Voiceover:

Airmen and Guardians. Ladies and gentlemen, please welcome to the stage the President of the Air and Space Forces Association, Lieutenant General Bruce Wright.

Lt. Gen. Bruce "Orville" Wright, USAF (Ret.):

Well, good afternoon, Guardians and Airmen. What an honor it is to be here today. And I would offer that in the front row. Secretary Kendall, Mr. Calvelli, Chief Brown, among others, thank you for your leadership. And now it truly is an honor to be here today with two digital giants to talk about innovation, leadership, and the lessons the defense industry and our new Space Force can learn from each other. As the first Chief of Space Operations, General Jay Raymond, has the monumental task of standing up a brand new service for the first time in 72 years. And what a magnificent job you've done.

Of course, with that responsibility comes enduring opportunities and General Raymond has set out to create the first ever digital service built to accelerate innovation. The new services, digital vision, highlights the need for cultural and technical transformation, to keep advantage over peer and near peer competitors in the increasingly contested digital domain. We're also pleased and honored to have Google Cloud CEO Thomas Kurian here today and in the spaces here with all of us to talk about his own experience. Thomas took the reign as the Google Cloud CEO in November, 2018. And over the past quarter century, he has built enterprise software and deep ties with government customers, not only at Google Cloud, but also at Oracle. At Google Cloud, Thomas is now focused on helping to accelerate digital transformations. So welcome to both of you and let's get started. General Raymond, please, can you tell us about standing up a new service from scratch and what kind of rapid transformation did that necessitate?

CSO Gen. John W. "Jay" Raymond:

Oh, well thank you. And it's a privilege to be back on stage. I've never been called a digital giant before, so that's a good one. In fact, I would say a digital dinosaur is probably a better description for me. I largely tell a story about, when you're in college, I didn't see a computer with a mouse until I was a senior in college. And cyber attack back then was, when your college roommate mixed up your punch cards when you typed up. And so, to say I'm a digital giant is an overstatement, but I did recognize that if you look at the space domain, the way you experience that domain is through data. Unless you're one of the lucky 600 or 700 ish or so folks that have had the opportunity to be in space, you experience that domain through data.

And I knew that if what was pacing us to innovate was not the standup of a service, it was the threat and the competition with both China and Russia. And so we had to move fast. And one of the things that I have long thought of is that we were too hardware focused rather than software focused. And that we needed to have the agility that we needed. And to be able to experience that, to harness that data, apply some analytical tools on top of that data, to solve some of our tough problems, this transformation was going to have to take place.

Lt. Gen. Bruce "Orville" Wright, USAF (Ret.):

Well, thank you sir. And if we could, Thomas, you've been at Google Cloud for over three years and after spending decades in leadership roles at Oracle, you're overseeing the creation of thousands of new products and features across the digital domain. And could you please talk about how you balance innovation and growth? What has been the biggest challenge and what advice do you have for others?

Thomas Kurian:

We've been through a period of extraordinary change since I joined Google. When I joined Google, no one told us in 2018 there was this thing called the pandemic that would happen in 2019. At one point, more than 60% of our employees were new to the company and had never met their colleagues. They never met their clients and they were brand new. And so we were creating a digital organization through necessity, because it was our digital platforms that was letting us get all of our people to work together. It was our digital platforms that were helping us serve customers in what they were trying to do. And we translated everything that we were facing through three simple lenses. Challenge creates opportunity. It's the fact that we were facing this challenge of having to make people work in a totally different way that created the opportunity for us to bring digital technology to make our people productive.

Innovation drives growth. We had to come up with new ways to solve technology challenges. Every one of those helped us grow and find new ways to serve customers. And lastly, we created a culture in our organization where people could work on missions that they cared about. And our view was, our mission was to bring technology to provide lasting transformation and lasting growth to organizations around the world. And so it's been an incredibly fast paced three years, but all of these lessons that we take in many ways, speaking to General Raymond, and so many service men and women, we've learned that there are many commonalities that we share, in the kinds of problems we're solving and the kinds of problems you're all solving for.

Lt. Gen. Bruce "Orville" Wright, USAF (Ret.):

Thank you, sir. Well, General Raymond, you've already alluded to this, but you're now leading an organization that is making a push to be the first fully digital service. What does that mean, again, in your own words and how are you going about working towards that goal?

CSO Gen. John W. "Jay" Raymond:

Yeah, first of all, I don't think it's a goal. I would steal a word that Secretary Kendall use. It's an imperative, if you have a service that has 16,000 folks and if you have a headquarter staff that has 600 folks, you cannot afford to do business the same way we've done business. We just don't have the manpower to be able to make that happen well. So the way we have defined a digital service, and I'm not saying we have the patent on this, we looked at it in three ways. First of all, we wanted to raise the digital fluency of the entire force. And so we've partnered with digital university to give licenses to every single Guardian in the Space Force to be able to take classes and raise their digital literacy. I think that's really, really important. The second thing that we wanted to do, the second line of effort on that, we wanted to have a digital headquarters that was data driven.

Our secretary talks about it all the time. I think he has a sign, bring data, over top of his office. We want to be a data driven, we want to be able to harness that data. And so we wanted to have a digital headquarters. And then the third thing, and I talked a little bit about this in my speech this morning, was we wanted to embrace digital engineering. And in our force design work that we did, we've actually done that all digitally and using model based systems, engineering came up with the digital models, both of the threat that we see and of the architecture design that we want to move to.

And then rather than just print out documents, we actually did the computer models and we handed that to industry and said, Here's what we think. Let's have this earlier conversation. If we do this right, then we can take everything from the force design, to then requirements, to then acquisition, acquiring the capabilities, then testing those capabilities, and then training our Guardians on those systems, all using that same digital thread. That's nirvana. We're not close to that, but we've taken a good step,

we've taken a good first step. We've done the digital design work, we're figuring out what a digital requirements process is, and I think it's going to pay significant dividends for us as we move forward.

Lt. Gen. Bruce "Orville" Wright, USAF (Ret.):

Well thanks sir. And back to Mr. Kurian, I love your notion that challenges create opportunities. We thought 14,000 people were going to show up this week and somehow it's 16,000, so we'll build on that opportunity. So connecting to the challenges and the opportunities that General Raymond is going through, how do you align with what you hear from other national security counterparts, customers, across a wide range of customers? And what similarities and differences do you see?

Thomas Kurian:

Now, what General Raymond said struck me, we all experience the world today through digital tools. And Space Force is unique in the sense that, the entire domain that it faces the average person doesn't experience it except through digital technology. When we look at the lessons we've learned as Google over the last many years, digitizing the entire world. And when I say digitizing the world, all the information in the world is indexed and served up every day through a search mechanism. Many of you probably use our maps, which is a digital representation of the whole world. There are large infrastructures, networks, computers in data centers in many, many different parts of the world that we deploy in order to support it. But our average person never sees or touches those machines. They're seen as digital tools that we manage, secure and operate remotely. So when we look at what's the experience we've had and how listening to General Raymond's comments that, what's the commonality?

I would say three things that are really important for lasting change. One is the tools and capabilities, whether that is protection with cyber machine learning and artificial intelligence to understand the large quantities of data, or third capability to build software that deals with large scale systems. That's a common purpose we've had and we share with Space Force. Second, to help attract talent because eventually all these tools and technologies only work if it can attract the best people. And attracting the best people, the best people in the world are always attracted for the purpose of a mission. And what you have sir is a real purposeful mission in protecting the next frontier.

And the third is, making it possible for people culturally to learn from digitization. Digitization is a journey. If we all look at years ago, we would all go to a retail store not remembering or knowing if the product that we are looking for really was available in the store. We just drive down and say. Hopefully it's there. Digitalization through Ecommerce made it possible to actually know the product was there before we got there. But all of that came through a process of learning and experimentation. And I think what we all conceive digital could be, is only the start of a journey. And so being open to experimenting and learning is the other thing that we've learned a lot from these past many years.

Lt. Gen. Bruce "Orville" Wright, USAF (Ret.):

Thanks sir. Well, General Raymond, shifting gears a bit, the defense department has always been innovative in its big ideas, but going from an idea to product can be a challenge, lots of ideas have died in what is called the Valley of Death. What are you doing and your team doing in your transformation efforts to bridge that technology Valley of Death or advanced technology Valley of Death? And how would you describe your relationship with industry to do so?

CSO Gen. John W. "Jay" Raymond:

I think I feel very fortunate in that... There is a, and I jokingly say this all the time, a big explosion of commercial activity taking place in the space domain. And there's lots of folks that are investing dollars to develop capabilities, because it's a cool place to, cool mission to be focused on. We want to be able to leverage that and harness that. We want to expand the industrial base, so it's not just the big primes, it's others as well. And if you look at what we've tried to do, we've stood up a couple of significant efforts at Space Systems Command out in Los Angeles to be able to harness this and develop these partners. So the first thing that we did, we stood up a commercial front door at Space Systems Command. And for all the new companies that have come in, that might not have had the experience of working with a department, we provide them with a sponsor, if you will. Somebody that's there, that can help them walk through the process and help us work better together.

We have leveraged AFT works and stood up a Space Works initiative as well, to get after the bridging the gulf, if you will, from having an idea, that capability. We have something called SpEC OT at SSC and we put a significant, there's a significant amount of new companies that are involved in that initiative and provides us a way to get those capabilities onto contract faster. So we're putting a lot of work on this. We think, if you come up with a new force design, we think there's two big opportunities. We think there's a big opportunity in our relationship with commercial industry and we think there's a big opportunity with our relationship with our allies and our partners. And we've got to work together to be able to capitalize on this and harness the good things that are coming out of our industry. I would bet, as I say every time, I would bet on US industry every single day. We just need to make sure that, one, we all are kind of rowing in the same direction.

Two, that we all understand how to work together. And three, that we can develop capabilities and get them in the hands of our war fighters on a tactical timeline, that is important. I'll tell you a quick story, and this is honest, honest against truth. It happened back in 2011 when I was stationed in Japan and there was a earthquake, tsunami, and nuclear reactor disaster. And we were having trouble coming up with a common operating picture for radiation. We were flying aircraft, Air Force was flying aircraft over Japan to measure radiation. There was sensors around Japan to detect radiation, but we didn't have a way to display it, and it was really causing issues. And so I reached, I called Google and I said, "How would you do this?" And they said, "If you go up to Google Tokyo, they'll be able to help you." So I got a helicopter, flew to Google Tokyo, and in this little conference room, walked two engineers with a laptop. And I explained the issue and they... About 15 minutes later, less than that, here's how we'd do it.

And I said, "Well, how would I do that?"

And they said, "Well, if you know somebody that knows the computer language, Python..." They didn't even say that. "If you have anybody that knows Python, we can teach them."

I said, "What's Python?"

And they said, "That's a computer language."

I said, "Well, I don't know if we have anybody." But I got back on the helicopter, flew back to Yokota, and I put an all call out across Fifth Air Force. "Anybody know Python?" Our first lieutenant at Yokota and a brand new Airman, literally been in the Air Force for less than a month, Ed Kadina, we send a C12 down to pick that young Airman up and funny story, funny story, they can't find him. I said, "What you mean you can't find him?" Well, he showed up at the airport with 36 pounds of bags and the Air Force had a rule that you're on space...

Or On that airplane you're only allowed to have 35 pounds of bags and we sent him home. I said, "Listen, this Airman is the most strategically important Airman in the entire United States Air Force. He can PCS up here on this plane, just whatever he owns, get on the plane." And literally that lieutenant and that Airman got on the helicopter next day, flew down to Google, and I think, don't quote me on

this, but within a couple days, we were up and running. I thought to myself at that time, man, we'd be lucky to get the TMT Tasker done by that time. And here we are with the capability. We've got to figure out how to harness this, if we're going to get after the challenges that we face.

Lt. Gen. Bruce "Orville" Wright, USAF (Ret.):

What a compelling story. That really leads to the next question for Thomas. Just listening to that example, could you and your extensive experience across the IT world, talk a little bit about how we can build on such communications, responsive communications, with the technology industry that can move at a faster clip than the military acquisition cycle sometimes can traditionally keep up with. Your thoughts and advice building on that great story would be terrific.

Thomas Kurian:

First of all, I think many of the problems that the United States government, defense, Air Force and Space Force face have analogies or equivalent problems that the commercial industry has solved. Having, for instance, a global representation of cyberspace and being able to keep it secure is something that we as a company have to solve every day, because if it was compromised, people would not feel comfortable or trusting in searching, sending email, accessing maps and other services that we offer. So the first thing I would say is, there's a lot more commonality in the kinds of problems that the commercial industry has solved and that the Air Force and Space Force needs to solve. The second is, in working together through partnerships, you can actually lower the cost to do many things, both in terms of physical infrastructure, computerized software, et cetera. And to some extent, because you learn from experience in technology, you can stand on shoulders of problems that have already been solved before, you don't have to reinvent and resolve problems that have been solved many, many times before in other contexts.

The third is, the pace of technology is moving extremely quickly. And if somebody told you that today you have in your pocket a smartphone that has more than five times the power of the fastest computer in 1995, you'd have a hard time believing it. And it's available for a few hundred dollars. The best thing that we can see is in helping the government, is to have procurement and standards adoption processes be able to use the pace of technology. The faster you can ride the technology curve, obviously with the appropriate procurement standards, certification processes, et cetera, the better. But when you are competing with adversaries, China, Russia, who are investing lots of money in equivalent programs, you want to be able to leverage the great capability that the technology industry in the United States brings to the government and the defense department.

Lt. Gen. Bruce "Orville" Wright, USAF (Ret.):

Thanks sir. General Raymond, back to building on your Japan story a bit. How can military services including the Space Force and companies such as Google Cloud, take advantage of their similarities and their differences to advance their respective goals and priorities? And I would add on, I thought your example really as a model for younger, mid-career, if you will, NCOs, officers and program managers and younger engineers to get together. So, I'd ask you to share your perspective in that context.

CSO Gen. John W. "Jay" Raymond:

We're trying. We're working really hard to develop, again, digitally affluent Guardians and to not just be able to use apps, but to do more coding. We want to have more people than two that can do Python. And so, one of the things that we're working on is, we have a program that we call Super Coders and we're trying to build indigenous software experts inside of our service. I think today, we've got just shy

of a hundred that have gone through this program, and we've got more being developed all the time. And then as we develop these super coders, we're looking what's the best place to put them? And so we're putting them in software factories, for example, Kobayashi Maru out at Space Systems Command. We're putting them in innovation cells in our deltas to be able to give them the tough challenges to work on, and see if they can write code to be able to help us.

And there's been some really good examples of where we have made some progress embedding those folks with our operators. We've developed some apps that have been on our command and control systems. We had a young Guardian at one of our units build a digital representation of some equipment that we used to have to take offline to train on. Now you can train. It was all done in house. And so we, as I went a couple years ago to that software factory that I mentioned, Kobayashi Maru, what I saw was a lot of great folks really working hard in trying to get after some really hard problems, but it was all an additional duty.

It was like, "Hey, anybody out there know software? We'll give you a little bit of training, you come work here and then you'll go back home." We're trying to build a more... We're not to the level yet where we can stand up a separate AFSC, if you will. It would collapse under its own weight. But we've got some identifiers out that we've put on their AFSCs to say that they're a super coder, and then we're purposefully assigning those folks at critical positions to help us harness the innovation that we think is out there, by becoming more digitally fluent.

Lt. Gen. Bruce "Orville" Wright, USAF (Ret.):

Thanks sir. Well, Thomas, listening to General Raymond, day to day, somewhat different missions and infact in some ways very different missions, but at the same time, again listening to General Raymond and some of his examples, what are some things that industry could learn insight, internal to industry, to make your own processes better? And could you provide some examples of, again internal challenges that you face and solutions that you work, that could give us some more insight, again in sharing information. And I would kind of cap that question with, could you just talk a little bit about the national security focus, internal to the broadly defined IT industry? So please.

Thomas Kurian:

So just listening to what General Raymond was saying, in the long term, the capability that Space Force needs to be a digital force is very similar to the capabilities that we've had to build in our own organization. The first one is, what are the key technology components you really need to be world class at? Software development, making sure as you develop software, you keep systems secure. Cyber, being able to process large quantities of data, being able to use algorithmic expertise. When we were talking about Python for example, being able to program in artificial intelligence, those are capabilities that are going to be critical to maintaining an enduring organization. The second is to attract people. We always think about at our organization, there are, every year from universities across the United States, there are young men and women graduating with great ideas and they are the people over the next five to eight years who are going to transform the technology industry, or the next five to 30 years transform the technology industry.

So the second thing we always look at is the best people work not just for money, but because they have a mission. And the mission is, needs to be a key factor in attracting people. And to retain them, you need to give them digital tools and culturally a rewards and recognition process that rewards them for what they're doing. At Google for example, we have two examples of things we run internally, a process called OKRs, objectives and key results. One of the things we've had explicitly with our managers is to say, you can get to only 80% of the OKRs. You can define 20% to be aspirational that you may not attain

and we're not going to hold you accountable if you don't attain them. So it recognizes that people want to stretch and you're not going to penalize them for it. Similarly, when things go wrong, because in many cases we're working on technology that's really at the frontier, and you cannot be perfect in predicting how that technology will go.

So we have a process where when things fail, we recognize it as what do we want to learn from it, as opposed to who do we hold accountable for the failure? And so we run a process called Blameless Postmortem, to understand why did something go wrong, what could we have learned from it, and how do we get better because of it? So the second big piece is making sure culturally and enabling the young people who want to come to serve in Space Force, for example, to come knowing that they'll have the right tools and the right culture, that will make them successful with their mission.

Lastly, we are at Google investing heavily in bringing, not just developing technology but bringing it to the government. We know that part of bridging the private sector and public sector is having people who specialize in understanding the needs of the government and how they use technology. How the Air Force, how Space Force will use technology? And we have specialists that we've hired to really understand deeply not just your needs, but how you apply technology to solve some of them. All these in our view, are part of finding a common purpose in bringing technology now as a key differentiator in the work all of you are doing.

Lt. Gen. Bruce "Orville" Wright, USAF (Ret.):

Thanks for both of you. And you've addressed this somewhat already, but in an opportunity to sort of reinforce your really the message of your leadership. General Raymond, some 30 years in the Air Force and now building a new service, a proven leader. And Thomas, very similarly a proven leader across the demanding corporate world information technology. As you continue to work on establishing a culture of growth, a culture committed to innovation and growth, can you both talk a bit more again about approaches you're taking to continue to encourage a culture of innovation? You talked about blameless innovation in your own organizations, and I would just add onto that, my guess is, you see your organizations, it's being flatter and flatter, more communications, sideways, up and down and less hierarchical, so General Raymond, please.

CSO Gen. John W. "Jay" Raymond:

So we really felt when we stood up this service that we wanted to design us, for speed, innovation, and bold action. If you look at the domain that we operate in, it's vast, things that operate in the domain are traveling at 17,500 miles an hour just to stay in the domain. And we thought that a hierarchical structure and a very large structure was not going to be what we needed. So we worked very hard to flatten the organization. We got rid of two layers of command to be able to reduce the distance, if you will, between the experts that are doing the work, largely the folks that are sitting out here, and the decision makers. And so that was one of the key tenants that we put in place to limit the bureaucracy. The second thing... Well I'd say first of all on the limiting bureaucracy, I think we've done that pretty well.

I think we've again completely flattened the structure. We've got our headquarters down to, as I mentioned up front, about 600 people. It's requiring us to think through how do we develop people differently? How do we develop squadron commanders differently, that don't have a group commander on top of them? How do you develop Delta commanders that don't have the second layer of O-6 command? And so we've had to think through that. One of the things that we've thought about on culture is, we want to be a war fighting culture. We want to be innovative, we want to be bold. And as we started to orchestrate that, we've been waiting for people from other services to come in, so we could blend the culture from all the different services and build our culture of our own. One of the

things that we're going to do here in a couple weeks, when we go out about a month from now, when we go out to the Air Force Academy to host Corona, we're going to actually do a session on culture.

And what we're going to do is figure out, rather than just see where the wind blows us when we meld these cultures together, we're going to look at how do we purposefully engineer the culture? What do we have to do? Things like flattening the bureaucracy, what are those other things that we should do to engineer, to get the culture that we want spitting out the other side. We've got work to do on that. And, it's not something... People ask me all the time, "When are you going to get your culture?" Well, it's not like you can order this online and get it delivered overnight. It's going to take some time, but rather than just let it evolve and emerge, we're going to work to figure out how best to engineer from where we are today to where we want to go. And that's the work that the entire Space Force leadership team will be doing for pretty much most of half a day here at Corona to make sure that we're moving in the right direction.

Lt. Gen. Bruce "Orville" Wright, USAF (Ret.):

Thomas, please continue on growth, innovation, a culture of growth and innovation.

Thomas Kurian:

Just a couple of examples to illustrate, the first thing when I listen to having a flatter organization, our view is one of the core elements of our organization is trusting those who are closer to the situation and closer to the data, to identify not just the problem but also the solution. We have, one of our core beliefs is that, if you really are hiring world class engineers, you have to trust that they will find a pattern in the data and they often will find a solution that senior management may not have thought about, and you need to trust them. One example, we'd run every time one of you uses our services, is being powered by computers in different parts of the world. And the computers take power in order to kind of run. And you need power also to cool the computers. So it's something that we pay a lot of attention to, both because of cost reasons, but also because of our commitments to more sustainable environment.

One of the things that, a few years ago, one of the engineers was looking at the problem, he was a fairly junior engineer, he said, "Hey, I noticed that we're spending more money cooling the coolant that's used to cool the computer. And that just sounds crazy. Why don't we just run the computers hot?" Now for 30 years it had been the theory in all of IT, that you ran computers at a certain high degree of temperature would cause damage to it. You had to run it in a certain level of... In a certain air condition, temperature controlled environment. He stood the theory on his head. We said, "He's probably right, let's experiment with it." But the first thing I would say is, in order to empower a culture of change and a culture of innovation, you have to trust those who are recommending the change and we empowered him.

He was right. The data showed he was right and we gave him a shot to prove it. The second thing I would say is, we find that the best ideas come from collaboration. One example of something we did within Google, when you have a network of computation as wide as we do, almost every day we are pushing the boundary on something that has not been done before. So you can't solve it purely based on past history. One of the things we did was build simulation, and we did large scale simulations. For instance, what happens if there's an earthquake in the Western United States and we lose all of California, which means we wouldn't have a management team, there would be no buildings. How would you handle a situation like that? And what systems and processes do you need to ensure that we would continue being operational?

All those principles, and not just the principles, but the technology behind it, now we bring to clients around the world. And so one of the things that we see a lot is, collaboration between our teams,

helped us think through some of the solutions we encountered. And we always have asked our teams, because we serve a mission to keep all the people in the world who are accessing information safe and secure, we have to have them dream big because they will need to solve problems every day that we may not have encountered before.

Lt. Gen. Bruce "Orville" Wright, USAF (Ret.):

Thanks sir. And General Raymond, if you might just wind up. Recruiting STEM talent, recruiting engineers, certainly for the department of the Air Force, for industry, is a national security imperative. And even we constantly talk about our own STEM programs at AFA, Cyber Patriot, Stellar Explorers, being again a national security imperative. And by the way, our vice chairman for aerospace education is an MIT graduate, Stephen Gurley. So we're all in on the national security imperative, again for STEM education. And then, how do you go about recruiting? How can we help you go about recruiting?

CSO Gen. John W. "Jay" Raymond:

One of the things that we're doing, and I... Sir, I don't know if you would agree with this, but when I go out and talk to universities, and I remember specifically talking to the Air Force Academy about a year and a half or so ago, and the entire class was there, and I started talking about software and how we were going to build... Heading towards an AFSC, but some first steps towards building organic software capability. There was a ton of excitement about that. I mean, cadets were turned around talking to another cadet, that's what I'm doing. I think, it's a little bit of what you said earlier, sir, that's what attracts talent, this new cutting edge ability. So what we've done is we've gone out and partnered with, we've developed a university partnership program with 14 different universities from around the country focused on two things.

One, recruiting and developing the talent that we need, and two, doing research and providing some of our tough problems to those students. To help them think through it and get them excited when they get there. So that's one thing that we're doing to really attract that talent. It's already paying dividends, as I mentioned in my speech, we're getting a lot of good talent coming in off the street. But I listened with great interest, what you were talking about. That's what attracts talent, these cutting edge tools and that's what we're trying to get after.

Lt. Gen. Bruce "Orville" Wright, USAF (Ret.):

Thanks sir. Well, let me again, thank both of you. You certainly have given us much to think about in a fascinating discussion. Such opportunities abound I think for an ever stronger department of the Air Force, Airmen and Guardian, and across our industry partners, a team to defend this nation. So please, thank you again. And if you would join me in a round of applause...

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