**Brig. Gen. William S. Rogers:**

Good afternoon. Welcome to the Air, Space & Cyber Conference's Global Strike Panel. I am Brigadier General William Rogers, the program executive officer for Bombers. As a short introduction, in this role, I lead the acquisition team and have the lifecycle acquisition responsibility for the B-1, B-2 and B-52, while also providing the organized train and equip functions for more than 85 percent of the B-21 team. During today's panel, we'll hear from three senior industry leaders on how we are addressing China as a pacing challenge. The members on this panel focused on Global Strike are aligned with Secretary Kendall's operational imperative and cross-cutting operational enabler priorities.

Working to accelerate change and delivering integrated operational capability to the nation in Air Force Global Strike Command, across both nuclear and conventional deterrents as well as when needed long-range strike. The government and industry partnership is also focused on improving the availability or ability to generate our fleets through innovation, improved processes, and a strengthened industrial base. It's all about providing operational capability to our Airmen and Guardians. Now, let me introduce our panel members. First, we have Dan Gillian. Dan is Vice President and General Manager at Boeing Defense Space and Security.

He oversees executive transport programs KC-46, P-8, E-7, bombers, AWACS, and Triple 777 X components. He also serves as a senior site executive for all BDS locations in Washington State. Previously, he led Boeing Global Services, US Government Services Division and managed the FA-18 and EA-18G programs. Dan's extensive experience includes P-8 program management, supplier management, and engineering. In the middle, we have Lieutenant General retired, Steve Shepro. He's the vice president of integrated customer solutions for Pratt & Whitney's military engines division, where he is responsible for engaging with governments and industries from around the world to understand their requirements and offer propulsion solutions to meet their needs.

Additionally, he oversees the growth of the military aftermarket business at the worldwide facilities and military installations where Pratt & Whitney performs overhaul, maintenance, supply chain management, and field services. Prior to his current role, Shep held the position of Vice President of Boeing Defense Space and Security, fixed wing aircraft, global sales and marketing, as well as vice president bombers and fighters business development. On active duty, General Shepro was the 21st Deputy Chairman of the NATO Military Committee, where he advised political leadership and steered policy, strategy, decision-making, and defense capabilities of the alliance.

A command pilot with more than 3000 flying hours and 600 combat hours. He has held senior positions on the joint staff, air staff, and coalition staffs. He has commanded multiple operational wings, groups and squadrons and has led US and coalition Airmen in numerous global operations. Finally, we have Doug Young. Doug is sector vice president and general manager of Strike for Northrop Grumman Aeronautic Systems, a premier provider of military aircraft, autonomous systems, aerospace solutions, and next generation solutions. Strike is headquartered at Northrop Grumman's Melbourne Florida site with major production and test operations in Palmdale, California.

In this role, he oversees programs within the Strike division, including the B-21 Raider, B-2 Spirit, and a number of restricted programs. Previously, Doug served as vice president and deputy program manager for Strike. He also held various prior positions within the Heritage Aerospace Systems, including Vice President of Missile Defense and Advanced Missions, and Vice President of Space Systems Resiliency. I will now turn to our panel members for their opening remarks before we dive into questions that will cover areas such as capability delivery, innovation, and process improvement, sustainment, supply, and other areas if time permits.

The goal of this panel today is earlier during strategic modernization we heard General Bussiere, General Cotton and Dr. LaPlante explained some of the what and why. Hopefully, we'll give some insight into the how we're doing it with possibly a little bit of a Bomber bias here. Over to you, Dan.

Dan Gillian:

Hey, good afternoon. General Rogers, thank you. AFA, thank you for the opportunity to be on the panel with all of you today. I run mobility surveillance in Bombers, one of Boeing Defense's four aircraft divisions, and as you said, we support the global strike force directly with B-52 upgrades and modernization, B-1 upgrades and modernization. We also build things that support the global strike mission like KC-46 and E-7. Increasingly, our focus and my division's focus is to connect all those things together so that the global strike operations, the global strike force has the best information available, the best situational awareness to prosecute its mission. I'm excited to be here today, looking forward to the discussion. Thank you.

Brig. Gen. William S. Rogers:

Thank you.

Lt. Gen. Steven Shepro, USAF (Ret.):

Thanks, General Rogers. I'd like to echo Dan's appreciation for AFA and everybody here today. It's good to be, and I appreciate being in this forum as we discuss rebuilding a strategic deterrence. The future is not what it used to be, looking back at my career. I guess what I bring into this conversation is, one, as a supplier of these two fine airframers, I'd say that propulsion is central to global strike. Propulsion gives global strike assets, be it bombers, be it family of systems, its global nature and the ability to strike effectively. Whether that's operational reach, survivability, penetration, or digital sustainment, which we'll discuss today.

We take the propulsion very seriously and we've paid close attention to Secretary of the Air Force Kendal's remarks that our ability to sustain a long fight in the future really underpins our credibility. That credibility underpins our deterrence, and so we see propulsion be an important part of that. I'd say right now the West has the edge, you have the edge. We provide both these airframers with thrust, with burn advantage, with very low observable capability advantage, and with digital sustainment that allows us to carry on a long fight. We have to keep that edge, and I appreciate the opportunity to comment on that. Thanks so much.

Doug Young:

Thanks for the question, Buck. Yeah, I'm really proud to be up here and representing all the Northrop Grumman employees that are working tirelessly day in, day out on two major legs of the triad. Building off the modernization theme that General Bussiere and General Cotton spoke about a little while ago. We have those two legs of the triad. We're very focused on execution with our Air Force partners to ensure we deliver those capabilities in a timely manner. My particular focus is on the air leg of the triad, as we make sure that we can go from full operational capability on the B-2 to transition smoothly to full operational capability on the B-21. That's the same mantra that the Sentinel team is also working with, with the Minuteman transition to Sentinel.

In the Strike division, our focus with these platforms is on the highly contested environment, so the non-permissive environment. Everything we do every day in this division across these programs is focused on range access and payload to ensure that we have the long range, the legs to operate globally anywhere in the world. That we have the right survivability technologies built into our systems and sustainably so

that we can ensure that access is guaranteed when the time comes. Finally, payload, having the flexibility built into our open mission system architecture to add on modernized weapons as they come available, to ensure that we're able to penetrate and deliver the effects that are required in the highly contested environment. That's our focus.

Brig. Gen. William S. Rogers:

Great, thank you. If we could, let's build on some of the, I'll say, capability and technology aspects. Starting with you, Doug, and maybe working across the panel, could you share how industries incorporating new technology capability in digital into both our operational and new programs and platforms?

Doug Young:

Yeah, thank you, Buck. Digital transformation is a phrase that we hear a lot. All of us are getting the opportunity to really drive it into our programs in this current time, because it is so critical to be able to have the ability to add new capabilities as the threat moves towards us. In the case of B-21, we have built into what we would call our software factory, the ability to rapidly adapt software and meet the need as the requirements change. As well as an open mission system architecture that allows us to add new capabilities that we're already evaluating for implementation as the system comes online. We've used those techniques and tools and brought them back into the B-2 environment.

Whereas, we have a software factory that we stood up as part of the B-21 development activity. We've taken that and brought it back into the B-2 environment with the spirit realm software factory that's been certified there for the B-2 program. In doing so, we also made an architectural change on the B-2 to segregate the flight systems from the mission systems. With that architectural segregation, which is also part of our strategy on B-21, it allows us to quickly modify and upgrade B-2 without affecting the flight systems and allows us to bring applications on very rapidly. One example, and there are many, is where we've developed new displays for the B-21 mission.

As we look forward to the threat environment, we're able to take those display applications and bring them back onto the B-2 to enable us to put those into operational use on the B-2 program, is one example of how we're actually modernizing B-2 as a benefit coming off of B-21. Then, finally, what we're learning on B-2 and continue to learn, have learned over the last 30 years, is informing our strategies for B-21 and being able to adapt and modernize rapidly is a fundamental we learned from that experience.

Brig. Gen. William S. Rogers:

Thank you. Shep?

Lt. Gen. Steven Shepro, USAF (Ret.):

I'm going to follow Doug's thread and give examples of digital engineering or digital sustainment. I think that's important because digital tends to be somewhat of a vague concept at times. It could be an Excel spreadsheet on a computer or it could be interactive real-time analysis of, in our case, in propulsion. In propulsion, it's interesting. When I started flying, which was a while ago, we used to pull oil samples after every sorting, pull an oil sample and see if we detected any debris. Soon, we got smart with analysis and started doing that every day. Then, with some time every week, but that still was expensive, inefficient.

Now, we can get real time data from the engine and we can then replace parts or maintain parts that we need to at a user basis. We call this usage-based lifeing. It's been very effective. We started out on the F135. We found that we can keep 30% more time on wing. Time on wing is essential to readiness, as you

all know in sustaining a long fight. It's to the point where we've been able to shift the predicted overhaul cycle and get 20% more time on some parts, 20% more time than we predicted by engineering analysis. Now, over the life cycle of that engine, we could save overall in the program $800 million, just on F135. Doing the same on C-17, F117 right now, and with many others.

That's one example of how we're applying digital statement, digital engineering to make a difference for readiness and credibility and deterrence for global strike command.

Brig. Gen. William S. Rogers:

Awesome.

Dan Gillian:

I think about digital in three ways, and one is the model-based systems engineering. Digitally native platforms like the B-21 are designed that way from the ground up. But even on B-52, as we're going to do the radar modernization program and the engine program, we're using model-based systems engineering, so we're backing our way into a digital airplane. As that plane flies out into the 2050s and beyond the B-52, we'll be able to continue to upgrade and have better digital data to support the platform throughout. I think it's really important that digital can apply across all pedigrees of aircraft old and new.

The big unlock is going to be an open mission system space that was discussed specifically with multilevel security and open together, which is a hard combination to crack. A platform like E-7 is helping us do that at scale with the Air Force right now, and those capabilities and applications that we develop for command and control and situational awareness will be able to cross across multiple platforms in a secure way via open. That's a huge unlock for the Air Force and for industry as we go forward. Then, the third way is in sustainment. I think we're just at the beginning part of really understanding what digital can do for the sustainment of aircraft, again, old and new, by letting the airplanes tell us what they need when they need it. It's a much, much different model.

Brig. Gen. William S. Rogers:

Great. I appreciate those insights. Now, building off some of the parts you hit there and maybe we heard earlier there are no bombs without comms. Could you maybe share some of your insights and what you're doing to connect, to better connect the bomber fleet and increasing the ability to share information? Dan, if you have any insights into that.

Dan Gillian:

At the core of it, it's about big data pipes and it's about processing to move data around and infusion on an airplane. Getting an AESA radar on a B-52 is going to make that a really informed node in the digital network. Working with you and the team on how we get that data on and off board in a way that can be integrated with other platforms in the battle space is the work we're doing now. Different comms, different antennas will continue to come online. If we design those in an open way, then we can be rolling in the capability as it comes and get away from some of the big legacy development cycles that we're all familiar with.

I think that's where agile software and the continuous development process comes in. Capability to the fleet every six months instead of every five or six years. It's a huge game changer, but the whole system has to adapt to really unlock what that is.

Brig. Gen. William S. Rogers:

Yeah, Shep?

Lt. Gen. Steven Shepro, USAF (Ret.):

Yeah, I'll reiterate the last point Dan just made. I think the whole system has to unlock that important point of data mesh. Secretary of the Air Force has been talking a lot about this book Recoding America. We've taken high interest in that. One of the excerpts from that book that struck me, struck us was the need to avoid just painting on layers. We get newer technology, we get the ability to transfer data, but if we keep painting it on an old system, it's really not going to enable us. What we really need is to relook the data mesh and the access to that data and how we're using it. It's a cultural question, and we can do this, we can do data mesh.

We can do access. I think that's important as we get the data. Like the example I just gave, communicating with the engine. It's, are we able to use that? Are we able to share that, or are we able to turn that into readiness? I remember when we started rolling out this capability hearing Airmen saying, "The engine is talking to us, we're just not listening to it." Now, we have an opportunity to shift that culture and to listen.

Doug Young:

Yeah, I think we heard in earlier session, it's really always been a mantra on the B-2 program, no comms, no bombs. A lot of our work in the open mission system domain is improving the comm linkages to allow us to get data onto the platform more rapidly and efficiently. Rather than having hundreds of keystrokes to put in a lot of coordinates and weapon guidance, we can upload that while the aircraft is in transit. That's been a big breakthrough for us. You might've read about our recent airborne mission transfer success, and it's really the first spiral of what we're doing as an opportunity roadmap for improving the comms and linkages for B-2.

Because in this highly contested environment, in this future that's coming at us in terms of the threat, we have to be able to go beyond operating alone and unafraid. We have to be able to fly these platforms into a contested and non-permissive environment and gather data from other sensor sources, whether it be space or other airborne platforms, to enable us to really prosecute our targets and more effectively use the weapons that we're going to carry. That allow us also to have a weapon suite that is modular in a way that allows us to mix loads and have a more sophisticated set of weapons at our usage using that off-board data to better target them and make them more precise in their action.

Brig. Gen. William S. Rogers:

I especially appreciate that. Building off the weapons aspect, and Doug, you may have hit it, but if you'd like to add more, how are your companies helping the Air Force integrate new weapons onto the Bomber platforms and how are they enabling the global strike mission?

Doug Young:

Yeah, I think fundamentally it comes down to the interface protocols and getting those into the legacy platforms and baking those into the new platforms that are coming in line, so that we have the standard UAI interface that will enable us to get the range of weapons that are now coming online. Really, the weapons domain is changing rapidly as many of you know in terms of their precision, their agility. Their low observability were required in order to get us the range. In addition to the range, the platform carries to really prosecute those deeper targets and perhaps stand in or stand off as required. That array

of weapons is now enabled by what the systems now have as far as a ubiquitous interface to enable that. That's the key.

Dan Gillian:

Yeah, I think UAI is a huge enabler here and everyone's moving that standard, which is great. It's great that there is a standard to move to, so we all know how to design around it. Then, B-1 and B-52, big airplanes, can carry a lot, and so pylon flexibility is really important. Station flexibility is really important. The LAM pylon on B-1 is a great example of industry investing and partnership with the Air Force to bring a capability to a platform to carry large and complex weapons in a very reconfigurable state. At the end of the day, flexibility at range is really, really important. New engines on the B-52 are going to allow the airplane to have 25% more endurance.

That's going to give increased flexibility, and with pylons and UAI, the way you can mix weapons together, as Doug said, is really a new thing that you all have to figure out how to employ most effectively.

Lt. Gen. Steven Shepro, USAF (Ret.):

Obviously, we're supporting the airframers and everything that they've laid out. We also make little engines too, and little engines that go on family of systems and even weapons. A little turbo jet that's currently on a Raytheon mold, as well as an MBDA SPEAR. What we're looking is to advance the capability to make those to enable affordable mass using additive manufacturing, 3D printing. There's a bright future and we know what a difference that family of systems will make in enabling global strike command.

Brig. Gen. William S. Rogers:

Great. Now, we've hit on some of these topics, but from a perspective in terms of the process, what are some of the things you're currently monitoring or interested in as you look across the defense or commercial industries, in terms of new technologies or processes? For example, open systems architecture, multi-level security. Go ahead, Dan.

Dan Gillian:

To me, it's about the standards and the processes that we're going to apply. The commercial capability that's out there to do open and agile software development is tremendous, but I don't think we're really ready for people in their mom's basements to be writing code that's going to go on a B-52 or a B-21. How we blend that commercial mindset and agile mindset into multilevel security in a structured way that you all can train to is complicated and we're really just at the beginning stages of that. Any platform that's out there with some open processing capability and we can work on bringing apps, it's as much about the con-ops we used to do that and the partnership between industry and government as it is about the capability itself, because the capability is there.

Brig. Gen. William S. Rogers:

Thank you.

Lt. Gen. Steven Shepro, USAF (Ret.):

Yeah, I'll mention again the cultural piece. The ability to accelerate and lose or accelerate or lose really pivots around a cultural change to be able to adapt to the digital tools and the digital enhancements

that we could bring. I think as we look in the future, we have a lot of commercial derivative possibilities, commercial derivatives that mean rapid fielding, means disruptive technologies, means things that could really enable that range, that reach, that penetrability. It's the cultural ability to say, "Yeah, we could fast track that. We could take a commercial derivative product. We could fast track that with abbreviated certification or using commercial certification or abbreviated testing based on digital modeling." There's a lot of things we could do to accelerate and win.

Doug Young:

Yeah, the commercial aspect of digital transformation, I'll say, is really actually one of the most fundamental reasons why in the last 10 years this has really become a thing. That is, we've always had digital data in designing our aircraft. The B-2 was designed in a 3D environment. We've had a lot of data. Our processing abilities now in a contemporary context allow us to process a lot more data, but what's really causing the shift is the application of commercial tools that have been developed over the last 10 or 15 years like agile, like virtual visualization, things like holo-lenses. We use holo-lenses in the factory now on B-21 that enable us to actually visualize where something's supposed to be installed.

Allow us to see through composite materials to do non-destructive investigations, when we might have an anomaly. That's now being considered for looking into sustainment. Where we can use a fairly commercially available tool, fairly ubiquitous in today's day and age, hardening it and using it in a factory and then ultimately in a sustainment environment. I mentioned agile open mission systems architecture. Remember the days when you would buy a computer and a printer and you'd have to go through a whole rigmarole to actually get the two to work together. Nowadays, you just buy stuff at Best Buy, plug it in and it goes.

That is really a fundamental that's been around for many years in our own commercial products, but putting that into a weapon system grade environment is really what's been happening over these last few years. Because these weapon systems have to operate with multiple certifications, nuclear certification, airworthiness certification, all those ilities that have to be baked in and those agencies have to trust that the commercially developed software is really going to work. That's a big part of the learning that's gone on here in the last few years, to bring this transformation to a reality, which ultimately leads into the point made earlier about agility.

We've got to be agile, and what these models allow us to do, given the breadth of data and the sophistication of the tools we're able to provide is to get a much more accurate prediction of how a system is going to perform or a component is going to perform. The band of error as we go into ground and flight test is much smaller today because it's enabled by those models and those tools. We are twice as accurate in our predictions on B-21 than we've been on historic programs based on the sophistication of those models and the accuracy of the result they're producing.

Brig. Gen. William S. Rogers:

Great. Knowing that operational availability, aircraft availability is a very important aspect of the bomber fleet, especially in terms of priority for Air Force Global Strike, could you share some of the things we're working on, some of the things your companies are undertaking to help improve that availability of the fleet? Dan?

Dan Gillian:

Yeah, so availability is huge for Boeing in how we support both B-52, B-1 and all of our products. This is where digital, I think, is really exciting. With C-17 for the Air Force right now, we've been working in partnership based on some work we did with the UK and Australian Air Forces who operate C-17s, to

really let the airplane tell us how it was performing individually so that the Air Force can start to make individual aircraft decisions and not fleet decisions. One of the challenges that everybody talks about with sustainment is supply. The problem in the supply base is that the supply chain sees big lumpy demand that drops in occasionally and then goes away 000, 100, 00. It's tough to build a business case around.

With digital, we can let each airplane tell us what it needs, when it needs it. That flattens and smooths the supply chain and industry can respond to a smooth supply chain demand signal. We've seen things like 12% reductions in unplanned maintenance with C-17. We've seen significantly reduced fuel burn. That helps obviously from a budget perspective for the Air Force. That's a 35-year-old airplane that we had to put a piece of hardware in to get the data off, but the data's there. That model will apply for B-52 or B-1. Any pre-digital type airplane. There's digitally enabled airplanes like KC-46, where you can get the data off. You just have to have the algorithms to look at it.

Then, there's digitally native airplanes like T-7 or MQ-25 for the Navy where you can design it in a way so that it has that built in. Then, back to the cultural comment from before, services just have to be willing to take that data and use it and let that be the truth. Let the airplane be the source of truth, which is disruptive for how we normally plan and support aircraft. That's a big area where we're focused. Obviously, knowledge of platforms, digital enables knowledge transfer, that's a big part. Having people out there supporting the airplanes is a big part of what we do to support you all in your mission. But I think we're just at the beginning stages of what digital is going to do for sustainment and the Air force is at the very front of the pack with C-17.

Lt. Gen. Steven Shepro, USAF (Ret.):

Yeah, my comment dovetails with Dan since he mentioned C-17, which is significantly important to global strike command and logistics under fire. Same with our digital technology, we're able to reduce or increase time on wing by 16% and we're reducing 20 shop visits a year. That's just by the same predictive analysis and communication. Again, great for readiness, great for deterrence.

Doug Young:

Yeah. The B-2 really provides an opportunity with the tyranny of small fleets to really cause a focus on the key movers to get higher availability. We're finding that if we can make improvements using all the data analytic tools that are available that have been mentioned, we can actually squeeze out another airplane's worth of availability. Instead of maybe having eight aircraft available at a given time, we can move in the direction of nine and 10. That's really a function of how well we can manage the supply chain, predict failures, and work with AFLMC and the SPO to ensure we get funding out there and to have a rapid turnaround time on those critical LRUs that are really driving that availability.

The tools and processes and the ability to prosecute large amounts of data are really we're unlocking, where those key failure points are ahead of us so we can resolve them and increase that availability. As we look into B-21 and move all the sustainment activities as far to the left as possible to ensure we're ready to get out to the first main operating base, it's all about generating the daily flyer. That's a key part of the outcome from the digital transformation activities, is that we have good design models and representations of how the aircraft's going to behave in the field well before the time comes, so that we can really enable that commitment to have this aircraft be a daily flyer, that being the B-21.

Really, two different factors that we're looking at both platforms to ensure that we've got that continuity from B-2 to B-21.

Dan Gillian:

A quick follow up there, I think the other thing that's really interesting about digital and sustainment, we talk about open, it's going to be very disruptive for the traditional business model from the Air Force to industry. If we're successful letting the airplanes tell us what they need, the short-term change is going to be, you need less stuff from industry. It's going to be smoother, but it's going to be less. It's a disruptive business model and I think it's going to test our speed of trust together on how we really commit to your outcome as our driving force, which we have, and how you reciprocate with the long-term stable contracts that have to come with that in order to allow those data analytics to do what they're doing.

I think that's going to be disruptive, but it's absolutely necessary for where you're trying to get and we're trying to get.

Brig. Gen. William S. Rogers:

Now, obviously, to be successful in sustainment, you need strong supply. I'll combine a couple of questions here, but Dan, I know you have a lot of experience with F-18. I know you've done some work for Boeing and how to better project or stabilize that supply chain. If you wouldn't mind expanding maybe on some of your lessons learned there and some of the things Boeing has done and for yourself and the other panel members along the supplier base and supply chain, are there any concerns or issues that you're currently working through that you'd like to share with the audience?

Dan Gillian:

I think everyone knows right now the supply chain is pretty constrained. Post-COVID and inflation and everything we've been dealing with, the supply chain is challenged right now, which takes me back to those first principles. The constant discussion about supply chain for availability and supportability goes back to that stable demand signal. Industry is out there and ready and willing to invest to support you in how you operate your aircraft. But those very lumpy, disruptive demand signals are really hard to predict and deal with. You have a constrained supply chain in that old sustainment model.

It's compounding issues at the moment. I think the rush to get to digital and let the airplanes tell us what they need to see, that's really my answer for how we get that stability. On F-18, back in the day, Secretary of Defense Mattis gave a challenge, 80% MC. Super Hornet at the time was down on 50%. The Navy and Boeing and other industry partners were able to get Super Hornet up to 80% and sustain it for years up at 80% based on some of those common same principles. Really understanding what the airplanes needed and then addressing it more locally than at the macro fleet level. Stable, predictable funding is a huge part of that.

When the sustainment funding gets cut late in the year and throughout the budget cycle, it's tough to react and respond. Those things together I think put you on the right path for sustainment. The C-17 example I gave earlier really dovetails nicely into that.

Brig. Gen. William S. Rogers:

Thank you. Shep?

Lt. Gen. Steven Shepro, USAF (Ret.):

Yeah, I'd say it's important that if you're in uniform, you understand what supply chains constraints mean. If you're an operator or doing operational planning, if you're planning a crisis or you're planning against a ramp up in operations, you know there's time lag that's built in because of the supply chain constraints. That's important. I think when I was in uniform, I didn't understand that fully enough. I would tell industry, "Okay, we foresee an operation perhaps or increased posture. I need you to start

ramping up parts in a month and I need delivery within two months." They'd look at me like, "What planet are you on?"

It's important that if you're in uniform, you understand that that needs to be part of the stable and the stable planning and the funding that goes into the supply chain, like continuous improvement program for engines. That's key.

Doug Young:

Yeah, the supply base is really important, and as OEMs our suppliers are going through the same workforce dynamics that were mentioned a moment ago in terms of COVID and macroeconomics. We have to be sensitive to that in working with our suppliers. In the case of B-2, again, tyranny of small fleets, our best ability there is to use a large breadth of buying power that both we have and Oklahoma City has to ensure that we're addressing the right constraints. Really back to the digital analysis tools that identify where those constraints are, so we can work with those suppliers to get ahead of things. We recently returned to flight with the B-2 and there were some hydraulic components that we had to change out as part of that investigation.

In working with the supplier, we were able to very rapidly turn that around in a matter of weeks as opposed to months in order to get those aircraft flying again. Those key relationships that are leveraged from a broader base of products that we offer at the company and work with these contractors every day, subcontractors, is a big advantage. I would say as well with the B-21 is baking in early use of commercial products. One strategy that the program has had is to have a large proportion of commercially derived products in the aircraft so that we have that large install base, because even with a hundred aircraft, the B-2, B-21 will be coming to a company that might build hundreds or if not thousands of a given system.

Commercially, we can leverage that base, leverage that overall experience base and cost basis in order to ensure that we're getting affordable sustainment because we're leveraging commercial products. That's been a key fundamental with an eye towards sustainment that we built into the B-21 program.

Brig. Gen. William S. Rogers:

Great. Along those lines, and we only have a few minutes here left, but are there any impacts you're seeing? Is other, I'll say, global sources of supply, there's more demand on global sources of supply, do you see any impact to us from an Air Force perspective, industry perspective in the US? Is that demand increasing? If so, what impacts are you all seeing? Dan?

Dan Gillian:

Short answer is yes. I think we are seeing pressure across the board. Again, an already pressurized supply chain now has things like desire to have more US-based sources of supply. Maybe some of the work that had been done globally, we're pulling back a little bit from based on world events over the last couple of years. Compressed and then a little more compression intentionally to get the sources and channels of supply that you want. That leads into discussions about dual sourcing and how to have effective dual sources and how we support that as a industry government team. I do see us getting better visibility, long-term, better stability long-term.

As primes we get a better understanding of the lead times down throughout the supply base, which are not what they used to be. We're sharing that information with the government and you are adjusting your models to how things are and not how they used to be. But there are still a lot of discussions that start with, well, in 2019 it was this, and it's just not that anymore. I think we're all getting to a

normalized state where we understand how to handicap the supply chain and that allows you to make better decisions about lead time and funding.

Brig. Gen. William S. Rogers:

Thanks.

Lt. Gen. Steven Shepro, USAF (Ret.):

Yeah. Adding to that, I'd say first that suppliers really are dedicated to the mission and that building of relationship with our suppliers, in our case sub-suppliers, is very important. They want to perform, they want to be part of the mission. They're facing the same challenges with labor pool and metallurgy, raw materials. We're facing that and confronting that together. I would say not just domestically, but we have a global supply chain. We have a lot of good allies, international partners that mirror the good allies and partners that we have in the military. That has been important as well. They are friends in need definitely, so we're building that supply chain. Thank you.

Doug Young:

Yeah, I think that for this one, in terms of what it really takes on the ground to deal with this is the data analytics to allow us to get some predictive understanding of what's going on in these marketplaces. Because in reality, it's a different thing each year, every quarter, relative to what is pinched in the supply market. Whether it's titanium, low observable materials, aluminum, it depends on really what's going on local to that marketplace. Being able to predict that with analytics is a real key to resource management. The development of a dual suppliers where that's anticipated, baking in the use of commercial products that have a wider install base to allow us to use our defense priority in order to get access to those.

There's a lot of tools, but I would say that it's something that it is in a rapid cycle, especially today's day and age, where it could be one thing this week, it could be a different thing next week. You have to be ahead of that.

Brig. Gen. William S. Rogers:

Great. Thanks gentlemen. As we head into the, just past the two-minute warning, are there any final messages or themes you'd like to share with the audience, convey to the audience?

Doug Young:

I'll start just by reiterating what General Bussiere said a few minutes ago. We are extremely excited about B-21 and the progress working in the recent engine runs and getting ready to go fly that aircraft. Really start proving to the world over and again the accuracy of how these digital models are reducing risk as we continue to conduct the test campaign for that program and continue to prepare to ramp up on production. I'm very excited about what's going on out in Palmdale right now.

Lt. Gen. Steven Shepro, USAF (Ret.):

Yeah, thanks. I've been very glad to be here as well. We're proud to support B-21 with propulsion just as we do daily with B-52 and all of your fifth generation fighters. Pratt & Whitney, again, believes propulsion is key to global strike command success, and so we're all in. Thanks.

Dan Gillian:

Thanks for the opportunity. On behalf of the 11,000 Boeing teammates that work with me in mobility and surveillance and bombers, it's really an honor to be supporting the US Air Force in this mission. Almost a hundred years of B-52 by the time we're done. It's really cool to be working on that platform and thanks for the opportunity today.

Brig. Gen. William S. Rogers:

Great. On top of that, I'd just like to thank AFA for including this panel in this year's Airspace and Cyber Conference. Thanks to you all for attending today's panel. I hope you found the discussion useful in understanding how we are working to provide award-winning capabilities in the global strike mission area. Hope everyone has a great conference. Thank you.