



# Frontiers

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## Building it **BETTER**

CST-100 spacecraft represents the best of "One Boeing" teamwork

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FSC LOGO

## ADVERTISEMENTS

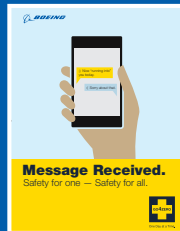
The stories behind the ads in this issue of *Frontiers*.

### 03



This ad is derived from a series of posters highlighting employees who are achieving quality improvements. More than 50 employee engagement teams across Commercial Airplanes posed and created taglines for their posters. A gallery of the posters can be found on the Boeing intranet at [http://programs.ca.boeing.com/quality/new/order\\_posters.shtm](http://programs.ca.boeing.com/quality/new/order_posters.shtm).

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Adapted from a series of posters in support of Boeing's Go for Zero—One Day at a Time workplace safety effort, this ad illustrates new standards that limit electronic device use to reduce distractions. A gallery of posters, along with other resources, can be found on the Boeing intranet at <http://go4zero.web.boeing.com>.

### 14–15



"Enduring Support," which focuses on Boeing's training expertise, is one of several ads in a Boeing Defense, Space & Security advertising campaign highlighting the capabilities Boeing brings to its customers. The ads are running in print and online business, political and trade publications.

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Featuring the Boeing Maritime Surveillance Aircraft, this new ad appears in global trade publications.

## ETHICS QUESTIONS

You can reach the Office of Ethics & Business Conduct at 888-970-7171; fax: 888-970-5330; website: [ethics.whq.boeing.com](http://ethics.whq.boeing.com).

## IAM PROMOTIONS

No promotions listed for periods ending Feb. 28 and March 7, 14 and 21.

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Boeing Helena  
787 Team



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Jason Kelley

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Shane Clayton

*Chris Smith*

Chris Smith

We're tearing down  
barriers to quality.

Find it. Fix it. Never again.

Commercial Airplanes  
.....  
Quality is personal.





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The CST-100 spacecraft Boeing is building to take passengers and crew to low Earth orbit destinations such as the International Space Station represents a true "One Boeing" effort of collaboration and teamwork. The spacecraft's innovative interior, with its blue LED lighting, draws on years of research by Boeing that went into the design of the passenger cabin of the 787 Dreamliner and the Boeing Sky Interior for the 737.

COVER: SYSTEMS ENGINEER TONY CASTILLEJA, FOREGROUND, AND FORMER NASA ASTRONAUT CHRIS FERGUSON, BOTH WITH BOEING SPACE EXPLORATION, TEST SYSTEMS INSIDE THE FULL-SCALE MOCK-UP OF BOEING'S CST-100 SPACECRAFT IN HOUSTON. BOB FERGUSON/BOEING

PHOTO: CLOCKWISE FROM BOTTOM LEFT ARE COMMERCIAL CREW PROGRAM MEMBERS TONY CASTILLEJA AND MELANIE WEBER; ANDY GILKEY AND CHRIS FERGUSON; KIM SUN AND ELIZABETH MORRELL. BOB FERGUSON/BOEING







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Only a prototype was built, but McDonnell Aircraft's Model 119/220, with four engines mounted in pods under the wing, was developed in the late 1950s and marketed as one of the first business jets. PHOTO: BOEING ARCHIVES

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Brazil, an emerging economic powerhouse, has been doing business with Boeing for more than 80 years. It's an important partnership for Boeing, one that is expanding in several new directions including biofuels research. PHOTO: SHUTTERSTOCK



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Employees at the Renton, Wash., factory are building 737 jetliners at a 42-a-month rate—a record production flow that once might have seemed unthinkable. The first to be built at that rate, shown, rolled out from the factory last month. How they are doing this is told here in pictures. PHOTO: TIM MCGUIRE/BOEING

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# Message Received.

Safety for one — Safety for all.



One Day at a Time.



# ONE TEAM, AROUND THE WORLD

## Four key areas of focus for building a better Boeing

In so many ways, 2014 represents a tremendous year for Boeing. One of them is that we're really beginning to realize the limitless potential that springs from people collaborating across our enterprise and the unique, powerful solutions provided for our commercial, defense, space and security customers globally.

So how do we build a better Boeing as we approach our second century? In Boeing Defense, Space & Security, we're building on our leadership and competitive positioning.

Much has been written on leadership. I've always admired leaders who clearly communicated their expectations and enlisted help in reaching tough goals.

That's why we've identified four areas we want to focus on in 2014: culture, transparency, strategy and people.

We must start with a collective focus—a generosity of spirit—that creates a culture where employees feel safe to try something different, and even fail, as we all try to succeed. When companies provide an environment that allows a healthy exchange and testing of ideas, it leads to innovation and growth. What I like to call a “collision” of ideas is possible if everyone is welcome at the table, encouraged to participate, and believes his or her opinion matters.

We use the phrase “One Boeing” to describe functional and program collaboration across the company. But it also means we're one team around the world, regardless of our personal backgrounds, professional education, and training or workplace perspective.

Achieving this One Boeing team requires trust, which brings us to our focus area of transparency. This is not a code word. Transparency is about having candid conversations, whether individually or in groups. It's about embracing different points of view because they can breed ideas. It's a relentless commitment to taking care of our people by including everyone on the entire journey.

**Chris Chadwick**  
President and CEO, Boeing  
Defense, Space & Security

Third, our future starts with deciding where we want Boeing to be and how we should get there. The “how we get there” is our next focus area: our strategy. We often make that piece sound too complex when it should be much simpler.

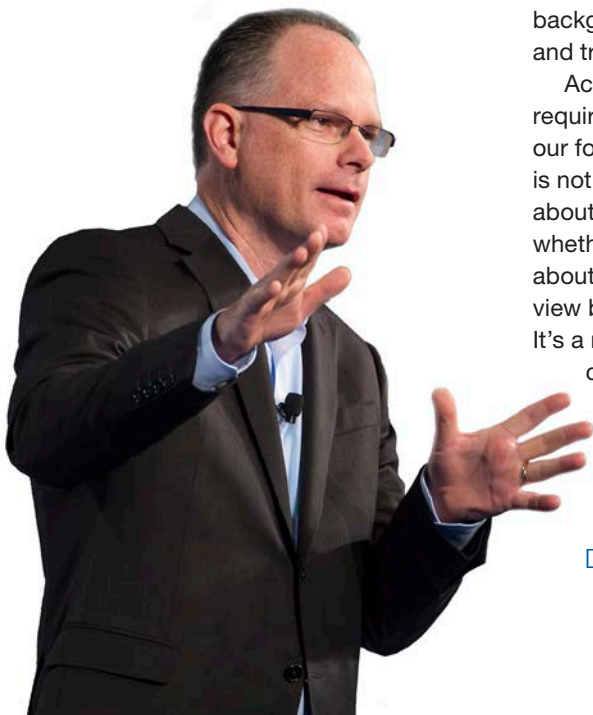
Strategy is about differentiation and competitive positioning—how Boeing separates itself from the convergence in the customers' minds of peer companies. Sometimes we set ourselves apart by offering the lowest cost, and sometimes by offering the most capability. Competitive positioning is rooted in strengthening core programs, winning the next franchise in core markets, and finding new opportunities that can profitably broaden our business.

All of this is based upon a diversity of people—our fourth focus area—and bringing a diversity of thought to the table. If we fail to value them, we will struggle regardless of whether we offer the right capability, at the right price or at the right time.

We must also remember that when we talk about people it includes our customers and the care we give them. Without them, we don't exist.

In the end, we must embrace a culture where we find opportunities to work together on our strategy, promote transparency, and make best use of the passion our people bring through the doors each day. This is how we build a better Boeing. ■

PHOTO: BOB FERGUSON/BOEING





## SNAPSHOT

# Overnight success

A 767 Freighter for FedEx leaves the Boeing paint shop at the Everett, Wash, factory at dawn. FedEx recently celebrated a dispatch reliability rate of 99.9 percent for its four newest 767 Freighters, which have significantly improved reliability and fuel efficiency compared with the MD-10 Freighters they replace. PHOTO: PATRICK RODWELL/BOEING







## QUOTABLES

“It’s smart enough to know what to do, and it follows a script.”

—Boeing’s Chris Ferguson, former NASA astronaut and space shuttle commander, on the CST-100 spacecraft, which is more autonomous and will require less training to operate than previous spacecraft. Ferguson is director of crew and mission operations for Boeing’s CST-100 program. See story, Page 20.

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“As important as they think their work is, it’s even more important.”

—William LaPlante, assistant secretary of the U.S. Air Force for Acquisition, talking about Boeing employees on the KC-46 program after touring the Everett, Wash., factory, where first tankers for the Air Force are in production. *Boeing News Now*, Feb. 25

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“Those who have booked it ... are blown away by what an awesome aircraft it is.”

—David Hall, Jetstar’s chief executive for Australia and New Zealand, on passenger reaction to the airline’s 787 Dreamliners. *New Zealand Herald*, Feb. 26



## Pam Zednick

HAS WORKED FOR BOEING:

25 years

PRIMARILY WORKS WITH:

Boeing's  
Accommodation  
Services

ORGANIZATION:

Shared Services  
Group





# ‘How can I help you?’

## Connecting people with the services they need to perform their jobs at Boeing

By Len Vraniak and photo by Bob Ferguson

Pam Zednick works for Boeing’s Accommodation Services organization, part of Shared Services Group. In this *Frontiers* series that profiles employees talking about their jobs, Zednick explains how she and her team are able to help others so they can better do what they do for Boeing.

Every day, my work helps improve people’s lives at their jobs. I don’t build or design commercial or military products, but the teams that do rely on me and the rest of the Accommodation Services team to help make their work possible.

I help people who have medical impairments receive the accommodations necessary to apply for, interview for, and perform the essential functions of jobs at Boeing. And I look forward to the opportunity to help people every day at work.

Although I’m a lead representative with the Accommodation Services organization, I’m also one of more than 90 Reasonable Accommodation employees at Boeing who are specially trained to support local requests for workplace accommodations.

There are many events that might trigger a request for reasonable accommodation. Since medical impairments often are not visible or obvious, we depend on employees identifying themselves as needing workplace accommodations. An employee may notify his or her manager of a special need, or notify Human Resources. Or managers may become aware of an employee having difficulty at work. Our team also takes

questions and requests directly.

I started with Boeing in the late 1980s and eventually moved into what became known as Accommodation Services. Through the Learning Together Program I enhanced my ability to serve employees by becoming a Certified Professional in Disability Management.

In 2008, I was part of an effort sponsored by Global Diversity and Employee Rights to develop and implement a companywide reasonable accommodation process. I am proud that my organization, Accommodation Services, became the model for the company’s process.

One of the challenging aspects of my job is increasing awareness of reasonable accommodation among employees, managers and Human Resources professionals. Many employees may not know about Boeing’s process for providing accommodations until they start experiencing difficulties on the job, but the company is committed to providing reasonable accommodations to anyone with a medical need.

Most accommodations are inexpensive and easy to provide. I work with many employees who

need anything from a simple work schedule adjustment to attend medical treatments to nonstandard equipment, furniture or facility modifications. I also help applicants get the services they need to apply for and compete effectively for a Boeing job.

Sometimes, we work with local or state agencies, such as services for the blind, to help determine the best ways to accommodate employees. Those agencies are attuned to the cutting-edge tools that will best benefit our employees.

In the end, my work is all about helping. That’s one reason I always answer the Accommodation Services help line by saying: “How may I help you?” Every time I ask that question, it reminds me why I’m here at Boeing. ■

*len.vraniak@boeing.com*

*For more information, employees can go to <http://companymedical.web.boeing.com>. From there, click the arrow next to “(Choose a transaction)” on the upper right of the page and select Accommodation Services.*



HISTORICAL PERSPECTIVE



# Just business

Although only one was built,  
McDonnell Aircraft's Model 119/220  
was 'a fine little airplane'



For those who can afford it, who put a premium on private, on-demand and luxurious air travel and want an office, kitchen—even bedroom—in the sky, business jets are the way to fly.

Today, a number of business jets provide that type of flying experience, from smaller models that carry only a few passengers to customized variants of large commercial jetliners. Boeing Business Jets, for example, not only offers modified versions of the company's best-selling commercial 737 jetliner but also the 787 Dreamliner, the 777 and even the 747-8. Boeing Business Jets currently has orders for more than a dozen Dreamliners, with the first delivered to a completion center in 2013. The first 747-8 BBJ was also delivered for luxury completion last year and will enter service later in 2014.

But nearly six decades ago, a fast jet transport that could crisscross the skies almost at will for business travel was only a concept. Until the U.S. Air Force announced a competition that would lead to the development of two of the first business jets—Lockheed's Jetstar and North American Aviation's Sabreliner.

Less well known was another jet developed for that Air Force competition—McDonnell Aircraft Corp.'s Model 119/220. Although only one was built, it would be the first business jet to receive a type certificate from the Federal Aviation Administration for air transport operations.

McDonnell Aircraft and North American Aviation are Boeing heritage companies.

The Air Force essentially was looking for a small jet transport when it announced in August 1956 a competition for UTX/UCX, short for Utility Trainer Experimental and Utility Cargo Experimental. Airplane-makers who entered the competition had to pick up the development costs.

Said James S. McDonnell, founder of McDonnell Aircraft: "This is a very interesting and sporting competition in that each competitor had to run the risk, with its own money, of designing and building an airplane and submitting it for evaluation by the government, and the government is in no way obligated to buy; they can take it or leave it."

His company's entry for the UCX contract was the Model 119, with

four jet engines mounted in pods underneath a low wing. It could accommodate about 10 passengers in a luxury executive configuration or carry nearly three times that many in a high-density cabin configuration. McDonnell Aircraft invested more than \$12 million in the development of the Model 119.

The jet was rolled out of the St. Louis factory on Jan. 30, 1959, and less than a month later test pilots George Mills and F.H. "Buck" Rogers made the first flight.

James McDonnell described the Model 119 as "a fine little airplane."

McDonnell Aircraft had established a transport division in December 1958 and hired Robert Hage, former project engineer of systems on the Boeing 707, to lead the sales and marketing efforts of the Model 119B, a commercial variant.

But on Oct. 7, 1959, the Air Force announced that Lockheed has beaten out McDonnell for the UCX contract.

Meanwhile, North American's T-39 Sabreliner had been picked for the UTC part of the Air Force contract. It was called the Sabreliner as a continuation of the successful Sabre brand.

The commercial versions of the Sabreliner and Lockheed's Jetstar, known as the T-39 and C-140, respectively, in the Air Force, would go on to have great success. They ushered in a new way to travel—not by commercial airplanes but by business jet.

McDonnell Aircraft continued to market the Model 119 commercially. Pan American World Airways negotiated with McDonnell about leasing 170 of the jets, which was redesignated the Model 220 to reflect that McDonnell Aircraft had entered its second 20 years in the aviation business. But after extensive market research, McDonnell Aircraft decided not to develop the commercial variant. The sole prototype was used by the company as a VIP transport for a while before being donated to Flight Safety Foundation's research facility in Phoenix. ■

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PHOTOS: (From top) The Model 119 in flight, 1959; the airplane was redesignated the Model 220 to reflect McDonnell Aircraft's second 20 years; the Model 119 takes off adjacent to the company's flight ramp in St. Louis, 1959. BOEING ARCHIVES





# ENDURING SUPPORT

Logistics & Training

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## VIEW FROM ABOVE

*Photos by Bob Ferguson*

To meet demand, Boeing is producing its best-selling 737 jetliner at rates that once might have seemed unthinkable.

Last month, employees at the 737 factory in Renton, Wash., rolled out the first airplane produced at a rate of 42 per month. While the focus now is on sustaining that rate, Boeing Commercial Airplanes has scheduled another increase to 47 a month in 2017 and is studying rates beyond that, should the market demand it.

Since 2010, production of the

PHOTO: Final assembly of the 737 begins when a fuselage, bottom right, is lifted into a tool where insulation blankets, electrical and hydraulic systems, and plumbing are installed. The fuselage then is moved to the start of the line, top right, to receive wings and landing gear.













Next-Generation 737 has risen about 33 percent, from 31.5 to 42 airplanes a month.

“Efficiency improvements in the factory, many of them developed by our employees, are a big part of why we’re able to successfully increase the number of airplanes we build,” said Beverly Wyse, vice president and general manager of the 737 program.

Boeing photographer Bob Ferguson recently visited the Renton site and took these photos from high above the assembly lines—a different perspective from the hubbub of activity on the factory floor. ■

*james.a.wallace4@boeing.com*



PHOTOS: (Far left) The nose of a 737. (Insets, from top) The 737 wing-body join position; as each 737 moves down the line, a tail (horizontal and vertical stabilizers), wiring, interior (seats, galleys, lavatories) and flight deck are installed, and by the time it reaches the last position on the moving line, engines have been added and the airplane is ready for flight testing; the 737 moving line runs the length of the factory, with support groups positioned nearby to quickly resolve issues and deliver parts to keep the line moving.





# Lighting the way



## Boeing's CST-100 spacecraft: A giant leap for the passenger experience

By Kelly Kaplan

Inside the next Boeing-built spacecraft to carry people into orbit, former NASA astronaut Chris Ferguson marveled at the cool, new-look interior.

At a glance, the outside of the full-scale mock-up of the CST-100 spacecraft in Houston is reminiscent of the Apollo command module that carried U.S. astronauts to the moon and back almost a half-century ago. But the interior of the CST-100 is worlds apart from that of the utilitarian Apollo and will provide passengers with a far richer experience, much as Boeing's newest jetliner cabins were designed to reconnect passengers with the magical experience of flight.

The spacecraft's interior lighting system, in fact, incorporates cabin

design concepts developed by Boeing Commercial Airplanes for the 787 Dreamliner as well as the new 737 Boeing Sky Interior.

The same kind of light-emitting diodes, or LEDs, used in the passenger cabin of the advanced 787 bathed the interior of the CST-100 in a pleasing blue glow as Ferguson and Boeing Space Exploration engineer Tony Castilleja checked out the spacecraft's easy-to-use controls and instrumentation, all the while lying on their backs in specially designed seats—seats that can be easily and quickly stowed once the spacecraft is in orbit and no longer needed.

"Previous spacecraft were very much like military aircraft, very utilitarian. They were not built for comfort or aesthetics," Ferguson said

PHOTO: Systems engineer Tony Castilleja, foreground, and former NASA astronaut Chris Ferguson check out the control panel in the full-scale CST-100 mock-up in Houston. BOB FERGUSON/BOEING





ARS

ARS



BOEING



after he emerged from the CST-100.

“But we are changing that paradigm a little bit,” he added, “to make it an inviting and a comfortable environment for that commercial customer, so they can look back and say that it was a wonderful experience ... so they can say, ‘I had the ride of my life.’”

Ferguson, a veteran of three space shuttle missions and commander of the final shuttle flight, by *Atlantis*, in July 2011, has logged more than 40 days in space. Now with Boeing, he oversees the crew interface of the CST-100 and has a key role in development and testing of system concepts and technologies for the spacecraft.

The CST-100 program is a model for the “One Boeing” approach to doing business, of collaboration across the company.

“Partnering with Commercial Airplanes has provided insights and innovation that is going to take the Boeing Sky Interior beyond just 30,000 feet (9,100 meters), and now to low Earth orbit,” said Castilleja, a Systems engineer with Business Development, Boeing Space Exploration, who is helping define the future of human space travel for Boeing.

When it comes to spaceflight, Ferguson and Castilleja share a passion. At age 16, Castilleja worked for NASA at the Johnson Space Center in Houston under the Summer High School Apprenticeship Research Program in 2004. He later joined Boeing. On the CST-100 program, he has provided technical design and program integration, and led upgrades for the full-scale mock-up.

“When I call Commercial Airplanes and others for some help on building our spacecraft,” he said, “it usually results in much excitement, and it shows in the innovation we’ve achieved together. I have learned so much about our Commercial Airplanes team. Working together, there is truly no challenge we can’t resolve.”

The CST-100, short for Crew Space Transportation, is being developed in collaboration with NASA’s Commercial Crew Program. The space agency wants private industry, not the government, to provide crew transportation, from

U.S. soil, to the International Space Station and possibly other future low-orbit destinations.

Since the retirement of the space shuttles, the U.S. has relied on the Russian Soyuz for crew transportation to the space station. In April 2013, NASA signed its latest contract extension with the Russian Space Agency for \$424 million for services, including six seats to and from the station. That’s \$70.7 million per seat. A U.S.-based transportation system could provide a reduced price per seat, according to NASA. Unlike the shuttle program, where NASA purchased the vehicle, the space agency plans to purchase transportation services on commercial crew vehicles for its astronauts. In the case of the CST-100, for example, Boeing would own and operate the spacecraft.

Featuring an innovative, weld-less design that can be reused up to 10 times, Boeing’s CST-100 capsule will transport up to seven passengers or a mix of crew and cargo to low Earth orbit destinations. The first test flight is scheduled for late 2016, with the first manned mission planned for early 2017.

Boeing is not alone, however, in developing a spacecraft in partnership with NASA’s Commercial Crew Program. Other industry competitors are in the race: Sierra Nevada Corp. and Space Exploration Technologies (SpaceX). All must meet stringent milestones and testing requirements of their respective spacecraft. NASA’s next phase is to award the Commercial Crew Transportation Capability contract in the fall of this year, with the space agency expected to select one or more commercial providers.

Boeing has a long and storied history in space exploration. Its heritage companies built the space

PHOTO: Andy Gilkey, left, human factors engineer, and Brandon Setayesh, mechanical and structural engineer, evaluate the tablet-based flight manuals that crews on the CST-100 will take into space. The spacecraft will feature wireless Internet and tablet technology for crew interfaces, docking assistance and communications. BOB FERGUSON/BOEING





 **BOEING**



**PERSONALITY**







“We’re going from military-like interiors toward this inflection point of commercial space travel.”

—Tony Castilleja, systems engineer,  
Boeing Space Exploration



shuttles, as well as the Apollo capsule.

Ferguson said CST-100 is much more autonomous than Apollo or the shuttle.

"It's smart enough to know what to do, and it follows a script," Ferguson said of CST-100, explaining that it will require far less training to operate.

"The pilot will monitor while the spacecraft does the work. That's the real big difference between the way Apollo worked and the way we're working today," Ferguson said, adding: "Someone once counted all the switches in the shuttle; there over a thousand. Everything was largely manual. The switches in the CST-100 are there to help the crew member do something quickly. The whole purpose of the instrument console has changed. Now, the only reason we have it is to assist if there's a failure ... Piloting is a lot less technique-driven and more straightforward than it was in the shuttle ... You're a systems monitor rather than an actively engaged pilot."

But that doesn't mean the CST-100 won't need an experienced and trained pilot. Recently, Boeing demonstrated,

as part of its agreement with the Commercial Crew Program, that a pilot could take manual control of the CST-100 and successfully fly it through various phases of a mission. It's not unlike a pilot turning off the autopilot on a commercial jetliner and flying the airplane, Ferguson explained.

Astronauts or crew members who pilot the CST-100 should welcome all the thought and Boeing innovation that has gone into the design, Ferguson said.

"They're going to like that it's easy to train, the interface is intuitive, and we give the astronauts a manual docking ability," he said.

But regardless of who does the piloting—computer or person—the crew will be in for a much different spaceflight than previous space travelers. That's because the interior of the CST-100 was designed with the passenger experience in mind, according to Ferguson and others on the CST-100 team.

"In space when we think of travel, we think of the rigors. On the aircraft side of the business, they're

thinking of passenger experience," Castilleja said. "We're going from military-like interiors toward this inflection point of commercial space travel ... the next step is to think about the human experience."

What began as a brainstorming workshop with Boeing Space Exploration engineers and a "Boeing Sky Team" from Commercial Airplanes materialized into a major differentiator for the spacecraft.

In early 2012, Commercial Airplanes held a Product Development Grand Challenge competition to encourage employees to take 10 percent of their work time and come up with innovative ideas that might not be explored during their typical workday. Four employees from Commercial Airplanes, all with a passion for spaceflight, entered the competition as the Boeing Sky Team.

Their proposal: Develop a business case for using elements of the new 737 Boeing Sky Interior for the CST-100 cabin.

"We saw a parallel between what we do at Commercial Airplanes every day and Boeing's future in space," said



PHOTOS: (Far left) Main control panel in the 1960s-era Apollo Command Module. BOEING ARCHIVES (Below) NASA astronaut Randy Bresnik donned an orange "launch-and-entry" suit before entering the CST-100 full-scale mock-up last July to test how astronauts can move around inside the spacecraft. NASA







team member Rachelle Ornan, regional director for Sales and Marketing, Boeing Commercial Airplanes.

That started a One Boeing collaboration with Boeing Space Exploration engineers, who were already considering such an approach for the interior of the CST-100. Over the next several months the Seattle-based team built a foam mock-up and experimented with LED lights. The team eventually spent three days in Houston. Engineers with Boeing Space Exploration also visited Seattle to learn more about the Boeing Sky Interior.

There were significant challenges in figuring out how to incorporate a concept for a commercial airplane cabin into the interior of a spacecraft.

“Knowing that there’s a true up and down in an airplane, that’s helpful. But in a spacecraft, there’s no up and down. That was the first challenge,” Ornan explained.

Added Castilleja: “Our Commercial Airplanes engineers got a taste for the restraints of a human-rated space vehicle.”

But having elements of the Boeing Sky Interior in the spacecraft, Ornan said, will mean a much better passenger experience.

“Throughout the spaceflight experience, passengers should have

a sense of calm and feel relaxed just as they do on airplanes,” Ornan said. “On a spacecraft, including a familiar daytime blue sky scene seems natural to meet the passenger’s need to remain connected to Earth.”

The design of past spacecraft such as Apollo and the space shuttles was driven by specific engineering requirements, Castilleja noted. “With the CST-100, this is the first time where we are exceeding those requirements and creating an actual customer experience.”

Ferguson pointed out that even though Boeing is designing the CST-100 for its U.S. government customer, NASA, there may be other commercial opportunities.

“We always have in the back of our mind those potential commercial customers,” he said. “We have to think about what that future customer might want built into the vehicle. So perhaps if we build it now, they will come.”

And having elements of the Boeing Sky Interior in the CST-100 will make the spaceflight experience for those future commercial customers so much better, the former astronaut said.

The Boeing Sky Interior, a customer option on Next-Generation 737s but the standard interior for the 737 MAX under development, draws on years of

research by Boeing in cabin design and feedback from airplane passengers. Blue LED lighting above the overhead bins in the 787 cabin, as well as for the 737 Boeing Sky Interior, gives the ceiling an open-sky look, connecting passengers to the experience of flight. But the lighting also makes the cabin seem more spacious.

“We highly integrated the lighting with the architecture to create a sense of sky above them,” explained Blake Emery, director of differentiation strategy for Boeing Commercial Airplanes. Emery led the research into the Sky interior for the Sonic Cruiser and 787 and subsequently the 737 Boeing Sky Interior.

Now, he could not be more pleased that the Boeing Sky Interior will light the way for passengers and crew who fly into space in the CST-100.

“Space travel is kind of like the way air travel was decades ago,” Emery said. “It is just at the beginning of being commercialized. We’re at a whole new frontier.” ■

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**ILLUSTRATION:** Boeing’s CST-100 spacecraft will typically carry five people plus cargo to low Earth orbit destinations, including the International Space Station. **BOEING**



# Partners

Boeing's growing presence in Brazil is the foundation for a long-term partnership with far-reaching opportunities

By Bill Seil



**O**n Oct. 23, 2013—Aviator's Day in Brazil—Boeing joined GOL Airlines, an all-Boeing customer, in launching the country's first commercial flight powered by biofuels. The flight, completed by a GOL 737-800, traveled from São Paulo to Brasilia.

It helped advance the "Flightpath to Aviation Biofuels in Brazil," an action plan that was developed by Boeing, Embraer and the Foundation for Research Support of the State of São Paulo.

"We studied what it would take to establish a commercially viable aviation biofuels industry in Brazil,"

said Donna Hrinak, who has served as president of Boeing Brazil since it was established in October 2011. "We concluded that Brazil has some important competitive advantages, not the least of which is Brazil's great experience in producing ethanol and biodiesel."

It's but one example of many opportunities for Boeing in Brazil, where the company is developing broad-based partnerships within this rapidly growing country.

"In Brazil, we're looking ahead to a very long-term partnership," Hrinak said. "It will only deepen and broaden as we learn more about

the capabilities of Brazilian industry, and they learn more about what it means to work with the world's largest aerospace company. There are excellent opportunities for win-win collaboration involving a wide range of technologies."

Boeing has been doing business in Brazil for more than 80 years. But the opening of the first Boeing Brazil office in São Paulo in 2011 was a bold step to expand its presence there—and further grow this important relationship. A second permanent office was opened in 2013; this time in Brasilia, the capital.

In early 2012, Boeing Research &



# for the long haul



Technology–Brazil (BR&T–Brazil)—the company’s sixth advanced research center outside the United States—was established. The company moved quickly to partner with the Brazilian government, businesses and educational institutions to strengthen the nation’s technological capabilities and expand its base of engineering talent.

Shep Hill, president, Boeing International, and senior vice president, Business Development and Strategy, said Brazil is a large, prosperous country with a great future. But to achieve its full potential, it must broaden its business base.

“Brazil is expanding beyond

raw materials to a more diverse economy,” Hill said. “This will create new opportunities for their young population. We are broadening and deepening our presence there to develop partnerships and support the growth of their aviation and aerospace industries.”

Hill said Boeing is working with Brazil at many levels to build an “aerospace ecosystem” that includes manufacturing, research and technology, as well as training programs for pilots, mechanics and air traffic controllers. The company also is supporting education programs at all levels, especially

those that promote careers in STEM (science, technology, engineering and mathematics) related fields.

Hill noted that Brazilian aircraft manufacturer Embraer has partnered with Boeing in both commercial and defense programs. It is an internationally respected company that has built a commercially successful regional jetliner fleet, as well as military aircraft.

“We’ve ramped up a lot in Brazil,” Hill said. “It’s an emerging economic powerhouse and an important

PHOTO: The skyline of Brasilia, capital of Brazil. SHUTTERSTOCK



market for our commercial and military products. I think we are well-positioned to grow with our Brazilian partners.”

Recently, BR&T-Brazil moved into a new facility at a technology park in São Jose dos Campos, near other government, business and academic research centers. Boeing Brazil has also extended its outreach to the general public by sponsoring a major advertising campaign that depicted Boeing as a longtime partner of Brazil.

Brazil’s future success in aviation and aerospace depends, in large part, on having a well-educated workforce, Hrinak explained, and since its opening in 2011, Boeing Brazil has been a strong supporter of education.

It began by playing an important role in the government’s Brazil Scientific Mobility program (originally called Science Without Borders). Boeing helped kick it off by accepting 14 Brazilian aerospace engineering students in a “180 degrees of support” program, which includes internships, work with a Boeing mentor and trips to Boeing sites in the United States.

“We are now moving to the next level by offering exchange programs to postdoctoral students,” said Al Bryant, managing director, BR&T-Brazil.

Brazil continues to be a strong market for Boeing products. In October 2012, for example, GOL, Brazil’s largest low-cost airline, placed an order for 60 737 MAX

jetliners—the largest airplane order from a single airline in South America’s aviation history. The 737 has long been used to serve the heavily traveled “air bridge” between Rio de Janeiro and São Paulo.

There also have been disappointments. In December 2013, following a spirited competition, the Brazilian government announced that the Boeing F/A-18 Super Hornet would not be selected to meet the Brazilian Air Force’s requirement for fighter aircraft.

“While the decision was disappointing, it in no way diminishes the company’s ongoing commitment to expand its involvement in Brazil,” Hrinak said. “Our participation in this







competition, in fact, opened the door to new partnerships and collaborative opportunities with the Brazilian government and industry.”

With Brazil hosting this year’s World Cup soccer competition and the 2016 Summer Olympics, the need for an efficient airport infrastructure is of growing importance. Hrinak said the government has begun revitalizing 65 airports by granting concessions to private-sector airport operators. Thus far, a controlling interest in six airports has been purchased by five different operators, with the government retaining 49 percent ownership.

“The government is really letting the private sector show what it can do,” Hrinak said. “These concessions have also brought in revenue that the government can use to invest in the rest of their aviation infrastructure.”

Van Rex Gallard, Boeing Commercial Airplanes’ vice president, Sales, for Latin America, Africa and the Caribbean, said the merger of Brazil’s TAM Airlines with Chile’s LAN Airlines

to create the LATAM Airline Group has changed the dynamics of the region’s airline industry. They, along with Avianca Brazil, provide regional and international service.

“LATAM is becoming an aviation powerhouse in the region, with at least 50 percent of its operations based in Brazil,” Gallard said. “At the same time, the merger has created a better environment for domestic airlines to grow and prosper in Brazil.”

Intercontinental flights coming into the country from LATAM and Avianca—as well as from the other 80 international carriers that have operations in Brazil, including 11 U.S. airlines—create opportunities for regionally focused carriers such as GOL and Azul Brazilian Airlines to take passengers to their final destinations, Gallard said.

Boeing’s *Current Market Outlook* forecasts that 2,900 new airplanes will be sold in Latin America over the next 20 years. An estimated 40 percent of the new airplanes will serve Brazilian carriers.

With its rapidly growing economy, Brazil also has an increasing need to expand its defense and security systems, according to Roberto Valla, Boeing Defense, Space & Security’s international business development regional director for the Americas. Brazil has a large geographic area to protect, along with extensive borders and shorelines. It must also secure islands and oil resources located miles offshore. There is a growing need for intelligence, surveillance and

PHOTOS AND GRAPHIC: (Far left) A Boeing 737-800 in GOL livery completed Brazil’s first commercial flight powered by biofuels last October. **GOL AIRLINES** (Above, clockwise from top) Students from Brazil perform a composite layup at the University of Washington, a Boeing partner. **MELISSA HELMENSTINE/BOEING** Graduate student Cristiane Scaldaferrri examines bio-based materials samples at the University of Minas Gerais, where BR&T-Brazil has a research partnership. **VÂNIA PASA** Artist’s concept of a 777 in TAM livery. **BOEING** Donna Hrinak, president of Boeing Brazil. **SERGIO ZACCHI**



“There are excellent opportunities for a win-win collaboration involving a wide range of technologies.”

—Donna Hrinak, president, Boeing Brazil

reconnaissance, as well as command and control capabilities.

“Our engagements with defense and security customers within Brazil have evolved significantly in recent years and span the breadth of the Defense, Space & Security portfolio,” Valla said. “Brazil, for example, has some very specific needs in the areas of both physical security and cybersecurity. We’re also forming partnerships within Brazil that are creating new business opportunities.”

In February, the unmanned aircraft ScanEagle performed demonstration flights for three days off the Brazilian Navy ship *APA*. Produced by Boeing

subsidiary Insitu, ScanEagle is in competition to meet a Brazilian Navy requirement for an unmanned aerial vehicle (UAV) to monitor the coast of Brazil. Under the nation’s Maritime Situational Awareness System competition, small UAVs will add a new level of surveillance for Brazilian ships.

In 2012, Boeing and Embraer agreed to collaborate on new weapons integration for Embraer’s A-29 Super Tucano pilot training and light attack aircraft. Super Tucanos enhanced with advanced weapons systems open new opportunities for international sales. The two companies also are collaborating by sharing technical information and







developing marketing strategies in support of Embraer's KC-390 aircraft, a medium-lift military transport.

According to Bryant, Brazil has proved to be a good choice to locate an advanced research center.

"Brazil has demonstrated that it is an emerging innovation engine," Bryant said. "The country directs significant funds to university research and has a long history in aviation. So it makes sense for Boeing to establish research efforts here and tap local technological talent and resources through partnerships."

Bryant said Brazil's expertise in biofuels made it a natural partner in the development of aviation biofuels. Boeing is also partnering with the Brazilian Institute of Space Research, or INPE, to develop remote sensing

and data analysis systems for efficient energy crop management. This is a program that could make use of nanosatellites, unmanned aerial vehicles and land sensors.

The company also is working with the University of Minas Gerais, located in Belo Horizonte in southeastern Brazil, to explore biomaterials that could be used to create more environmentally responsible airplane interiors. BR&T-Brazil is working with Boeing Commercial Airplanes environmental and interiors teams to identify promising materials. Brazil also is doing work in the area of advanced metals, some of which could be adapted for use in Boeing airplanes.

"We're not just working on interesting projects," Bryant said. "We're working on things that are

important to Boeing and our customers and are of mutual interest to Brazil."

BR&T-Brazil, he added, could ultimately serve as a hub for research collaboration with other Latin American countries.

"Research involves innovation that may pay off five, 10 or 20 years from now," Hrinak noted. "That, better than anything else, demonstrates our commitment to maintaining a lasting partnership." ■

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PHOTO: A ScanEagle unmanned aircraft is launched off the Brazilian navy ship *APA*. The navy is conducting a competition for an unmanned aerial vehicle and was evaluating the ScanEagle's monitoring capabilities.  
KETCHUM





## Milestones















## IN FOCUS

# Trailblazer

A Delta IV rocket carrying the fifth Boeing GPS IIF satellite leaves a bright trail across the night sky after launch from Cape Canaveral Air Force Station, Fla., Feb. 20. The latest Boeing-built Global Positioning System satellites are providing greater navigational accuracy through improvements in atomic clock technology, a more resilient signal for commercial aviation and a longer design life of 12 years. The sixth GPS IIF is at the Florida launch site undergoing preparations for launch in the second quarter of the year. The remaining six are being stored and maintained at the Boeing Satellite Development Center in El Segundo, Calif., to be launched as needed by the Air Force.

PHOTO: UNITED LAUNCH ALLIANCE





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