Guess Speaker Presentation - Mr Lynn Vernon-20241024\_181749-Meeting Recording.mp4

Speaker 1 (00:00:02) - My question, my first question to you is who can tell me what is NASA's goal? That's what Kennedy said. NASA's goal is to go where no man has gone before. Correct. To explore space. Outer space, okay. He said it. He said it. Alright, what if I told you, if you went back and looked at the NASA Space Act, the Space Act literally says NASA, go gather data. From that data, develop information.

Speaker 1 (00:01:03) - From that information, develop knowledge for the betterment of humankind. So the foundation is data. So we go to explore to gather data to learn. We send humans in space to gather data on the human factor to learn. And what do we learn? What kind of things have you heard from NASA that we've learned? Signs of water. Actually, yes. Some of the recent findings with the James Webb telescope and several others. There's some fascinating stuff. Even on the moon, we found water. And on Mars, we found water. Microwave oven. Yeah.

Speaker 1 (00:02:07) - The technology that we use, that can provide...

Speaker 13 (00:02:13) - Radiation, the cosmos.

Speaker 1 (00:02:14) - Yeah, there's some interesting things, and we'll talk a little bit about that. So you and I were talking earlier. So with Apollo, when Apollo was flying, we used ground stations that communicated with the vehicle. Anybody have an idea, and you can't answer this, or anybody that was in here when I was talking about it. What was the data rate for Apollo? A little more. No, it was 64 bits per second. Bits per second.

Speaker 1 (00:02:55) - The amount of compute power that we used for Apollo included the whole first floor of the control center, which is close to 15,000 to 18,000 square feet. Big mainframes. Big mainframes that were programmed with punch cards. How many of you actually have held or done anything with a punch card?

Speaker 13 (00:03:18) - Outstanding. No.

Speaker 1 (00:03:22) - That's high technology. We had punch cards that programmed our mainframes that were literally decks and decks and decks of punch cards that did all the programming. And inside that mainframe was all the processing, and all the displays that we had were basically ASCII text displays. The amount of processing that we used at that time, raise up your cell phone. You have more processing power in your cell phone today than we had for Apollo.

Speaker 1 (00:04:04) - So with that, you start thinking and you start looking at where we're going with AI evolution, with the cybersecurity challenges, with the data that we're ingesting and producing. Where's it going? We've got AIs that are running on GPUs and now TPUs. Tons and tons of processing power in big data centers that literally are having to move close to the power stations to be able to maintain the power and the cooling that is needed in those data centers.

Speaker 2 (00:04:45) - So, there's an interesting challenge as we go into this. So, I'm going to talk a little bit about the data, I'm going to talk about AI, I'm going to talk about how NASA, where we're looking at things, and we're going to discuss some of the interesting challenges that you will be facing from cybersecurity, from an AI, from a training, a teaching, all these elements. Even in your day-to-day life, what things will change. So, I've got a little video to kick you off. Now, this video, it does talk by 2024.

Speaker 2 (00:05:37) - After this video, we'll talk about why that hasn't occurred.

Speaker 3 (00:05:45) - 50 years ago, we

Speaker 2 (00:06:05) - pioneered a path to the moon. I had the audio going and now it's not. Thank you. Now, we're still

Speaker 13 (00:07:08) - not.

Speaker 3 (00:07:08) - Talking about my sharing, it's not giving me the audio.

Speaker 2 (00:07:13) - Yeah, but I had, that's my mic, I had it a minute ago.

Speaker 13 (00:07:18) - 50

Speaker 3 (00:07:31) - years ago, we pioneered a path to the moon. The trail we blazed, cut through the fictions of science, and showed us all what was possible. Today, our calling to explore is even greater. To go farther, we must be able to sustain missions of greater distance and duration. We must use the resources we find at our destinations. We must overcome radiation, isolation, gravity, and extreme environments like never before. These are the challenges we face to push the bounds of humanity. We're going to the moon to stay by 2024, and this is how.

Speaker 4 (00:08:17) - This all starts with the ability to get larger, heavier payloads off planet and beyond Earth's gravity. For this, we design an entirely new rocket.

Speaker 3 (00:08:28) - A space launch system. SLS will be the most powerful rocket ever developed.

Speaker 4 (00:08:32) - And with components in production. And more in testing. This system is capable of being the catalyst for deep space missions. We need a capsule that can support humans from launch. Through deep space and return safely back to Earth. For this, we've built Orion. This is NASA's next generation human space capsule.

Speaker 3 (00:08:54) - using data from lunar orbiters that continue to reveal the moon's hazards and resources. We're currently developing an entirely new approach to landing and operating on the moon. Using our commercial partners to deliver science instruments and robotics to the surface, we are paving the way for human missions in 2024. Our charge is to go quickly and stay, to press our collective efforts forward with a fervor that will see us return to the moon in a manner that is wholly different than 50 years ago.

Speaker 4 (00:09:27) - We want lunar landers that are reusable, that can land anywhere on the lunar surface. The simplest way to do so is to give them a platform in orbit around the moon from which to transition.

Speaker 3 (00:09:37) - An orbiting platform to host deep space experiments and be a waypoint for human capsules. We call this lunar outpost Gateway.

Speaker 4 (00:09:45) - The beauty of the Gateway is that it can be moved between orbits. It will balance between the Earth and moon's gravity in a position that is ideal for launching even deeper space missions. In 2009, we learned that the moon contains millions of tons of water ice.

Speaker 3 (00:10:02) - This ice can be extracted and purified for water. It can be separated in oxygen for breathing or hydrogen for rocket fuel.

Speaker 4 (00:10:08) - The moon is quite uniquely suited to prepare us and propel us to Mars and beyond.

Speaker 3 (00:10:15) - This is what we are building.

Speaker 4 (00:10:17) - This is what we are training for.

Speaker 3 (00:10:19) - This we can replicate throughout the solar system. This is the next chapter of human space exploration. Humans are the most fragile element of this entire endeavor. And yet we go for humanity. We go to the moon and on to Mars to seek knowledge and understanding and to share it with all. We go knowing our efforts will create opportunities that cannot be foreseen. We go because we are destined to explore and see it with our own eyes. We turn towards the moon now, not as a conclusion, but as preparation. As a checkpoint toward all that lies beyond.

Speaker 3 (00:10:55) - Our greatest adventures remain ahead of us. We are going. We're going. We are going. We are going. We're going.

Speaker 2 (00:11:16) - What was this video posted?

Speaker 3 (00:11:18) - Huh?

Speaker 4 (00:11:19) - What was this video posted?

Speaker 13 (00:11:23) - 2009.

Speaker 2 (00:11:26) - No.

Speaker 13 (00:11:53) - 2012. Yeah. Whoops. The trail we blazed cut through the fictions

Speaker 3 (00:12:22) - So you heard it.

Speaker 2 (00:12:24) - Discover and expand knowledge for the benefit of humanity. That's probably mine. See if everybody can.

Speaker 4 (00:12:42) - All right.

Speaker 2 (00:12:43) - Can everybody still hear me online? Raise your hand if you can. So discover and expand knowledge for the benefit of humanity. You kind of heard that element. Explore.

Speaker 3 (00:13:01) - Learn.

Speaker 2 (00:13:01) - Understand. Develop new capabilities. Develop new technologies. All of these to expand and for the benefit of humankind. Right? So we're going to the moon. Artemis, as you heard, that was talking about Artemis. This is the program that's going back to the moon. You know, it's the sister of Apollo. Apollo was our first mission. So that's how it got identified as our next program.

Speaker 2 (00:13:38) - Now when you look at Artemis and you look at what we're doing, we talked about this a little earlier about the Space Act of NASA. And if you think about the Space Act and look at what we're trying to do, it is for the benefit of humankind.

Speaker 1 (00:13:57) - we're doing it to learn.

Speaker 5 (00:13:59) - We want to explore.

Speaker 1 (00:14:01) - We want to expand our knowledge. We want to find new things. We want to make life better for all of us. So, there's key elements. There's, as part of the Space Act and the requirements, it's data sharing. That's why you see all that Earth science data, all the atmospheric data, all the imagery, all of the data from the experiments, that is released to the public, released to the science community, released to the general community. We partnership. The Artemis Program is being defined by the Artemis Accords.

Speaker 1 (00:14:51) - The Artemis Accords currently has 33 countries that have signed up that we're all going to the moon to get. 33. And over 300 universities and small businesses as well as commercial companies. it and you think about what Apollo did to change how we look at things, when all of these countries come together to do that one objective, what does that mean? How will we look at things differently? Right. So, that becomes an element of, this becomes one of those common threads for us all. Young and old.

Speaker 1 (00:15:51) - American, Russian, China, Japanese, United Americas, you name it. Geospatial data, that's a fascinating one. There's a lot of studies as far as even what's going on with Earth. The tidal waves, the water problems, the atmospheric issues. Even when you look at the aquifers that are feeding water to the world in different areas in the country. How is it shifting? What is changing? These provisions ensure NASA data contributes to the scientific advancement. So, ESRI is actually one of those satellites that was actually put up that scans data, the Earth.

Speaker 1 (00:16:52) - And so, it gives us a lot of imagery data. It's, yeah, it's impressive. But, I'm going to blow your mind here in a minute. And feel free to ask any questions.

Speaker 5 (00:17:09) - I have one.

Speaker 1 (00:17:10) - Only one?

Speaker 13 (00:17:14) - I have a million. I'll start with one.

Speaker 5 (00:17:16) - You said that many universities, small business are all growing. How can HCC participate?

Speaker 1 (00:17:26) - I think it's a great opportunity for HCC to participate in many ways. Students, there are opportunities as pathways and interns to come work at NASA. Professors, through Space Act agreements, there are opportunities where we have a challenge that you could partner in helping to solve that challenge. In research, there are opportunities even for professors under CRADA Acts to come and work on a fellowship. So, lots of opportunities for all of us to engage and all of us to do things together. So, why we explore?

Speaker 6 (00:18:21) - Isn't that interesting? Science, national posture, inspiration. Did you know that NASA, as far as a logo, is the number one known logo around the world? Why? Inspiration. Doing things that are hard. Accomplishing unique challenges. And when doing that, we've got to think about physical science, biological, planetary, human research, advanced and technology priorities, climate, economic leadership, human condition, exploration, astrophysics, heliophysics. Tell me one place where cyber security or AI doesn't come into play. Where does it not?

Speaker 6 (00:19:25) - In one of these areas. Also, I can tell you, I'll ask this question. What one discipline or skill does NASA not hire or use? Can you name one? Can anybody? We have chefs. We have lawyers. We have architects. We have engineers, mechanical engineer, electrical engineering, civil engineering. We have scientists. We have doctors. We have IT. Everything. Because when you start looking at what we do and where we go, what do I have to consider? If I'm putting humans in space, I got to think about their environment. How do I protect them?

Speaker 6 (00:20:26) - How do I make them safe? How do I feed them? How do I keep them physically fit in zero gravity? All these elements you got to think about. When you talk about partnerships and engagement between all of us, how do I keep that space act or that agreement for SpaceX data protected when it's their intellectual property that we're using or they're using our data? Why are we not on the moon today? Okay, that's a good question because we talked about that. It did say 2024. When we planned it out and proposed this, the US agreed and said, we shall.

Speaker 6 (00:21:31) - Then Congress said, you shall with this amount. Then technology said, well, you're not quite ready. When you look at all those factors, a lot of it is contributing elements. It's not cheap. It's not cheap. Our most costly element for NASA is not what we do in space. It's getting to space. It costs us over $150,000 per pound. If you look at the rocket that takes us up, the amount of thrust that we have to have to get us up there, not only has to get these humans, our cargo, and the other elements, but all that fuel that it's consuming as it's going up.

Speaker 6 (00:22:33) - The amount of total capacity that you get in space is very small compared to the capacity and the total weight of that rocket. The first one of you that develops anti-gravity propulsion, I want to meet you. I want to thank you and help us get there. I see somebody being looked at. Good question. We are actually going to the moon as far as a manned space flight this next year.

Speaker 1 (00:23:18) - So we're going to orbit it with a crew and then the following year we're going to try to land.

Speaker 6 (00:23:25) - So that's 2026.

Speaker 1 (00:23:29) - Can we develop enough technologies, enough capabilities and get enough funds and backing from across the world to get us to 2030?

Speaker 6 (00:23:37) - I don't know.

Speaker 1 (00:23:40) - But can it be done at the rate of technology change? So the challenge becomes understanding that drivers and those elements and looking at predicting how we can get there.

Speaker 6 (00:23:54) - So I hope that we can. I think in my children's and my grandchildren's lifetime, we will. But going to Mars brings its other unique challenges. So let's talk moon to Mars.

Speaker 1 (00:24:15) - That's M2M, moon to Mars architecture. And we talk about the architecture of what we're trying to do, what we're trying to achieve, how we're going to do it. Historically with Apollo, the vision, the goal was we're going to the moon. And that was a challenge from President Kennedy.

Speaker 6 (00:24:34) - So the expectation was just to achieve that. We've changed our thought process and our elements of how we're approaching it and saying, OK, why are we going to the moon?

Speaker 1 (00:24:49) - What are we going to do? Why are we going to Mars?

Speaker 6 (00:24:52) - And so now we're engaged with the world scientific community to understand why.

Speaker 1 (00:25:03) - And based on that why, we're designing an architecture. And remind me later, we'll talk about AI in that same concept.

Speaker 6 (00:25:16) - So in looking at this, you can see human lunar return, sustained lunar evolution, foundational exploration, human to Mars.

Speaker 1 (00:25:25) - So we go to the moon and like was shown in the video is being able to tap that water to be able to actually get water, oxygen and fuel.

Speaker 6 (00:25:37) - Now, using the moon as a stepping stone to Mars, if I can produce the fuel, might be less expensive than trying to lift off the earth. But I've still got to get everything to the moon.

Speaker 1 (00:25:52) - So then it becomes the question of how do I manufacture something there on the moon? What do I manufacture?

Speaker 6 (00:25:59) - So in situ 3D printing becomes an interesting element.

Speaker 1 (00:26:07) - So now we get into construction, mechanical, radiology, all these elements that we got to think about.

Speaker 6 (00:26:18) - Material science, very interesting. One of the big things I want to point out for this group is right here, data systems and management.

Speaker 1 (00:26:33) - Now, why?

Speaker 6 (00:26:36) - Why is that a fundamental element of the architecture?

Speaker 1 (00:26:41) - Anybody?

Speaker 6 (00:26:43) - We need to know. We got to decide what data we're going to bring, right? For what purpose? Because we have a limited communications. But we also need to decide what data we need to capture and make available to our tools.

Speaker 1 (00:27:01) - And what does that mean? And how does it work together?

Speaker 6 (00:27:04) - But not just us. If it's 33 countries and over 300 companies, commercial space, all these working together, what data do we share?

Speaker 1 (00:27:16) - And how do we share that data and protect that data from the beginning?

Speaker 6 (00:27:24) - Interesting challenge, isn't it? A human problem? Why do you think it's a human problem?

Speaker 1 (00:27:33) - Systems when it comes to that.

Speaker 6 (00:27:35) - Sometimes you find a lot of failures in cybersecurity. Some of these things are forced set up in systems architecture. Forced set up in systems architecture. Because 9 times out of 10, cybersecurity is one of the last items thought about.

Speaker 1 (00:27:51) - And the data element is also the next to last. The technology, the capability, the vehicle, the propulsion, the avionics, all those elements. And you start thinking about that when you think that paradigm and it becomes an afterthought.

Speaker 6 (00:28:10) - it becomes a problem.

Speaker 7 (00:28:13) - Also because we have adversaries. So everything by the rules, everyone in agreement, things are going to be more fluid. But we have adversaries that don't want us to or the community to be protected.

Speaker 1 (00:28:34) - It's mine. I won't protect it.

Speaker 6 (00:28:36) - It's my system.

Speaker 1 (00:28:39) - It's my data because that's what empowers me. So when we start thinking about that and Samir, you kind of said about bringing us all together, we've got to change that paradigm, that culture and think about it differently. It's ours.

Speaker 6 (00:29:01) - It's for all of us.

Speaker 1 (00:29:04) - So that's why it's one of the fundamentals of the architecture. Changing that paradigm, changing that culture, changing that way we look at things from day one. And trust me, in this, for you cybersecurity teams, we have experts that are focused on vehicle, data, cybersecurity, in space and everywhere. So for those that have been working in IT for a while and thinking about IT for a while, when you stand up something, what's your focus?

Speaker 6 (00:29:43) - The system, the application, or the data?

Speaker 1 (00:29:52) - Come on.

Speaker 6 (00:29:54) - What's your...

Speaker 1 (00:29:55) - There you go.

Speaker 6 (00:30:00) - So historically we built systems that housed data.

Speaker 1 (00:30:07) - And yes, that data was used for many things. Okay. And we kind of knew, in general, what that data was. But our whole focus and our whole methodology of how we're approaching things and what one of my primary responsibilities is, is change from system thinking to data centric focus. Glad you could join. What's your name?

Speaker 7 (00:30:34) - My name's Jabbar.

Speaker 1 (00:30:35) - Jabbar. Nice to meet you, Jabbar. Excellent.

Speaker 7 (00:30:43) - And he's been injured for a while. He is fine.

Speaker 6 (00:30:52) - So this gets into a different thought process, a different methodology of how you look at things, right? Not quite historically how we looked at things. So with that, let's look at the data systems and management. This group of capabilities that works together to transfer, distribute, receive, validate, secure, decode, format, compile, and process data and commands.

Speaker 1 (00:31:21) - International Space Station that's currently flying in the low Earth orbit currently is really managed by the Mission Control Center here at Johnson Space Center.

Speaker 6 (00:31:40) - That's interesting because it was charged all day just protecting for this, so

Speaker 1 (00:31:55) - now we're going to have an interesting issue as far as audio. I am going to have to switch audio for a second, guys, so bear with us. Where's the other cord for the audio?

Speaker 7 (00:32:21) - The other table?

Speaker 1 (00:32:22) - Yeah, the other table. Hey, can everybody still hear us online?

00:32:42 -

Speaker 6 (00:39:45) - Yeah, yeah, you can talk to me. I'm in a meeting, so all I need— Test.

Speaker 2 (00:39:53) - Now they can hear us.

Speaker 6 (00:39:54) - No, no, let me— No, it's sending it now. Can you all hear us online? All right.

Speaker 2 (00:40:02) - Sorry.

Speaker 6 (00:40:06) - Yeah, now they—yes, now they can hear. So, thank you all for letting us know.

Speaker 2 (00:40:22) - Keep us informed.

Speaker 6 (00:40:24) - So, let's—looking at that, the velocity of the data, the veracity of the data, as we go through this, it's not going to get easier.

Speaker 2 (00:40:36) - You know, more data does not equal more insight, especially if I can't do anything with it. So, anybody ever heard about a Yotabyte?

Speaker 6 (00:40:50) - First time? Isn't that great?

Speaker 13 (00:40:54) - Yotabyte.

Speaker 6 (00:40:58) - Enough info to bury the entire U.S. under 296 feet of sand. That's a lot of data.

Speaker 2 (00:41:08) - That's a lot of data, right?

Speaker 8 (00:41:10) - What is that in relation to what they say the DNA can hold? Because don't they say they can hold petabytes and they can drop them over blood or something?

Speaker 2 (00:41:16) - Yep.

Speaker 8 (00:41:16) - That's what my question was. Like, is it something—is there a way that that's being used at all? Like, I mean, I know that once you go past the hard drive, right, you only get to a certain size, otherwise the hard drive increases in size, and you can put more inorganoids and biologic data.

Speaker 6 (00:41:30) - Well, so, you know, there's a lot of elements of even what can I do in quantum glass.

Speaker 8 (00:41:35) - Yeah.

Speaker 2 (00:41:37) - And become some interesting elements of what I can do. If you're a sci-fi nut like me and look at the quantum quartz storage that is portrayed in sci-fi, it's coming.

Speaker 6 (00:41:54) - It's coming.

Speaker 2 (00:41:55) - But in that regards, when you start looking at that, that amount of data, on a little device the size of your thumb, it's pretty scary.

Speaker 6 (00:42:06) - What can you do with it? So today, if we look at—and I mentioned Apollo, 51.2 kilobytes, kilobits, I mean, within the unified return, so that's the total element. Shuttle, 192. KU band for shuttle, 50 megabits. Station that's up there flying today, 600 megabits possible, but we typically use 300, but most of that's imagery, video.

Speaker 2 (00:42:42) - But it's data too. But there's a lot more data that we produce on the vehicle than we ever downlink. We only downlink what we need to ensure operations, and that if something comes up, we can get that other data.

Speaker 6 (00:43:04) - But this data is kept and stored?

Speaker 2 (00:43:07) - Kept and stored.

Speaker 6 (00:43:08) - And turns into dark data? I still have Gemini data from all the vehicles. I have the imagery. I have the photos.

Speaker 2 (00:43:19) - I have all the data from Gemini. We are a national resource. We are a national lab. Our data from a vehicle is considered a permanent record.

Speaker 6 (00:43:39) - Bag tapes, a lot of areas.

Speaker 2 (00:43:43) - I've got film that is the type of film that is having the vinegar syndrome, a C-type tape, video. It's now going through vinegar syndrome, and I have it in a cold vault to prevent it from degrading any further. So a lot of those elements that we've got to deal with, that historical data. There's also within the federal government NARA, which is National Archive and Records. And there's a lot of our stuff that we've fed to NARA, a lot of paper.

Speaker 6 (00:44:16) - A lot of paper. Dark data. Now, Hubble Space Telescope, okay, we had 2.7 uh let's see, I lost my gigabytes per day. James Webb, who loves James Webb? Man, some of those images are just amazing. 58 gigabytes per day. Who's heard of the Roman Telescope? It is being built right now. It is being built right now. Sorry, 1.1375 gigabytes per day. How much of that can you process? What can you do with it? What's the possibilities? So when we start looking at the terabytes of data that we're going to be bringing in, how do I share it? How do I process it?

Speaker 6 (00:45:33) - How do I know what's in it? So as we get through this, the data value implications when we start looking at this, not just data growth, but the need for speed. So I need to be able to do these things even faster. Welcome. Even faster, but even more in a shorter time period. So from a cyber security perspective of the challenge, how do I know? How do I protect? Who has access? Where do I keep it? What do I do with it? From an AI, what can I learn from it? What can I achieve with it? What do I not know about it?

Speaker 6 (00:46:34) - So as we look at these data challenges, you look at some of the surveys that were out there from Gartner Data Analytics. They surveyed over 600 data leaders around the world. And according to these studies, the lack of data management and governments could be viewed as a free climbing with no harness or safety. Really? Come on, guys. Good luck. Thank you. Are you coming back? Oh. So who likes to free climb without a rope? I like it. How does that make you feel? How do you, what do you think in that regards? Edgy. It's anxious. Yeah. Hopefully excited.

Speaker 6 (00:47:34) - Vulnerable. Very present. That becomes an interesting element, right? How about you guys? Y'all been awfully quiet. So when we start looking at the barriers and thinking about the barriers of achieving data governance, you know, lack of commonly understood approach across organizations, that's one of our big challenges. Lack of key roles, lack of skills, experience, inadequate funding, resistance to governance. It's mine. You want it? Why do you want it? It's mine. I do what I need with it. You don't need it. Why do you need it?

Speaker 6 (00:48:25) - Why do you need to know what I'm doing with it? This is a daily story in cybersecurity's life. So roadmap. We got to look at this. We got to think about data disorder. Somebody tell me, what do you think is data disorder? Give me an example. Yes. Incomplete data? That's a possibility. Yes.

Speaker 1 (00:49:03) - Maybe duplicate. Yeah.

Speaker 13 (00:49:04) - Okay.

Speaker 1 (00:49:05) - What else?

Speaker 7 (00:49:06) - The same data, financial records, bank, back to, I don't know, human resources.

Speaker 1 (00:49:21) - Right.

Speaker 7 (00:49:22) - The same information, but the bank can be, you know, make certain decisions based on the same data.

Speaker 1 (00:49:29) - Right.

Speaker 7 (00:49:29) - That don't align with the money you're going to get.

Speaker 1 (00:49:35) - And it's a good example of thinking about all the elements you all talked about as far as data disorder and think about the perspective of who changed what data when, and how do you know what's authoritative and what's not? Where is it? Where is that authoritative? How do we know where it is? And do we know for sure that that hasn't been corrupted in some way? And understanding that data and what it means to us. A bank is a good example in thinking about those financial records and who owns that data of the financial records and who is it accounted to?

Speaker 1 (00:50:15) - And if that person dies, who does it go to? And how does that record get transitioned?

Speaker 7 (00:50:30) - Let's say somebody applies for a job, right? They run the background check and everything, financial records, and that's a third party that's doing that. And you cannot ask, for example, saying, well, can I have a copy of what you, you know, inquire about me?

Speaker 9 (00:50:51) - Oh, Yeah, it's your data.

Speaker 1 (00:50:58) - Now, if I think about data disorder and AI, what does it mean?

Speaker 9 (00:51:06) - Unclassified, unstructured, everything that you have is basically at its infant stage.

Speaker 1 (00:51:11) - And as a result?

Speaker 9 (00:51:13) - It's free.

Speaker 1 (00:51:16) - It's free to everyone, but also it could hallucinate because it really doesn't know.

Speaker 9 (00:51:22) - It's over the scope.

Speaker 1 (00:51:23) - So we got to get into this defined data. We need to understand that data. We need to profile it. We need to classify it. I need to identify it. Is it PIA data? Is it ITAR data? Is it export controlled data? Is it private medical data? Is it vehicle data?

Speaker 9 (00:51:42) - Is it individual data?

Speaker 1 (00:51:45) - Is it decisional data?

Speaker 9 (00:51:47) - What is it?

Speaker 7 (00:51:48) - Let's see.

Speaker 1 (00:51:52) - Sure. We'll talk that. So I need to make sure I master, create a master and reference data. I need to evolve and start looking at this and thinking about these elements as to how we're approaching it. Okay. And I need to document and I need to govern it from day one, from the time it's generated to wherever it goes. And then I get into smart data. Now, who all has AI? Raise your hand.

Speaker 7 (00:52:30) - All right.

Speaker 9 (00:52:32) - I will challenge every one of you.

Speaker 1 (00:52:35) - Do you focus from here to the right or from the right to the left? From left to right. That's your thought.

Speaker 13 (00:52:53) - What else?

Speaker 1 (00:52:56) - No. As far as looking at how I approach this and looking at how we're going, do I do it from left to right, right to left? Here's the element. And what I see a lot, and I'm going to poke at those data scientists every day is because they want to sit here and focus on getting this structure. And I'm sitting there going, what am I going to do with that data and how am I going to use it?

Speaker 1 (00:53:24) - So I need to be engineering from right to left, just like we were talking about the vehicle of looking at when I go to Mars, that I want to understand the science of what I want to try to achieve and then design a capability to achieve it. A different mindset, a different focus.

Speaker 1 (00:53:50) - But therefore, I challenge it's not left to right as far as data and AI ready data, it's AI engineering, it's engineering data to achieve an AI objective. My goal, my objectives of what I'm trying to achieve, I can define from everywhere from process improvements to large data analytics to understand what I don't know to anomaly checking and evaluation. So with that, AI considerations that we've got to get into, what is our AI readiness framework? And we've got to look at, are we organizationally ready? No. Are we culturally ready? Sure.

Speaker 1 (00:54:50) - I have talked to so many people that go, here comes Terminator. Yeah. But guys, I will tell you that when I look at AI, I don't look at it as artificial intelligence. No. It's assistive intelligence. Here's why. The human brain and the capabilities for its intelligence and to develop and analyze things is very unique. Our compute powers, our algorithms, we're starting to mimic certain elements to assist. But true artificial intelligence, I think is quite a ways away. So our perspective of what we're looking at as we go into it.

Speaker 1 (00:55:46) - Yeah, I know you're thinking about this. Keep thinking about it. As we go into this, and as I look at the mission and going to Mars, do I want an AI to command a mission critical vehicle?

Speaker 13 (00:56:04) - No. Can it? Could it?

Speaker 1 (00:56:10) - Really?

Speaker 13 (00:56:11) - I don't know.

Speaker 1 (00:56:14) - That becomes an interesting element. Can you validate that that AI can make those decisions? Exactly. It's non-deterministic in a lot of those respects. So the challenge gets into that deterministic. I can automate a lot of things because I can determine the states and what it does. But when I get into AI, the non-deterministic state that I'm dealing with becomes more difficult to validate and prove to ensure the safety of the vehicle, the mission, the crew. So as we go into this, we got to think about those ethics. We got to think about the readiness.

Speaker 1 (00:56:58) - We got to think about how we approach it, what it can do, what it shouldn't do, and where we go with it. We're going to use going to the moon. Yes.

Speaker 7 (00:57:16) - We did it once.

Speaker 1 (00:57:18) - It's way, way far. Right. We did it going there and staying for a couple of days and coming back.

Speaker 7 (00:57:30) - Exactly.

Speaker 1 (00:57:31) - We're going there to be there.

Speaker 7 (00:57:35) - My thinking is, yeah, this is a completely different scenario where we're going to be in a completely different state with being there. But the fact that we went... with less information. I think we're overthinking.

Speaker 1 (00:58:16) - But your focus is just going to the moon. My focus to go to the moon is to learn to live to stay.

Speaker 7 (00:58:29) - I'll leave that phase. Go to the moon, go back to the origin of 2024, right? That would be a working approach. Once we're there, then we can develop.

Speaker 1 (00:58:49) - From a taxpayer's perspective, would they want you to just go to the moon and come back?

Speaker 6 (00:58:59) - Would they be willing to just pay for that?

Speaker 7 (00:59:02) - What did you learn?

Speaker 6 (00:59:03) - What did you achieve?

Speaker 7 (00:59:05) - That was the goal.

Speaker 13 (00:59:07) - Yeah.

Speaker 4 (00:59:08) - But we did that in the city.

Speaker 7 (00:59:09) - But we haven't completed that in the city. That's hard to tell.

Speaker 4 (00:59:14) - There's a whole array of expectations and expectations. It's like going back to, I don't know what I don't know, but now we know a little bit more to know what we need to know.

Speaker 6 (00:59:31) - And NASA's total funding is a little less than 1% of the total federal budget.

Speaker 7 (00:59:39) - I know, it's way less than it used to be, but we're kind of building all these in a wider perspective. We still need to kind of go over the first step. We haven't replicated that.

Speaker 6 (00:59:55) - Well, no, we actually orbited the moon this last year with a vehicle.

Speaker 7 (01:00:02) - But not the way that we did it last year.

Speaker 6 (01:00:04) - No, actually, with a vehicle, same, orbited. We got pictures back. We brought it back and we brought the vehicle back. It was not manned. That's the next one. But you're right. There's some elements of what we lost from knowledge from the previous time that impacted our capability to return. So it's a trade. Now we're gonna talk about AI and AI elements, garbage in, garbage out. Have you all heard this term? All right. So now let's talk about a possible AI need.

Speaker 6 (01:00:58) - When I fly astronauts to the moon or fly astronauts to the Mars, I may or may not have a medical doctor. So with that, I need to have an AI well, that can assist in diagnosis and provide insight. Now, the basis of how I train that AI is based on the medical experiments and data that's been gathered on every astronaut that has flown in space.

Speaker 7 (01:01:44) - All the different systems and what their heart rate was doing. Probably, I mean, you guys have it all.

Speaker 6 (01:01:48) - Oh, yeah.

Speaker 7 (01:01:48) - Yeah, that's me.

Speaker 6 (01:01:49) - But what's the problem?

Speaker 7 (01:01:50) - Well, everybody's different, right? So everybody's body's different.

Speaker 6 (01:01:53) - What else?

Speaker 7 (01:01:54) - Different missions, different equipment, different abilities now, I mean, you can do it.

Speaker 13 (01:01:58) - All right.

Speaker 6 (01:02:00) - In the 1960s, did any of the astronauts look like you, sir? No.

Speaker 13 (01:02:08) - No.

Speaker 7 (01:02:09) - Who were they? My man, a lot of people.

Speaker 6 (01:02:12) - So now I start looking at that data and I just think about the bias that is going into that data. And how do I consider and address the bias because of the historical data that I've got? So it becomes an interesting element when you start looking at these pieces as we go into it. But I also have to consider the intent. Is it we're trying to create a record? Something happening? Is it an exercise? Am I asking a machine to write a report?

Speaker 6 (01:02:52) - Is the report even worth writing because I can put it in an AI? Should I? If an AI writes my report, what's the purpose of the report? What we use the tools for needs to be considered. So this has really got to be thought through, not only on the ground, in our day-to-day life, but onboard the vehicles. So it doesn't have those human workarounds. Everybody knows if you're AI group, you should know, run, how many R's in strawberry through chat GPT? That's why they call it the strawberry monster. It's wrong.

Speaker 7 (01:03:42) - That was a bad one.

Speaker 6 (01:03:44) - It's wrong. Why?

Speaker 6 (01:03:49) - Why did it have that problem? Because of how it was trained. It cannot reason? It cannot reason. It cannot analyze through that. It cannot recognize the characters. If you look at a lot of the images that are out there that are produced, I can show you some images from that are images of NASA astronauts. And you look at those images and you would sit there and think the NASA logo would be a simple one. But over 60% of those images that are produced by AI, the NASA name is garbled. The U.S. flag has either too many stripes or too many stars.

Speaker 6 (01:04:32) - Showing Mission Control Center and the elements of Mission Control supporting, it has people floating up on top of consoles. So how can I trust AI? The key element is scientific best practices. We've got to have the right oversight. We've got to look at verifying and validating. And we've got to think about these elements like, why do I get the six-fingered astronaut? What's causing that? What are the elements I need to capture as far as miscaption?

Speaker 6 (01:05:12) - And so it gets down not only to the data that I put into it and what I'm trying to achieve, but even what I ask it and how I ask it becomes critical. So as we get into this and we look at evolving to AI engineering that I was talking about, going from the right to the left, I've got to be able to look at accuracy, robustness, fairness, efficiency, and looking at these. And clean data is the foundation of achieving this. Right? But I also need to understand what I'm trying to achieve.

Speaker 6 (01:05:56) - So as we get into these data expectations for AI, we talk about this for visual perception, speech recognition, decision making or recommendations, the data that we've got, imagery, video, well I've got a ton of that, speech, a lot of audio, data from telemetry, commands, and all that processing. Now, when we start looking at that and thinking about in the future and how we do that, you said you had a system that you run in GPUs. How many GPUs are you running? Nine. Okay. How much data are you processing?

Speaker 8 (01:06:44) - I mean, it just depends. I mean, now the videos are taking the most data, right? Like when you process videos and like what you're talking about with the 3D images. I like them because it's like we can see how the resolution of data is starting to improve. Once it skips from videos, I think that our digital twin is going to look a lot better. We'll be able to see a lot farther than what we see now. Oh yeah.

Speaker 6 (01:07:04) - That's a big part. But, let's look at that. Do you have to update that data? Do you have to retrain that data? Alright. Now I'm flying to Mars. I've got an AI model that's running in there. I've got a bandwidth that's this wide. How am I going to update that data? How am I going to retrain it? Do I have the GPUs that can be flown in a rad radiation environment going through the Van Allen belt and still survive? How do I compress this? How do I get this smaller? How do I do a small language model that I can validate with a large language model?

Speaker 6 (01:07:52) - How do I validate as we were talking about earlier to ensure that elements are consistent? Are valid? How do I update it when I'm flying? How do I work those elements? These become a big part of our challenge of putting it on the vehicle. With the International Space Station, when we started flying the International Space Station, the Pentium chips started coming out.

Speaker 13 (01:08:14) - Yeah.

Speaker 6 (01:08:16) - Guess what? We didn't fly a single Pentium chip. You know why? The radiation caused latch-ups. Anybody know what a latch-up is? Basically, the radiation would create a transistor to bridge. It'd zap it. False data, error information, failed system.

Speaker 8 (01:08:43) - That's special.

Speaker 6 (01:08:45) - No. We can formal code. We rad-harden. But it limits the capabilities of what that is. So when you start looking at that, that becomes a challenge. Now, our vision is, I want a lunar data center. I want a capability to have all that processing that I need on space. Guess what? Google does too.

Speaker 5 (01:09:19) - This last couple of weeks we've seen the release of a few models claiming they are getting better at reasoning. I've been playing with them and the jury's still out. Yesterday there was a launch of a new model that doesn't use the transformer model. It's a different process. So the evolution, how that is impacting on the evolution of the projects in terms of alignment.

Speaker 1 (01:10:04) - Well see that becomes a big part of the challenge. Right now what's flying on board the space station is 2000 technology. When I build a vehicle, I'm building it based on what I can prove today and flying that today. But what comes tomorrow, who knows? Can I update? You know, who's familiar with Voyager? When did Voyager launch? Anybody tell me? 73. So the technology that's there and still flying and we're still communicating with it. We actually commanded it not too long ago.

Speaker 13 (01:10:59) - So

Speaker 1 (01:11:12) - I have to have the technology at what we call a TRL readiness level, technology readiness level that we can ensure the security, the safety and the life of that technology. And if I fly certain elements, I've got to be able to have the capabilities to do line replacement units that I can carry with me, which means when I go and talk about how much I carry up, it's not just one because I can't call Amazon to have it delivered to me. I got to have three or four.

Speaker 1 (01:11:59) - So we're going to talk a little more about, we've talked about the security, the concerns of the data and the data sharing and the information that were going on there. Let's talk some of the AI models because I know Patricia and I talked about some of that in some of the areas that come into play. You've heard some of the ones that I've talked about here, for example, the medical officer. There's another one that we're exploring right now that is a geology AI that's going up with the crew to moon.

Speaker 1 (01:12:24) - What we're trying to prove is that basically this AI tool could be visually scanning any rocks or formations that they see on the moon and say, that is this or that's of interest. We want to take that back with us. That's something we already got. Just leave it there. On the ground, digital twins as we talk about and how do I get that data, but also predictive analysis. If I start looking at the vehicle and helping to go and determine what's going on, where is it going? What's achieving? What data am I getting from it? Do I know?

Speaker 1 (01:13:05) - Can I analyze all that data? And if I start looking at that a thousand gigabytes from the Roman space telescope, how many people do I need looking at it or how much AI can I put into place to help me gain insight into it? So let's talk about that from overall data, information, knowledge, wisdom, trying to get smarter. We're trying to develop wisdom. What are our challenges? What do you see? Where do you see yourself?

Speaker 5 (01:13:55) - Where do you see yourself?

Speaker 6 (01:14:04) - In the whole, in the whole, where do you see yourself? Solution developers, okay? Constantly learning.

Speaker 13 (01:14:20) - Constantly learning.

Speaker 6 (01:14:23) - What about you, in the red?

Speaker 13 (01:14:34) - Yeah.

Speaker 6 (01:14:38) - I see every one of you helping us. You know why? Because your diversity, your perspectives, your views, you may go work for the oil industry, you may go work for commercial industry, but what you're producing may influence what we do. What we are trying to achieve, you may help enable, or we may achieve something that enables you. So together, we're on this mission. Together, we're trying to do this journey.

Speaker 13 (01:15:35) - Okay.

Speaker 4 (01:15:36) - All the IT, the AI gig. Okay, so I'm actually curious. You're looking interesting at the IOT platform.

Speaker 6 (01:15:52) - That's part of it.

Speaker 4 (01:15:54) - Yeah, and 3377 last semester, right? That's the IOT class. And the tendency with the smaller models. So is NASA working with those companies, or is NASA buying from those companies?

Speaker 13 (01:16:32) - Yes.

Speaker 6 (01:16:32) - Both. Both. In fact, I had a meeting the last two days with the Google AI experts on looking at how we could solve unique challenges for our safety and mission assurance analysis, utilizing Google Vertex. I had a session with Microsoft back about two months ago with over 400 attendees where we did a workshop looking at Moon to Mars and how we enable the mission for AI. And the dock in the box and the geology analysis, that's where they're actually working with us. Google actually has the TPU capability, NVIDIA TPUs. They are actually working those.

Speaker 6 (01:17:29) - The TPU actually we have on an edge computer that is an IOT device that's flying on the station. Yeah, that's awesome. On that vehicle, we developed an AI model that analyzes the EVA gloves, the images.

Speaker 4 (01:17:46) - Why?

Speaker 6 (01:17:48) - Why did I do that? Yeah. So every EVA, when they go out, they grab things. And that glove gets cut, scratched, scraped, everything. And if that glove is damaged enough, they go out on the EVA, I've lost a crew. So we analyze it. Right now, it's people on the ground that take all those images and sit there and examine them under using microscopes and everything else that they can think of to analyze it. The AI model is kind of testing out to see, could we do it with an AI? Interesting application.

Speaker 6 (01:18:36) - I've got teams that are looking at, how do I apply AI into performance analysis, performance reviews of individuals? What kind of data have they produced? What kind of data have they achieved based on their expected role? Should I? Should I? Hmm, is that ethical? Becomes an interesting question, doesn't it?

Speaker 1 (01:19:08) - So, there's not an area that I don't see an opportunity for consideration of AI. But the challenge becomes, should I? Is it cost effective? Is it beneficial? A lot of areas where I've got people doing repetitive, mundane work, it doesn't make sense. I need them to be engineering. I need them to be thinking beyond. So on the ground, a lot of the opportunities are, how can I get rid of that mundane activities that they're doing on a daily basis to free up that time to go do the critical work that I need to do? We have standards.

Speaker 1 (01:19:59) - We have standards across the agency. We have international standards that vary for various elements, from materials, mechanical design, avionics, everything else. So we actually are looking at an AI model that can allow an engineer to say, I'm doing this, what standards and what parts of those standards apply to me for what I'm trying to achieve? Now, isn't that gaining me some efficiency, rather than them spending hours scouring through and maybe missing a standard that they didn't know about?

Speaker 1 (01:20:43) - So I've got to ensure that data is right and that they're asking the right question in the right way. Other thoughts? Other questions?

Speaker 13 (01:21:00) - Sir?

Speaker 1 (01:21:00) - There are meta-Orion glasses that do the holographic displays. Are you planning on implementing those? Actually, we do have augmented reality and virtual reality as part of our designs that we're doing. So there is a large group within the agency. Robotics is a big thing. If you've seen Robonaut, we have Robonaut flying on board the space station today. It has legs. It can maneuver around outside the vehicle or climb all the way through the vehicle and support the crew. We have all kinds of elements. But the question is, is it automation?

Speaker 1 (01:21:35) - Is it robotics? Is it AI? Becomes the definition, huh? It's everything. What question comes to mind? Yeah. So here's an interesting element. Y'all are playing right now with AI models. And you know, many of these AIs have scraped the internet. Basically gathered all that data. The validity of that data is kind of scary. Now, NASA, as we're approaching AI, will not use those models. We will not use those tools. They will be in-house.

Speaker 1 (01:22:44) - They will be in our systems, our tenant space, with our data, either as a rag or as a training, depending on what we need to do with that model. But it's our data. We don't care about what's out on the internet, except for maybe standards, maybe scientific research for medical, some of those elements. But we pull it in and control what's in there. So from a security perspective, my biggest thing is, I've got to ensure and know what data is there to begin with. And that it's only my data.

Speaker 1 (01:23:42) - You bet. You bet. I also do multi-factor across all of my systems and I have controlled access for administrative rights that requires a second factor and I also have security clearances that require for any identity that has to go through a significant amount of vetting. So being able to even get to the system you have to bridge through multiple things. Now with that said, as I go forward, zero trust. Zero trust framework. We are moving there, okay? We are moving to SASE. Why?

Speaker 1 (01:24:24) - Because I want to get that onion to where that pearl has got my best controls and then each layer out of there only what's needed and that I understand you are the one that I know is accessing it and you have a right to access it. And that's our zero trust model. Yes, ma'am.

Speaker 4 (01:24:53) - We got security. But you guys are going to get it. I mean, we will be distributing for those of you who ask questions of physical. Obviously, the AI students, as my students, which should be here, will have preference in the room.

Speaker 10 (01:25:21) - Don't they? I just put you on the spot.

Speaker 1 (01:25:26) - I got you back, ma'am.

Speaker 10 (01:25:32) - You just mentioned that whatever I end up helping as well as students and Microsoft and OpenAI collaborate together for SASE. Is NASA not open to working with any other AI companies to work on any of their projects? Or are you guys very consistent with doing everything in-house?

Speaker 1 (01:25:54) - We're very diverse. But we're also very controlled in how we approach it. So we have Lambda deployed internal, OpenAI internal, but I control it. But as they evolve, where they're leading technology, we engage with them. And with our contracts, we engage with them. But any capability that is out there that could help us go to the future is a potential. As long as it's U.S., which is one of our jobs. Which one? You get one or the other. The left.

Speaker 10 (01:26:48) - All right.

Speaker 1 (01:26:53) - All right. Next. Any of you aware that even if you're in school, you can come work for NASA? There are programs called Pathways and Internships. So you can go explore that. Do they have advising? So there are fellowships that actually apply to international students that can be done. It's through a little different group. And I can, if you're interested, I could show you what that is. I'm sorry, because of your citizenship? Or yeah, that's why I'm saying there is there is another path of a group that I can show y'all.

Speaker 1 (01:27:45) - In fact, if we want to get to that area, I can talk some of those elements.

Speaker 10 (01:27:49) - Oh, definitely. All right.

Speaker 1 (01:27:56) - That's what you're looking for. Before we leave this and go into that. What other items? What other questions? Any dad jokes?

Speaker 6 (01:28:28) - Well so currently we do not use any real-time data to analyze projecting where we're going. However, we do use real-time data where we take AI and analyze it to see and predict possible failures or issues such as with the KU band, our communications, or other systems. This one? So that becomes part of the challenges we look towards. Anything else? Any other questions? Yes ma'am. Artemis Accords. No, 33 countries, 300 companies and universities. It's a great question. It's a great question. Oh yeah. Yeah.

Speaker 6 (01:29:50) - That's an interesting question because for our laws that we are governed by, we have to go through and review anything we share with another entity for export release, export control. And can I export that data? That includes, can I export a table? So to your point and to your question is, yes I can share it, but I have to be diligent about what I share and with who in the process that I go to. But I also have to know what that data is, what level that data is, and how is it protected?

Speaker 6 (01:30:45) - Well, so the International Space Station currently has 15 international countries as part of that. And we've been flying the International Space Station for 25 years. But the 33, the Artemis Accords, is a totally different objective and those agreements are being worked today. No, not the Space Act because that's NASA's objective. The policies, the agreements, the methodology of the engagement, that's what has evolved. But the Space Act is still true to our objective.

Speaker 9 (01:31:53) - I would like to know, do you have any projects with IAEA or IAEB to have projects on cyber security?

Speaker 6 (01:32:08) - Oh yeah, I have, I have, and let me kind of clarify part of your question as far as how cyber security is, how AI is. Cyber security is a foundational element. Period. Everything I do, I have to consider what does it mean. And the foundations of what I do with cyber security is critical. No matter what, whether it's doing compute on a virtual machine, doing data sharing, doing spacecraft communications, command and control, or AI. It's a foundation. We can't forget it. Why? Because our vehicle, the Space Station, is a national lab.

Speaker 6 (01:32:59) - It's a national resource. We've got to protect it. Our vehicle has humans on board. I've got to ensure the safety of those humans. Our vehicle, as far as the intellectual property that is produced, is a combination of developments with NASA and commercial companies and foreign countries. And I've got to protect that intellectual property rights. So there is no place that I can ignore cyber security. But I will tell you that historically, they didn't have a seat at the table from the day it was being conceived.

Speaker 1 (01:33:44) - It was more, I've got this capability. Now what do I need to do? We're changing that paradigm. We're changing how we're pushing it. All right, so let's get, go ahead, keep going. No, cybersecurity is not to protect systems. It's to protect information and data. A system may house it, but it's not to protect systems. It's the intellectual property and the data.

Speaker 4 (01:34:39) - Actually, going back, AI. There has been a lot of evolution in terms of, like we say, one day in AI, it's been like, we have new developments almost every day. There are the different views in terms of optimistic views, pessimistic views, and probably there's a reality somewhere in between, and the whole concept of AGI. How do you see NASA within this scenario?

Speaker 1 (01:35:37) - All right, I'm going to have to get you to ask the question a little bit differently. Nice to meet you. So say it again. Say it again.

Speaker 4 (01:35:49) - Okay. There's a lot of talk about AGI. Yeah. There's a lot of talk of a completely different future in five years.

Speaker 1 (01:36:03) - Yeah.

Speaker 4 (01:36:09) - How do you, or how's NASA, is preparing and sees the near future? I think it's easy to imagine the future in 20 years than it is in five.

Speaker 1 (01:36:30) - Could be. I mean, a lot of what we're doing right now is we're kind of defining what NASA will be in 2040. So that's a fair ways in the future. Now, we also have to be cognizant, as we talked about as I do development and capabilities, of what is that technology curve and where's that technology curve going. So as we were talking about why I'm working with Microsoft, why I'm working with Google, I'm looking at where are they going, where do they see it going, where do we need it to go, and how do we influence it.

Speaker 1 (01:37:10) - So together is the only way we can achieve it and look at it. So I will tell you that, and I predict five years down the road, I have a notion of what might be. Is it going to be correct? Let's flip that coin. So how many of you sail? Anybody sail? Anybody like to sail? Y'all familiar with sailing? All right. You sail? All right. Okay. So if I want to go from point A to point B sailing, is it a straight line? What is it? My tack. So just as we're talking about this going five years, I know I want to get here. But I know I may have to go over here.

Speaker 1 (01:38:08) - Tomorrow I go over here. Tomorrow I go over here. And I have to be flexible enough and agile enough to be able to do that. And I have to have the diversity of the views to make sure that we're thinking about that.

Speaker 4 (01:38:28) - Again,

Speaker 1 (01:38:44) - is AI able to do that? Yes. Is NASA currently doing that? No.

Speaker 1 (01:38:53) - It's a challenge. It's a challenge of, like I was talking about, as we get these tools into our environment, those tools have to go through a fairly rigorous certification to ensure that what we do in it, only we can see it. That includes for our cybersecurity. So those tools right now are not there. They're getting there. They're almost there. And I hope to have some of the first ones enabled, authorized to proceed in the next month. Yeah. Yes, sir. Yes. International agreements.

Speaker 1 (01:39:48) - Now you asked two different questions and we'll talk about that in a little different element. So the crew itself and who's flying as far as the international crew, they are trained across the whole system. And with that in mind, which one do you want? With that in mind, we've got to make sure that we have a partnership with them to do that. So we have a Russian segment up there. We have a Japanese segment up there. We have a European Space Agency segment up there. We have astronauts from Russia, Japan, Canada, UAE, Brazil, you name it.

Speaker 1 (01:40:42) - So in that regards, we do share. Now, we also have a lot of experiments. And those astronauts do help with a lot of the experiments. But those experiments a lot of times have principal investigators. It is not NASA. And therefore, it's that principal investigator statement. But NASA itself has the rights to be able to share with them and use that per our agreements. But it's limited and we do agree.

Speaker 4 (01:41:23) - We have a question from the online people. Marathi, also known as Lincoln, is asking, How is NASA using predictive analytics to anticipate potential issues or outcomes in its space missions?

Speaker 1 (01:41:42) - Excellent. So predictive analytics is a lot of the elements that we do, particularly with the Mission Control Center supporting Space Station. So we have a lot of tools built into our command and control system and our telemetry system where we're bringing telemetry down from the vehicle. And then we have the capability through our processing there to do predictive analytics based on historical data and current data. We keep all of that data that's downlinked. We have all that data. So we have historical data for years on that component.

Speaker 1 (01:42:18) - And we can look at patterns and we can look at what kind of failures. And if I see certain conditions, then I can predict what possibility may occur based on that data. So as far as exact tools, we'd have to get into the algorithms and everything else. I wouldn't say it's necessarily a commercial tool capability. It is more custom built. And the systems that are used. So we have the TDRS satellites, which are part of our geosynchronous satellites that we communicate from station up through that satellite back to the ground.

Speaker 1 (01:43:00) - Those satellites have been flying for close to 20 years or more. Actually longer than that. Many of them. So the ground systems that's processing that has operating systems and data processing that is based on how that vehicle works. It's not easy for me to convert that to upgraded technology. So we literally have at White Sands in New Mexico, a team that they scoured eBay when all these parts and components started going out of market and bought all they could.

Speaker 1 (01:43:45) - So that they can literally replace with that. And also they have technicians that are sitting there knowing that technology and can repair it. But doing that on the vehicle, I have to ship something up if I don't have it up on the vehicle. When you talk a mission that's 30 years long, that's not next door, it's a totally different thought.

Speaker 7 (01:44:19) - I use like a focus area, I think, because it's not windows, not in NASA always.

Speaker 1 (01:44:33) - I will say the bulk of our systems are unexposed.

Speaker 13 (01:44:37) - Which one?

Speaker 7 (01:44:45) - Very mindful that the students are dying to hear about the opportunities for them. Fellowships, internships, jobs.

Speaker 1 (01:44:57) - What do you want? Which one?

Speaker 7 (01:45:01) - She didn't get a chance.

Speaker 1 (01:45:03) - She had one.

Speaker 7 (01:45:05) - Oh, I gave her mine, man.

Speaker 1 (01:45:06) - Whichever one you want. The NASA meatball. Do you know this is called the meatball? Called the NASA meatball. I don't know where the name actually came from. It's historical.

Speaker 7 (01:45:41) - With technology that's 30 years old. So they have to test How do you get the most innovative technology out there now to interact with that, that's 30 years old?

Speaker 1 (01:45:54) - That becomes the problem. That becomes the element of the challenge when I talk about something that's flying continuous. Many times I can't. I mean, I've got Windows file shares that are still operating because of the systems they interact. I've got basically a Windows 286 machine that's tied to electron microscope and operating electron microscope. You know why? It cost me $5 million to replace the electron telescope versus keeping that 286 PC running Windows 9. I have to do a trade. It's a risk-based decision. And I have to look at the elements.

Speaker 1 (01:46:36) - So let's get into the elements of working at NASA. And I'm kind of skipping over some of the things, but humanity of Earth, you know, finding new water sources. That's a big part of what we talked about as far as elements. So there's a... I don't know why it keeps doing that. I apologize. I'll keep seeing my notes from boards. This computer itself is not a classified computer, although it could have moderate ITAR data, which I would not release to you. So humanity on Earth, detecting cancer.

Speaker 1 (01:47:21) - You know, there's an interesting element that I can do in space and that we actually have done. I can grow a pure protein crystal that can cure diabetes. The problem is I can't mass produce and I can't produce it on the Earth because of gravity. So how do I produce it in space? Cancer research, the things that we look at and the things that we do as far as imagery analysis and analyzing cancer in 3D and the elements, when you start talking about the human factor in space, it's different. What is up and what is down when I'm in space?

Speaker 7 (01:48:11) - There is none.

Speaker 1 (01:48:13) - What does not having gravity do to your body?

Speaker 6 (01:48:22) - When we first flew on Space Station, we had a crew sitting there for years. Guess what? Our toilet failed in one month. Can you tell me why? No, it was designed for gravity. That wasn't an issue. The system?

Speaker 4 (01:48:45) - What about it?

Speaker 6 (01:48:51) - The astronauts were losing calcium at a rate that we didn't predict. Almost 300 times the rate we predicted. And it caused the system to fail because it couldn't handle it. So internships, pathways, STEM. As we get into these elements and look at what is your opportunities? Hmm. You got pathways, which has a possibility of employment, civil servant, STEM, non-civil servant. Here's your capabilities where you can go. And the majors that you can do and the type of degrees that we get. Pretty much everything. I have business degrees. I have legal degrees.

Speaker 6 (01:49:52) - I have arts degrees. I have communications degrees. We use them all. We use them all. Fun thing is, I've actually had high school juniors and seniors come and work for me for doing things.

Speaker 4 (01:50:15) - That's brag about you. We got a product team. Explain your project. The one who won the award.

Speaker 6 (01:50:45) - Janet Lau? Come up here. I want the others online to be able to hear you.

Speaker 13 (01:50:56) - Come on.

Speaker 6 (01:51:05) - So tell me about this project.

Speaker 4 (01:51:19) - triage machine. So the theme that year was health care and me, Ruben and Sumedha, who worked on was an idea to develop this machine where it can prioritize who needs emergency care services first in the line. So, you know, when COVID hit and there was a whole lot, you know, from our services and the workers were very less. So we wanted to come up with this machine where people could go and their demographics would be stored there already. And they would be prioritized. We need care first, no matter who showed up first that urgent care.

Speaker 4 (01:51:53) - So now the next question was whenever you're developing something like that, you need people to be familiar with it and not be afraid of it. So we wanted it to be able to translate in different languages so people can relate to it because you have to have that human factor whenever you're developing something. So we tried to have a good origin and NLP involved in this so it could translate into different languages. And we wanted it to be set up in different areas where health care wasn't provided as much. So everybody could have access to it.

Speaker 4 (01:52:24) - Not only the people in cities, but people in villages. And another idea was to have an app or have it in pharmacies like Walgreens and stuff so that somebody doesn't have an urgent care center or emergency center in their house. They have a pharmacy or they have a grocery store that has a pharmacy in that grocery store. So you could go there and get that taken care of as well. So the idea was to help people and prioritize their needs whenever there's an emergency scenario.

Speaker 6 (01:52:54) - Excellent.

Speaker 9 (01:53:00) - So, this year my project was basically, so the last year we covered like multiple areas of AI, like computer vision, then NLP, then things like that. But this year, I was the only one in the team, so I asked Muska, and she said, no, but last year. But I'm happy with the last year. No, I was on a world tour.

Speaker 13 (01:53:29) - World tour.

Speaker 9 (01:53:29) - And Ruben, he got a job, so I was the only one in the team. So this project is basically about, it's a computer vision project. You know, it's like finding cancer cells from the blood sample. So I use, you know, the children's leukemia, leukemia cells be looking into the blood sample. So, the reason I started this project, because I'm actually a blood donor, so whenever I go to the blood bank, I always see that there's a lot there, and I thought, okay, let me do something for this.

Speaker 9 (01:54:20) - Then I keep looking for the data for this project, and I get data from cancer research foundation. They actually label the outermost of the data, so my job was just like developing a code model, and it was like, I get very good results from that, the data which I get. It's all because of the data which I use. Pretty rough. Yeah. The only thing is, like, I did a little bit of coding, then I put the right data. The accuracy was pretty good. Yeah. I win for the Global Festival. That's for the Territorial Award.

Speaker 13 (01:55:08) - the Territorial Award.

Speaker 9 (01:55:10) - Next year, let's see. Okay, we're going to win the Global Festival.

Speaker 6 (01:55:13) - Fantastic.

Speaker 9 (01:55:14) - Globally.

Speaker 6 (01:55:15) - Fantastic. I love where we've gone, because that could actually apply even if I started looking at the astronauts and looking at how can I predict potential failures, potential issues of health for that crew. Both of yours could be applied in NASA. It's a possibility. We have an opportunity. You talked about digital twins. We had a set of twins that flew on NASA. One flew. One stayed on the ground. They're identical twins. The two twins? No, it's people. The twins. Oh.

Speaker 9 (01:55:58) - One flew.

Speaker 6 (01:56:02) - It's like digital twins. Well, this is where I'm going with the digital twins. One flew on the vehicle. One stayed on the ground. What we did was we analyzed the genomic elements between the two. That data is available as genomic twins data that is available from NASA to the medical community. They're currently analyzing what changed between those two twins from when one flew, one stayed on the ground.

Speaker 6 (01:56:37) - There's where we start detecting, as you're talking about that cancerous cells, what changes happened at the genome level on the one that flew versus the one that stayed on the ground.

Speaker 13 (01:56:50) - Where are you at? The Kelly twins.

Speaker 6 (01:57:00) - 362 days.

Speaker 9 (01:57:02) - That's tough. That's going.

Speaker 6 (01:57:05) - He's not the longest.

Speaker 9 (01:57:08) - 366.

Speaker 13 (01:57:13) - No.

Speaker 6 (01:57:14) - We beat it. Thank you. Thank you so much. Did you get a, did y'all want one?

Speaker 9 (01:57:22) - Did y'all get one?

Speaker 6 (01:57:23) - They deserve a pen. A pen. All right. So all of these are NASA locations where you talk about opportunities of where you want to work.

Speaker 13 (01:57:36) - I saw that.

Speaker 6 (01:57:40) - Yes. Well, you know, I can tell you that over here was because of launch, over here as far as headquarters is because of DC, and then the others just evolved because of community and political influence and military capabilities at the time.

Speaker 1 (01:58:10) - We have one, Jess Johnson, the Human Space Center. We are also, hey, but we're the largest of all the centers across the agency. So we look at historical, if you've seen the movies of Hidden Figures, that is actually her right there in front of one of the IBM computers that she was learning and training on with our astronaut that flew for that mission. So the pathways, you talk about that program, it is U.S. citizens. Sorry about those that are not U.S. citizens. It is a little bit of a challenge because we are a government agency. No.

Speaker 1 (01:59:12) - Are you going to school? Then you can be an intern. No. I've had post-doctorate that are in their 50s, 60s. So if I go back to school, I can become an intern, all levels, yes. So I don't know that I know the numbers or the ratios as far as a community college, but yes, there are some that I have known that have been from community colleges in different areas. I will tell you that the bulk are colleges, universities that have engineering degrees that are AST qualified.

Speaker 1 (02:00:19) - AST is a particular classification for engineering that requires certain math and other science classes with your degree to be AST qualified, such as through calculus three and a lot of elements that create that AST qualified for electrical engineering. But as I stated, there are individuals that are for IT called 2210s that are not AST, but they could either have the experience or they could be at a community college. They could have been military and learned it at the military and come in. I have a archivist, historian. I have artists.

Speaker 1 (02:01:22) - I have communications degrees. You know, it's pretty much across the board. So it just kind of depends. But when you start looking to your question, the bulk is engineering degrees.

Speaker 9 (02:01:40) - That is the bulk. What impresses you?

Speaker 1 (02:01:47) - So associates themselves is a little more difficult because it wouldn't qualify as an AST, but an associates could get you into other levels of grade starting for certain jobs. In those in that regards.

Speaker 9 (02:02:03) - What excites you? Whenever people come in and they say they want to be for a particular department or whatever it might be, it's exciting to work on a research team. What are you expecting to see that makes you all excited when a person comes in?

Speaker 1 (02:02:18) - Passion.

Speaker 9 (02:02:19) - Innovativeness.

Speaker 1 (02:02:23) - Creativity. Transparency. Sir? How do you identify that? How do I identify that? I ask you questions.

Speaker 1 (02:02:41) - I could give you 10 questions and know how you'll work with the team, know how you would approach your challenges.

Speaker 11 (02:02:50) - Can you give an example of two questions?

Speaker 9 (02:02:53) - Take two out of that. That's what I just asked the question.

Speaker 13 (02:03:05) - Are you an FBI agent?

Speaker 1 (02:03:05) - Not now, not yet. What was your biggest challenge that you had to address in the last year and how did you address it?

Speaker 13 (02:03:15) - You asked for it.

Speaker 9 (02:03:25) - Okay, so the biggest challenge was entering for the same competition and putting together the presentation was very difficult. We had to, and the challenge with that is to

Speaker 13 (02:04:05) - And we

Speaker 1 (02:04:27) - never done so. So the model of your response to those questions is CAR. What was the challenge? What were your actions? What was the results? And you went through all of those. I would have liked a little more prescriptive of you and the team and how you engaged. So that would be another question that would be a follow on. Is have you ever had an issue with another individual personally and how did you address it?

Speaker 13 (02:05:11) - And what was that?

Speaker 9 (02:05:11) - In classes with your assigned groups, even with people you don't know, and you have to do research together, and you find out some members of the team don't participate, don't even come to the meeting, and you have to submit at the deadline. So what do you do? Do you report them? Do you get the work done? So sometimes the way I handle it was reach out and understand, get a sense of where they're at.

Speaker 13 (02:05:46) - That's my challenge.

Speaker 9 (02:05:49) - And even when you communicate with them, you don't get that. But you still have to do the work. So that's one way of handling that type of challenge. Difficult, but I can feel the need to go out and expose them.

Speaker 1 (02:06:09) - So you told me two things. You're a team player. You respect the individuals as far as their current state and what may be driving them. But one of my concerns is if I'm holding you accountable and you didn't report it, then are you a leader? So it's a work in progress. We all learn. So those are kind of examples when you start thinking about it. Think about that challenge. Think about your action. Think about the results. Those are big things when you start applying that you want to consider.

Speaker 1 (02:06:50) - In fact, you ought to sit down and write out experiences that you had that are related to the position and to think about if you were asked a question related to that, how would you answer it? But not just the things you did at work or at school, but even with others. How do you interact with others?

Speaker 13 (02:07:27) - How do you engage?

Speaker 1 (02:07:27) - Can you be a team player or are you a lone wolf? As an astronaut, that's a very unique kind of person. Are you willing to fly with three other people for two years and only be with those three people for two years in a cabin that's the size smaller than this room?

Speaker 1 (02:08:05) - That's a unique perspective. Yes, ma'am. Go ahead. You forgot? We'll come back to you. We'll come back to

Speaker 13 (02:08:37) - you.

Speaker 1 (02:08:37) - Outstanding.

Speaker 9 (02:08:39) - I have met with...

Speaker 13 (02:08:47) - Yep. Yep.

Speaker 9 (02:08:53) - We got a lot of it. Got a lot of it.

Speaker 1 (02:09:04) - You are correct. The advantage of being a federal agency that can negotiate the rates and the deals that we have with those companies. Because it's not just NASA negotiating. It's the federal government negotiating.

Speaker 13 (02:09:27) - Yep. Nope.

Speaker 1 (02:09:29) - So, there becomes my lawyers and engaging in reviews of those contracts based on policies and control of our data.

Speaker 10 (02:10:05) - The mental, because you were saying the physical state, their health of the astronauts. What about their mental health?

Speaker 1 (02:10:11) - You bet.

Speaker 10 (02:10:12) - And I was thinking about an element that could be good for them to be over their two years is to have an AI they could talk to as well. And have human, quote unquote, interaction with somebody that asks about their day. Talk about starting interest. Instead of being stuck with the same three people, you can escape a little bit.

Speaker 1 (02:10:36) - So, you want HAL 9000? No, no, no. It is a valid, it's a valid element. So, we actually have a, at Johnson Space Center, an in situ environment which was 3D printed, which is the Mars environment. Where we actually have five people that are living in there for a year to learn, to understand. And we keep all the conditions as if they were on Mars. Loss of communications, delays in communications, the materials that they've got, the expectation of the physical demands, the mental demands. All of it. So, we learn.

Speaker 1 (02:11:27) - We learn from the crew on board the space station flying for a year. All of those elements, that becomes that human factors that we've got to consider. If you're willing to sit like in Apollo and you're willing to sit in a capsule for four days that's no bigger than a small bathroom, you're our person.

Speaker 13 (02:11:52) - Yes, sir. Yes, sir.

Speaker 9 (02:12:03) - If somebody gets that, obviously I would think that you're trying to get the data from people living in that habitat right now.

Speaker 1 (02:12:18) - Pretty much, they sign a release of any and all data that we extract from them as individuals.

Speaker 9 (02:12:23) - Is there a known scenario that you can't create?

Speaker 1 (02:12:30) - Only zero gravity. Only zero gravity. I can't do that on the Earth. Yes.

Speaker 13 (02:12:47) - Yes.

Speaker 1 (02:12:52) - So, this was actually the space lab module inside the shuttle cargo bay. This was not the space station.

Speaker 1 (02:13:04) - On the bike or the treadmill? Oh, yeah. Yeah, we have those on board on Orion. We're actually going to have a rower He was on the shuttle, yeah, yeah, yeah, he was on the bike. So one of the big challenges is the physical fitness How do I maintain the physical fitness? We found that part of the calcium loss and the muscle integrity in zero gravity We got to have the right exercise, but how do you jog on a treadmill in zero gravity? Tie them down.

Speaker 13 (02:13:34) - Tie them down.

Speaker 1 (02:13:35) - Also, how do I ensure that that Treadmill as they're running does not create vibrations that impacts all the experiments or the vehicle. I have to isolate it. I have to isolate it. You had a question.

Speaker 7 (02:13:49) - So, look, there were a couple of details. They gave this Icon that they got when I was being put in the Races station. There was an AI Watson It was a blue kind of screen that explained this astronauts in the station Yeah, I'd have to go back and look I don't remember any details on that one Yeah, I mean there was some elements I knew they were doing some experiments along those lines for the mental health Elements and where we need to do, you know, one of the things with the crew on board They actually do have email.

Speaker 1 (02:14:39) - They have the capability to call their family On the phone, you know and be able to have that connection. However Have I go to the moon that becomes more difficult It's an expensive phone call. They called the president didn't they the when they talked to the astronauts that landed on the moon President Nixon called him, didn't they? We can do that. We have audio communications, but there are challenges Yes, sir You created that like Yeah, yeah, so the one I was talking about is the Mars Environment that is actually a Johnson Space Center.

Speaker 1 (02:15:21) - It is actually the whole structure was 3d printed and It is a full in situ environment where we have people going in there that we lock them up for a year And they have to go through all the experiments they have to wear the gear they have to use the tools all of those things They have like getting messages their data across right so we may like the Mars rover like doing ISRU ISRU Yes How do you like over?

Speaker 1 (02:15:58) - Yes, that's part of the challenge that we have right now as far as Mars communications it's 30 minutes one way Assuming that we have line of communications and Mars is not on the other side of the Sun When Bill did his presentation last year Perfect.

Speaker 7 (02:16:18) - I think it can be tying a lot of things to what Bill said. Yes or not?

Speaker 1 (02:16:25) - Hey, yeah, so we have to make sure we design the systems To not have immediate failure So we build redundancy in all of our architectures From our computer processing. It's typically a three level redundancy So a single failure cannot take out the system. We have to ensure certain reliability and capabilities But we also have to make sure that crew is trained to be able to deal With real-time conditions and incidents.

Speaker 1 (02:17:00) - That's why they go through training that is Years long through all of those possibilities all those scenarios Anything we can dream up We train them on Yes, sir.

Speaker 1 (02:17:29) - Well, so your question is certainty as far as Mars, and can we live there? Our exploration that we've been doing on Mars indicates that we can, although we've got to have the right habitats, the right tools, the right elements to be able to live there. As far as Mars and extracting water, we've seen indications and we have elements that indicate there is water, but we've not had validated proof yet, not like we have on the Moon.

Speaker 1 (02:17:58) - So us going to the Moon gives us that first analogy of being able to evaluate that and determine what it will take as we go towards that and see how we can do it. So I would say we don't know yet. Big Sabre has a question.

Speaker 7 (02:18:26) - It's, you know, balancing the safety, you know, the caching of that data, all of a sudden.

Speaker 1 (02:18:43) - Yeah, all that becomes elements. I mean, if you think about encryption and what we've done historically, you know, we've evolved from 56-bit to 128-bit to 256-bit to 512 to 1058. So the encryption algorithms continue to evolve, and particularly when you talk supercomputer capabilities to crack it, we have to consider those elements. But I have to consider also the power and the elements that it takes to ensure that encryption and what I can do, as well as what it does to my data in effect for being able to communicate it.

Speaker 1 (02:19:19) - So it's a balancing act, it's a risk-based decision that I do in everything. But that's going to continue to be a challenge as we go forward, as we look at these elements. Where it's going to go, good question. Where I think we need to have it, I want quantum pairs. Quantum pairs. Quantum pairs is the idea, basically, if you look at quantum pairs, whatever action I do on this quantum occurs on this quantum element, no matter the distance. So therefore, I can create a communications capability that is infinite in data and totally secure. Emeril.

Speaker 7 (02:20:06) - Oh, is that 2526?

Speaker 1 (02:20:08) - No. We're going to send humans in space 2526 time period and orbit the moon. As far as landing, it'll probably be closer to 2728. Yes. I'm sorry? Quantum encryption?

Speaker 13 (02:20:36) - Yes.

Speaker 1 (02:20:36) - It's theoretical right now, still being done in universities and analyzed as far as a concept. So just like anything, as you look at what occurs in research and capabilities, it evolves into technology readiness and where we can utilize it. So we may help push that or pull that to our needs to achieve it, because it's a need that we're looking at. Will it get there? Who knows? You know, there's a couple items I want to touch on because we do have some international groups, STEM engagements. We talked about that, U.S. citizenships.

Speaker 1 (02:21:19) - You have to have a certain level of grade capabilities, at least one academic year in your degree program. These requirements vary depending on the center and what areas they're looking at hiring you in. That's an AST qualified, which helps you, but you don't necessarily have to be AST qualified for some jobs. So all those elements come into play.

Speaker 1 (02:21:48) - So preferred fields of study, you see STEM. That really does get into a lot of the engineering, nanotechnology, software engineering, sciences, but also we have business, non-technical capabilities, administrative, accounting, economics, finance. Back years ago, early on in NASA, there was actually a president, and I think it was President Johnson that came to NASA Johnson Space Center, and he came across an individual and he asked him, what's your role? And the individual said, my role is to help humans go into space and to learn.

Speaker 1 (02:22:32) - You know what that job of that individual was? He was a janitor.

Speaker 1 (02:22:40) - Have the passion, enjoy it, look at what you want to do, achieve what you want to do, enjoy it in everything that you do. That's the key. Whatever you can dream of, make it happen. It's the art of the possible. Let's see where it goes. The internships, we talked about those as far as being part of the diverse workforce, inspiration, looking at what we're doing.

Speaker 1 (02:23:11) - NASA interns are NASA ambassadors, so basically an intern is at the university, they're coming and working with us, they're learning what we're doing, but they're taking it back to their community. They're creating the excitement.

Speaker 1 (02:23:34) - The benefits, you can rotate between NASA centers, NASA jobs, you can get possibility of pathways, get health insurance, life insurance, retirement, sick leave, annual leave, military leave, paid federal holidays, STEM engagement, competitive, ability to select 15 projects each semester and apply for internships, short term, fun projects, come work for me. Part of the question is what I'm not hiring for.

Speaker 2 (02:24:24) - I'm not hiring legal, I'm not hiring finance, and I'm not hiring any of the elements other than that.

Speaker 1 (02:24:32) - But anything related to IT, anything related to cybersecurity, anything related to data systems, AI, I'm hiring.

Speaker 2 (02:24:45) - I'm on LinkedIn.

Speaker 1 (02:24:46) - She's connected to me on LinkedIn.

Speaker 2 (02:24:49) - Connect with me on LinkedIn, guys.

Speaker 1 (02:24:55) - We do have academies. We have a lot of academies. We do a lot of training from everything from systems engineering, project management, model-based systems engineering, IT systems development. We have certifications for the capability for you to go through training, get certified for AI, for cloud architecture, for VM, for O365, you name it. If you're NASA, part of the package, part of the package.

Speaker 2 (02:25:38) - Hang on.

Speaker 1 (02:25:44) - Yes, ma'am. Are there opportunities to work projects abroad? We have international partners today. We actually have a group that is in Russia. We have, as part of the partnership, the Russian Control Center is integrated directly with us, and we have part of our team and our data systems in Russia where we communicate with. I also have Japan, Canada, ESA, Germany, Brazil. Yes. JSC also is the largest as far as foreign national engagements, and our groups travel all the time. Not really, but Australia does have one of our ground stations for NASA.

Speaker 1 (02:26:50) - Here's one of the elements when you start looking at applying. They look for keywords in your resume and elements applying to the project. But when I start looking at you for potential, I want to start looking at your experience and your skill, not just the keywords.

Speaker 2 (02:27:09) - You could splash all the keywords in there, you know, but it doesn't mean anything.

Speaker 1 (02:27:14) - What are you capable of? And that's where I look at your resume differently versus that you've had this class or like on the STEM kind of things where you've gone through these courses.

Speaker 2 (02:27:29) - Now, I may use you based on those keywords of having that training to see how you work. Here, I'm looking at how do you work based on the knowledge you learned.

Speaker 1 (02:27:44) - Yes, ma'am.

Speaker 2 (02:27:50) - Too late.

Speaker 1 (02:27:59) - Interns, apply there. U.S. citizens, apply there. Resume tips. Make sure you look at this. Make sure you consider this. You getting it? I'll let y'all get a picture before I switch.

Speaker 13 (02:28:17) - One, two, three.

Speaker 1 (02:28:24) - All right, some of the tips. One of the things I look at your resume, I don't wanna see a whole bunch of technical statements that don't tell me squat about you. I wanna see in your resume the challenges you faced, the actions you did related to those functions and capabilities, and the results you achieved. And they need to tie to the position functions that you're applying for. at is how do you interact?

Speaker 12 (02:30:31) - How do you communicate? Are you shy? Are you an introvert? But I'll tell you what,... a... need. I love it.

Speaker 1 (02:30:39) - Find that passion, find that joy, engage in that. Dun, dun, dun, dun, dun, dun. Research opportunities, inspires. There's a lot of capabilities, particularly for the professors. Some of the elements you might wanna look here under inspires. The professors need to be teaching as well. Yes. Yes.

Speaker 1 (02:32:32) - Here's an interesting one.

Speaker 4 (02:32:35) - That's the one you're looking for.

Speaker 1 (02:32:36) - Mm-hmm. Fellowship. Looking at that. U.S. citizen or national at the time and proposal of the submission. In STEM. Enrolled full-time in a master's or doctorate. GPA 3.0 to 4. And projected degree plan. Continuous enrollment. So inspires there's your path to get there.

Speaker 4 (02:34:28) - I think it's different about the way we're doing things here at HCC is we are focused on applied.

Speaker 1 (02:34:38) - Applied.

Speaker 4 (02:34:39) - So to deliver, you know, market ready AI professionals. Okay. And how does that fit with NASA because it's not so much of the guys who are going to create the newest and greatest algorithms but the guys who understand what's in there and help apply.

Speaker 1 (02:35:07) - Well, so that applied concept is the key elements that we just discussed. And looking at some of the elements that are occurring. I apologize, guys. Something's going flaky with my computer and it's not allowing me to... Well, it's the OneNote that is recycling and it's taking control. You may have infected me, man. So, yeah, I've actually done some of that, but it's not even letting me

Speaker 13 (02:36:01) - get...

Speaker 1 (02:36:01) - So, there are opportunities as far as international for the inspires and those kind of capabilities that you can apply for. There are capabilities as you become, if you become a full US citizen, to work for NASA. If, you know, so there are paths. You just kind of have to work through them. Inspires is the first area I'd go look.

Speaker 13 (02:36:30) - Okay.

Speaker 1 (02:36:32) - It's interesting that even though my laptop's closed, it's showing the screen. Yeah. Which ones? Both? Yeah, the second one on the access, the internships, and everything, I'll make sure and send to Patricia and she'll share them with you. The first one, you know, I'm still looking at some of that elements to see what I can officially release as far as the... It should... There's nothing in there that's sensitive, so it shouldn't be a problem because we've been talking it.

Speaker 1 (02:37:13) - But actually having the documents, that's a different thing I have to work through. And I just haven't had a chance in the time that we've been talking to do that. Was there another question?