FDD EVENTS

The Sprint to Field the Army Force of the Future

Introductory remarks by LTG (Ret.) Edward Cardon
Featuring Brigadier General Brian W. Gibson, Willie Nelson, and Brigadier General John L. Rafferty
Moderated by Bradley Bowman

CARDON: Thanks for joining us today for this important conversation from the Foundation for the Defense of Democracies, or FDD. I am retired Lieutenant General Ed Cardon, a member of the board of advisors for FDD's Center on Military and Political Power. In February 2017, General Dan Allyn, then the Army Vice Chief of Staff, sounded the alarm in testimony to Congress. He warned that America's competitors and adversaries were fielding military capabilities superior to those of the United States. He said, and I quote, "The Army requires modernized equipment to win decisively, but today we are outranged, outgunned and outdated. We have prioritized our near-term readiness to the detriment of equipment modernization and infrastructure upgrades, assuming risk and mortgaging our future readiness." This eroding U.S. military superiority risks inviting aggression and could result in defeat in armed conflict. This is exactly what the congressionally mandated bipartisan National Defense Strategy Commission warned the following year in 2018. "The hard-power backbone" on which America's security relies "has eroded to a dangerous degree," the commission cautioned.

The Army could not delay any longer a much-needed generational modernization effort designed to deliver world-class combat capabilities to our troops. Given the acquisition failures in the past, leaders understood the Army could not take years and years to field these new capabilities. In 2017, I was honored to lead the task force that helped create Army Futures Command, and in 2018 it was stood up to lead the modernization of the Army. Now, a few years later, Army Futures Command and its Cross-Functional Teams have advanced vital research and development programs, and some important capabilities are in initial fielding. But the most important capabilities are yet to be fielded and the next few years will be crucial. There is no time to waste. The commander of U.S. Indo-Pacific Command testified again last week that the military balance of power with China continues to become "more unfavorable." Research and development programs will not deter and defeat aggression. Fielded combat capabilities do.

And that is the challenge. Getting these new combat capabilities into the hands of our troops as fast as possible. That is also today's topic. We are honored to have with us Brigadier General John Rafferty, Director of the Long-Range Precision Fires Cross-Functional Team. Brigadier General Brian Gibson, Director, Air and Missile Defense, Cross-Functional Team, and Mr. Willie Nelson, Director, Precision Navigation and Timing Cross-Functional Team. They are the Directors of three of the eight Army Futures Command Cross-Functional Teams.

And this discussion is just one part of the great work of FDD's Center on Military and Political Power. FDD is a nonpartisan research institute focused on national security and foreign policy. The Center focuses understanding on defense strategies, policies, and capabilities necessary to deter and defeat threats to the freedom, security, and prosperity of Americans and our allies. It is one of FDD's centers of American power, which also houses deep expertise on economic and cyber strategies and tools, and the ways all American instruments can be utilized together. For more information we encourage you to visit our website and to follow us on Twitter.

I am now pleased to turn the floor over to my colleague Brad Bowman. Brad serves as Senior Director of FDD's Center on Military and Political Power, where he focuses on U.S. defense policy and strategy. He has tremendous experience as a long-time Senate staffer, Army officer and assistant professor at West Point. Brad, over to you.

BOWMAN: Thank you, General Cardon. I really appreciate that introduction. I'm Bradley Bowman, Senior Director of FDD Center on Military and Political Power. During the hearing last week that General Cardon mentioned, Admiral Davidson highlighted the growing missile threats to our forces, the need for strengthened missile defense, as well as the value of forward deployed ground-based long range precision fires. Army Futures Command and it's cross-functional teams are advancing an impressive array of related research and development programs. But those programs will not serve their deterrent purpose until they are in the hands of America's forward deployed forces. That raises some questions, which I'm eager to discuss today. How is the Army doing in developing new missile defenses, long range strike capabilities, as well as

the capabilities and networks to support and integrate them? What progress has already been achieved, what challenges remain? And most importantly, when can these capabilities be in the hands of our troops?

We have the three best individuals around to discuss these issues. They are Brigadier General Brian Gibson. He is Director of Army Future Command's Air and Missile Defense Cross-Functional Team at Fort Sill, Oklahoma. We have Mr. Willie Nelson, a member of the Senior Executive Service, serves as Director of the Assured Positioning Navigation and Timing/Space Cross-Functional Team. And last but not least, we have Brigadier General John Rafferty, a longtime friend of mine, who also happens to be the Director of the Long-Range Precision Fires Cross-Functional Team. We're going to try to avoid acronyms today, but that is one you might want to remember, Cross-Functional Team, CFT. So, with no further delay, I'm excited to get started. John, it's great to see you.

RAFFERTY: Yeah. Likewise, Brad. Thanks to you and FDD for giving us this opportunity.

BOWMAN: It's really my pleasure. And each of you are so busy, I don't take for granted that you've spent some time to talk with us. So, let me jump right in. To set the scene, John, for those who don't follow these issues as closely as you and others do, can you briefly describe what the long range precision portfolio is, what your responsibilities are, and why you think our war fighters need the capabilities you're working on?

RAFFERTY: Yeah, Brad, that's a great question to start this dialogue with, because, really, the last part is the most important and it's the threat. And this is a great power competition, and we did take a modernization holiday in some critical areas across the Army. And so, we know that while we were consumed by operations in the Middle East, our adversaries went to school on how we fight and started to invest in sophisticated and integrated air defenses in long range and coastal artillery systems that really have this effect of keeping us at arm's length, what we call layered enemy standoff. And that exists at echelon, at the tactical echelon all the way to the strategic echelon. And so, we're driven as a cross-functional team by the threat.

What we're doing in the Long-Range Precision Fires Cross-Functional team is, I mean, the hint is in the title in terms of working on long range. But that doesn't mean that we're walking away from the close fight. In fact, the lethality that we're bringing is focused entirely on that decisive close fight that we know that ground combat is always going to end in that knife fight at the end. But back to the title, we are working across echelons to deliver the strategic systems that will provide the access, so the punch a hole in the anti-access and area denial systems that our adversaries are investing heavily in. At the operational and tactical level, the long range and precision and lethality that will defeat those integrated IADs [integrated air defenses] or that long-range artillery threat, that then allows us to conduct a combined arms maneuver, which is what we do better than any Army in the world.

It takes incredible training venues and a commitment to combined arms training, and it takes a professional non-commissioned officers corps, which we have and that's the envy of the world. And so, we view our investments in long range systems as really enabling the close fight at the end. And I'll pause there, Brad.

BOWMAN: No, that's great. And I'm honestly so glad that you started with your first point about modernization that had been so long delayed. From my perch on Capitol Hill for years, that's exactly what I saw. I saw the Army with an insufficient budget and therefore having to postpone modernization while it struggled to fund current operation and maintain readiness. And so now it seems to me with deference to you three gentlemen we're undertaking, the Army's undertaking the most significant military modernization effort, arguably in decades, maybe even four decades. And I hear you generally saying that that's the case. I have that about, right, John?

RAFFERTY: Yeah, I think so, Brad, and really our portfolio is a mixed bag. It's a mixed bag of ranges from tactical to strategic, and it's a mixed bag of acquisition approaches. So, if we start at the tactical level, we're using our 804 authorities to go to rapid prototyping and rapid fielding of the extended range canon artillery system. So, a platform with a much longer gun tube and a robust breech that allows us to use supercharged propellant and new projectiles to reach 70 kilometers with the accuracy we need against those targets sets. At the operational level, we're using a program of record approach to PrSM. That's the precision strike missile, which is our replacement to ATACMS. It goes beyond 500 kilometers and has the growth to incorporate seekers to attack maritime targets or emitting IADs in the future, and then opportunities for increase in range.

And then at the strategic level, it's another mixed bag. We've got a science and technology project for the strategic long range cannon, which is our big bet to see if we can shoot an affordable volume of projectiles at strategic ranges. And then we're in support of the Rapid Capabilities and Critical Technologies Office, and that's their residual combat capability in '23 for a hypersonic system at thousands of kilometer range. So, it's a mixed bag of systems, a mixed bag of acquisition approaches, and just causes us to work together as a team with our government and industry partners in ways that maybe we haven't before.

BOWMAN: And that's a great overview of both the sense of urgency, because we delayed modernization for so long, we have adversaries fielding systems that are as good or better than ours in some cases, and the need for us to act quickly and overcome some of the acquisition challenges in the past. And also, the way you laid out both the strategic, operational, and tactical level capabilities that you're working on. I'd love to just drill in a little bit, if you wouldn't mind, on the PrSM, and you mentioned the ability to target maritime targets. We all know that the capabilities you're working on will be fielded wherever the Army is operating, and that would include the Middle East or in Europe, but also of the Indo-Pacific, which we'll drill into a little bit more later.

Can you just give us a little bit more specificity on PrSM up to this point, what are the accomplishments that you're proud of, where you see that program, and anything more that you might want to add on the ability to target maritime targets? Because that's not something that the average listener might think of when they think of Army fires, is the ability [to target] maritime targets.

RAFFERTY: Yeah. Brad, that's great, and I guess I'll start with the last part about targeting. And that's why it's so important that I'm here with Willie Nelson and with Brian Gibson, is because we know that these target sets that we need to attack with our long range systems will require us to make real advances in how we're acquiring targets, how we're distributing the information, how we're finding those targets in the volumes of data that we haven't had before, how we're using artificial intelligence, and just teaming up in ways that are new for us. And so quickly, with Brian Gibson on the line, he and I and our teams are working to explore how we shorten, how we take advantage of the suite of sensors that the air missile defense portfolio has and the incredible capability of command and control. They have an IBCS [Integrated Air and Missile Defense Battle Command System] and connecting that with AFATDS [Advanced Field Artillery Tactical Data System].

So now we have our Army tactical fire direction system, how then do we take advantage of all those sensors, and then we have more shooters against those, and we close that, shorten that sensor to shooter timeline. That's the key to all our systems, especially PrSM at those long ranges, that if we don't tighten up that sensor shooter timeline, then likely the systems that we want to engage, will move, will employ countermeasures, and they want to live too so we've got to do everything we can. And then that highlights the work that Willie Nelson is doing, his leadership on the Army Sensor to Shooter Campaign of Learning, and his leadership on the Army Tactical Space Layer. That's opening up new doors for us or

new windows for us into seeing the enemy use of AI spearheaded by Doug Maddy and the AI Task Force and the ISR Task Force working together to help us find targets in this information, use AI to speed that call for fire to the shooter.

So, we're taking an end-to-end approach to this. We make most of our noise about the signature systems that we're developing, but we are the reason why they have operations guys in these CFTs, is because we take a combined arms approach to it and we know that we're going to have to work together to fight and win in the future. Specifically, on PrSM, we couldn't be more confident in that program based on a really successful last probably 18 months of testing, three successful flight tests that in the past, that first flight test may have just been simply put to see if it comes out the front end of the launcher. But instead, that first flight test, we have valued every single thing from its launch, max speed, max apogee, height of burst, accuracy, and lethality, and all of those were spot on and it's been that way for our first three flight tests.

We have four tests over the next nine months. One is a 400 kilometer shot coming up in April out at White Sands Missile Range from a place called Fort Wingate. And then we'll go out to Vandenberg Air Force Base for the max range shot. Let's see how much beyond 500 kilometers we can go. And then we'll work shots into Project Convergence '21 in November at White Sands in which we'll have for the first time two missiles per launch pod container in separate flight events. So, we've got a great industry partner. We've got I think not a day to lose or a dollar to waste, but we have a clear path to delivering an urgent material release in 2023, and it's really a tribute to Lockheed Martin, to the Program Office, and in the PEO Missiles and Space, Army Test and Evaluation Command, and Aviation and Missile Command, who will eventually give us that urgent material release.

The teamwork, and that's the operative word in CFT, is building the team, and in this case, I could not ask for better teammates to deliver this really necessary capability starting in '23.

BOWMAN: Thanks. That's a great rundown. Before I pivot to the other two gentlemen whom I'm eager to talk with, as we work through our discussion here, I'm going to attempt to weave in a few questions from reporters, and I have one of those here. As you know, General Rafferty, it's important to increase the rate, so we were talking about PrSM, but going back to artillery for second, it's important to increase the rate of fire for artillery. I understand that you've been briefed by a number of companies that are part of this so-called Fire Faster Cohort. Jen Judson at *Defense News* would like to know, "What is the plan to take some of their ideas to the next level, and how might they be integrated with efforts like the Army's government designed auto loader that I understand will be tested at UMA soon?"

RAFFERTY: Well, it's a very timely question, because last week was week 18 of our Fire Faster Cohort. And that was an effort undertaken with our partner, the Program Manager for Self-Propelled Howitzers and the Army Applications Lab, and the Armament Center from DEVCOM out of Picatinny. And we're all taking advantage of some time we have and the guidance from the senior leaders, which is approach our canon modernization in this way: extend the range, improve the lethality, and then increase the rate of fire. And that's how we're doing it. So, we've got time to get the rate of fire right. And what we learned from our first experience with the Army Applications Lab in this community of innovators was that we don't have all the good ideas, and if we can break down barriers to small business to doing business with the government, maybe we can crack into this community who – their livelihood is solving hard problems, and we've got a lot of those.

And so, we gave them this problem of, we want to fire faster. Cast a wide net across the country. Received about 100 proposals. Down selected, very tough to get down to 15, and then started an 18 week sprint. Week two of that sprint was a user experience in the field. Let's put these small business in the back of the howitzer during the live fire operations day and night, conducting realistic combat training at Fort Hood. And then have routine interactions with them for the next 16 weeks resulting in their proposals, which were last week. So, the Program Manager was here sitting right next to me. So

that was assault and an AFC right next to each other with 15 one-hour briefs of their proposals. Now we're in the process of down selecting to five, it's going to be hard. But what we saw were incredibly promising technologies that may, in some ways, compliment the autoloader, that may give us an alternative to the government designed autoloader, but either way, give us really good options to make a really hard decision later this year, going into next year.

You're right, the government auto loader is the 31 round large capacity, is undergoing some initial characterization testing at Yuma right now. I'll be there the week after next to see a demo. And then we'll really look forward to the 23 round capacity autoloader in September. And that's really that sweet spot of capacity that we want is 23 rounds. So, I think I'd like to say, we've put a chalk mark on the calendar of when we want to make this decision. And we think we'll be in a position probably at the end of this year where we'll be able to make the right decision for increasing the rate of fire in the extended range cannon artillery platform. Over.

BOWMAN: Great, no outstanding. Thank you. That's perfect. I can go all day, but I'm eager to talk with the other two gentlemen as well. And I'll circle back with you maybe a little bit later, some follow-up but let me transition now, if I can to Brigadier General Gibson. Brian, it's great to see you. Thanks for making time to chat.

GIBSON: Thanks Brad. I appreciate it. It's funny, John and I are literally neighbors both on and off of what we're doing here inside of this building on where we live here on Fort Sill. So, it's great not only doing this with him, but Willy, I think as you heard, John alluded to, he helps us all be better for all the right reasons. So, it's a good grouping of folks. So, if I could, I'd like to just give you a broad overview, I think of the portfolio as –

BOWMAN: Yeah, that'd be great. That'd be perfect.

GIBSON: What John asks. So, like John, we're very focused on what's it looks like in the future, against potential adversaries and it has to drive everything we're doing. As you will likely know, inside the Army Air Defense Force, we have been a Patriot centric force for a few decades now, really since Desert Storm. And it's a phenomenal weapon system, but the Army made a lot of hard choices that they need to make to win the fight that we were in. And that modernization holiday that you referred to earlier, I think, you might not have called it a holiday, but the time that we took to win the fight we were in inside of their defense portfolio, that really presents opportunities now to overcome both capacity and capability gaps that we have really seen ourself faced with over the last few decades.

For us, the Patriot force and many of our other forces of the past that we still depend on to this day are phenomenal weapons systems designed to do incredible things, but they're that. They are weapons systems. Technology today allows us to break apart weapon systems and to get better outcomes at the end item level or sort of the platform level.

So, I think what you'll see inside of the Air Defense portfolio is that we are, we are singularly focused as our top priority to try and achieve platform integration at the lowest level with both current systems, but also as we develop new systems in our future. And when we achieve that, the outcomes are not small and they're not intangible. They are absolutely incredible for the work that we've already put into our systems of today, but more importantly, the systems of the future to get the maximum utility out of whatever we're trying to achieve, whether that'd be sensors, whether that'd be effectors or whether that be inside the joint integrated air missile defense space that we play a lot in just as a function of operating in an air and land domain simultaneously.

So, for us inside the portfolio, like John pursuing tactical to strategic, a range of acquisition approaches, I think you'll see that's pretty common to many of the cross-functional teams because it's that flexibility that allows us to achieve speed

and achieve capability, simultaneously in the past where we weren't able to do that. For us, that that includes a new air defense common mission command system.

It includes pursuing a radar replacement for the Patriot force. It includes trying to field capabilities to bridge the gap between what Patriot and THAAD provide us today at the operational strategic level and what we have at the tactical level. So, to find a bridge in between those two, and that's really with the indirect fire protection capability. Not an easy acronym of IFPC, and I'll try to stay away from it, but that's what that means. And then lastly, to regrow our tactical short range air defense force. So, it is those four lines of effort that, when tied together differently with common mission command, really achieves an outcome that is not only in the anti-access area denial world that John described earlier, but in large scale combat operations that is absolutely beneficial to our Army and to our joint partners. And for me, like John, I may be a year younger than John, so I'm giving him a hard time.

And for Willie, I'm probably 10 years younger. Sorry, Willie, as we tee you up here in a few minutes. But seriously, in my career, certainly this is the most amount of modernization I've seen and experienced inside the air missile defense portfolio. And arguably, it's probably the most simultaneous since the Cold War. Patriot was developed in the sixties, seventies, fielded in the eighties, went to war in the nineties and has been there ever since. So, for us, you can look at Stinger, it's a similar missile system that has a similar path. We are very intent on not Patrioting and Stingering in our way to a future force. So, hopefully that gives you a big broad brush on some of the things we're focused on. Over.

BOWMAN: No, that's great. Thank you so much. And I'm glad that you focused on the changing threat from cruise missiles to unmanned aerial systems as you know far better me, this is not a theoretical threat. We're seeing this play out today in Iraq and Saudi Arabia, around the world. And it's just a matter of time until these capabilities are potentially brought against our forces in a more concerted way, potentially not from some militia or terror group, but from a great power adversary. And it's so great to hear that you're working with the sense of urgency on developing and fielding those capabilities. In that spirit, could you tell me, if you wouldn't mind, you mentioned the four lines of effort and some specific systems, can you just give us a very quick kind of update of where we are in each of those four lines of effort, and most importantly, from my perspective, do you think we're going to be able to field [them] to our war fighters in the next one to three years or so in your portfolio?

GIBSON: Yeah. Thanks Brad. So, I'll pick up where I left off on the first comment about the most simultaneous modernization in the portfolio, just to capture sort of the last 18 months of activity in those lines of effort, which will then stage for, well, what's this look like in the next two to three years? So, in the last 18 months, we have conducted a limited user test for our Army Integrated Air Missile Defense System, AIAMD, and its network is that thing John referenced earlier, the Integrated Battle Command System, which is a common mission command platform. We have begun prototyping for that Patriot radar replacement, the lower tier air missile defense sensor, LTAMS. We have bought, purchased, trained, and are beginning to assess two Iron Dome batteries worth of equipment. We have begun a competitive effort to then down select later this year for our enduring indirect fire protection capability.

And then lastly, we have within 18 months, designed, prototyped, tested, fielded, and now are training our first maneuver short range air defense battalion. That's all within 18 months. So, what's that look like two to three years from now? In two to three years, you will have the first battalion fielded with this Integrated Battle Command System. They will also be equipped with the lower tier missile defense radar simultaneously at the platform level.

Our two Iron Dome batteries will be fully employed across our Army, whether that be inside of training and garrison or deployable around the world, based on decisions that get made and the environment we operate in. Our enduring

competition for the indirect fire protection capability will have been concluded, and we will have initial capability, several number of launchers and missiles in FY23. And then lastly, we will be on the tail end of fielding sort of this first set of our maneuver short range, air defense battalions, four brand new of them that we just started with fielding for this year. So, in three years, you'll see all of this kit fielded in our Army. And then there's a period of time, obviously after that to pure fleet our Army based on decisions and support from Congress and an Army leadership. But this isn't a theoretical, this isn't just thinking about the future, that's absolutely important. That's why we're here for Futures Command. But this is about fielding and sustaining the momentum that we've gained over the last 18 months and to make it real for our Army.

BOWMAN: Thank you for that. I mentioned reporter questions. I have one more from Jen Judson this time for you, Brian, if I may. She is interested in the indirect fires protection capability, a shoot off coming later this year, you touched on that a bit. But she has kind of a more specific question. And here it is, "How is the Army going to assess capabilities appropriate for cruise missile defense and unmanned aerial systems, as well as counter rockets, artillery and mortars? Are all of these capabilities going to be assessed at the shoot off or will there just be a focus on cruise missiles and UAS to start with the latter focus on the counter rockets, artillery and mortars. And then how are you going about tackling these different threats, integrating that capability into an enduring system?" I know that's a mouthful, but I'll let you take that where you want to go.

GIBSON: No, that's great. I appreciate – Jen's been an avid supporter, but also very good at trying to hone in on, I think the challenges that we seek to overcome. So, first of all, one of the principles for our missile defense is we must layer at Echelon. You're never going to have enough. You can't protect 100% of the things, no matter how much you want to do that. And there's lots of good reasons why that's the case. So, this principle of layering at Echelon applies also inside of these new systems, that new weapon capabilities we're seeking to develop and to employ. This enduring program for IFPC is no different. So, there are a range of threats that our systems of today and our systems in the future must be able to counter, whether that's from the low and slow non-advanced unmanned aerial systems, or all the way up to hypersonic missiles, if we must, as our adversaries continue to seek those capabilities.

But if we design a Swiss Army Knife approach at Echelon to counter every single one of those, we probably end up with a less capable system against any one of them specifically. And that cruise missile defense threat really fits very neatly in sort of this space for IFPC. Our choice we have today is to continue to use the Patriot missile system in ways that it can counter these more advanced threats or to preserve it for the more advanced threats and to develop other capabilities that can take on some of these other threats. That's what IFPC is about. So, we're going to learn more, not only with what we're doing with Iron Dome this summer currently, but also as we go through this period over the next months for the Enduring Program, the shoot off is just one variable that we're assessing to truly assess performance and to make a down select decision later this year.

So, it's a series of models and simulations based on high fidelity results and runs that both industry and the U.S. government have available to them. It's certainly performance out on the range when we do the Enduring shoot off. And then it's also a look at the capability to deliver this in time and on budget and sort of combination is those three buckets of things to get us to an enduring capability. For us from cruise missiles, all the way down to counter rockets, artillery, or mortar, that is the sweet space that we are trying to design this weapon system for. So, we will assess the potential winner later this year on achieving that capability. And then we'll develop in time as we move from there. Does that answer your question?

BOWMAN: No, that's great. Thank you so much. Appreciate it. Let me go ahead and transition if I may now to Mr. Nelson. One of the reasons I'm excited to have you three together talking is the long range precision fires is viewed as the

Army's number one priority, but air and missile defense is one of the most important things that the joint force needs from the Army and all of this, arguably, won't be possible without the work of Mr. Nelson and his team. And so, Willie turning to you, if I may, your cross-functional team is a bit of a mouthful, a lot going on there. I'm eager if you'd be willing to tell us kind of what your portfolio is and why you think it's so important for the war fighters.

NELSON: Hey, thank you, Brad, and gentlemen, thank you. And I agree with what you said. I think what's important is when you look at how the Army developed the modernization priorities, they took a very holistic view. It wasn't just on long range fire, or just R&D, there are some enablers in which the network is a key piece of as well. But as you indicated, understanding your position, but breaking down the APNT acronym, assured positioning navigation and timing. Understanding your position, being able to do that very accurately, having navigation aids that can operate in denied and degraded environments. And then timing, quite frankly, if I was going to rename the APNT acronym, I'd put all small letters and T would he be a capital T because frankly the networks, nothing works without timing.

And so, part of what we try to do within that line of effort, and there are three lines of effort the CFT is trying to develop resilient, autonomous, and alternative forms for P, N and T, for the positioning, navigation and timing. And then we work with all the other CFTs to help make sure that these new capabilities and technologies are embedded into their systems going forward. So, as you indicated, we cross almost all the programs within the Army, certainly all of the cross-functional teams. And again, our job is to help make them better and make them resilient in the face of a very, very sophisticated adversary who knows and understands our reliance on GPS. Quite frankly, that's not a surprise, it's a great tool, but it does have – again, our adversaries know that, and they're taking measures to try to, to prevent us from being able to use that. So, again, I have three lines of effort, the assured position navigation and timing is one of those. I'll talk a little bit about that. Tactical space and how the Army uses space capabilities is another one. General Rafferty mentioned that already once. I'll go into a little bit of detail. And then finally navigation warfare, or the acronym is known as NAVWAR. Again, another mouthful, but that really talks about the sophistication of how do we sense the environment that our operators are in, how do we understand if we're being jammed or just we're under foliage, we're in a canyon and just not able to get a good fix. How do we help soldiers operate in those environments? And then my favorite, we punch back. We know we're being degraded and denied but taking the opportunity to create a bad day for our enemies as well. And so again, let me break that down a little bit and from assured positioning navigation and timing, what we're really focusing on, there are three parts of the art.

Well, everything in the Army relies on it, but we really focus it on the ground domain, the aviation, and precision and weapons. And those do fairly neatly align with the PEOs, the centers of excellence in the labs across the Army. But within the ground domain, what we're looking to do is be able to develop sophisticated assured position navigation timing capabilities that go into our ground mounted capabilities called MAPS, Mounted and Assured PNT System. And what that does is that has an AI capability with it. It then goes into, in this case, Stryker vehicles or Abrams and it provides a multi-source layered approach to provide PNT. Should GPS go out, it has other alternative forms to be able to develop the P, N or T that is needed for that vehicle and that fighting unit. And so again, MAPS is a good success story.

I'll circle back on that in a minute. There's an equal program called DAPS or Dismounted Assured PNT. We've been using the DAGR now for centuries, which is that handheld GPS unit. It needs to be replaced with the new M-code. We're working some systems that again, provide what we call a PACE plan, primary alternate contingency and emergency. Something that can gracefully degrade when you're in a jammed environment and it just naturally seamlessly degrades to other sources of P, N or T to provide seamless support to the war fighter. We're working other alternative forms of PNT, both RF based and non-RF based. The Army has a significant amount of efforts going into inertial measuring units and inertial navigation units working with DARPA and some of the FFRDCs [Federally Funded Research and Development

Centers] and UARCs [University Affiliated Research Centers] out there. You talk about a hiatus. We've put a lot of that work quite frankly in miniaturizing those and getting those down into very, very small form factors that General Rafferty needs, for example, in a precision guided weapon.

The size of your fist, you have to have the latest, greatest information and technologies to be able to provide that type of precision and accuracy. It's a challenging problem from a size, weight and power standpoint. So again, a success story on the mounted PNT side. A couple of years ago when the CFT stood up, the Army struggled for years to write a requirement for PNT. It was just there, it was ubiquitous. It's like writing a requirement for air. It was very challenging, and all the services had a challenge, but we finally rolled out the direct of requirement process, which AFC and ASA(ALT) supported, wrote a directed requirement in about six months. The good news is it was seven pages. It wasn't volumes and volumes and reasonable information, but it was seven pages that got down to the nitty gritty of this is exactly what our war fighters need.

In parallel, we prototyped some first-generation MAPS, or mount assured PNT systems. We then equipped folks in Europe, units in Europe with those systems. And now you're getting feedback from the war fighters in theater they're using them in operations, they're using them in on the field, and then we're getting feedback. And now the second generation, which is going down a formal more JCIDS with an actual capability description document CDD is in place. And so, I guess what I'm saying in 18 months, like the other gentlemen have mentioned, we've been able to write a requirement, prototype and equip units in the field to be able to roll that information back to improve a second generation, which is going into the field next year. And so, 18 months is pretty dynamic in anybody's world. So that same I'll say OODA loop is working on the dismounted system as well.

I'll move to aviation. Really, aviation was focused on getting ourselves over to the new M-code, which is the next generation GPS, as well as working in new anti-jam antenna systems for our aviation fleet. Significant efforts. Again, working with PEO aviation in the AvMC [Aviation and Missile Center] out of DEVCOM and making great progress there. The precision weapons, as I mentioned, the hard problem there is getting these sophisticated capabilities down to the very, very small size weight and power needed and probably the most challenging cases can be down to a PGK, or a precision guided kit. And we're again, working with the folks, our experts at Picatinny, General Rafferty's folks at Long Range Precision Fires. The thing I like about the CFT is the T in CFT is team, and none of us can do this alone. It really does take all of us to get there. So, that's really the PNT side. I'll see if you have any questions on that before I move on to the tactical space side.

BOWMAN: No, that's great. I welcome a quick update on the rest, and then I'm eager to follow up with you.

NELSON: Sure. I'll move to space, but real quick, one of the challenges with going to M-code or the new military code for GPS is the Army has a real scaling challenge. We have over 500,000 GPS receivers across the United States Army. That's a challenge to any budget or any technical system when you look at how you integrate those into three or 400 different programs across the Army. It's a real challenge. We're pleased that we've taken a big bite at that apple. You're going to see the M-code capabilities rolled out here in this next year. And so, we're very ecstatic about that, but it took a very, very large approach across ASA(ALT) and ASC to sit down with all the program managers to really understand how do we integrate these capabilities. Now, tactical space. It's not probably surprising to your viewers that the Army is one of the single largest users of capabilities coming from space.

And again, it's no surprise we use [it] for communications. We just talked about GPS PNT and of course ISR, intelligence surveillance and reconnaissance. But what we've found is in order to operate inside of our enemy's decision-making cycle and working again with General Rafferty's team, we're able to actually develop prototypes and put capabilities up into space that actually drastically reduced that decision-making cycle on our forces. So, we're actually now going to

be able to have eyes and ears deep into enemy territory. And as General Rafferty mentioned earlier that decision by our adversaries to create a very long standoff benefited them greatly. But what we found out, what we're finding is space can be a key enabler to help bring us back into that capability, be able to sense very deep, be able to provide actionable and targeting information to our long-range fires and war fighters in a very, very fast loop to be able to again, out process our enemies, and as well as before they're able to move.

And so again, some pretty significant capabilities there. The third is what we refer to as navigation warfare, or NAVWAR. I indicated that earlier. It's really the ability to sense the operational environment, the EW environment around you, and be able to understand whether or not you're either dismounted, mounted, aviation platform, you take is operating in a GPS denied environment or degraded environment, or is everything just great, which would be wonderful too. And then also since once that environment, both not just around your vehicle or around the soldier, but what's the environment at the impact or target point and be able to provide that information real time to the mounted and dismounted troops or commanders in the field to be able to inform and help them make the most lethal and tactical decisions they need on the battlefield.

So, I think that kind of sums it up real. Again, it's providing resilient assured position navigation and timing, be able to use space in new and interesting ways to be able to provide data and information to our war fighters directly in theater, and then be able to sense the environment real-time to be able to make our commanders make more informed decisions and our weapons systems to be able to perform at their design capabilities. So, I think I'll respond to any questions you have at that.

BOWMAN: That's a great overview. You're clearly a busy man. And so, thank you for all that you're doing there. You touched on it a little bit. I just want to give you a quick 30 second opportunity if you like. Are there any capabilities that are on the cusp of being ready for fielding in the next one to three years that if you receive sufficient authorization and appropriation that you might want to highlight? Something that's kind of ready to go in the next one to three years that you might want to hit on that you haven't already covered.

NELSON: Yeah, absolutely. So, I mentioned MAPS, but really, I do want to foot stomp that. The generation two, which is the latest and the greatest, the best capability United States Army has ever had, that will also incorporate M-code, which has been congressionally mandated in many NDAAs, but again, brought to life again in this last NDAA from Congress, will be fielded here in the next year. And so, we're excited as can be, but again, just go back. It's just two years, as the other gentlemen have mentioned. That processing time has never been done in near 30 years of experience. So – I'm sorry, Brad.

BOWMAN: No, I don't mean to interrupt you. I just had a follow up on that point if I may. Obviously, we don't want to count our chickens before they hatch, it's not done till it's done, but I think an objective observer could say there's a lot of impressive work being done quickly here. And those of us who are familiar with some of the hiccups in the past couple of decades will be impressed by this. I'd be interested in hearing from any of the three of you in 15, 20 seconds or less, if you're willing, what's the secret sauce so far in you guys being able to make such significant progress so quickly? Something more than, "Hey, it's Army Futures Command." I get that, but what's the specific thing take advantage of having all three of you here at one time that has allowed you to more move, shall we say, more quickly than the Army has moved in the past? I heard the requirements document, not a hundred pages, it's seven pages. What is the secret sauce? I'd love to hear from any and all of you on that question?

RAFFERTY: I'll take a whack at it first. I'll try to keep it at 20 seconds.

BOWMAN: Great.

RAFFERTY: I think one, it's the recognition of the threat and then it's the steady, consistent drum beat from the Army senior leaders on the importance of delivering this capability to the field as early as '23. And we're all, at least in my portfolio, we're all right around that timeline. And the consistency of that message, the consistency of the resources to support that has really provided a really strong unifying signal that the CFT can then rally around. And so, it's easy to get people on a winning team, right? The winds at our back to do this. A lot of hard work, a lot of risk, a lot of not counting our chickens, like you said, but everybody who's in this enterprise, I've found, shares the same objective and wants to put this capability in the hands of our soldiers. And so, I really think it's as simple as the leadership. Over.

BOWMAN: General Gibson?

GIBSON: I'd also echo it's also the acquisition flexibility that Congress has allowed us to use. It's the leadership from the Army and it's the appropriations and the authorities combined from Congress that has allowed us to make progress. And John's absolutely correct. I don't mean to undervalue that it's all about the team, but when you have those three things together, this whole big enterprise has a tendency to move. And I think that is the secret sauce, at least in my opinion. Over.

BOWMAN: Mr. Nelson?

NELSON: I would agree with both. I had one more thing. I think it's about singular vision and partnerships. And so, it's the ability for, as General Rafferty, lay out the priority, rally folks around that priority, it pulls AFC in line. It pulls ASA(ALT), all resources ASA(ALT) has to their – it brings our centers of excellence in, and then let's not forget our user pack and our war fighters in the field, all in that same basket together, all driving in the same vision to the same milestones. We did some sensor to shooter test that General Rafferty mentioned earlier in Europe last year. That would have never been possible if these teams hadn't come together and rallied around and done three sensor to shooter tests, live fire tests in the field, putting satellites to guns with operational soldiers in less than a year of planning and execution.

I've never seen that happen either. It's again through General Rafferty's leadership, General Gibson's leadership and the team, but I will just bring again, having the operators and the war fighters alongside the engineers, both in the dirt at Project Convergence and in the field is the key enabler in that partnership that keeps this Army vision for each of these modernization priorities going forward. Over.

BOWMAN: No, that's great. And for our listeners, ASA(ALT), that's the army headquarters element that focus on acquisition, logistics and technology. So, I have a question from Sydney Freedberg for you, Mr. Nelson, if you're willing with *Breaking Defense*. He's interested in how the Army is working to link the offensive and defensive pictures to get at the enemy left of launch and employ effective missile defense right of launch. Can you discuss that a little bit? Actually, I throw that to any three of you that want to talk and kind of get into the idea of synergy of the three CFTs working together.

NELSON: Well, I'll start with that and I'll leave the other two colleagues here, from my foxhole, what I see is really the ability to sense deep and to provide that to a variety of different operators, to General Rafferty's team for long range fires to be able to provide that quickly to General Gibson's teams to be able to counter the fire, to be able to understand where the fires are coming from. The ability to move that data so quickly through, and there's a significant efforts with autonomy, excuse me, well, AI and machine learning. We're finding a lot of ways now that technology is able to just radically move the decision-making process to the left. And then again, data becomes ubiquitous. It becomes data that all can use, both from

an Army, but from a joint standpoint, and hopefully then from a coalition standpoint, but it's all about moving data quickly at speed to Echelon.

BOWMAN: That's great. That's great. Do either of you want to jump in?

GIBSON: Yeah. I'd chime in and also add that it's not just about our future systems that I think as Sydney alluded to, but our current systems like our joint tactical air ground stations and JTAGS. It's clearly in support of our land component forces to provide a series of capabilities in the missile side business that we do, but there's information, undoubtedly, I'm sure that and current systems needs to be and can be unlocked and shared now across platforms. And I think that really is inside of, at least on my side of the equation on the defensive, protective fire side of life, where milliseconds matters, from the point of especially the tactical system with rockets, artillery, mortars, you've got hardly any time to react. We just can't be beholden to a singular sensor finding whatever you're seeking to destroy and to counter.

So, there's great opportunity here at all Echelons, I think, to achieve what Willie just sort of laid out from a vision perspective. I know with John and I especially on offensive and defensive fires, our radars can pick up multiple things regardless of what their primary thing that they're trying to find is and being able to share information quickly across architectures in a redundant fashion that matters to the end users on either side of that, I think that's really where the keys to this lie. And then over to John if he wants to add on that.

RAFFERTY: Again, this probably isn't lost on everybody that's paying attention to these issues, but the difference between using space-based assets for intelligence versus using space-based assets for reconnaissance, surveillance, and target acquisition. We use those terms interchangeably sometimes, so it might seem subtle to some that we go from intelligence to RSTA or Reconnaissance, Surveillance, Target Acquisition, but it's not subtle. The change with the leadership's emphasis on using the assets as to find targets, that's a critical change. That opens up the door to what Willy described as this ubiquitous sharing of data across the Army, across services.

Then how are we now going to link into that data? How are we going to use our tactical fire direction and fire control systems to get at that data? It goes with how we're moving some of our C2 systems to the cloud, so that that data is easier to access and easier to take advantage of, and how we're using AI to sort through that data to find targets based on the commander's high payoff target list. That shift from Intel to RSTA is not a subtle change of terms at all. Over.

BOWMAN: I'm glad you said that, and many of the viewers may have read Chris Brose's book, *The Kill Chain*. One of the key ideas in there is, my wording of it, three Ds, detect, decide and deliver. Detecting the threat, deciding what to do about it, and delivering the desired effect or munition as quickly as possible. The more we can connect, as you gentlemen have been saying already, every sensor and every shooter, including those in space, the more effective we're going to be able to do that. So, I'm glad you said that.

GIBSON: Brad?

BOWMAN: Let me, John, circle back to you quickly on – Oh yeah. General Gibson, please go ahead.

GIBSON: Can I just add one follow-up comment to that?

BOWMAN: Yeah, go for it.

GIBSON: This idea of connecting everything, some people may think that you're also pushing the data of everything to everybody. Right? So, when you start talking about this idea of networks and architecture and what's useful to the end user, we are all laser focused on that challenge and that problem. How to do it most efficiently, most expeditiously, but also most appropriately, because nobody needs all of the data at every single node, nor should we design our system for that to be the case.

So, I think that's just an important thing, because if we take that approach, then I think we'll probably achieve a less favorable outcome, system by system threat, counter by threat counter, et cetera. So, as John described, going to the cloud, and Willie described this ubiquitous net of connecting things, it's connecting things smartly and doing it rightly at echelon, I think, which is the keys to this. Thanks.

BOWMAN: No, that's great. Thank you for that. General Rafferty, coming back to you, the new Secretary of Defense, relatively new Secretary of Defense and the new Deputy Secretary of Defense have said to Congress that China's the pacing threat, that obviously we're going to use these capabilities to deter aggression in a lot of places, but China's the pacing threat. All of the services, as you know better than me, are developing a range of capabilities. In the Indo-Pacific context, General Rafferty, I'd be interested to hear your thoughts on the unique value or comparative advantages of the capabilities that you're working on in your portfolio that might complement those that the Navy and Air Force are developing in the long range precision fires domain.

RAFFERTY: Well, Brad, you're right. We are really focused on the Indo-Pacific region, and we're lucky to have U.S. Army Pacific as a great partner. The commander of U.S. Army Pacific is my senior mentor for the portfolio. So, we have a routine and an excellent productive dialogue and meaningful exercises to help experiment with some of the capabilities that we're developing so that we aren't just focused on can we do it from a material standpoint, can we mature the technology? But also, we're focused on how are we going to do it? How are we going to fight with this capability?

All our analysis tells us we should, but really, the how are we going to fight goes to the approach of Army Futures Command of having soldier touchpoints is important on how the equipment works, but the soldier touch points on how we're going to fight with it are just as important. In the Indo-Pacific, it really leaps out to you speed, range, and convergence. Speed, because of the enormous distances that have to be covered, there's no bit of time that's too short to save in the sensor to shooter chain, and the speed and the performance of munitions is incredibly important.

So, the hypersonic system, obviously that's baked into the title there, but for their precision strike missile operating at high Mach speeds really helps to close those ranges quickly. It makes it more survivable against countermeasures in the A2/AD, the anti-access/area denial complex. But the range is in thousands of kilometers and hundreds of kilometers for PrSM and the hypersonic system. The mid-range capability that we're pursuing really gets in that self-inflicted, self-created gap that didn't exist before, but it just goes with let's see what we're capable of delivering in surface fires.

Obviously, that's signal from INDOPACOM combatant command is very clear that they need the surface-to-surface delivered fires not just to create additional dilemmas for the adversary, right? You've got things coming from air, from maritime launched, but also from land-based, but also land-based systems are there 24-7. They're all weather, and that's an important deterrent capability and then creates those multiple dilemmas for the adversary if deterrents fails.

What I mean by that, multiple dilemmas is a mix of munitions that travel at different speeds, subsonic, supersonic, high supersonic, and hypersonic, that follow different trajectories and different paths, that come in different volumes. That effect overwhelms the adversary's ability to make decisions, and that's when we're able to penetrate and disintegrate

the anti-access/area denial complex, but that only comes from convergence. When we're able to converge the effects of space based RSTA over cyberspace and the use of artificial intelligence, and then land and maritime and air domains, and synchronizing those effects in ways that and in time that we can't do now.

We can episodically synchronize anything right now. I mean, we're the best army in the world, but to do those sorts of things at the range and the speed is going to cause us to have to converge these effects. That's what is so critical about our Project Convergence path of experimentation, that Army Futures Command and the Army, quite frankly, are on.

But I think also in terms of the Indo-Pacific, when you get down to the extended range cannon artillery system or you get into the munitions that we're delivering that can be fired from a number of platforms and PrSM beyond attacking the maritime targets, is this realization that to view conflict in the Indo-Pacific in the lens of limited scenarios is probably short-sighted. We recognize that that conflict in that region would very quickly spiral out of control from one limited scenario into multiple scenarios, ranging from the Arctic to the South China Sea. That's what drives the importance of the Army's focus on the Indo-Pacific. It's the scale that only the Army brings and the decisive armor combat power that only the army delivers. Over.

BOWMAN: No, thank you for that. So much of what you said there underscores for me the importance of what Mr. Nelson's CFT is doing to synchronize everything. Also, your point there at the end about having some, my words, not yours, having some humility about the geography and the character of a future conflict and being cautious, informed by history about our ability to predict what a conflict looks like, both in terms of where it happens and the character of that conflict, is well-taken.

We have about seven minutes left, so I was hoping to do a lightning round on a couple of things. Let me jump to you real quick, if I could, General Gibson. You mentioned Iron Dome and that the US army procured two Iron Dome batteries from the Israelis. Can you give an update on when you think those might be ready for deployment if a combatant command were to request them? When do you anticipate they might be ready for deployment?

GIBSON: Yeah, thanks, Brad. They'll be ready by the end of this year. It is a near-term thing that we are achieving. You have army air defense soldiers, not contractors, not military civilian. You have US Army air defense soldiers on them as we speak. So, there's a series of activities we need to complete enroute to the end of this year. When we give them the thumbs up, things that you can imagine, of training, testing, and integration of US communications, a few other things.

But no, absolutely not. We are not going to park these things. We're going to use these things and use them with Army air defenders and intend to use them globally if we must.

BOWMAN: Outstanding. Both in terms of us supporting the Army's use of these two batteries we already have, and considering components of Iron Dome for IFPC, are you getting all the support and information you need from the Israelis?

GIBSON: Yeah, it's been great. There's been a lot of reporting over the last several years as this whole activity has develop. I think with anything, when you evolve international relationships and you deal with international industry and all these things, there's a period of time to bring ourselves to a point where we find ourselves now, which is absolutely a great place to be.

So, yes, in short answer, we have received everything that we needed. I tell you that it's only, in my opinion, I know it's biased with blinders on, but it's only made us even more closely aligned with our Israeli Ministry of Defense and the

activities and industry that matter to both countries so much. Although our environments may be different, how we intend to employ these weapons systems and architectures for which we'll employ them, there is a strong bond that this program has made stronger.

BOWMAN: That's great. Thank you. There has been a lot of reporting otherwise, so I think that's an important statement from you. So last question from me, and then I'll give each of you 30 seconds, if you like, to wrap up with any comments. I wish we had more time, but we don't. But I'll throw this out, and any of the three of you wants to take it, I welcome it. Are there any specific congressional authorities or appropriations that your cross-functional team needs this year or next year that are particularly important to getting these capabilities in the hands of our war fighters? I'll throw that out and anyone can jump on and who likes.

GIBSON: So, I'll start, if that's all right, Brad, I then go to these two gentlemen. So yeah, we absolutely need Congress's continued support to allow us to stay on the path that we've told them we're on, especially on not buying more standalone weapons systems. Whether US, whether international, I don't care, but that, if we do that, that goes exactly counter what we're trying to achieve, to have weapon systems that are no longer closed, yet they're open at the end item level to achieve a greater effect on behalf of the joint force. So, Congress's continued support, especially on the NDAA side, to allow us to pursue our strategies, to not procure more things that are closed by their nature for very intent as we achieved these new capabilities. Thanks.

BOWMAN: General Rafferty or Mr. Nelson, anything you want to add to that?

RAFFERTY: Well, Brad, I think what we've tried to do in the two plus years in the cross-functional teams have been in existence is have an open and routine dialogue with our partners on the Hill and to let them know, one, we're doing exactly what we told you we were going to do, and we're making every day and every dollar count. This transparent dialogue, I think, has been very effective in making sure that we get the resources that we need to deliver this critical capability.

So, I just say that we're going to continue to endeavor to keep that open dialogue open or that open dialogue going. We just ask for their continued support.

NELSON: Brad, I'll just finish with thank you for the authorities the Hill has given us to be able to utilize other transaction authorities or agreements, OTAs, in the mid-level acquisition process. Those have been key enablers to enable us to go fast and be able to do the rapid prototyping necessary to achieve some of the results you've heard here today. So, we ask for the continued support of those. We'll use them responsibly, of course, and again, as was mentioned, the transparency with the Hill has been fantastic. We look forward to that continuing.

BOWMAN: Well, thank you to each of you. I lied about the closing statements. I think we do have a hard stop. So, I'm just going to have to jump here to conclude. Let me just say I thoroughly enjoyed this conversation. The work that each of you is doing is vital to the well-being of our service members and the security of our country. So, from my perspective, your success is our success, and we wish you the very best. For more information on FDD and the latest analysis from our Center on Military and Political Power, I encourage everyone watching to visit fdd.org, as well as visit us on Twitter @FDD. This concludes our event. Thanks to our audience for tuning in.