

Building the future today

The Geostationary Operational Environmental Satellite-P spacecraft being built by Space and Intelligence Systems is the third in a series of Geostationary Operational Environmental Satellites. The GOES satellites are advanced multimission weather and Earth-observation satellites for the National Oceanic and Atmospheric Administration and NASA. GOES-P is scheduled to launch in 2008.

BOB FERGUSON PHOTO

Network and Space Systems, an IDS business, is working to create a network-enabled information age

By DAVID SIDMAN

There's no road map to designing and building the future. But that is precisely the task ahead for IDS' Network and Space Systems business.

"We see ourselves at the beginning of a new network-enabled information age, just as almost 100 years ago we were at the beginning of this aerospace age," said Roger Krone, N&SS president. "It's a road of discovery for all of us."

N&SS has a broad portfolio of developmental programs, including space exploration, complex communications programs, missile defense, and satellite and intelligence programs. They may take years to develop, but their value might only be measured, for example, in the seconds it takes for an encrypted message to be delivered or a missile to be intercepted.

N&SS programs are "game changers" for just about everyone: the warfighter, the astronaut, the intelligence community, the average citizen—and Boeing employees. With important needs emerging quickly in these areas, Boeing has the opportunity to define the future of this industry segment—just as it has done in others—by working to create solutions that generate the most value for the company's customers. "One of the exciting things about this business," Krone said, "is that the chapter hasn't been written yet. We're writing that chapter and creating that future."

Here's a snapshot of the Network and Space Systems business.

Reliable, secure communication: Command, Control and Communications Networks

The word "radio" brings to mind an image of an AM/FM receiver in the car or maybe what the military uses to communicate—listening to music and talking to a person being the extent of radio's capabilities.

Now imagine a radio that can do more: It can carry voice, but can also transmit data and video. It has Internet-like capabilities. It's secure, it's wireless, and it can adapt to the environment it's transmitting in, hostile or friendly. That's the combat radio of the future, and it's being developed by Command, Control and Communications Networks. C3 Networks is home to transformational communications and command and control development, including the Joint Tactical Radio System Ground Mobile Radios program.

JTRS GMR is one of C3 Networks' key programs, and it solves an important problem for the U.S. Army: how to connect its warfighters who use different legacy radios. "Right now, we have a soldier out in the field with one type of radio and he can't talk to someone who has a different type of radio because they're different frequencies," said Henry Gomez, a system integration engineer for JTRS GMR.

JTRS GMR solves that problem because it's a software-based radio; the software enables the radio to understand different radio signals. Using JTRS GMR, warfighters will be able to transmit and receive communications with multiple legacy radios used at the other end of the transmission link.

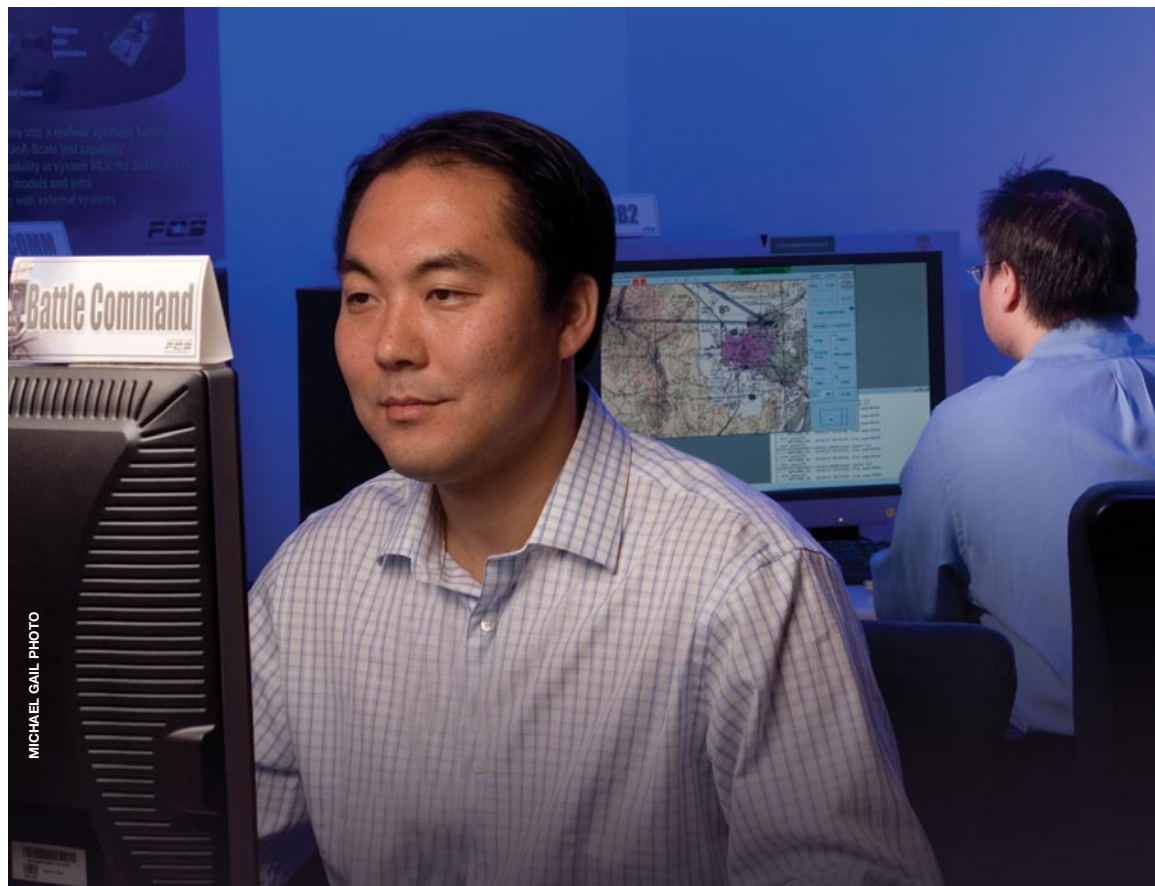
The JTRS GMR system involves complex software integration with millions of lines of code, much like the system it's going to be a part of: the Future Combat Systems program.

Increased lethality and survivability: Combat Systems

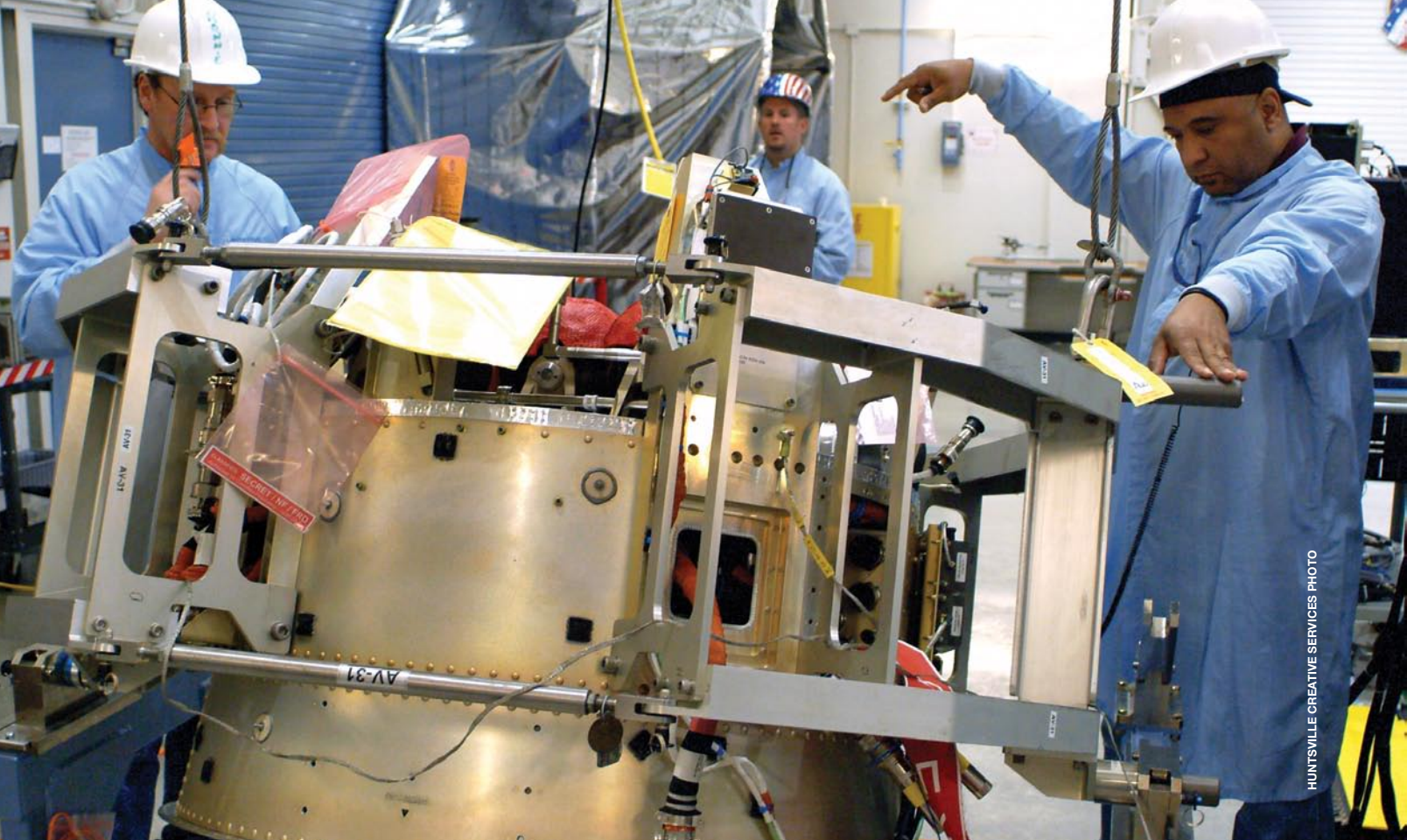
The Combat Systems division of N&SS is home to the U.S. Army's key modernization program, Future Combat Systems. This networked fighting force of the future will give each soldier access to unparalleled situational awareness—as well as new technology to defeat the enemy faster.

Boeing, as lead systems integrator for FCS, is working alongside Army experts and more than 600 partners and suppliers across the United States. Together, the FCS "One Team" is build-

Sun Kim (foreground) and Jimmy Liu, software engineers on Future Combat Systems, work at the Software Integration & Test lab in the Systems Integration Lab at Huntington Beach, Calif. "I'm very excited and proud I'm working on a system that will help save soldiers' lives," Kim said.



MICHAEL GAIL PHOTO



The people behind the network

It takes a network of people to create a network-enabled information age. Below and on Pages 57 and 59 are profiles of some teammates.



KEVIN GILLINDYNE PHOTO

Name: Elizabeth Boyd
Title: Systems engineer
Worksite: Kennedy Space Center, Fla.
Years with Boeing: 8
Role at work: Mechanical engineering, Payload Canister/Transporter Operations
Why are you excited about the work you do? “Processing flight hardware is not an ordinary job. Every day is different and challenging. And it’s exciting meeting these challenges and seeing how it applies to the big picture: space exploration!”

In Huntsville, Ala., Ronnie Hornsby (left) and Nick Antoine (right) install the Booster Avionics Module into a stand as Johnny McCutcheon controls the crane. Their work supports the Ground-based Midcourse Defense system.

ing and integrating a system of systems that includes unmanned air platforms and both manned and unmanned ground maneuver, maneuver support and sustainment systems. Each piece of the system—sensors, munitions, unmanned air vehicles, ground vehicles, robotics, and a battle command system, to name just a few—are all tied together by a common software system with one goal in mind: to support the soldier. “Sometimes you have to wait for your computer to respond, or you have to reboot when you’re having problems,” said Mike Ernst, chief engineer, FCS Spin Out. “We’re doing more so that FCS runs real-time all the time. When that soldier presses a screen, there can’t be a delay. Our systems can’t ever fail.”

FCS networked technology will save lives when deployed—much like the networked technology of Boeing’s missile-defense programs.

Detect, track and destroy: Missile Defense Systems

There are no second chances when trying to intercept an incoming ballistic missile. That’s the reality for employees at Boeing Missile Defense Systems. Their mission is to develop and deploy defensive solutions to protect the United States, its military and its allies against ballistic missile threats—and to ensure that those defenses work perfectly when they’re needed.

Building a layered missile defense system that protects against the three phases of missile threat—boost, midcourse and terminal—is no easy feat, given the speed of missiles and the vast distance they travel. The level of precision involved requires “smart”

missile interceptors or lasers whose guidance systems are tied into a network that's continually receiving and transmitting information about possible threats.

The Airborne Laser, Ground-based Midcourse Defense system and Patriot Advanced Capability-3 Missile seeker are three MDS programs designed to provide that layered defense. The ABL will protect against missiles in the boost, or launch, phase. GMD protects against missiles in midcourse, the longest phase of missile flight. And PAC-3 protects against missiles that are terminal, or falling towards their target.

"There's a lot of space out there that we have to analyze for targets, and then react to a target versus a decoy," said Anthony Lanting, an electronics technician who works on the Ground-based Midcourse Defense program. "It requires an absolute degree of accuracy."

A ride into space: Government and commercial launches

Because space is critical to the success of the network, *assured* access to space is required. That is what United Launch Alliance will provide. A 50-50 joint venture between Boeing and Lockheed Martin, ULA combines Boeing's Delta II and Delta IV launch vehicles with Lockheed Martin's Atlas launch vehicle in order to provide the U.S. government with superior mission assurance at an affordable cost. The ULA transaction was completed on Dec. 1.

The majority of employees in the former N&SS division of Launch Systems are now employees of ULA. Boeing will still have commercial launch capabilities, however, which will be part of the C3 Networks division. Whether the launch is for ULA or a commercial customer of Boeing's, the Delta family of rockets has a proven track record dating back to 1960 of boosting government, commercial and civil payloads into orbit.

Pushing the boundaries of space: Space Exploration

Astronaut Michael Collins once said, "It's human nature to stretch, to go, to see, to understand. Exploration is not a choice, really; it's an imperative." Collins bravely lived his words as an astronaut aboard Gemini X and Apollo 11 during the 1960s. That was the beginning of the Space Age, and Boeing has continued to support NASA since then. "One of Boeing's key competitive advantages is knowing firsthand the requirements for safe human space flight," said Cheryl Britt, program manager for Space Exploration's Transformation and Integration organization.

Space Exploration is in a state of transformation as it continues to support the legacy programs of Space Shuttle and the International Space Station—while gearing up for the Vision for Space Exploration, which calls for manned spaceflight back to the moon, Mars and beyond. NASA's Constellation program, which will accomplish that mission, includes Orion (Crew Exploration Vehicle), Ares 1 (launch vehicle), robotic space systems, and lunar landers and habitat infrastructure.

"Our legacy programs are all about sustaining low-Earth orbit. The Vision for Space Exploration is really about pushing out beyond and extending humanity's presence," said John McCann, a Space Exploration systems engineer working Constellation pursuits.

Extending humanity's presence also extends the network in space, where spacecraft built by Space and Intelligence Systems provide a crucial cornerstone for the Network and Space Systems business.

Communicating and understanding information: Space and Intelligence Systems

Television. Navigation systems in cars. Weather forecasts. They all depend on satellites that orbit the Earth. Instead of just relaying information from space, though, Space and Intelligence Systems



THOM GOEBTEL PHOTO

Name: Andy Murphy

Title: Project engineer

Worksite: Springfield, Va.

Years at Boeing: 21

Role at work: Geospatial project engineer for Space & Intelligence Systems' Mission Systems

Best part of the job: "There are no cookbooks here. We work from scratch, creating tools that make a difference and support men and women in the field. Never in my wildest dreams did I ever imagine I would be working in intelligence."



SALVADOR SANCHEZ PHOTO

Name: Brian Wismer

Title: Senior systems engineer

Worksite: Anaheim, Calif.

Years with Boeing: 25

Role at work: Family of Advanced Beyond line-of-sight Terminals System Requirements & Analysis Lead Engineer

Why are you excited about the work you do? "I have been involved on the FAB-T Program since its inception. To see something be developed from an initial concept to working hardware and software has been very exciting for me."

Most memorable work experience at Boeing: "I was part of the capture team working long hours for months in an attempt to beat the incumbent contractor for [FAB-T]. We finally arrived at the day the announcement would be made and sat with anticipation in one of the conference rooms waiting for the result. When it was announced we won, the joy (and high fives that followed) was one of the most memorable moments of my career at Boeing."



TOMI RULLE PHOTO

Name: Nancy Millman

Title: International contracts and pricing, Combat Systems

Worksite: St. Louis

Years at Boeing: 16

Role at work: Participate in capturing new international business for Combat Systems

Most memorable work experience at Boeing: "While in IDS International Contracts and Pricing, I was a member of the UK Chinook Through Life Customer Support capture team that recently won

the Atlas Achievement Award. I was a part of the team for about half of the five years of negotiation. The award recognizes teams with exemplary performance based on several criteria."

Daily philosophy: "Be thankful for family and friends—including the four-legged kind. Be open and honest in all aspects of life and enjoy the work you do."

N&SS: What's in it for us?

Network and Space Systems is about combining the physical network—things you can see, such as a radio, a satellite or even a soldier—with anytime-anywhere communications. The result of the combination is to turn raw information into actionable intelligence. Here are a few of the network-centric programs of N&SS which, ultimately, help everyone.

For the warfighter: Enhanced capabilities for conducting urban warfare. Fighting enemy forces and gathering surveillance information in a hostile urban environment present many challenges. When Future Combat Systems introduces its first round of technology to the current force in 2008, part of that rollout will include new unattended ground sensors that will enhance the soldier's situational awareness and improve perimeter defense, surveillance and target-acquisition capabilities.



For the cell phone user: Uninterrupted mobile phone transmission. As you move, cell phone signals hop between cell phone towers, when they're nearby. The Mobile Satellite Ventures program's satellites and ground systems will create the world's first commercial mobile satellite service that will use both space and terrestrial elements. Combining the best of satellite and cellular technology, MSV will deliver reliable voice and data coverage across North America starting in 2010.



For weather forecasters: Accurate prediction and tracking of severe weather. Thanks to this year's successful launch of the Boeing-built Geostationary Operational Environmental Satellite-N aboard a Delta IV rocket, scientists will be able to more accurately monitor conditions that trigger dangerous weather. The satellite will not only serve the United States by continuously observing and measuring meteorological phenomena in real time across the Americas and their surrounding oceans, but also will serve the world by transmitting vast amounts of observational data.

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For the intelligence analyst: Data and imagery collection and exploitation. Information is critical for the intelligence community, and that's what Space and Intelligence Systems' Mission Systems specializes in. With the U.S. National Geospatial-Intelligence Agency and

the National Security Agency as its largest customers, Mission Systems specializes in imagery production and manipulation. Combined with its data production, analysis and dissemination expertise, Mission Systems provides end-to-end IT solutions for this important customer base.

For the U.S. homeland: Missile defense. The Airborne Laser and the Ground-based Midcourse Defense system are two key components of U.S. defense. ABL is a modified Boeing 747-400F aircraft that will be equipped with a precise, high-energy laser capable of destroying ballistic missiles in the boost phase of flight. GMD is the first missile defense program deployed operationally to defend against ballistic missile attacks.

For humanity: Manned and unmanned space exploration. Spirit and Opportunity, the two rovers rambling across Mars, have transmitted amazing pictures and significant amounts of data to Earth. Launched aboard separate Delta II rockets in 2003, each rover is powered by solar cells built by Boeing subsidiary Spectrolab. Their success is the foundation for human missions to Mars and Boeing's Constellation program efforts. The Constellation program supports NASA's implementation of a sustained and affordable human and robotic exploration program as part of the U.S. Vision for Space Exploration.



NASA PHOTO

Space Shuttle *Discovery* launches from Kennedy Space Center, Fla., in July at the start of mission STS-121. *Discovery's* next mission, STS-116, is slated for December and marks the 20th mission to the International Space Station.

combines those space-based communications assets with the capability to analyze large amounts of data. S&IS builds commercial and military satellites, which deliver data to Earth, and then uses data collection and analysis capabilities to provide services for the intelligence community.

Looking forward, S&IS will continue to blend its satellite and information businesses. For a look at that future, consider a successful S&IS simulation that highlighted the Global War on Terror's key dilemma: how to find and track people considered a threat to security.

For the first time, signal intelligence receivers proved they could automatically identify the target—a mock terrorist—and trigger airborne surveillance assets to track the target on the ground, while capturing full-motion imagery and broadcasting it instantly to analysts several hundred miles away. Boeing used a mobile mesh-net satellite communications network to broadcast live video and command and control information from two different unmanned aircraft systems simultaneously to the East and West coasts.

Dan Jones, director of the Advanced Information Systems unit of Boeing Space and Intelligence Systems, said: "Our ability to creatively integrate technology from Boeing, our customers and our valued partners provides near-term focused capabilities that make the promise of network-centric operations real." ■

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N&SS at a glance

President: Roger Krone

Employees: 23,600

Headquarters: Crystal City, Va.

U.S. states with major locations: California, Missouri, Alabama, Texas, Florida, Virginia

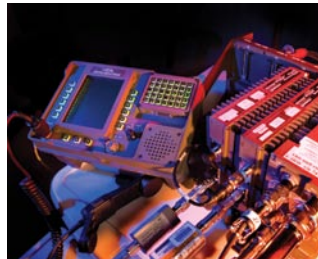


BOEING PHOTO

Missile Defense Systems

Vice president and general manager: Pat Shanahan

Key programs: Ground-based Midcourse Defense; Airborne Laser (left); Arrow; Advanced Tactical Laser; Avenger; Patriot Advanced Capability-3 Missile seeker



BOB FERUGSON PHOTO

Command, Control and Communications Networks

Vice president and general manager: Rick Bailly

Key programs: Joint Tactical Radio System Ground Mobile Radios (left); Airborne and Maritime/Fixed Station Joint Tactical Radio System; Boeing Launch Services; Family of Advanced Beyond line-of-sight Terminals; ICBM Systems; Combat Survivor Evader Locator; Integrated Shipboard Systems; Integrated Command & Control; Vigilare and High Frequency Modernisation Project (Boeing Australia Ltd.)



NASA PHOTO

Space Exploration

Vice president and general manager: Brewster Shaw

Key programs: Space Shuttle; International Space Station; Checkout, Assembly and Payload Processing Services; Constellation program



BOEING GRAPHIC

Combat Systems

Vice president and general manager: Dennis Muilenburg

Key programs: Future Combat Systems, British Army's Future Rapid Effects System



BOEING PHOTO

Space and Intelligence Systems

Vice president and general manager: Howard Chambers

Key programs: Commercial/civil satellites including Geostationary Operational Environmental Satellites N, O, and P, Mobile Satellite Ventures, DIRECTV, Thuraya; military satellites including Wideband Gapfiller Satellite system and Global Positioning System; proprietary programs



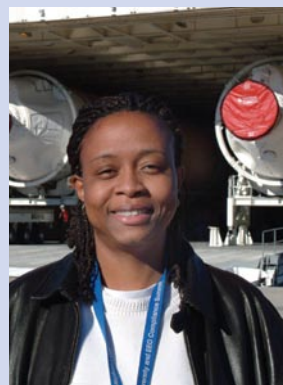
HUNTSVILLE CREATIVE SERVICES PHOTO

Name: Kyle Metchnik
Title: Integration Specialist
Worksite: Huntsville, Ala.
Years with Boeing: 12

Role at work: Member of a team that assembles, integrates and tests the electromechanical assemblies used in the seeker on the Patriot Advanced Capability-3 missile.

Most memorable work experience at Boeing: "I worked 10 years on the International Space Station program as a mechanical technician, where I integrated

equipment racks for the lab module. Once I accompanied Space Station hardware on its trip to Kennedy Space Center, Fla., aboard a C-5 cargo jet."



HUNTSVILLE CREATIVE SERVICES PHOTO

Name: Tinesha Ross
Title: Test and Evaluation engineer
Work site: Decatur, Ala.
Years with Boeing: 7

Role at work: System administrator and Ground Support Equipment for the Delta IV Cryogenic Second Stage

Most memorable work experience at Boeing: The Delta IV rocket's first flight, in November 2002. "It's an incredible feeling when we see evidence of our hard work paying off."

Best work-related advice ever heard:

"At this year's Diversity Summit, Joyce Tucker [Boeing vice president of Global Diversity & Employee Rights], said, 'The only limits we have are the ones we set for ourselves.' Her words stayed with me and are one of the main reasons I continue to work hard and strive to be the best at everything that I do."