordable throughout their life cycle. This has evolved in their business culture over time as they've found ways to overcome the challenge of working with limited resources."

Israel has a layered missile defense system, with the lowest layer made up of systems to defend against rockets, artillery and mortars. A layer above this is the Arrow 2, which is designed to intercept shorter-range ballistic missiles. Arrow 3 will be the highest layer of defense—intercepting longer-range ballistic missiles that can potentially carry weapons of mass destruction.

"Israel is a small country in a difficult neighborhood, so Arrow 3 is a vitally important program," Ricardel said. "When you

“Just based on the nation’s geographic location, air travel is, and is going to remain, of huge importance to Israel.”

– Todd Nelp, vice president, European Sales,
Boeing Commercial Airplanes



look at some of the most urgent threats in the world today, ballistic missiles are among those at the top of the list. Arrow 3 technology, in addition to being essential to Israel’s defense, could be of great value to other nations facing similar threats.”

Avi Barber, vice president, Israel, Boeing Defense, Space & Security, said Boeing is working with the Israel Air Force on various modernization efforts, including systems upgrades and the acquisition of new products. The V-22, for example, would provide the Israeli military with more speed, range and altitude than a traditional medium-lift helicopter. It would also be less vulnerable to hostile fire and better able to maneuver around bad weather. Israel is also considering replacing its nine Boeing 707-based tankers with modern KC-46 tankers.

Israel was Boeing’s first international customer to purchase the Joint Direct Attack Munition (JDAM), a highly accurate weapon that uses GPS or laser technology to zero in on the target. Boeing’s Harpoon missile is the main sea-to-sea missile on Israel Navy vessels.

Barber noted that Israel’s world-class technology sector includes a strong defense industry. It is involved in weapons systems, radars, missile defense, space, communications and unmanned air vehicles.

In addition to military aircraft, Israel depends heavily on commercial aviation.

“Just based on the nation’s geographic location, air travel is, and is going to remain, of huge importance to Israel,” said Nelp, the commercial sales vice

president. “The Israeli people have a strong connection to the United States, so there is frequent service to and from the U.S. Europe is also a big market, and traffic to and from Asia is increasing.”

El Al has flown nearly every Boeing jetliner model since it acquired its first 707. It is currently expanding its fleet with 737-900ERs (Extended Range) and is considering a future purchase of the 787 Dreamliner.

Arkia, based in Tel Aviv, is primarily a tour operator, but it has some scheduled flights. It flies to various European nations and other locations. In 2006, Arkia’s majority owners, the Nakash family, ordered two 787-9 Dreamliners, with the intent to serve long-range destinations, including the United States and the Far East.



ILLUSTRATION: (Above) Arkia Israeli Airlines has ordered the 787 Dreamliner. **BOEING**

PHOTOS: (From far left) An El Al Boeing 777-200. **GAIL HANUSA/BOEING** El Al's first 777 receives finishing touches at Boeing's Everett, Wash., factory in 2007. **BOEING**

(Right) Boeing volunteers in Israel support the Food for Life Project by sorting and packing food at a warehouse during Boeing's Global Day of Service last year. **ASSOCIATED PRESS**

Ryan Rubenstein, the sales director for Commercial Airplanes for Israel, said he enjoys working with Israeli customers, who are tough but professional and friendly.

"The people are great," he said. "Once you have established a relationship with them, they treat you like family. In some ways, Israel has to function as an outpost, so they've had to learn to be self-sufficient. And they've been able to do that remarkably well." ■

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Boeing supports a variety of programs in Israel, from health services to education



Boeing Israel supports a wide range of charitable activities, and works with others to leverage the community spirit of the country's diverse cultures.

"Israel is a very complex society with immigrants coming from Europe, Russia, North Africa and many other regions," said David Ivry, president, Boeing Israel. "It's a challenge to bring together all these cultures. But Israel has had success in creating a melting pot that combines the talents of its people to build a better society."

Boeing's corporate citizenship programs in Israel focus on health and human services; arts and culture; and civic, educational and environmental grants, said Dorit Shaashua, who coordinates Boeing's Global Corporate Citizenship efforts within the country.

Shaashua, who is business support manager for Boeing Shared Services in Israel, said Boeing Israel supports nine individual civic and charitable programs. It also coordinates employee volunteerism within the country.

One program supported by Boeing is Ezer Mzion, which is working to expand Israel's bone marrow donor registry. The goal is to compile a list of 1 million donors in the Ezer Mzion registry.

"This will enable them to find matches for approximately 90 percent of the patients who turn to the organization," Shaashua said.

Boeing also supports Israel's trauma center for victims of terror and war. Known as NATAL, its efforts include work to strengthen the resiliency of children and teachers. Teachers receive intensive training in coping with stress and anxiety through group therapy, guided discussions, psycho-educational workshops and team-building exercises.

ITWorks is a program designed to secure Israel's future through employment. With Boeing's support, it works to open the high-tech and communications job market in Israel to disadvantaged populations and close social gaps between groups.

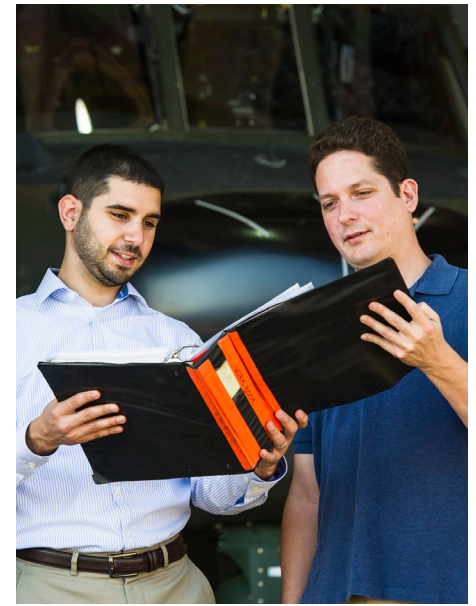
Earlier this year, Boeing Israel was recognized for its support of the Global Awareness Investigation and Action initiative, an international environmental research project involving middle and high school students.

— Bill Seil



Two rotors, one team

PHOTOS: (Clockwise from above) The CH-147F Chinook; among the teammates who supported the CH-147F's flight-test program were Instrumentation technicians Charlie Kulkarni, left, and Daniel Tan; Ramy Mourad, left, Chinook Test Operations manager, and test director Jason Patterson; crew chief JJ Wallace; Roger Forrest, electrician. ED TURNER/BOEING Flight-testing the Chinook in Arizona. MIKE GOETTINGS/BOEING



Canada's new CH-147F Chinook is the result of Boeing teamwork across the continental divide

By Adam Tischler and Tom Marinucci

As the familiar sound of the Chinook helicopter's twin rotors fills the air above the Arizona desert, the aircraft's performance catches the casual observer off guard.

Jeff Bender, chief rotorcraft pilot with Boeing Test & Evaluation, is maneuvering the CH-147F, destined for the Canadian military, through a slalom course. Just a few dozen feet over a marked runway, the aircraft is putting on a dazzling performance, nimbly weaving through the narrow course like a skier feeling the face of a slope.

"This aircraft was born to fly," Bender said.

But why is a Chinook undergoing flight testing at Boeing's site in Mesa, Ariz.? This is Apache country, where Boeing Military Aircraft builds and tests its AH-64 Apache helicopter. The Chinook is built some 2,300 miles (3,700 kilometers) away, at the Boeing site in Ridley Township, Pa.

In fact, this marks the first time a Chinook has ever been tested at the Mesa site. The test pilots taking the Chinook through its paces are beneficiaries of a



methodical design and build stage of the program, structured to launch flight testing early and on the right foot. The Chinook's performance in flight test shows the payoff of teamwork between Boeing Military Aircraft's Chinook team in Ridley Township and Boeing Test & Evaluation's rotorcraft flight-test team in Mesa, according to Steve Parker, director of the H-47 Chinook Canada program. That collaboration led to an earlier-than-expected completion of major flight testing and has helped this complex developmental program meet an aggressive production schedule.

The first of Canada's 15 Chinooks was delivered on schedule last month to the Canadian Air Force customer. Six more Chinooks are expected to follow by the end of 2013.

"Our people in Ridley Township and our colleagues in Mesa and from across the enterprise worked together to rise to the challenge, and I know our customer appreciates it," Parker said.

The Canadian Chinook is significantly advanced, compared with its predecessors. It offers improved capabilities such as a new electrical system, extended range tanks, upgraded electronics, a Digital Automatic Flight Control System and a Directional Infrared Countermeasures system.

"There are differences between this Chinook and the ones I've flown before, but flying this helicopter is like putting on my best pair of boots," said Bender, who has been flying Chinooks for 24 years. "It just feels right to me and it's ready to go to work."

Discovering and fixing unexpected issues during flight test can be costly and time-consuming. But to meet the first-delivery

target, the Chinook testing program had to be completed on time. To a flight-test planner, testing the aircraft's new features presented a mountainous challenge of more than 200 hours of flight testing.

Due to production learning curves, aircraft test programs occasionally begin with an "immature" aircraft requiring unplanned modification during the testing period. But the Chinook that rolled out of the Ridley Township facility was a "mature" aircraft ready to go test immediately, without the threat of delays down the road, Parker said.

Early and constructive coordination with the Canadian customer led to getting the right requirements and engineering in place before a single rivet was bucked on the CH-147F, Parker explained. It also led to increases in first-time quality and reduction of traveled work. The factory team, for example, completed initial electrical testing without a single installation error. This customer coordination allowed rollout of the first CH-147F in time to make its first flight days ahead of schedule, Parker said.

As head of the Canada Chinook Program, Parker established a clear policy: Stay open to new ideas, even if they challenged long-held program assumptions, and build a no-surprises culture across the program. That expectation carried through to flight-test procedures. Although the Mesa site has successfully tested the AH-64 and AH-6 models for decades, never before had a Chinook been tested there.

By combining experienced H-47 teams from Ridley Township and around the enterprise with the seasoned test teams in Mesa, the program was able to bring together a trove of rotorcraft testing

The first of Canada's 15 Chinooks was delivered on schedule last month. Six more are expected to follow by the end of 2013.





PHOTOS: (Opposite page)
 A CH-147F Chinook takes to the air near the Boeing factory in Ridley Township, Pa., where the helicopter is made. FRED TROILO/BOEING
 (This page, clockwise from top right) A look at the side of the Canadian Chinook; on hand during the flight-test program were crew chief JJ Wallace, left, and flight-test engineer John Curran; test pilot Shawn Disarufino; mechanic Terrance McKinnon. ED TURNER/BOEING



knowledge to support the CH-147F in the new location, Parker explained. Additionally, the Arizona weather and test ranges maximized the amount of days the team could conduct the required tests.

Unconventional ideas were given consideration, many leading to cost or time savings. Rather than follow the common practice of collecting test data and reviewing it at the end of the test program, the Ridley Township teammates reviewed and shared test data with the customer as it was produced by their Mesa colleagues. That tactic not only eliminated surprises that can occur when all the data from a test program are reviewed solely at the program's conclusion, but it enabled real-time issue mitigation with the Canadian customer, said Ramy Mourad, Boeing Test & Evaluation test manager for the Canadian Chinooks.

As a result, testing milestones were being met regularly, he said. And flight-test objectives that traditionally take days were being accomplished in a single day.

Mourad traces the strong performance back to great

teamwork and the factory handing off a "healthy aircraft and a head start." The test team then had flexibility in its schedule to move non-test events, such as implementing design upgrades prior to delivery, significantly ahead of the plan.

The effect was like a relay team gaining time with each leg.

Said Parker of the on-time first delivery and program success: "The entire Canada team maintained a collective focus to provide the customer and its warfighter the very best of Boeing, believing they deserved nothing less." ■

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Reaching for the stars

Focus on in-flight comfort and service has made Asiana Airlines a 5-star attraction *By Kevin Yoo*

In the highly competitive commercial airlines business, leading the pack and staying on top is a feat. Yet Asiana Airlines has done it four years running, winning “best airline” accolades from five organizations within 25 years of its launch as South Korea’s second flag carrier.

“We continue to look for ways to improve our in-flight services and product offerings by maintaining a modern fleet of fuel-efficient and environmentally responsible aircraft,” said Doo Jin Lee, senior vice president of Public Relations for the airline.

Boeing’s partnership with Asiana Airlines dates from the airline’s inception in 1988 when Asiana took delivery of its first airplane, a Boeing 737-400. The airline made its inaugural flight in 1989 and has rapidly expanded, with service to 71 cities in 23 countries.

As a member of the Star Alliance network, Asiana Airlines currently operates 23 Boeing passenger airplanes on 91 routes around the world. The carrier also operates 11 Boeing Freighter airplanes on 28 routes. Its Boeing fleet is composed entirely of 767s, 777s and 747s.

“Our dedication to ensuring the highest safety and comfort for our passengers has been our No. 1 priority,” Lee said. The effort has paid dividends.

In 2009, *Air Transport World* magazine named Asiana its

“airline of the year.” From 2010 through 2012, respectively, Asiana won the same honor from the airline research group Skytrax and from *Global Traveler* and *Premium Traveler* magazines. In fact, the airline was honored twice in 2012, also receiving *Business Traveler*’s prestigious “best overall airline in the world” award.

In addition, Skytrax has awarded Asiana Airlines a Five Star Airline ranking. To date, only six other airlines have received this classification.

Last summer, Asiana became the first carrier in Korea to introduce two-door suites, called “OZ First Suites,” on a new Boeing 777-200ER (Extended Range) airplane. The suites feature Boeing’s Signature Interior, which comes standard on all 777 airplanes; beds that fold flat; and 32-inch (81-centimeter) video display screens that, according to Lee, are the largest on any commercial passenger jet.

Asiana is slated to receive its 13th 777-200ER later this month, and the airplane will become only the second 777-200ER to feature the new OZ First Suites.

“Over the years, Boeing aircraft have played an instrumental role in helping Asiana Airlines become a world-class, five-star airline,” said Ihssane Mounir, senior vice president of Sales and Marketing, Northeast Asia, for Boeing Commercial Airplanes. “We look forward to continuing our long and mutually beneficial relationship.” ■

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See the Boeing statement on the Asiana Airlines accident.



PHOTO: A Boeing 777-200ER (Extended Range) in Asiana Airlines livery. ASIANA AIRLINES



GROWLER ON THE PROWL

A U.S. Navy EA-18G Growler electronic warfare aircraft, top, from VAQ-141 at Naval Air Facility Atsugi, Japan, and an F-15C from U.S. Air Force 44th Fighter Squadron at Kadena Air Base, Okinawa, maneuver near Guam during the multinational Cope North exercise earlier this year. The Growler and the F-15 are made by Boeing in St. Louis. The weeklong flying exercise, featuring large-force operations using 15 different aircraft types from the U.S. Air Force and Navy, and the Japan Air Self-Defense Force and Royal Australian Air Force, improved the three allies' ability to work together and collaborate in fighter, refueling, tanker and bomber operations. Realism was provided by an "opposing force" of F-16s from the USAF 18th Aggressor Squadron from Alaska. PHOTO: JIM HASELTINE/HIGH-G PRODUCTIONS



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F-86 Sabre Model Plane



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