What sets Rockwell Collins apart

One of the qualities that sets Rockwell Collins apart from others is our ability to solve complex problems and develop innovative solutions. Not many companies have the technical diversity that we do. We continue to be a pioneer in our industry because our employees are constantly finding ways to turn ideas into valuable solutions and make leaps in technology.

While our industry respects tradition, it values innovation. We know our growth is dependent on satisfying customer needs and wants — both now and in the future.

This issue of Horizons magazine includes several stories that illustrate this.

In the cover story, you’ll read how more than 140 employees from a number of technical domains were challenged to design and develop what will be the Gen III Helmet Mounted Display System (HMDS) for the F-35 Lightning II jet fighter — the United States’ most advanced tactical aircraft. This futuristic helmet system will be the first to provide full flight and mission capability day and night. You’ll learn more about the outstanding technical achievements in this program. For instance, you’ll find out why our integrated digital night vision solution is a real differentiator for us.

More examples of how we’re making leaps in technology to meet customer needs are found in the article, “A Legacy in the making.” Employees from the United States and Brazil worked together to provide Embraer with a state-of-the-art flight deck for its mid-light Legacy 450 and mid-size 500 business jets. The result is a Pro Line Fusion® cockpit featuring our HGS-3500 Mounted Display System (HMDS) for the F-35 Gen III Helmet-Mounted Display System.

Proving our night vision solution

Engineering problem-solving and improvisation are key to demonstrating our latest night vision technology.

A Legacy in the making

Embraer wanted a flight deck so advanced, it can see into the future. Working in sync with the Brazilian original equipment manufacturer, our company developed one that met their tough specifications — and more.

Aviation aftermarket service is flying high

Rockwell Collins is poised to take advantage of a growing aftermarket service business.

Lean roadmap leads to international success

Award-winning team’s use of Lean ElectronicsSM helped establish a Rockwell Collins brand presence in a key emerging market.

Career opportunities are looking up

Removing lateral transfer guidelines gives employees more prospects for career development and growth.

Service anniversaries

Rockwell Collins is celebrating its 100th anniversary this year.

On the cover

Rockwell Collins and Elbit Systems of America designed and developed the advanced technology of the Gen III Helmet-Mounted Display System for the U.S. Air Force F-35 Lightning II jet fighter.

On the back

This ad — which highlights our safety-enhancing situational awareness technology recently appeared in FLYING Magazine and Professional Pilot Magazine.

The news

Keeping passengers moving

Rockwell Collins’ ARINC airport solutions make passenger processing quicker, easier and safer.

Cover stories

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New CH-53K helicopter includes Rockwell Collins’ digital glass cockpit

Rockwell Collins’ Pro Line Fusion® avionics suite and horizontal stabilizer trim system (HSTS) were on board the Bombardier Learjet 85 aircraft when it completed a successful first flight on April 9 in Wichita, Kansas. Rockwell Collins was awarded the Learjet 85 contract in 2008, marking a milestone six years in the making. Ryan Mans, a systems engineer at Rockwell Collins, has spent the past two years on-site at Bombardier’s facility in Wichita providing engineering support for the Learjet 85. During that time, he experienced a perspective that most people don’t have a chance to see.

“Working with Learjet and the Rockwell Collins team to resolve issues and see the aircraft build progression made the first flight that much more exciting,” said Mans.

Craig Olson, vice president and general manager for Business and Regional Systems at Rockwell Collins, said Pro Line Fusion’s breadth of mission capabilities and the ingenuity of the HSTS is a “perfect match” for the next-generation performance and technology this clean-sheet aircraft brings.

Bombardier’s Learjet 85 takes flight with Pro Line Fusion® avionics

The CH-53K helicopter will have the means to move troops and equipment from ship to shore and to higher altitude terrain more quickly and effectively than ever before. The U.S. Marine Corps, which has named the new aircraft the “King Stallion,” expects to begin operational service in 2019. It’s exciting to finally see this aircraft assembled and ready for flight test,” said Kelley Kirtz, principal program manager for the CH-53K program at Rockwell Collins.

“Rockwell Collins’ Pro Line Fusion® avionics suite and horizontal stabilizer trim system with mission management system that incorporates fully integrated flight and navigation displays.

Rockwell Collins CEO and President Kelly Ortberg and Nan Mattai, senior vice president of Engineering and Technology, talk with a member of the Dark Matter FTC team during the FIRST LEGO® League (FLL®) programs. The partnership serves as the main component of our company’s Engineering Experiences initiative to promote science, technology, engineering and math (STEM) education.

This annual event is a culmination of the season for FIRST® – For Inspiration and Recognition of Science and Technology – and was held April 23-26. It brings together students from the FIRST Robotics Competition (FRC®), the FIRST Tech Challenge (FTC®) and the FIRST LEGO® League (FLL®) programs. The National Aeronautic Association (NAA) presented aviation’s highest honor to the X-47B Unmanned Combat Air System Demonstration (UCAS-D) Joint Industry Team – which includes Rockwell Collins – during a special ceremony on May 29 in Orlando, Florida.

The NAA voting committee recognized the U.S. Navy, Northrop Grumman and industry partners with its 2013 Robert J. Collier Trophy for “developing and demonstrating the first unmanned, autonomous air system operating from an aircraft carrier.”

Rockwell Collins supplied the Northrop Grumman-built aircraft the advanced data link – Tactical Targeting Network Technology (TTNT) – used to support autonomous control in the historic catapult launch and capture of the UCAS-D on the aircraft carrier U.S.S. George H.W. Bush in the summer of 2013.

Rockwell Collins part of Collier Award-winning X-47B UCAS-D team

Rockwell Collins once again played a key role in bringing together the world’s next generation of engineers and innovators for four days of competition at the 2014 FIRST® World Championship.

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Keeping passengers moving

Rockwell Collins’ ARINC airport solutions make passenger processing quicker, easier and safer.

You’ve arrived at the airport to travel to an important business meeting or to a favorite location for a well-earned vacation.

You’ve checked in for your flight at a self-service kiosk, had your luggage tagged, passed through security and are now checking the status of your flight on the information display.

Many of the services you just experienced were likely provided by Rockwell Collins’ Information Management Services (IMS) business. IMS provides passenger processing products and services at more than 130 airports around the world, including many of the key international airline hubs.

With global airline passenger traffic projected to rise an average of 5 percent a year over the next two decades, airport operations constantly face the challenge of moving people as efficiently and seamlessly as possible, according to Chris Forrest, staff vice president of Global Airports for Rockwell Collins.

"With the number of travelers increasing every year and changing security requirements, efficient passenger processing is more crucial than ever," Forrest explained.

Under a new five-year agreement announced in March, our company’s latest ARINC vMUSE™ Common Use Passenger Processing System (CUPPS) will soon be placed in all four common-use terminals at London Heathrow Airport — one of the largest airports in the world.

According to Forrest, this is just one example of how Rockwell Collins continually innovates to provide customers with state-of-the-art, cost-effective solutions within the aviation industry. To meet passengers’ expectations to navigate throughout airport touchpoints with their mobile devices, our company also offers mobile solutions for check-in, flight information, security and boarding.

"We are in a key position to keep airports on the leading edge of technology and efficiency," Forrest said. "We’re constantly looking for new ways to improve passenger processing, while saving airports and airlines money as well."

By Megan Strader
The Perfect Fit

Rockwell Collins’ unique expertise differentiates us for the F-35 Gen III Helmet Mounted Display System.

The F-35 Lightning II jet fighter is the United States’ most advanced tactical aircraft. It has supersonic speed, radar-evading stealth, the ability to hover and a powerful integrated sensor package. One of the critical components that enables realization of the full capabilities of this fighter is the Helmet Mounted Display System (HMDS) designed and developed by Rockwell Collins and our joint venture partner, Elbit Systems of America (ESA).

Our state-of-the-art HMDS provides a virtual Head Up Display (HUD) and other critical flight information directly onto the visor of the helmet. It features a bi-ocular, 40x30 field of view, high brightness, high resolution display, with integrated digital night vision. When fully integrated with the aircraft sensors and systems, the HMDS provides the F-35 pilot with unparalleled situational awareness. That includes the Distributed Aperture System (DAS) from Northrop Grumman, which gives pilots the ability to see through the structure of the aircraft for a 360-degree view as well as a direct picture of the ground beneath them.

Custom fit to fly

Only two people in the world are currently authorized to assemble and custom-fit a helmet to an F-35 pilot, enabling the pilot to fly the Lightning II aircraft and execute missions. They are Rockwell Collins employees, Dan Kalsow, a senior systems engineer, and Rodney Breuer, a senior customer support manager, both in the F-35 HMDS program.

The two began fitting pilots in the Pilot Fitting Facility (PFF) at Eglin Air Force Base near Ft. Walton Beach, Florida, in the fall of 2011. Since that time, they’ve fit over 120 pilots from the United States Air Force and Navy, in addition to three foreign national pilots from the Netherlands.

According to Kalsow, each fitting presents its own unique challenges.

“'We have to fit a helmet to an asymmetrical human head so the optics package on the display visor is within two millimeters of exact center of each of the pupils,' he explained.

'The process takes approximately four hours per helmet and involves two contact days with each pilot. On the first contact day, precise measurements are taken of the pilot’s head, including a 3D head scan and the use of a pupilometer to measure the distance between the pupils. Once Kalsow and Breuer have the measurements and the helmet components – most of which are produced at our company’s facility in Wilsonville, Oregon – they begin assembling the helmet. This process includes custom-milling each helmet visor so the helmet fits the individual’s head comfortably and maintains its stability under high gravity (G) maneuvers.

“Our helmet liner must stand up to the pressure of high G maneuvers so the optics package remains aligned with the pilot’s field of view,” Kalsow noted.

When the helmet is assembled, the pilot comes in for a fitting during the second contact day. It’s at this time that the optics package is aligned to the pilot’s pupils and the display visor is custom contoured – a process that must be done precisely so the pilot has a single focused image at infinity.

Pilot safety is the priority

According to Kalsow, each fitting presents its own unique challenges.

“Pilot safety is the priority,” he explained. “It’s critical that the pilot’s life may depend on the HMDS and what he or she sees or doesn’t see,” Kalsow said. “It’s critical that Rodney and I respond to pilots’ concerns so they are happy and confident in our product. We’re passionate about keeping pilots safe.”

Keeping pilots safe is one of the primary purposes of all the advanced technology of the helmet and the F-35 Lightning II aircraft.

When pilots began reporting a number of issues with the Gen II HMDS, the Department of Defense (DoD) identified it as one of several F-35 program risks in 2011. Problems included inadequate night vision acuity, jitter and latency of the DAS imagery displayed on the visor. The issues resulted in a loss of confidence from our customer prime contractor on the F-35 program, Lockheed Martin.

As part of the helmet-fitting process, Dan Kalsow (back) and Rodney Breuer (front) test to ensure the pilot’s pupils are within 2 millimeters of exact center to be properly aligned with the optics package on the HMDS.

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Keeping it sold

To address the issues with the Gen II HMDS and regain customer confidence, the joint venture with partner ESA was restructured, and Rockwell Collins was positioned as the lead for the F-35 HMDS program.

A core team of approximately 24 systems engineers from Rockwell Collins facilities in Cedar Rapids, Iowa, and Wilsonville, and ESA locations in Merrimack, New Hampshire, and Haifa, Israel, was formed to tackle the “Big 5” technical issues affecting the resolution of the data displayed on the helmet visor. Led by John Lewis, senior engineering manager in the F-35 HMDS program in Cedar Rapids, the team developed solutions for each issue before the HMDS Critical Design Review (CDR) in October 2012.

“The goal we had as a company was to not lose this program to BAE Systems,” Lewis said. “Our team had a ‘Keep it sold’ chart to mark our progress during the time leading up to the CDR.”

The team addressed each of the Big 5 technical issues utilizing the Lean Electronics®8-Step Problem Solving Process. The team also leveraged experts from throughout the Rockwell Collins enterprise and ESA to assist in resolving the technical problems.

Our engineers in Warrenton, Virginia, who work on unmanned aircraft system flight controls, were called on to validate software algorithms to solve the readability problem known as jitter—a symptom of the aircraft shake generated during a high G burn. Knowledge from engineers in our Head Down Display Center in Cedar Rapids was used to fix the display contract issues. Expertise from our Advanced Technology Center was leveraged to take on the complex math to resolve the alignment problem relating to the accuracy of the targeting information displayed on the visor.

There also was the issue of affordability. We had to meet cost targets set by the Department of Defense (DoD), and our facility at Wilsonville took the lead in ensuring those targets were met.

According to John Kahle, programs manager in Airborne Solutions F-35 Products in Wilsonville, those cost requirements were broken down across the various components that make up the HMDS.

“We worked both within our factory and our suppliers’ factories to identify ways to lower our costs to meet the government’s cost targets,” Kahle said.

Regaining customer confidence

After working many long days and leveraging the expertise of more than 140 Rockwell Collins employees from around the world, the F-35 HMDS program team came away from the CDR with only three action items. Following four successful night flight demonstrations of our digital integrated night vision solution in 2013, the joint venture team of Rockwell Collins and ESA was named the sole source provider of the F-35 helmet on Oct. 10, 2013.

“We had clear goals on what we had to do to win,” Lewis said. “Our colleagues from throughout the enterprise stepped up to work with our team to take on tough technical challenges with innovative thinking.”

Production of the Gen III HMDS with our latest state-of-the-art technology is scheduled to begin in mid-2015. The aircraft will replace virtually all jet fighters in the U.S. military and is expected to enter into service in 2015. The aircraft also is being purchased by U.S. allied countries.

“It’s a multi-billion dollar program including Global Service and Support,” McKillip noted. “Plus, the program award shows confidence from our customer that Rockwell Collins and ESA have the best technology for helmet systems in the world.”

Expanding our footprint

Kalsow and Breuer are looking forward to fitting and training pilots on the new Gen III HMDS. Their expertise will soon have to be replicated, however, as more PFFs come on line.

Rockwell Collins recently was awarded a contract to stand up another PFF at Luke Air Force Base near Phoenix, Arizona. We expect to receive word later this year about a contract for a third facility at the Marine Corps Air Station in Beaufort, South Carolina.

McKillip noted that our work is really just beginning with this program as it expands domestically and internationally. Rockwell Collins and ESA are monitoring trends with our HMDS technology in the field and are focused on continuous improvement.

“Fighter programs last a long time, and this one is just getting started,” McKillip said. “To continue to differentiate ourselves from the competition, we must keep innovating solutions and providing our customer with exceptional customer service.”

By Annette Riddick

*The team included Tony Ball, Rob McKillip and Bob Foote were part of the F-35 core team whose work resulted in our company and ESA being down selected as sole source provider of the F-35 HMDS.
Proving our night vision solution

Engineering problem-solving and improvisation are key to demonstrating our latest night vision technology.

The question facing the F-35 Helmet Mounted Display System (HMDS) engineering team at Rockwell Collins and our joint venture partner Elbit Systems of America (ESA) was: How do we demonstrate our latest integrated digital night vision solution for the Gen III F-35 HMDS, when this next generation helmet won’t be ready for months?

It turned out the answer involved an F-35 test pilot and a twin-propeller Cessna airplane.

According to John Lewis, senior engineering manager in the F-35 HMDS program in Cedar Rapids, Iowa, the customers – Lockheed Martin and the F-35 Joint Program Office (JPO) – felt there were weaknesses in our night vision solution for the Gen III F-35 HMDS, when this next generation helmet won’t be ready for months?

The question facing the F-35 Helmet Mounted Display System (HMDS) engineering team at Rockwell Collins and our joint venture partner Elbit Systems of America (ESA) was: How do we demonstrate our latest integrated digital night vision technology. Their solution involved placing the ISIE 11 sensor on the front of a twin-propeller Cessna aircraft and modifying the pilot’s F-35 HMDS to receive output from the sensor.

Planning and improving

Engineers on the HMDS team tackled the issue like any other engineering problem to systematically figure out how to do that. And they improvised.

On the F-35 Lightning II jet fighter, an ISIE 11 night sensor would be mounted on the glare shield at the front of the aircraft and another on the pilot’s HMDS. For the demonstration flight, engineers determined the sensor could be mounted on the front of ESA’s Cessna, and the pilot’s HMDS could be modified to receive the output from the sensor.

An F-35 test pilot from Lockheed Martin participates in one of the April 2013 flight demonstrations of our integrated digital night vision solution.

Next came the exhaustive planning to address all the logistics and hurdles to ensure each of the four demonstration flights – two in April and two in June 2013 – were successful. The results of these demonstrations were being watched closely by both Lockheed Martin and the F-35 JPO.

“The test pilots wanted to see laser spotting, they wanted to look at runway lights, they wanted to look at water versus tree lines,” Lewis said. “Flight test cards were built to include all the pilots’ specific requests – just like we would have done for an actual test flight.”

No detail was overlooked, and the team received outstanding support from the Rockwell Collins enterprise, ESA, Lockheed Martin and the F-35 JPO in the planning and execution of the demonstration flights.

Executing the demonstrations

At approximately 11:15 p.m. on April 15, 2013, the Cessna aircraft took off for the first demonstration flight from St. Mary’s County Regional Airport in Maryland, located near the Patuxent River Naval Air Station.

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The halo effect, acuity, contrast and brightness of images coming through our night cameras were being contrasted with the resolution in analog night vision goggles – a solution being offered by our competition for the F-35 helmet program, BAE Systems.

“We believed our latest solution using the ISIE 11 sensor would match, if not exceed, what the competition’s analog goggles offered,” Lewis said. “We wanted to demonstrate this technology to government test pilots as soon as possible to show that it would provide them with the high resolution capability they require to complete night missions.”

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Throughout the 60-minute flight, Sam Hinckley, a lead optical engineer with ESA, captured the imagery from the night sensor and recorded the pilot’s comments.

During subsequent flights, the pilots were able to compare the ISIE 11 sensor with the analog ANVIS 9 goggles in real time. “We were able to demonstrate that the ISIE 11 digital night vision met or exceeded the capability of the analog goggles,” Lewis said. “And the pilots concluded that our sensor technology met their mission objectives.”

Pilots rely on high resolution night vision capability to fly night missions. And because they can be up in the air for hours, they need that acuity at close range when looking into the probe of a refueling tanker.

“There’s no room for error in that,” Lewis said. “Pilots rely on high resolution night vision capability to fly night missions. And because they can be up in the air for hours, they need that acuity at close range when looking into the probe of a refueling tanker.”

In October 2013, Lockheed Martin named Rockwell Collins and our joint venture partner, ESA, sole source provider of the F-35 HMDS. Production of the Gen III helmet is scheduled to begin in 2015.

Planning and improving

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Embraer wanted a flight deck so advanced, it can see into the future. Working in sync with the Brazilian original equipment manufacturer, our company developed one that met their tough specifications—and more. Introducing the Rockwell Collins Pro Line Fusion® flight deck on the Legacy 450/500.

A journey to the heart of Embraer's flight testing facility in Gavião Peixoto, Brazil, reveals the first fully integrated Rockwell Collins Pro Line Fusion® flight decks for the Legacy 450/500 program. On any given day here, you're likely to meet Rockwell Collins employees working next to Embraer employees as the Legacy 500 aircraft prototypes undergo final testing for certification.

"The relationship between Embraer and Rockwell Collins is very strong," said Senior Engineering Manager Marco Silveira, a native Brazilian who has worked on commercial aviation programs at our company for nearly 10 years. "We have a good group of experts supporting Embraer, and that group has built a lot of trust between the two companies. Pro Line Fusion plays an important role in Embraer's success."

Seven years ago, Embraer approached several companies, including Rockwell Collins, to develop an avionics system for its mid-light Legacy 450 and mid-size Legacy 500 business jets. Back then, the Brazilian original equipment manufacturer was looking for a flight deck that would help differentiate these twin jets in the marketplace.

Our company was confident that our brand-new Pro Line Fusion cockpit was the right fit to set future standards for capability, value and reliability. Embraer agreed. "Embraer looked to Rockwell Collins for our overall avionics expertise to deliver a state-of-the-art solution that met their aircraft goals," said Dan Gienger, Rockwell Collins' principal program manager for the Legacy 450/500. "But they also made it clear that maturity was a key component of their strategy. They want a smooth entry into service. Throughout the program, we've worked collaboratively with Embraer to ensure our system meets operational intent and can support their customers' needs in the end."

New safety-enhancing technology

The Legacy 500 will soon be the third platform in the world certified with the Rockwell Collins Pro Line Fusion integrated avionics system. And while the aircraft includes all of the system’s advanced features—including the large, high-resolution displays—the flight deck also was designed with Embraer’s vision of the future in mind.

For starters, it was created as its smaller twin—the Legacy 450—on the same development track, which means the avionics software applications are identical for both aircraft.

"All of the technology we’re integrating into the Legacy 500 will apply to the Legacy 450, and any new functionality we add to the Legacy 450 over the next year will be available in the Legacy 500 as well," said Gienger, explaining that the Legacy 500 will enter into service this year, and the Legacy 450 is expected to follow some time next year. "There are some configuration changes that we do for each aircraft, so Embraer will have to integrate the functionality on both airplanes and flight test. But anything new we deliver only has to be tested once."

One example of this type of commonality is the Rockwell Collins HGS-3500 compact head-up guidance system (HGS™), capable of presenting synthetic and new multi-spectral enhanced vision system (EVS) imagery to improve safety and access to airports during low-visibility conditions. This technology has never before been available in mid-light and mid-size business jet segments. The compact HGS and EVS solution, once available in 2015, will be fully integrated on both the Legacy 450 and the Legacy 500.

"Embraer employees often voice their excitement at bringing this new situational awareness technology to this market segment," said Susan Schnapp, principal program manager for the HGS/EVS in Wilsonville, Oregon. "Embraer always sets the bar really high, but they’re very good partners in overcoming aggressive challenges. They want the Legacy 450/500 to be the best in class. Our compact HLG will only make the aircraft better."

Another Pro Line Fusion feature that will be available first in the marketplace on the Legacy 450/500 program is a safety-enhancing Airport Moving Map application. This functionality was not part of the original scope of the program, and Gienger remembers being somewhat skeptical about adding it.

"Anytime you add new functions that need to be certified, there’s a risk," said Gienger. "We felt the risk was manageable, and we made Embraer very happy because the development team did a fantastic job delivering a quality product. They hit every one of their milestones."
Automatic flight control

The $18 million Legacy 500 and $16 million Legacy 450 are also the first two business jets under $50 million to use fly-by-wire flight controls, which provide weight savings and greater precision in flying compared to conventional manual flight controls. Pro Line Fusion communicates with the fly-by-wire system to provide automatic flight control.

“Our flight controls team took algorithms that were tried and tested through years of experience and applied them to Embraer’s fly-by-wire system,” explained Gienger. “Yet, since we were working with brand-new fly-by-wire technology, it required close collaboration with Embraer and their simulation capabilities to understand how the systems interact in flight and what changes were needed.”

Coen Van Der Linden, a flight test engineer and control law analyst within the Rockwell Collins Flight Controls department, began working with Embraer three years ago on the requirements for flight testing the controls for the flight director and autotrottle functions. About a year ago, Van Der Linden began participating in the flight test on the Legacy 500 and shortly after that, the team started talking about the certification test plan.

“We exercised all the various modes on the autopilot system to see how it was working and to see how the autotrottle was behaving,” he said. “Embraer has a very accurate simulation model, but the best simulator is always the airplane itself.”

In recent months, he’s been providing support for the last phase in the certification process.

Smooth ride

The one word that Van Der Linden and other Rockwell Collins engineers involved in flight testing have used over and over again when describing the Legacy 500 is “smooth.”

“If you push the throttles up, there is hardly any noise from the engines. A little bit of back pressure on the stick, and it pitches up. If you center the stick, it holds exactly where it was left because of the fly-by-wire system,” said Dale McPherson, our company’s chief systems engineer for the program who trained Embraer’s test pilots on how to use our avionics system. “The aircraft is just smooth. Very comfortable.

“Embraer has taken great pains to make the Legacy 500 flight deck beautiful,” continued McPherson, who used to work as a corporate pilot and aircraft maintenance technician. “When you run your finger across the front panel, everything is flush. More importantly, information is presented really well. It’s clean. It’s simple. It’s truly beautiful to look at.”

During the early stages of flight deck development, Embraer put a lot of focus on minimizing clutter and anything that might cause pilot confusion, according to McPherson.

“Working together with the customer, we really brought a more advanced and easier-to-use interface to Pro Line Fusion,” he said. “To meet Embraer’s vision for this flight deck, we included things like automatic focus motion, automatic cursor motion, cursor tabbing. We also completely redesigned the trackball and the trackball software.”

Focused on quality

Seven years ago, Luis Martinez started on the Legacy 450/500 program as a project engineer. Today, he’s a senior engineering manager. He, along with the rest of the Rockwell Collins engineering team, has developed close, personal relationships with their Embraer counterparts. They talk at least once a week; more often, it’s two or three times a week.

“We’re very much one team. Embraer wants to reach the end state together,” said Martinez, who is based in Cedar Rapids, Iowa. “During formal testing, Embraer engineers have come here and have tested alongside us. They weren’t here just to look over our shoulders to make sure we’re doing things right, either. They were here to talk through solutions and come to an agreement together in order to get the best product out there.”

Our customer quality engineer for the Legacy 450/500 program at our facility in Melbourne, Florida, Jason Dever, began working with Embraer about a year and a half ago when his Operations leadership asked him to help develop a tool that would provide better insight into quality metrics. This tool allowed the Rockwell Collins team to better engage with the Embraer team on any early design issues or areas where processes needed to be more robust.

“One of the Embraer executives told us that any returns or failures during the development phases are really gifts, and we should view them as that because it’s a chance to address any weaknesses early in the program,” said Dever, who works just a few miles down the road from Embraer’s manufacturing facility in Melbourne.

“Embraer is incredibly thorough and very focused on advanced quality planning.”

An example of this, according to Dever, is the four-day product and process maturity review the customer held at our Melbourne facility, where our company produces the majority of the Pro Line Fusion products for the Legacy 450/500 aircraft.

“During this event, we looked at 19 different factors to show full compliance to their requirements,” he said. “This was the first time we had ever done anything like this for any Business and Regional Systems customer. We weren’t quite sure what to expect, but it turned out to be a big success for us.”

Challenging program, important work

Roberto Figueiredo, a Rockwell Collins senior systems engineer based in Gavião Peixoto, has 30 years of avionics experience in Brazil. Along with Rogério Ribeiro, who is also a senior systems engineer for our company, his role is to support Embraer’s Legacy ground and flight test campaign.

Figueiredo has participated in several tests, and it’s an everyday occurrence for him to see Legacy aircraft take off and land. Still, he’ll never forget the first time the Legacy 500 prototype No. 1 landed in Gavião Peixoto in November of 2012. He even has a photo standing in front of the aircraft with Ribeiro to remember the day.

“I’m so proud to be working on a program like the Legacy 450/500 because it has an amazing avionics system; it’s state of the art,” said Figueiredo. “I believe as others around the world experience the technology, they will also be in awe of our work on this challenging program.”

By Crystal Hardinger
Aviation aftermarket service is flying high

Rockwell Collins is poised to take advantage of a growing aftermarket service business.

Inside an airplane hangar, about 45 minutes outside Little Rock, Arkansas, Jimmy Jones watches as a crew from CAVU Aerospace dismantles a retired ATR-72 turboprop airplane. On this day, he’s overseeing the final parts being taken off the aircraft — Intertrade’s 15th purchase in just the last five years.

“It’s hard work,” Jones noted. “They start with the avionics and flight controls and, within a few weeks, we’re down to just landing gear. As they pull the plane apart, I’m helping get the pieces sorted, boxed up and sent off to one of our warehouses.”

Jones, based out of Memphis, Tennessee, is a senior quality assurance technician for Intertrade — a Rockwell Collins company and a global leader in providing new and recertified airframe, avionics and engine parts for commercial, regional, business and military aircraft.

Jones, along with Raven Wells, senior quality assurance technician, and Daniel Canizaro, quality assurance technician — also based in Memphis — have inventoried approximately 750 parts from this turboprop airplane for recertification and resale by Intertrade.

“Like most things, as aircraft get older they are retired,” Jones said. “But just because a plane is taken out of service doesn’t mean there aren’t plenty of great parts on it that can be used again.”

The parts from this aircraft will be sold by Intertrade, which is just one part of Rockwell Collins’ Service Solutions business. Through Service Solutions, Rockwell Collins is working to capitalize on a growing aviation service aftermarket, valued at over $2 billion in 2013, according to Bob Haag, senior director of Global Service Business Development.

“Aftermarket is essentially everything we do from the time the new product is delivered until the time it’s obsolete or no longer being used by the customer,” Haag explained. “It’s the support and services that keep planes in the air.”

At Rockwell Collins, that support comes through five areas within Service Solutions: Maintenance, Repair and Overhaul (MRO) — the basic repair and upkeep of products; Field Services — which provides product support and training primarily to Government Systems customers; New Part Sales — to allow customers, including government militaries, to be self-sustaining and do basic repairs themselves; Global Asset Management — the rental or leasing of products to commercial airline and business aviation customers; and Intertrade — the selling of used aircraft components and management of our customers’ Rockwell Collins and non-Rockwell Collins equipment repairs.

According to Haag, it’s estimated that 80 percent of the money a customer spends throughout the life cycle of an aerospace product takes place after delivery. With the aftermarket outlook trending toward expansion, he said Rockwell Collins is positioning itself to capture an increased piece of that business.

Backlog and budget cuts

Fueling the growth in the service industry are two contradictory trends. One is the robust upturn in the air transport market, according to Thierry Tosi, vice president and general manager for Service Solutions.

More about Intertrade
- Intertrade was founded by two former Collins Radio Company employees in 1969 and purchased by Rockwell Collins in 1999.
- The company originally specialized only in Rockwell Collins avionics.
- Intertrade employs more than 50 people.
- With headquarters in Cedar Rapids, Iowa, Intertrade has distribution facilities in Memphis, Tennessee, London and Singapore.
- Intertrade maintains one of the largest used equipment inventories in the industry.
- International sales account for about 40 percent of Intertrade’s business.
For instance, two major Original Equipment Manufacturers (OEMs) – Boeing and Airbus — are currently at historically high production rates with backlogs of seven to nine years, depending on the platform. At the start of 2014, Boeing reported a backlog of 5,070 commercial airplanes. As of March 31, the Airbus backlog stood at 5,521 aircraft.

“Rockwell Collins has a large amount of content on those aircraft alone,” Tosi said. “Because those are long-cycle platforms that typically come with four-year warranties, those aircraft will be in need of support over the next 10 to 20 years.”

As an example of how our company supports our commercial air transport customers, a number of our Boeing 787 customers are employing our Global Asset Management (GAM) programs to assure needed spare equipment is in the right place at the right time. These customers leverage Rockwell Collins’ global asset pools to improve their fleet availability while also reducing overall life cycle costs.

While commercial aircraft production is on the rise, the same cannot be said for the number of new government aircraft entering into service. As a result of the plan to capture new business, Rockwell Collins is looking to expand several current strategies. One of them, specifically on the government side, is centered around Repair Chain Management (RCM), in which Rockwell Collins would contract with a customer to repair and sustain not just avionics, but other parts, whether made by us or other companies. For example, governments could drastically cut the cost of repair contracts for their military aircraft if Rockwell Collins serviced all the avionics, hydraulics and landing gear. In addition to being more streamlined for the customer, this also would increase revenue for Rockwell Collins.

Another avenue for growth is in the business jet market with the potential expansion of our company’s Corporate Aircraft Service Program (CASP). CASP is essentially an insurance policy for business jet or private plane owners. Since the owners of those aircraft typically don’t have a dedicated service shop with spare parts readily available, repairs can be lengthy and expensive. Rockwell Collins can insure all of our products through CASP for a set amount of time — allowing customers to receive new parts in a very timely manner, without hassle.

With several world events, such as the World Cup and the 2016 Olympics, Service Solutions expects to see an increase in business jet usage and an increase in those taking advantage of the CASP program.

Intertrade expansion

Intertrade also is playing an important role in growing Rockwell Collins’ service business as the demand for used parts increases. According to the aviation consultancy firm ICF SH&E, the air transport serviceable parts market made up about 11 percent of the parts market in 2001. In 2013, that number grew to 18 percent. And it could climb to 20 percent of a $15 billion parts market by 2015.

Shawn Bergquist, director of Intertrade, said the company will continue to expand and evolve to meet the needs of its growing global customer base. Over the next five years, Intertrade’s revenue is expected to increase proportionately as it further expands its offering of parts from multiple manufacturers. One step in that expansion includes an engine division in Boca Raton, Florida, added in October 2013.

“Engines make up approximately 65 percent of the surplus market spending,” Bergquist noted. “We’ll continue to study the trends and make smart acquisitions so we remain a full service, used components supplier to our customers.”

Boeing 787

For better serve customers in the Europe, Middle East and Africa (EuMEA) region, Intertrade opened a new distribution center in March near London Heathrow Airport. The distribution center primarily houses high-in-demand avionics and next-generation Boeing 737, Airbus A320 and ATR-72 inventory.

Bergquist said the new warehouse will allow Intertrade to keep costs low for customers in EuMEA by providing increased parts availability and shortened lead times due to the closer proximity of parts. All of this Service Solutions expansion aligns with our company’s overall commitment to accelerating growth, as well as our focus on superior customer service, according to Tosi.

“The aftermarket is a big portion of our business, and we see a lot of opportunity right now,” he said. “Plus, taking care of customers throughout the life cycles of their aircraft plays an important role in building an affinity and trust with them.”

Intertrade’s current success in the aftermarket is being noticed by others in the industry. Rockwell Collins and Intertrade received Aviation Week’s 2014 MRO of the Year honor in the Innovative Suppliers/OEM services provider category. The award was presented in March at the MRO Americas conference in Phoenix, Arizona.

Back in Memphis, as Jones waits to help “part-out” Intertrade’s next aircraft purchase, he’s feeling positive about the direction of the company.

“I’ve been in the aviation industry for 30 years, and I know there will always be a demand for aftermarket services,” he said. “I’m happy to be doing my part to ensure we have quality parts available for our customers.”

By Megan Strader and Annette Busbee
Members of Rockwell Collins Brazil, along with their colleagues in Cedar Rapids, Iowa, and Blagnac, France, used lean tools to find space at our facility in Brazil for production of the HF 9087D radio, as well as the HF tester and chamber. They are (from left) Mariana Santos, Cesar Esquin, Cristiano Carvalho, Walter Spinosa and Altemar Oliveira.

Lean roadmap leads to international success

Award-winning team’s use of Lean Electronics™ helped establish a Rockwell Collins brand presence in a key emerging market.

The HF-9087D Production Flow team received the 2014 Enterprise Lean Achievement Award for its use of Lean Electronics™ tools to help meet a customer’s offset requirements and grow our business in Brazil.

At the outset, the team’s task seemed daunting. The challenges included developing a process for the establishment and ongoing production and service for our HF-9087D radio in Brazil, according to Leanne Killmeyer, manager of Business Development and team facilitator.

The customer had to meet offset requirements for the sale of 50 of its military helicopters in Brazil. An offset is a trade condition put on exporters to purchase products or help develop a foreign country’s industry in order to open markets for the exporters’ products and services. Rockwell Collins has a number of products and platforms on this helicopter, including the HF radio and Pro Line 21™ avionics. To absorb our offset obligations as a result of the sale, our company proposed that the customer purchase an HF radio tester, and we would produce the 50 radios at our Rockwell Collins Brazil facility. The client agreed.

The HF-9087D Production Flow team had just 60 days to establish the testing and production process without having standards and processes in place at our facility in Brazil. “At first look, the project was overwhelming and no one believed we could do it,” Killmeyer recalled. “But we were determined to make this happen, so we pulled from our Lean toolbox and quickly got to work.”

Lean tools for tough problems

One of the key tools used by the team was Value Stream Mapping (VSM), the process used to identify all actions and tasks required to bring a product from its inception to delivery. “VSM was the roadmap that guided us and tied it all together from beginning to end,” Killmeyer noted. “It put processes in place. And we combined long-term mapping with multiple Burst events and the 8-Step Problem Solving Process to define and propose the offset solution to our customer.”

The project team included employees from Brazil, France and the United States, as well as customer representatives. According to Killmeyer, transferring knowledge to include the HF-9087D radio from Rockwell Collins France to Rockwell Collins Brazil and from the customer to its subsidiary in Brazil was complicated due to the multiple parties involved.

The team utilized the ADKAR (Awareness, Desire, Knowledge, Ability, Reinforcement) change management approach and DMAIC (Define, Measure, Analyze, Improve, Control) processes to drive their efforts. Killmeyer labeled the outcomes “extremely successful.”

A second challenge involved finding the space to build the radio and set up the new HF tester and chamber at our Rockwell Collins Brazil facility. This had to be done without increasing the footprint or incurring additional cost. Once again, the team went to the Lean toolbox – this time using S-S (Sort, Simplify, Systematic Clean, Standardize, Sustain) to establish production in our existing facility.

“In the end, the HF tester was manufactured and delivered on time, and the first radio was produced and delivered two weeks ahead of schedule – with all the offset requirements met,” Killmeyer said. “I have never been so proud to be a part of Rockwell Collins.”

Another benefit of our proven in-country production capability is the establishment of a strong Rockwell Collins branch within the region, according to Cristiano Carvalho, principal strategic development manager at Rockwell Collins Brazil.

“We positioned ourselves as a resourceful partner and built trust in Brazil,” Carvalho said. “And the processes and sustainable production flow created here can now be replicated in any country. As an international company doing business in various multi-national programs, this helps position us for future growth.”

By Colleen Scholer

Lean helps us become more efficient through the elimination of non-value added activities. Employers can learn more about the Five Principles of Lean, which identify focus areas to achieve operational excellence, on the Lean Electronics page on Rockwell Collins Online.

Lean Achievement Award Runner-up and Category Winner

Overall Runner-up: The Master of All Plans (MAMP) project team delivered value throughout the supply chain by creating a leaner process with fewer touch points and better security, as well as creating a single enterprise standard process. Their results included the elimination of a root cause of customer obsolescence and increased supply chain effectiveness.

Best for Lean Six Sigma Tools: The Airborne Application Lifecycle Management (ALM) implementation team launched lean activities that led to the revolutionary reorganization of engineering workflows in conjunction with the introduction of new Application Lifecycle Management and Mobility initiatives.

Best for Shareholder/ Stakeholder Benefits: The KC-46 Boeing Defense Systems Hardware Development team utilized Design to Cost Plus (D2CP) process to drive significant improvements into New Product Introduction. This resulted in significant long-term hardware savings and product transition to the factory.

Best use of Rockwell Collins Employees: The Air Transport Systems team realized increased margins for its Communication/Navigation/ Surveillance (CNS) 2100 Series by dramatically reducing the material and manual touch time product costs while simultaneously addressing obsolescence concerns.

LEAN ELECTRONICS

B O X D RO M E N S • 2 0 1 4

VOLUME 19 • ISSUE 2

2 1
Career opportunities are looking up

Removing lateral transfer guidelines gives employees more prospects for career development and growth.

Michael Weber was in engineering project support in Commercial Systems in Cedar Rapids, Iowa, for nearly three years when an opening became available for a senior project manager in Operations. He felt he had the skill set to do the job and believed the promotion would be a good career development move for him.

However, corporate procedure at that time didn’t allow employees to apply for a position posted internally that would result in a promotion. Weber felt stuck.

“I really enjoyed the work I was doing in engineering but, as a non-engineer, the potential for me to develop my career in that area was limited,” he said. “I felt the position in Operations presented a great opportunity for me, but I was informed I wasn’t eligible because of the lateral transfer practice.”

Weber discussed his situation with a Human Resources contact and shared his view that the practice limited his career options.

He wasn’t the only employee to express frustration with the guidelines. Other employees communicated via the 2013 Voice of the Employee (VOE) survey that they also had been restricted in their ability to be considered for promotional opportunities based on the company’s lateral move guidelines and rigid promotion schedules.

Human Resources and engineering leaders listened to the feedback, and in September 2013 the practice was eliminated, giving employees the ability to apply for positions when they’re ready – at any time throughout the year.

When another senior project manager position opened up in Operations, Weber applied for it and received the promotion. He began his new responsibilities in December 2013.

“It’s been a great move,” Weber said. “I’m taking an ownership role on advanced projects, I’m learning along the way, and I’m progressing in my career at Rockwell Collins.”

Removing roadblocks

The ability to attract, engage and grow our talented employees at Rockwell Collins is a focus for Human Resources, according to Martha May, senior vice president of Human Resources.

“One of our highest priorities is to give our people a place to use their talents, to develop their skills and move ahead in their careers,” May said. “While lateral transfers still provide important development options, we want to remove barriers to career enhancement. We want our people to apply for both lateral moves and promotional opportunities when they fit with their skills, experience and career goals.”

According to May, the recent changes demonstrate our company’s new approach to career development. Additional updates include eliminating the “minimum years of experience” requirement, allowing employees to add specific information about their roles or skill sets to their position title and updating the career path for engineers.

Focus on university recruiting

Along with removing barriers to career development, there also has been a shift to more robust university recruiting to fill entry-level positions left vacant from the progressive promotional changes.

According to Bonnie Knittel, manager of College Relations at Rockwell Collins, we are being more intentional about expanding our student outreach beyond the typical career fair. The new approach focuses on proactively building long-term relationships with students, university faculty and staff early in the college education process, while also using social media to stay in contact with quality candidates throughout the recruiting cycle.

“We’re also enhancing our Intern and Co-op programs to provide more exposure to career development opportunities so these students will want to come back and work at Rockwell Collins,” Knittel said.

Weber concurs that the removal of the promotional restrictions has made it easier for him to remain at Rockwell Collins, rather than seeking a new job at a different company.

“It’s been positive for me,” he said. “It’s opened up more options that will allow me to grow and develop my career here.”

By Colleen Scholer
Around the world

Service anniversaries

Rockwell Collins offers congratulations to employees who have marked significant service award milestones in recent months.

**APRIL**

Glen A. Schwartz
Dean M. Gross

**MARCH**

Thomas M. Tucker
Carolyn M. Seeliger
Karole L. Jonas

**JUNE**

Steven L. Reece
Mae Webb

Steve Reece
Sr. Electronics Engineer, GS Sensor & Airborne Labs

September 1969
Cedar Rapids, Iowa
Start date:
Current position:
Original position:

“Principle Logistics
Current position:
Sr. Electronics
Avionics

What is your proudest accomplishment at Rockwell Collins?
I played a key role in winning our first contract with Bombardier on Fusion Systems & RMS Engineering.

What piece of advice do you have for new employees?
Don’t be afraid to ask and keep asking until you are satisfied.

CELEBRATING 40 YEARS

**CELEBRATING 40 YEARS**

Joyce V. Cerny
Cedar Rapids, Iowa
Start date: June 1974
Original position: Engineering
Current position: Sr. Manufacturing Production Control Specialist, Data Links

What piece of advice do you have for new employees?
Don’t be afraid to ask questions and keep asking until you are satisfied.

**CELEBRATING 40 YEARS**

Gary L. Anderson
Cedar Rapids, Iowa
Start date: June 1974
Original position: Engineering Lab Technician, Test Equipment Engineering
Current position: Sr. Electronics Engineer, CS Sensor & Airborne Labs

What was your most challenging project? Helping to develop and test the microelectronics for the EKV program.

**CELEBRATING 40 YEARS**

Richard E. Jean
Bryan L. Jurgenow
Carolyn D. Louhr
Eva Maria Medina
Paul K. Nemeth
Joel Roumegous

PEGGY S. SPROSTON
Terry A. Zimmerman
MAP
John S. Alexander
Victoria A. Au
Kenneth I. Beyer

DENISE H. BRUNACI
Tammy Charb
Mark R. Hammern
D’Arielle Hinton
Underhdy
Natalie D. Joens
Mary L. Long
Juana Angelica Leon Moreno
James L. Lorenz
Robin R. Love
Patricia M. Osborne
Julia E. Peacock
Dirk O. Peters
Charles R. Robinson
Shalamin D. Sisco
Barbara J. Thyra
John T. Wallborn

Michael R. Amert
Michaele A. Biskerton
Karen A. Crank
Don H. Ellenberg, Jr.
Gregory A. Estberg
June A. Horner
Todd E. Hatton
David A. Kegel
Kathy K. Krah
Thomas E. Laing

Rockwell Collins celebrates 40 years in Melbourne, Florida

More than 1,400 employees at Rockwell Collins in Melbourne, Florida, were joined by several state and local officials and community leaders on April 10 to celebrate the facility’s 40th anniversary. Lee Smith, who began his career with the company about two months after the facility opened in September 1974, was one of the employees in attendance.

“I never imagined Rockwell Collins would impact my life the way it has,” said Smith, a senior manufacturing production control specialist. “I’m very proud of everything we’ve accomplished.”

In addition to Jeanne Boland, senior director of Melbourne Operations, company executives like Bruce King, senior vice president of Operations, and Craig Olson, vice president and general manager of Business and Regional Systems, attended the celebration and reflected on our company’s rich heritage.

Melbourne Mayor Kathy Meehan also was in attendance and read a proclamation in commemoration of the milestone.

Kathy Meehan, mayor of Melbourne, Florida, presented Jeanne Boland, senior director of Operations at Rockwell Collins in Melbourne, with the proclamation read in commemoration of the facility’s 40th anniversary.
What was your most challenging project? What is your favorite aspect of your current position? Working with the engineers and other team members, and the challenge of learning new designs.

What is your favorite aspect of your current position? Enjoy seeing the variety of products produced by Rockwell Collins as they are tested in the Environmental Effects Laboratory.

What was your most challenging project? My most challenging project was designing the power conditioning and distribution subsystem for the High Speed Photometer instrument on NASA’s Hubble Space Telescope.

What is your favorite aspect of your current position? I enjoy seeing the variety of products produced by Rockwell Collins as they are tested in the Environmental Effects Laboratory.

What was your most challenging project? My most challenging project was designing the power conditioning and distribution subsystem for the High Speed Photometer instrument on NASA’s Hubble Space Telescope.

What was your most challenging project? What is your favorite aspect of your current position? I enjoy seeing the variety of products produced by Rockwell Collins as they are tested in the Environmental Effects Laboratory.

What is your favorite aspect of your current position? Something we can all enjoy.

What was your most challenging project? What is your favorite aspect of your current position? Working with the engineers and other team members, and the challenge of learning new designs.

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What was your most challenging project? My most challenging project was designing the power conditioning and distribution subsystem for the High Speed Photometer instrument on NASA’s Hubble Space Telescope.
What is your proudest accomplishment at Rockwell Collins?

I am most proud of developing the first volunteer-based internal audit program and being a 1996 finalist for the Chairman’s Team Award. I organized volunteers from cross-functional Iowa areas, created ISO Auditor training, conducted hands-on skill-based instruction, provided audit opportunities in a variety of areas and better prepared employees for surviving external audits in their own areas.

What piece of advice do you have for new employees? Find a subject that improves with age. My proudest accomplishment at Rockwell Collins was being awarded a patent for a hermetic seal design for a variety of areas and better prepared employees for surviving external audits in their own areas.

What is your proudest accomplishment at Rockwell Collins? Establishing the Rockwell Collins Small Business Program after it was first federally mandated in the late 1970s. I managed a successful Small Business Program for 15 years.

What is your proudest accomplishment at Rockwell Collins? Receiving the Engineer of the Year award.

What is your proudest accomplishment at Rockwell Collins? Being a member of the Chairman’s Team Award.

What is your proudest accomplishment at Rockwell Collins? I worked on the F-22 Bidding Team in 1993 for which I was nominated for the Chairman’s Team Award.

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What is your proudest accomplishment at Rockwell Collins? I worked on the F-22 Bidding Team in 1993 for which I was nominated for the Chairman’s Team Award.
What is your favorite aspect of your current position? I have the opportunity to meet and work with a great department.

What is your most challenging project? One of them was certainly the EDU replacement project for the EDU.

What advice do you have for current students? Learn from the vast pool of talented engineers.

What is your favorite aspect of your current position? The variety of equipment I work on and the people I work with each day.

What is your favorite aspect of your current position? It has been a great place to work with a great group of co-workers in a great department.
HORIZONS AROUND THE WORLD

Christopher F. Roe
James W. Plummer
Richard C. Peterson
Wendy S. Osterhaus
Andrew K. Ormsby
Kelly T. O'Brien
Scott M. Nyberg
John M. Murray
Joel J. Miller
Anais Anabel
Bianca Hayde
Ronald J. McLaren
Beatriz Adriana Mendoza Romero
Lizaola Barrera Canizalez

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In memoriam

Rockwell Collins offers condolences to the families and friends of the following employees and retirees, whose deaths were recently reported.

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joseph Anderson*</td>
<td>Palm City, Alabama</td>
<td>April 21, 2014</td>
</tr>
<tr>
<td>Robert L. Anderson*</td>
<td>Junction City, Ohio</td>
<td>March 11, 2014</td>
</tr>
<tr>
<td>Rhonda R. Bakur*</td>
<td>Edgewater, Florida</td>
<td>April 17, 2014</td>
</tr>
<tr>
<td>William S. Blackburn*</td>
<td>Edgewater, Florida</td>
<td>April 17, 2014</td>
</tr>
<tr>
<td>Alan J. Brown*</td>
<td>Saint Augustine, Florida</td>
<td>March 13, 2014</td>
</tr>
<tr>
<td>Peter T. Carsey*</td>
<td>Cupertino, California</td>
<td>Feb. 18, 2014</td>
</tr>
<tr>
<td>Michael P. Caves*</td>
<td>Cedar Rapids, Iowa</td>
<td>March 6, 2014</td>
</tr>
<tr>
<td>Lillian Caves*</td>
<td>Farmington Hill, Michigan</td>
<td>Feb. 1, 2014</td>
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<tr>
<td>Rex Darley*</td>
<td>Foley, Alabama</td>
<td>April 19, 2014</td>
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<tr>
<td>William D. Devery*</td>
<td>Winchester, Kentucky</td>
<td>March 28, 2014</td>
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<tr>
<td>Gary L. Dimmitt</td>
<td>Solon, Iowa</td>
<td>March 11, 2014</td>
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<tr>
<td>Harry D. Eddleblute*</td>
<td>Bakersfield, California</td>
<td>March 2, 2014</td>
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<tr>
<td>Christoph W. English*</td>
<td>Hendersonville, North Carolina</td>
<td>March 20, 2014</td>
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<tr>
<td>Pasquala Faleo*</td>
<td>Presso, Florida</td>
<td>April 12, 2014</td>
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<tr>
<td>Gerald R. Fay*</td>
<td>Kenton, Ohio</td>
<td>Feb. 16, 2014</td>
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<tr>
<td>Laurence A. Ferguson*</td>
<td>Tustin, California</td>
<td>Jan. 31, 2014</td>
</tr>
<tr>
<td>Rebecca J. Flakos*</td>
<td>Lorne Tree, Iowa</td>
<td>March 8, 2014</td>
</tr>
<tr>
<td>Richard S. Glascock*</td>
<td>Canford, Michigan</td>
<td>March 6, 2014</td>
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<tr>
<td>James H. Grant*</td>
<td>Urbana, Ohio</td>
<td>Feb. 19, 2014</td>
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<tr>
<td>Donald L. Heisler*</td>
<td>Livermore, California</td>
<td>March 4, 2014</td>
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<tr>
<td>Paul E. Hoffmeyer*</td>
<td>West Des Moines, Iowa</td>
<td>April 12, 2014</td>
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<tr>
<td>Takuo Honda*</td>
<td>Honolulu, Hawaii</td>
<td>March 5, 2014</td>
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<tr>
<td>Betty L. Ingram*</td>
<td>Cincinnati, Ohio</td>
<td>April 8, 2014</td>
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<tr>
<td>Helen S. Leggatt*</td>
<td>Melbourne Beach, Florida</td>
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<tr>
<td>Thomas E. Levy*</td>
<td>Crooksville, Ohio</td>
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<tr>
<td>Scott A. MacKey</td>
<td>Newport, North Carolina</td>
<td>March 1, 2014</td>
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<tr>
<td>Billy D. Massay*</td>
<td>Phoenix, Arizona</td>
<td>April 13, 2014</td>
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<td>Donald B. McBain*</td>
<td>Marion, Iowa</td>
<td>Feb. 1, 2014</td>
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<tr>
<td>Robert Medina*</td>
<td>Sun City Center, Florida</td>
<td>May 2, 2014</td>
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<tr>
<td>John L. Meyer*</td>
<td>Milton, Florida</td>
<td>April 18, 2014</td>
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<tr>
<td>Jerry D. Moore</td>
<td>Youngstown, Florida</td>
<td>April 26, 2014</td>
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<tr>
<td>Jack A. Murray*</td>
<td>Huntington Beach, California</td>
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<td>Michael D. Mauro</td>
<td>Tulsa, Oklahoma</td>
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<td>Luther D. Myers*</td>
<td>Bartlesville, Oklahoma</td>
<td>March 21, 2014</td>
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<tr>
<td>David G. Norman</td>
<td>Marion, Iowa</td>
<td>April 27, 2014</td>
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<tr>
<td>Peggy D. Palma*</td>
<td>Cedar Rapids, Iowa</td>
<td>Feb. 13, 2014</td>
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<tr>
<td>Michael J. Pinos*</td>
<td>Cedar Rapids, Iowa</td>
<td>Feb. 7, 2014</td>
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<tr>
<td>Gary D. Reider*</td>
<td>Cedar Rapids, Iowa</td>
<td>Jan. 31, 2014</td>
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<tr>
<td>Michael P. Rozek*</td>
<td>Fountain Valley, California</td>
<td>May 15, 2014</td>
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<tr>
<td>Daniel D. Salazar*</td>
<td>Atoka, Oklahoma</td>
<td>April 14, 2014</td>
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<tr>
<td>Larry R. Schlhuber*</td>
<td>Cedar Rapids, Iowa</td>
<td>April 28, 2014</td>
</tr>
</tbody>
</table>

*Retiree
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