



# The Scenic Route to Space

Two rocket scientists overcome challenges and bring others along for the ride

## Negative Turned Positive

Sandra Senegal Purdom beat the odds the day she was born.

Her mother went into labor three months early. Baby Sandra was not expected to live. Doctors asked her father, a U.S. Army officer on leave, to make the gut-wrenching decision to save his wife's life. They would try their best to save the baby, too.

Four months later, the Senegals brought their daughter home from the hospital alive, well and ready to take on the world.

"I started out fighting and have fought for everything I have my entire life," Purdom said. "I'm not about to stop now."



### BOARD MEETING

Boeing engineers Sandra Senegal Purdom (left) and Patrice Hall run through the build sequence for the Space Launch System engine section Core Stage 3.

PHOTO: LIZ MORRELL/BOEING





**ON THE MOVE**

Space Launch System's Core Stage 1 rolls out for transport by barge from the NASA Michoud Assembly Facility in Louisiana to Kennedy Space Center in Florida in early 2020.

PHOTO: ERIC SHINDELBOWER/BOEING

“When I told him I wanted to be an engineer, **he said I'd never make it** because I didn't have what it takes.”

**SANDRA SENEGAL PURDOM, BOEING ENGINEERING MANAGER**



**Driven by Science**

As a Black and Indigenous girl with a proclivity for science, Purdom understood early the challenges that lay ahead. Throughout middle and high school, her parents suggested STEM subjects and influenced her interest in becoming an engineer.

However, the encouragement Purdom received at home wasn't always reflected in the classroom. She was struggling to keep up in a challenging physics class. One of her teachers questioned if she belonged.

“He asked what I wanted to become and if I was planning to go to college,” she said. Reflecting on those questions as an adult, she came to a realization. “My teacher didn't think a little Black girl was college material.”

“When I told him I wanted to be an engineer, he said I'd never make it because I didn't have what it takes.”

Purdom didn't hear “you don't have what it takes.” She heard “game on.”

“All I thought was, ‘I will come back and show you,’” she said.



“That was a great day. He didn't remember what he said, but I told him **his disbelief was my catalyst.**”

**SANDRA SENEGAL PURDOM, BOEING ENGINEERING MANAGER**

**Breaking the Mold**

With the energy and determination to succeed, Purdom finished in the top percentile of her California high school class. She was accepted into California State University, Northridge, and decided to pursue chemical engineering. Of the eight students enrolled in her major, she was the only woman and person of color.

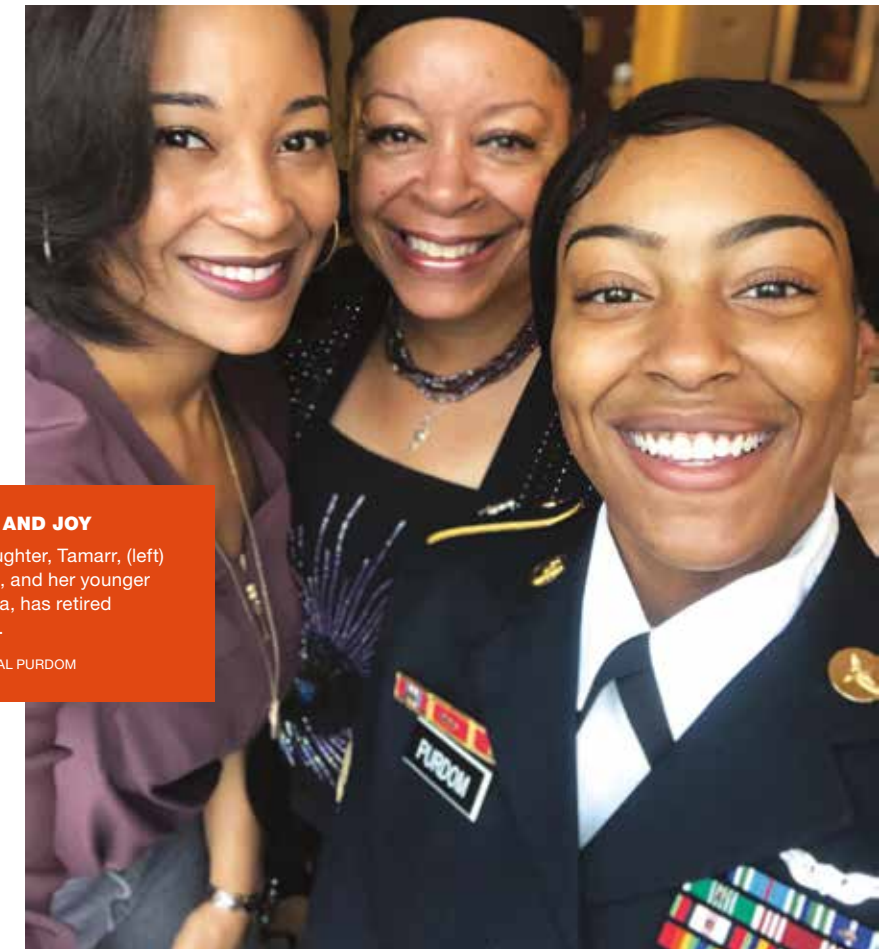
During Purdom's senior year, the school was forced to close the program due to low enrollment. Just another hurdle. Flexible and agile as ever, she switched her focus to mechanical engineering — and made another big decision.

“I got married,” Purdom said. By the time she finished her degree, she also had a toddler daughter and another on the way.

“I walked across the stage eight months pregnant, but I made it,” she said. “I worked full time and had a 2-year-old when I finished my degree. If you have the tenacity, fight and passion, you can do anything, no matter the circumstances.”

With a newly minted college diploma in hand, she went back to her high school to visit her former physics teacher. She said she wouldn't have her engineering degree without him.

“That was a great day,” she said. “He didn't remember what he said, but I told him his disbelief was my catalyst.”



**PURDOM PRIDE AND JOY**

Purdom's elder daughter, Tamarr, (left) is a flight attendant, and her younger daughter, Samantha, has retired from the U.S. Army.

PHOTO: SANDRA SENEGAL PURDOM



### A Passion for Helping Others

After college, Purdom found her way to Boeing through her work as a contract manager for the Army Corps of Engineers. This experience took her from mechanical and chemical engineering to environmental, safety and quality work.

As a production engineering manager for the company's Space Launch System (SLS) team at the NASA Michoud Assembly Facility in New Orleans, she helped Boeing build the core of the heavy-lift rocket that travels to the moon and eventually to Mars.

Now she's transitioning to a role as a product security engineering manager. She will manage the product and cybersecurity design and planning requirements for the U.S. Air Force E-7 program.

When thinking back to her early challenges and the obstacles she's overcome, Purdom is most proud of following her early instincts.

"All of these great experiences have made me who I am and solidified the passion, values and expectations that I have for myself," she said.

As she's progressed in her career, Purdom acknowledges that, while everyone has the ability to pursue their vocation, they may need help getting there. As a manager, she's focused more effort to help other minority teammates who don't necessarily have the opportunities or mentorship to reach their full potential.

Before joining Boeing, when Purdom owned and operated a consulting company, she helped new business owners understand the federal contracting world and helped Black business owners research resources set aside for historically marginalized groups. At Boeing, she volunteers at job fairs and maintains an open-door policy so young engineers feel comfortable talking about both technical topics and professional development.

"My passion has always been helping others who aren't necessarily going to get the opportunities or advocacy to help them grow," Purdom said. "I really want to show young engineers what it means to have a manager who truly cares about them and will go to bat for them."



**"All of these great experiences have made me who I am and solidified the passion, values and expectations that I have for myself."**

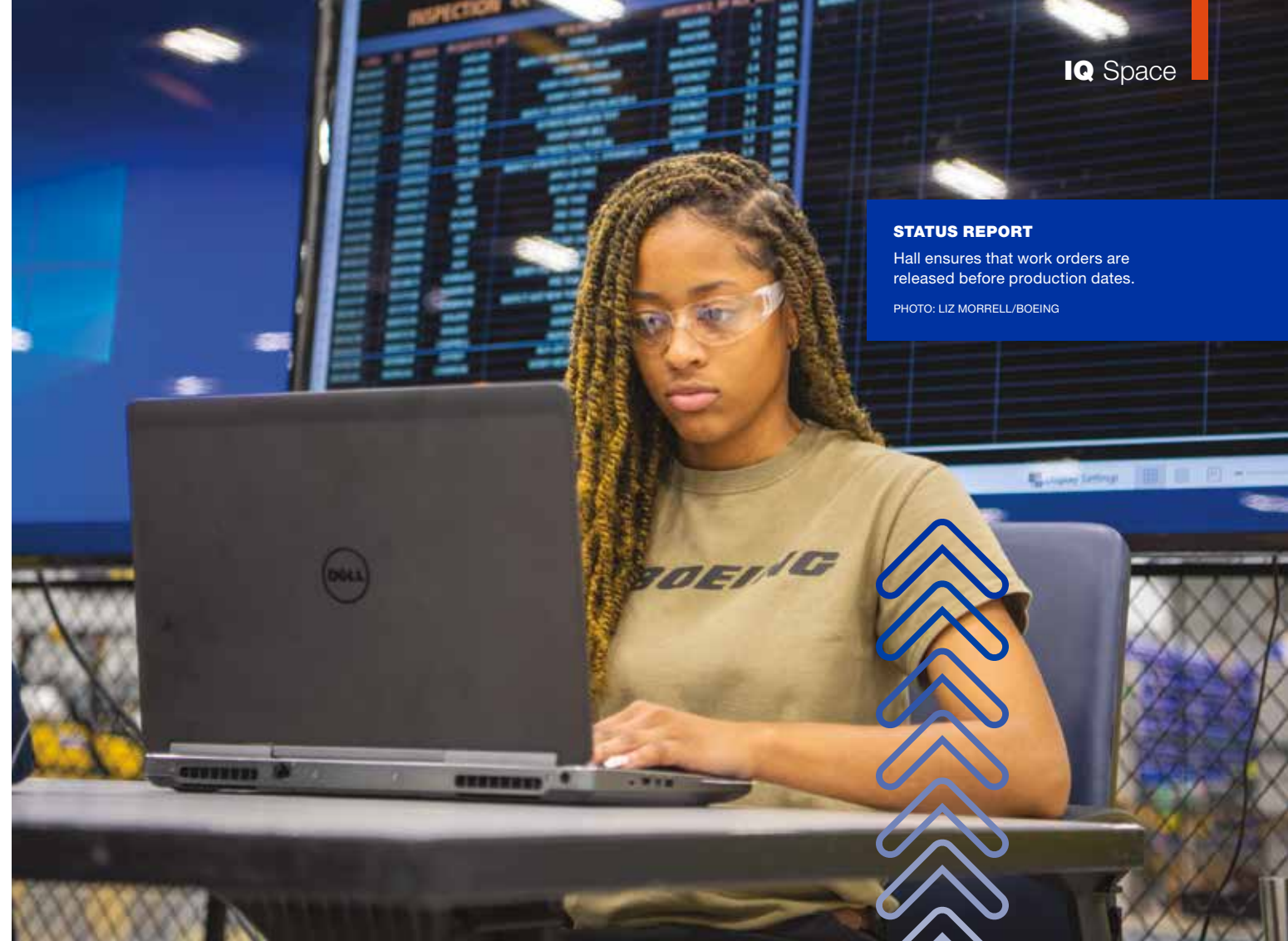
**SANDRA SENEGAL PURDOM,  
BOEING ENGINEERING  
MANAGER**



#### DOC CHECK

Purdom (left) and Hall review documents in the shadow of the SLS engine section (behind, left) and the connected liquid hydrogen and liquid oxygen tanks.

PHOTO: LIZ MORRELL/BOEING



#### STATUS REPORT

Hall ensures that work orders are released before production dates.

PHOTO: LIZ MORRELL/BOEING



### Engineer on the Rise

Patrice Hall considers herself lucky.

She became a first-generation college graduate after earning an aerospace engineering degree from Tuskegee University, a storied historically Black university, during the first wave of the COVID-19 pandemic in 2020. She's also one of Purdom's mentees. Hall started at Boeing as an intern then moved into a role as a manufacturing engineer on the build team for the SLS program. She is now a computing architect across the enterprise.

"Patrice is a phenomenal young woman with a bright, wonderful personality and is always looking for new opportunities to learn," Purdom said.

#### Answering the Call

It took Hall a while to settle on engineering. She was a high-achieving student who enjoyed a variety of subjects. But she always felt most at home with science and math. She ultimately decided to shoot for the stars.

"I've always been curious about space and what's out there," Hall said. "I thought about becoming an astronaut."

**"I've always been curious about space and what's out there. I thought about becoming an astronaut."**

**PATRICE HALL,  
BOEING ENGINEER**



Although both of her parents strongly encouraged her educational pursuits, neither had graduated from college. So Hall began the arduous task of navigating these uncharted waters herself.

After graduating from high school, she enrolled in community college before eventually transitioning to Tuskegee University. A favorite academic counselor from the community college who was also an alum of the university strongly encouraged her to apply. Hall said it is one of the best decisions she ever made.

“I wouldn’t trade my Tuskegee experience for the world,” Hall said. “It made me who I am today.”

Tuskegee University is the only historically Black college or university with an accredited aerospace engineering program. Hall said that further sealed

the deal for her. As an alum, Hall keeps in contact with her Tuskegee engineering family, and like a family, they offer solace during hard times and celebrate their triumphs together.

“That’s what makes us so tightknit,” she said. “As alums, undergrads, we know the struggle, but we know we’re able to rise above it. Tuskegee believes in and invests in its students. As an homage, we do the same for Tuskegee.”



**STUDY HALL**

Hall honed her engineering acumen at Tuskegee University. The majority of her classes were held at Foster Hall.

PHOTO: PATRICE HALL



**“I wouldn’t trade my Tuskegee experience for the world. It made me who I am today.”**

**PATRICE HALL,  
BOEING ENGINEER**



**GRADUATION DAY**

In May 2021, Hall graduated magna cum laude from Tuskegee University with a bachelor’s in aerospace engineering. Here she celebrates with (from left) her stepmom, Earlette Hall; dad Patrick Hall; mom Samantha Walden; and stepdad Anthony Walden.

PHOTO: PATRICE HALL

**Pushing Forward**

Although Hall drifted away from her early dreams of becoming an astronaut, her passion for space and exploring the stars remains stronger than ever. She has high hopes that one day soon she can say she helped send a crew into space.

Of all the experiences and opportunities at Boeing, she most values building relationships with mentors. “I didn’t realize just how important mentorship is until I got into the real world,” Hall said.

The guidance she received from these pathfinders influenced and reaffirmed her passions, values and career choice. She said this personal connection and counsel is especially important in a highly technical field.

“You never know what route you’ll take. And it’s important to find someone willing to embark on that journey with you,” Hall said. “Seeing people like Sandra as managers, pushing forward — you just don’t realize that you can be in that position until you see someone like you there.” **IQ**



**Diversifying Engineering**

As women engineers, Sandra Senegal Purdom and Patrice Hall represent a slim demographic of STEM professionals. Women account for just 13% of all U.S. engineers, according to the Society of Women Engineers (SWE).

Those numbers get even smaller when considering specialization. Only 8% of mechanical engineers are women, according to the U.S. Census Bureau. For women of color, the number continues to shrink, as they comprise less than 2% of all engineering professionals, according to SWE and the National Society of Black Engineers.

Around the world, women remain underrepresented in engineering despite gains in overall professional and technical achievement.

The World Economic Forum published the Global Gender Gap Report 2020, which includes the gender gap as observed in five-year hiring trends on LinkedIn. According to the report, women account for nearly half of professional and technical workers around the world, but their representation lags in engineering (15%).

Boeing has committed to addressing this gap by investing in STEM education and workforce development programs aimed at diversifying the aerospace industry. In 2021, Boeing contributed approximately \$44 million across 296 grants in support of STEM education and workforce development programs and reached 2.7 million young women and girls through various company-sponsored STEM programs.

At this year’s Space Symposium in Colorado Springs, Colorado, Boeing became one of the 14 charter signatories of the Space Workforce 2030 Pledge. The document affirms the company’s commitment to advancing diversity across the aerospace industry and beyond.

In 2021, Boeing provided \$3.4 million in grants to support historically Black colleges and universities (HBCU) through scholarships, student programs and curriculum development, and Thurgood Marshall College Fund (TMCF) programs. Hall is a beneficiary of a Boeing | TMCF scholarship.

Boeing Executive Vice President and President and CEO of Boeing Defense, Space & Security Ted Colbert, a Morehouse College graduate, presented Hall with the scholarship during a gala in Washington, D.C. “At the time, it didn’t feel real,” Hall said. “It was really special to see him there, especially knowing he’s also an HBCU graduate.”