

Sue Nelson

Hello, I'm Sue Nelson and welcome to the Create the Future podcast brought to you by the Queen Elizabeth Prize for Engineering, celebrating engineering visionaries, and inspiring creative minds.

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It's been 50 years since someone from Earth last walked on the moon. But footsteps will be gracing the lunar surface once more within the next few years due to NASA's Artemis missions. And today's guest, Christine Bland has played an important role in Artemis, through her work as an electrical engineer for Lockheed Martin Space Systems Company in the US, specifically on the Orion spacecraft that will take astronauts back to the moon. Christine's many awards include the One Colorado Lifetime Achievement Award for contributions to engineering diversity and inclusion into the workforce, as well as receiving the LGBT Engineer of the Year award in 2014. And Christine, who's transgender continues to play a role in expanding the visibility of minorities within engineering, of which we'll hear more later. Welcome to the podcast.

Christine Bland

Thank you.

Sue Nelson

First of all, how would you describe the Orion spacecraft?

Christine Bland

The Orion spacecraft is a state-of-the-art space vehicle. It's designed to take astronauts into deep space to the moon beyond the moon to Mars, eventually, it's got some of the most advanced electronics on it that's ever flown in space.

Sue Nelson

People remember the landing on the moon and the inside of the Apollo capsules. There are quite a few in museums now. And there are all sorts of gadgets and switches that you move. But actually and this is where you come in that the inside of Orion is a different thing altogether, isn't it?

Christine Bland

Yeah, it definitely is totally different than the Apollo capsules. The Apollo capsules, of course were built from an electronic standpoint with transistors which are large and bulky and very power consuming. Today's spacecraft is built with state-of-the-art electronics that are radiation hardened to withstand the deep-space, heavy particle bombardments and the solar winds. So it's very, very technologically advanced from the Apollo. So it gives us a lot more capabilities as far as what we can do with electronics and docking and manoeuvring and monitoring of the fields around the spacecraft.

Sue Nelson

And your team was specifically responsible for the digital design of specific units, weren't they?

Christine Bland

My particular job with Orion is, I'm responsible for all the electronics or complex electronics ICs, that sort of thing on Orion to make sure that they are designed correctly and basically bulletproof from issues occurring.

Sue Nelson

And what was the most challenging aspect of that design?

Christine Bland

Oh, there's so many I, I couldn't begin to tell you how many challenges and issues we've had to overcome over the years. I joined Orion in 2009 to lead up the design effort for the data and power units which control the power throughout the vehicle. And between 2009 and 2014. When we launched EFT 1 (exploration test flight), we had a huge number of engineering challenges to overcome. And we needed to pull this box together because it was being designed for by three different aerospace companies and trying to manage those different design teams to come up with one box in time that met our requirements for the vehicle was very challenging.

Sue Nelson

Now I was at the launch of the Orion spacecraft test flight in December 2014. For me, it was an amazing experience, you know, a definite wow moment. But I can imagine for you, it was not so much a sort of, "oh, look at that. It's a great launch" that there were a few more emotions going on in your mind?

Christine Bland

Oh god, yes, the 2014 launch just like I'm going to feel when we launch Artemis 1 here in a few months, was exhilarating. One of the things that I've learned through my career is on all of these deep space missions or NASA missions. There's something called delayed gratification. We work for years and years and years to build these systems, watch him go from concept to actual hardware, and then launch. During the 2014 launch, I was here in Denver at one of our facilities working one of the consoles for supporting that launch. And when that took off, it just put tears in your eyes, you know, to see years and years of hard work of you and your teammates, going into the heavens. And that particular mission. Of course, it was a short mission. But, you know, it went up through the atmosphere went through the Van Allen belt went deeper into space, and we've been in the last 50 years comes back at a high velocity and zapping down into the ocean. And the mission was such a success. Watching that whole thing was just beyond words, and being able to describe how you would feel to see your efforts being paid off so successfully. It just it's beyond words.

Sue Nelson

It must also be you know, so nerve wracking, also to know that if something goes wrong, "I hope it's not me." Sort of feeling?

Christine Bland

Yeah, absolutely. You know, we've all been every engineer, every technician, every everyone that's involved across the board with any of these missions, you know, it's in 30 seconds, all that work is being tested when they hit that button, and it's lifting off. And then during the mission, and I've been on the other side of that question, which is what happens when it goes wrong. And you just your heart sinks, you get this gut and you start asking yourself the question, "What did I do wrong? What possibly could the stuff I worked on, cause the anomaly or whatever it is to happen?", and you start doubting everything that you've done.

Sue Nelson

Do you feel that now that engineers are given a little bit more kudos and recognition for the role that they play in these missions now?

Christine Bland

Yeah, the you know, the life of engineers have drastically changed. If you remember watching in the 50s, the engineers in the various console rooms and so forth. They all wear white shirts, black ties, black pants, shortcuts, glasses, pocket protectors, and today, they come from all walks of life, and they're much more human much more personable, and relatable. It was very male centric back in the day. And that's all you saw though there were women that were participating in what was going on, you saw that in Hidden Figures, the

documentary that was made a few years ago. And so a lot of people had a hard time relating to it. I'm glad I didn't. Because, you know, back in junior high school and high school, I knew what I wanted to do with my life. And becoming an engineer and working on NASA projects was my lifelong dream. And somehow, without really knowing how I made it work.

Sue Nelson

That's amazing to know what you want to do from such a young age and then achieve it.

Christine Bland

I vaguely remember, you know, I was on a school trip on the school bus and for some reason, my mind started wondering what I wanted to do and being an engineer for the NASA programmes is what popped in and it stayed with me. That image stayed with me my entire life. And little by little, I've worked my way to achieve that goal, and I don't know what things I did to make it happen, but it happened. And from where I started out in the 50s to where I am now, nobody could have predicted I would get this point.

Sue Nelson

You've also been given this Snoopy pin from NASA, now quite a few people outside the States won't quite realise the significance of that. So perhaps you could explain it?

Christine Bland

Back in the in the 50s, and so forth, the Peanuts cartoon was very into space. They made Snoopy basically a mascot. And they started giving this award called the Silver Snoopy Award to individuals that exhibited the best in the field for making sure astronauts were safe protected, that basically gave their all to make the mission successful. So I received that honour a couple of years ago, nominated through the programme manager through NASA's office and it was, you know, I was very honoured that...

Sue Nelson

I'm not surprised.

Christine Bland

Yeah, that's the astronauts themselves, it's given by the astronaut managers, it's people outside totally outside of your venue that's recognising the stuff that you're doing.

Sue Nelson

And let's face it, if anyone's going to appreciate the work of engineers on a space programme, and the beauty and the accuracy and the importance of it, it's going to be astronauts whose lives depend on it.

Christine Bland

Absolutely. And that, to me, that was, you know, I've received a number of accolades and honours through my career. And there's a handful that are just I will treasure tremendously. You mentioned earlier, the Lifetime Achievement, Engineer of the Year Award, and the Silver Snoopy are three that I just, it just blows my mind that I've achieved those.

Sue Nelson

Let's change astronomical bodies from the Moon to Mars, because you've done a huge amount of work relating to Mars, how did that actually begin?

Christine Bland

You know, like a lot of things in life, I just sort of fell into my first assignment. I was brought into the team here in Denver that was working on the Mars observers, the satellites that we've sent up to Mars to grab images and science from Mars. So one by one, the programmes I worked on were successful. And so you know, by the time I switched over and started working Orion, I worked a tremendous number of deep space missions and satellites that have brought back you know, so much information and knowledge about our solar system.

Sue Nelson

You've designed the electronics for quite a few of the Mars Rovers, like Spirit and Opportunity?

Christine Bland

The Spirit and Opportunity were designed by JPL. And the folks that my management and I knew at JPL brought me in to work on the power system and the system that keeps the spacecraft alive during night. Because the way the rovers would work, they collect energy and do their science during the day and they go to sleep at night. Well, they needed a system to collect that energy and watch the health during the night and then wake everybody up and say it's time to get going, guys. And so they brought me on board to do that. And it was a lot of fun. As far as I know, some of that design is still being used on the rovers, the follow-on rovers. And, you know, if it works, NASA doesn't want to, you know, why redesign something that works?

Sue Nelson

And It must be hard, you know, designing electronics for rovers that are millions of miles away. And you know, the power of the sun for solar arrays is much weaker at that distance. You know, is that sort of one of the main challenges that you have in terms of power supply for your electronics, or do you work around that?

Christine Bland

Well, you've got to make sure, you know, when that when NASA decides they're going to send a mission they specify the conditions that your electronics have to operate under, and you design it to work and you find a way to meet those requirements with the power, the weight, the functionality with the tools you've got. So it is challenging. And you sort of hinted at something that I'd like to follow up on, which is the difficulty of working with spacecraft that's a million miles away on a distant planet, or taking pictures of Jupiter or telescopes that you're not there, you can't see what's going on when something happens, you know, you've got to figure out what's going on to keep the spacecraft alive. And that is extremely difficult because all you get is some telemetry, you know, the design, you know that the characteristics of what's going on. And solving those problems to keep the mission going sometimes is very, very difficult. And we've all heard of the issues that the rovers had, but NASA overcame, you know, we've got, you know, to be an engineer today working NASA stuff, you've got to be very talented and be able to figure out things that you don't have all the pieces parts to figure it out with.

Sue Nelson

You've already touched upon, you know, what led you towards your current job this, you know, this desire to work for NASA as an engineer as a child inspired by the Apollo missions. And, and you went on to study electrical engineering at the University of Colorado, Denver. How did you get your first job at Lockheed?

Christine Bland

Actually, I started working for Martin Marietta that merged into Lockheed Martin at the time, some years later, but basically, I had interned at Martin Marietta, and had made connections so let them know when I was graduating, and I reached out to the engineers and the HR group and got my foot in the door. And I've been very successful ever since.

Sue Nelson

Now, while you were working at Lockheed, in 2011, you transitioned from Ricky to Christine, who you've called your true, authentic self, was it an easy thing to do?

Christine Bland

No, was extremely hard, leading up to the transition, coming out to my co-workers. By then I had been working in the NASA fields and become well known both inside Lockheed Martin and NASA and the suppliers that provide a lot of our electronics as Ricky a very male type person. And when I had to come out, I had to start, you know, reach out to our HR group and our managers and at the time I came out very few, if not any, individuals had come out before me, there had been some but they are far and few between. So we had to find and develop the processes and how to strategize let everybody know. At that time, a lot of engineers would change careers, they'd change locations, they disappear from their old gender and reappear somewhere else's and new gender. And I wanted to keep doing what I did. I love it so much. So we came out and we had a big meeting where we had maybe 200 people where you know, something I kept so secret my entire life was on display to all my co-workers in one moment. It was life changing, to say the least. And so we let everybody know, we called all my suppliers, we call NASA, HR and my managers to let them know that Ricky was turning into Christine. And that the Lockheed Martin programme management expected respect and, and the work not to change, you know, from Lockheed's perspective, doesn't matter if I'm male or female, it's the work I'm doing is so critically important. It's gotta keep going and not miss a beat. If things go wrong, you cost money, it cost schedule, and, you know, could end up with loss of mission or some other really bad events, if you don't keep everybody moving at the same pace.

Sue Nelson

And how did your fellow engineers react?

Christine Bland

They were very positive. They were surprised. You know, they were extremely supportive. If anybody was not supportive at that time. I didn't know about it. They didn't let me know, from my experience now, that's somewhat unusual, because there always seems to be somebody that doesn't like the fact that they're that they need to respect somebody's gender change. I'm a very personable person, I think. And that goes a long way for my success. And when people were confused or had issues, I'd take the time to listen to what they had to say and explain what was going on. And if they made a mistake with pronouns, or so forth, you know, it was easily addressed at the time and never became an issue. My life really blossomed after 2011.

Sue Nelson

And did the fact that Lockheed Martin had a pride group, which had been founded in 1981, which is a huge amount of time ago, did that make a real difference?

Christine Bland

It did, I'd actually reached out to the pride organisation, in 2007, because I started getting very nervous about the fact that I was starting to wear polish on my hands and some other things that I was doing that would change my appearance, and I was getting nervous that I'd get laid off. And I had no idea what the protections were. So the pride group is who I reached out first, and they put me in touch with the HR group and the diversity inclusion. And we spent a lot of time talking through the issues and I was reassured through that chain of network that Lockheed had my back that I would not get fired that they did not expect any kind of repercussions for as I changed and went through a transition. Now it took four more years before actually transitioned. But you know, that pride group was so important because you know, if you're trans, if you're gay, if you're non binary, anybody that has fears that something's going on, to have other employees that are

supportive, that know where you came from. It is so valuable to relieve those fears and give people resources on how to address their issues. And that goes, if you're African American, if you're Asian military, any of the other LGBT Pride ERG BRG organisations out there, that they are very, very needed throughout the industry.

Sue Nelson

Now, you're now a leader within Lockheed Martin's pride group, and you're also a board member of Out to Innovate, which is related to the promotion of engineers, scientists and educators within STEM fields and to get more awareness of these issues. Now, it's difficult to get exact numbers, but estimates suggest that LGBT people are less represented in STEM fields. Why do you think that is?

Christine Bland

I know that a lot of fields a lot of people that are still in the closet, if you will, are afraid that if they come out, they will lose their position, their credibility, so they just don't come out. You know, people are people. So, from my perspective, from the US, and the folks I've talked with, inside the United States, there is a lot of movement, you know, a lot of anti LGBT and especially trans feelings out there that are active in really making it difficult for people to live their lives as their true authentic self, either in a gay marriage or relationship, you know, or being trans and, and trans kids are a big focus in the US these days. And I tend to treat it as you know, people fight against change, and some of the things that the LGBT represent is change at the very fundamental perspective of our day to day lives, you pointed out that when I transitioned, all my co-workers had to change with me, they had to start to see me as female and not as male. And that lays back in the mind, of, of how we relate to each other from our very beginning as kids. And though you know, my personal experience was very positive, other folks, it isn't. It's the fear that they won't be accepted by their friends and family and co-workers. That is one of the big fears that keep people in the in the closet. And it takes time and visibility and exposure to the folks that are in the in the LGBTQ community to really make it so it's an everyday occurrence.

Sue Nelson

And why is it important to bring what some people might consider the personal particularly, you know, a generational sort of view to things is that you sort of kept who you are separate, to work?

Christine Bland

And here's you touched, one of the issues is that, you know, we take a lot of things for granted, you know, a heterosexual couple that's got kids, you know, they'll have pictures on their desk, they will talk about their weekend and things that they've done, you know, if they get married or engaged, they talk about their honeymoon and so forth. And so, you know, just as human beings, we are social, we talk about these things with one another. And most folks don't even think about that when they're in the workplace. It's there. It's just such a part of who we are as human beings, and we don't think about it. But when somebody comes out as gay, and they start to show pictures of their husband, or their wife and their gay marriage, it's shocking to them. So then all of a sudden, now why are you bringing this into the workplace? Well, it's because that's who we are as human beings. We are social creatures, we share who we are our experiences, we go to ballgames we go to concerts, and if you're, if you know, and you like somebody that's gay, the fact that you're going to be around them, and they're going to have their spouses with them, and their boyfriends and girlfriends. You know, it, it's just part of being human. And some folks have a hard time with that they see it as you're sticking in my face. And it doesn't belong here. Well, it belongs wherever human beings are.

Sue Nelson

So this might explain why the magazine chemical engineering and news when they conducted a sort of an informal poll in 2016 of its readers, they found that 44% of LGBT respondents said that they'd felt excluded or

intimidated or harassed at work in the course of their career. What do you wish you could tell yourself, you know, if you were going back in time, to when you finished your degree?

Christine Bland

I would say “have courage have faith that you will get there not only as a successful engineer, but your true authentic self”. I knew I was trans at age five, and I hit it all the way until I was, you know, up through my 40s and early 50s until I started realising I couldn't live that life anymore and it took me a long time to get to the point where I had the courage to come out. And I would have told myself as an engineer, that you know “have the courage to be who you are. And you would succeed. You know, have faith in yourself”.

Sue Nelson

And is this do you think why, often in any profession, the role of a mentor can make a huge difference to someone's career, particularly if there's someone who is like you. Do you think this role of mentoring is crucial for diversity and engineering?

Christine Bland

I think that is absolutely crucial, because think about it, you're sitting there your entire life struggling with some issue or an issue, you're gay, you're bisexual, you're transgender, and you're struggling with his in your own little in your head and you're you've isolated because you know, the folks that are around you may not accept it and they may, you know, it just so much fear is caught up, having a mentor that's gone through it and can advise you on how to tackle those issues is so important. I've mentored quite a few individuals through the years. And, you know, I wish I would have had a mentor when I came out of when I came out of college or in high school for that matter, that would help me solve a lot of the issues I suffered through my life, as a result of being in that closet, a mentor would have gave me the courage and the tools I needed to overcome my fears and succeed whenever I came out.

Sue Nelson

Well it sounds like your company, you know, played a hugely positive role in terms of your career and life. I wondered, as we come to the end of the podcast, what ground-breaking engineering innovation would you like to see, when the Queen Elizabeth Prize?

Christine Bland

From a new technology standpoint, I would say, advances in computing technologies that we're impervious to radiation would help us because one of the things I do really believe, is that we are on the verge of just a huge industry in the space field. You know, I'm involved with it ESA stuff.

Sue Nelson

The European Space Agency.

Christine Bland

Yeah, they're building our service module. So I've been able to work with a lot of engineers from in Europe on that effort.

Sue Nelson

This is the module that powers the Orion?

Christine Bland

It powers it, it's also the thruster, it does all of that. Those technologies, more than just power. But being that I have to make sure that all the FPGs and ASICs...

Sue Nelson

What are FPGs?

Christine Bland

Think of them as customized ICs.

Sue Nelson

Ok. Integrated circuits.

Christine Bland

Yeah, that we designed that allow us to stick a lot of electronics in a very small package. I've been able to review a lot of stuff and gotten to know many engineers from France, Italy, England, Belgium, and it's been eye opening. At some point I plan on when I retired traveling Europe and spending time in the art museums and stuff.

Sue Nelson

We haven't even touched on that. But you know, you love art and I've looked at your art online as well. It's obviously a while we always say that scientists and engineers are very creative people, and so many of them, love the arts and are engaged in the arts and you're the same.

Christine Bland

Absolutely. Yeah and so one of the things, I've wanted to go to the Louvre and spend time in the Louvre and some of the art galleries in England, and you can't take a vacation to spend a week there, you've got to, you've got to spend time and immerse yourself in the culture and the people and spend time to, you know, travel and learn the art of what's going on in Europe. But getting back to science, you know, there's a lot of momentum across the country and in the world, for that matter to get us into space. And learn more about the moon, Mars, you know, our entire solar system for that matter of fact.

Sue Nelson

And it couldn't be done without an engineer, like yourself. Christine Bland, thank you very much for joining me on the Create the Future podcast.

Christine Bland

Thank you.

Sue Nelson

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