

Center for Strategic and International Studies

Online Event

“MDA and the 2022 Budget”

DATE:

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FEATURING:

Vice Admiral Jon Hill

Director, Missile Defense Agency

CSIS EXPERTS:

Tom Karako

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*Transcript By
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Tom Karako: Well, good morning, everyone. I'm Tom Karako, and on behalf of the CSIS Missile Defense Project I want to thank you for joining us for what's going to be a great event talking about the Missile Defense Agency and the FY '22 budget.

And for those livestreaming today, just a quick note that you can submit questions online via the event page, and then via the whizbang capabilities – all-domain capabilities of the CSIS IT Department that will come through a series of tubes to my tablet here. And I'll be reading those live and directing them to our speaker.

Our speaker is, of course, Vice Admiral Jon Hill, who has for the last two years – as of this month – served as the director of the Missile Defense Agency. So, Admiral Hill, welcome. We're privileged to have you back at CSIS. We're going to cover a lot of programmatic and budgetary ground today, but before we do that I just wanted to hand it over to you to talk a little bit about your priorities and where the agency is now, so.

Vice Admiral Jon Hill: All right. Hey, Tom, great to see you in person.

Mr. Karako: Yeah.

Vice Adm. Hill: As we were walking in today, I think we did the countdown and we said it's been over a year since we've been able to see each other. So it's just a wonderful opportunity to be here in person.

I guess to kick it off I'll just mention two things. I always like to start with our mission statement. You know, kind of three big takeaways, right?

The first one is to defend, you know, our country, our forward-deployed forces, and our allies. That is front and center on what we worry about.

It's a layered defense capability. And the way that I define layers is more than one opportunity to either sense or engage an incoming threat.

And then the last piece is really across all phases of flight. Now, all phases of flight are tough depending on what we're talking about, and we'll probably get into that a little bit when we start walking through some of the programs.

The other thing is to talk about how we prioritize what we do. And fundamentally, it's one thing: It is providing capability to the warfighter. And we do that through science and technology, through development, on to testing and production, and then supporting the services as they operate and sustain the systems. And we'll get into all of that, I'm sure, as we come to the programs.

Again, thanks for having me here.

Mr. Karako: Glad to have you. It's been a tough year having to deal with COVID and all that. How's the agency dealt with those bumps?

Vice Adm. Hill: Yeah. It was tough. And I'll weave that into some of the programs as we walk through them, but one of the more visible ones is the Long-Range Discrimination Radar up in Clear, Alaska. That one is probably the front and center one because that has everything involved in it. We are on a base that – where we are doing military construction. We're also building a radar on the East Coast and moving that material in for the buildup. We had to come to an all stop. And when you're in Alaska during that time of the year, you know, what it takes to put something in layup or in caretaker status, that's a real challenge, and then you've got to get everybody out of there. We had to turn around the shipments that were coming in. And you still want to keep the production line going. So there were some delays associated with that, but we've really done a great job with the state of Alaska picking up where we left off as soon as there was an opening and an opportunity to go back in, you know, following all the protocols. We were able to catch up on military construction, which is great news, and we were able to keep radar production going with some fallbacks. You know, you get people that get sick on the production line, you have an impact there. But in the end, we're still going to get to where we need to be this year, which is that initial light-off and then government acceptance, or what we call initial fielding.

Mr. Karako: Well, why don't we just start with the threat –

Vice Adm. Hill: Sure.

Mr. Karako: – that drives all this. And you know, it's – it used to be more just about the ballistics, but now it's everything from UAVs to cruise missiles to gliders and so on.

Vice Adm. Hill: Right. Right.

Mr. Karako: And so I guess I would just say that that complexity has affected you all and you're changing the name of THE major defense acquisition program around which MDA is oriented, the BMDS. You've changed it to the MDS. Where do you see that threat spectrum going in the future?

Vice Adm. Hill: Right. So the core of what the Missile Defense Agency does still is centered on homeland defense against the ballistic attack. That doesn't go away. But what we have to do is now challenge ourselves to deal with the emerging threats, and I consider those the maneuvering high-speed threat or what's been known as the hypersonic threat. That one's a real challenge because

global maneuver now assumes that you may not be able to see it based on where sensors are placed today. And so when we talk about space later, that is a solution on how we get there. And then there is this cruise-missile problem that NORTHCOM and NORAD are very concerned about. And so we are trying to work our way through that as well.

You know, for hypersonics we were designated by Congress to be the executive agent to take on hypersonic defense, and so I can talk about that architecture later. But cruise-missile defense is one of those areas that it's just hard, you know, because you have to figure out what you're going to defend. And if you talk to General VanHerck, he'll talk about I need to know what the policy implications are on what we defend and how, and then it's an architecture discussion again. And we'll get into that later.

So one of – I guess the last thing I'll say in terms of threat, I think what has really changed and what has really opened my eyes over the last couple years as we have worked through these problems, we used to be very concerned about the dimness of some of the propulsion that's being used on ballistic targets. We were always concerned at the speed once they come back into the atmosphere. So never, you know – we weren't really challenged by speed in the endgame. I mean, that is a factor. But it was always about countermeasures, you know, decoys and other things that really keep you – well, it forces you to have a shot doctrine or a salvo policy to kind of – you either kill everything in the scene or you know exactly what you're going after.

With the advent of the hypersonic threat and even our cruise missile threats, it's really more about dealing with that maneuver in the atmosphere. And if you don't have the sensor coverage because they've maneuvered out of your sensor coverage, then it becomes a track propagation problem. And what that means is the uncertainty in that flight path, and are you ready to engage something or you're uncertain in the track? And, you know, FTM-44 is an example where we purposely did not have long sensor coverage, and so it was a propagation uncertainty problem for us, and that was a real challenge that test, but, you know, we succeeded there.

But I tell you, the actual threats – they're going to do those things. They're going to maneuver, they're going to go very fast, and they are going to be popping off countermeasures. So it's not easy.

Mr. Karako: That's a good detail about FTM-44, though.

Vice Adm. Hill: Yeah.

Mr. Karako: Let me stay high for a little bit and that is, you know, in the past couple years, new national defense strategy –

Vice Adm. Hill: Right.

Mr. Karako: – says – has kind of reawakened our perception of long-term strategic competition. How has that affected you? Yes, you mentioned homeland ICBM rogue-state threat, still a big focus, but how have you been adapting so far over the past couple years?

Vice Adm. Hill: Yeah, I would say the best way to adapt is to not lose your alignment with policy. Right? So when we're dealing with the homeland ballistic threat, you know, clearly a rogue-nation problem, we have a different answer for the near-peer competitors. When you get into the regional fight, though, that's where things can become ambiguous in terms of source – right? – where those threats are coming from. And, you know, pick any theater around the globe, we don't have the time to do attribution. We just need to defend that force, whether it's a sea base or a forward-deployed maneuver unit from the Army. We just have to deal with that. And so I kind of break life down as the homeland threat; there is the regional threat, which is keeping the fight forward so we can protect the homeland, so you have to have strong regional forces. And then there's this other piece that we don't often talk about it, and you got into it a little bit on unmanned air vehicles and, you know, close-in cruise missiles, and that's really more the service equity for self-defense, whether, again, it's a sea base or a base, and so that's an area that we're not heavily in, but I'm questioned all the time, why are we not in that area? And those are decisions to be made downstream. But I still think the capacity that we have within the regional systems that we have really play heavily in that, and they also play heavily, potentially, in the homeland game.

Mr. Karako: Great. So you've already used this word I think twice, and that's architectures.

Vice Adm. Hill: Right.

Mr. Karako: So the MBS is at this period of transition; there's lots of architecture studies going on, whether it be hypersonic defense or cruise missile defense, and the like. But you used that word I think deliberately. Could you say, what is it that you mean when you talk about that? Why do you focus on the architecture? Why is it important to have an architecture-wide approach to missile defense – and defeat, for that matter?

Vice Adm. Hill: Yeah, it's a great, great question. Architecture is one of those words that gets thrown around by a lot of folks, but for me, it's a really – it's a way to break the problem down – right? – into the three main pieces, so detect, control, engage. And you can apply that to any one of these fights. Whether it's a ballistic or hypersonic or cruise missile fight, you have to detect what you – you have to detect the threat. Right? That's your sensor architecture. Then you have to have the fire control, command-and-control networks; that's the

second piece, the control piece. And then when you get to engage, those are your weapons; whether they're hard-kill, soft-kill, kinetic, non-kinetic, you have to kind of consider all of those.

So when I look at a cruise defense of the homeland problem, I immediately go to what sensor architecture do we have? It's what General VanHerck would call the all-domain awareness problem. Right? Does he have that or not? Does he have the command and control in order to see what those sensors are seeing? Are you getting tracks on the glass, for example? Right? Do the operators have a clear picture of what they're doing? And then, do they have the weapons or the capabilities to go after those?

So, for me, architecture is detect, control, and gauge – sensors, fire control, command and control, and weapons.

Mr. Karako: So there's another word that gets thrown around and that's multi-mission.

Vice Adm. Hill: Yes.

Mr. Karako: And I noticed in the way that you talk, but you said the high-speed maneuvering threat, also called hypersonic things. But I've also heard you say many times that if you're standing on the deck of a ship and supersonic, hypersonic, whatever's coming in, it all kind of looks the same.

Vice Adm. Hill: It does.

Mr. Karako: And so, therefore, you know, as we think about the homeland, cruise missile, hypersonic and such, you know, what is the relative importance of a multi-mission effector or a multi-mission sensor? What's the relative importance of that? How do you kind of trade off? Because you also don't want to shoot a really exquisite multi-mission thing –

Vice Adm. Hill: Right.

Mr. Karako: – if it's a low-end threat.

Vice Adm. Hill: Yeah, you know, generally, if you talk to any of the warfighters, they want max multi-mission, right, because what they're trying to do is, if they're going to have a capability someplace, they would like that capability to see space objects; they would like it to see, you know, what's coming down from space; they want to see what's out in front of them in the atmosphere; they would love to see what's on the surface, and some of them even want that same sensor to have an undersea-track capability. Right? So that's all very hard. Most of our programs are built and purpose-built for a very specific region in the battlespace. So the answer to that is to network those together.

I think multi-mission capability from a fire-control perspective is where we have to be. And, you know, one great example would be the Aegis Combat System – handles space tracks; it is managing tracks in the air; it's got a cruise missile-defense capability in it. We're building in hypersonic defense capabilities into it. So when I say multi-mission, I tend to go to the system first. I'm less interested in the multi-mission weapon. There's one that's out there that I often talk about, the SM-6 missile, but you can say Patriot's the same thing. Right? It's doing cruise missiles; it's doing ballistic missiles. So you want as much flexibility as you can, and where it becomes very real is when you talk to the commanding officer of a ship who only has so many launch cells in the vertical launching system, so they want to carry the ordnance that they're going to need for the upper-end fight, which tends to be a multi-mission fight. And so we want to help there and not have so many different variants of things in there that are boutique for a specific mission. So, as we move forward for future missile designs, particularly in the regional area, if there's something we can do to have a multi-mission capability, then we'll go do it. You can't always achieve that, though, just given the differences in how these threats fly.

Mr. Karako: So you just did a nice deference to policy there a moment ago.

Vice Adm. Hill: Yeah.

Mr. Karako: Of course, the department is, I think, about to start a missile defense review.

Vice Adm. Hill: Right.

Mr. Karako: I was just curious if there's anything in particular that you're hopeful that they will look at in that review that will affect your life.

Vice Adm. Hill: I think the reality of what we've seen happen globally – and what you're seeing today is not a simple ballistic missile going in. What you're seeing are ballistic missiles, cruise missiles, aircraft, unmanned vehicles. I mean, that's what I would do. And so the real challenge today is how do we holistically understand the integrated air missile defense picture? And now you go outside of just a missile defense review that's focused on the Missile Defense Agency.

The last one, back in 2019, was not just focused on the Missile Defense Agency. You have to, by default, look at the whole threat space and then what capabilities do we have and what can we afford to procure over time? I think what the department is looking for, as we move forward into the missile defense review, is kind of two things: one is, you know, what is the full catalogue of capabilities we have now? What programs of record are funded and moving forward? How are they going to evolve over time? And then, how does that balance against the investments we make in the

strategic side of the house? So deterrence: You can do deterrence by denial, and that's essentially the business I'm in on defense, and it's a tough business. But, you know, against – but then you look at the other types of deterrents we have out there; whether it's diplomacy – I mean, there's a whole range of that.

So I think the review will get into that, which will make it fairly complex, but that's OK. I think the – as the threat becomes more complex, the obvious answer is our answers to that are just unfortunately complex. It's not the simple world anymore.

Mr. Karako: Right.

Well, let's move to the budget. We'll still stay at the high level for a minute and that is, when you were rolling out the budget, you really, I thought, the – you know, 80 percent of your budget is going to RDT&E.

Vice Adm. Hill: Yeah.

Mr. Karako: And that kind of matches, I would say, some of the trends and the discussion points for DOD-wide. You know, focus on RDT&E, make some big bets. So I was just curious, how would you characterize at the top-line level the big muscle movements, the hard choices, the big bets that you're making for the later part of the decade?

Vice Adm. Hill: Yeah. Great, great question, Tom.

So when I go back to the guidance that I gave my team as we were formulating that budget, with lots of coordination – you basically do it from the bottoms up. Right? You look at all your programs. Right? What's the next need and what are those warfighter requirements that drive you to what that budget ought to be?

For me, it came down to three simple things: We need space capability. We need it yesterday. So the Hypersonic and Ballistic Tracking Space Sensor, HBTSS, we need that. So I wanted to make sure that was prioritized in the '22 budget, and it is. I wanted to make sure from a homeland defense perspective that the Next Generation Interceptor, or NGI, was fully funded to the CAPEICE (ph) as directed by Congress. So we did that. And then I wanted to make sure that we're answering the call on hypersonic defense, and so the Glide Phase Interceptor, which gives us another layer after the hypersonic threat, I wanted to make sure that that was squarely in the budget.

So, if you look at those three things and their associated connections through C2BMC, you'll see investments there. You'll see cyber-resiliency in the

budget across all the elements – really important operationally and just day to day. Right? And so that was really the going-in principle there. And so that meant we had to take some risk in some other areas, which is reflected really in the unfunded requirements list.

Mr. Karako: Fair enough. And I saw you tell SASC, look, where we took risk was procurement. And that certainly is reflected. I was a little surprised in your unfunded requirements list. And, you know, for whatever reason UFR always gets more attention than the budget sometimes. But it was a little – it was on the small side, 367 million (dollars) instead of a billion or two, as in recent years. I was curious about that. But I also noticed that the top two items in your UFR were procurement, but relatively small – two IIAs, 12 THAADs. What’s going on there?

Vice Adm. Hill: Yeah, so it’s hard, I would say. I have zero experience in the experience of this year of releasing the one budget – right, one budget year, right, because what you miss in that is what we’re pointing to, what the vectors are as you go downstream through the FYDP. So since we don’t have that, you sort of get this, boy, I don’t understand. When it comes to the SM-3 production line, I want to make sure that that line is stable. That we’re – if we’re at minimum sustainment rate that’s OK. That means we can invest later. But I want to make sure that we have a healthy production line. And so although you see a small number in the unfunded requirements list, it’s because I want to make sure we’re at the right rate.

Now, there’s lots of other things that play into this, right? At the end of the day it’s about numbers of rounds that you’re producing give you a better cost. So I want to get the best cost point we can get with the assumptions that we have for military sales coming in as well, which come later. So right now, in ’22, it’s – we’re in production with the SM-3 Block IIA, stabilize that production, and move out. Same thing with THAAD. I want to make sure that we get the best price point by having the right numbers coming off the line. And since you only have that view of ’22 it’s an incomplete picture, but that’s really what we’re trying to say.

Mr. Karako: Now, the DepSecDef Kath Hicks I think just recently authorized, I think it was, 11 IIAs to go from out of testing into fielding. Curious about what’s going on with that. Do we know where they’re going? What’s going on with that?

Vice Adm. Hill: Yeah, first to kind of answer the question of where they came from. So they were built with RDT&E, Research, Development, Test & Evaluation, dollars. And in a complex, cooperative development program Japan and the United States, you know, building a missile together, we wanted to make sure we had full proof of manufacturing down, which also meant flight testing along the way. And so we built a fair number of rounds, while we’ve expended a

fair number, which is why we're now formally in production. But what that meant is we had these 11 rounds.

And we've done that before in prior missile variants. We had some handful that were now available. So the question is, can you deploy an RDT&E round that was used for proof of manufacturing principle, and get that out to the fleet? And I was really happy that the – at the SecDef level they approved that waiver, because they were built with RDT&E. So not a lot of drama behind it, other than the fact that we have that available inventory and we want to get it out there now, because as we started with the threat, the threat's there now. I think the fleet leaves them – needs them.

And so the question is, where do they go? They were built specifically to go to the two Aegis Ashore sites in Europe. But they were also built to function in the INDOPACOM theater. And so there's something called Global Force Management that will take over that process. I have thoughts.

Mr. Karako: I knew that was going to be the answer.

Vice Adm. Hill: Yeah, well, I have some thoughts on where they might want to go, but at the end of the day I'm not that guy, right? You don't want me to be that guy. You want the operators to determine where it's going to go.

Mr. Karako: Yeah. Another area, big picture, that you took risk, it looks like, is O&M. Takes it like 10 percent down, or something. Is that going to come back and hurt you later on? What's going on there?

Vice Adm. Hill: No, I think it just reflects the maturity of systems and the maturity of the services in doing operational sustainment of those systems. So, you know, 10 percent may sound large, because it is. And you may immediately try to think that, oh, we're taking a hit to readiness. We're not. We have the most ready systems out there. You know, we take it very seriously that we've got strategic systems out there. And so the last thing I ever want to see is a fall off of availability or reliability. And so we've made great investments there.

We also had a lot of help from Congress over the last couple years. And so we're very solid on the ground-based mid-course defense side, working with the Navy. Very solid on where we are with the Aegis and the SM-3. So I don't have readiness worries with that little bit of a decrement there.

Mr. Karako: Good, good. Staying within kind of the color of money thing, you know, we've had a great five – however many years of budget certainty with the Israel relationship. It's a very critical alliance relationship in terms of missile defense cooperation. But there's talk now about, you know, an additional plus-up for Israel, given their recent events. You know, something like a billion dollars of munitions and Iron Dome, the kind of rounds the Biden

administration is looking at. I can't help but ask, if that were to be procured out of your budget and your top line was not raised accordingly to match, I can do just enough arithmetic to figure out that that's going to squeeze other priorities, right?

Vice Adm. Hill: Right. Right. I don't think that's where we're going. This is not new. We have handled emergency appropriations in the past, and those were not forced into – or causing us to reduce U.S. missile defenses. But Israel's a great partner. And, as you know, we do Iron Dome co-production with them. We do the David's Sling system and we do the Arrow systems with them, along with their targets. And so a great partner. We learn a lot from each other. And I think what you're going to see when this comes through, you know, all the coordination, is that the country will support, as the president has said, to go do – announce down to the details of how to go do it. And that includes where the funding's going to come from. So it's all in the trade space for now. I'm not real worried about it.

Mr. Karako: Good, good. Well, let's move to kind of the institutional question. And I take your point about the next Missile Defense Review looking at other institutions, not being so MDA-centric. But it seems like every other year or so in the NDAA, Congress has some provision about protecting your acquisition authorities. And the 2019 MDR, you know, talked at great length about the importance of flexible and agile decision making.

And that's why I think I, and maybe other folks, were a little confused when the Trump administration two years ago put out the directive-type memorandum from the DepSecDef Norquist at the time to rewrite your charter. And it does need rewritten. But it also seemed to, you know, impair some of your flexible decision making, and even elevate approval authority for all kinds of decisions to the undersecretary level. What's your take on that? Is the DTM still a live wire? And how should the MDA charter be updated?

Vice Adm. Hill: Yeah. So we did move out in the last administration to update the charter to accommodate the administrative changes. That never made its way through being finalized. And so –

Mr. Karako: You mean, like the AT&L?

Vice Adm. Hill: Right, like the AT&L language instead of the A&S and R&E breakout. Those were just make-sense kind of things. When the directive-type memo was first being crafted it was focused in on things that we do out of best practice, which I'm all in on, right? So if you want me to do a(n) independent review on risk, we should do that, right? And so – and we did do that. You want me to designate lead services? Yes, we do do that. And so those best practices I think are great.

But as you mentioned, when you elevate decisions outside the agency my big concern is that it's actually very simple, because I'm asked this all the time. It is about accountability. So if you're going to nominate and confirm a director of the agency to be the acquisition executive for the Missile Defense Agency, decisions can and should be made at the agency level. When we start to roll those decisions up the chain, you know, accountability is lost. So that's point one for me.

Most people get wrapped around the second issue, which is time, right? The speed and agility on most things is driven by the human decision speed. And human decision speed, when it's in a package that goes through several different staffs, multiple different people along the way who are not accountable, that drives time into the system. And so when a combatant command tells you they're concerned about loss of agility, it is that.

I lived in that world in my prior job as a PEO, where many of those decisions has to roll forward to a Defense Acquisition Review Board. Which, by the way, on the service side, they worked to push those back down to the PEOs and down to the program managers. That DTM did the exact opposite for MDA. And my pure concern, accountability, and time.

Mr. Karako: Great. And then it is odd how discordant that is with what the department's doing in so many other places. But in terms of accountability, in terms of acquisition authorities, just a quick follow up. The next-generation interceptor in terms of processing, it went to the JROC. So in addition to the MDEB you also went to the JROC. Is that the new norm? How would you tell that story? What happened there?

Vice Adm. Hill: So I think there's times when the JROC does make sense. For NGI, though, it was happenstance. The prior vice chief has asked for an NGI update brief to the JROC. And we said, yes, we'll do that. The update brief came to General Hyten, at the time. So he got his update brief. And it was a great discussion. And then afterwards I talked to General Hyten. And he said, you know, Jon, there are times when a program of this magnitude – and it is a large magnitude program, with two wards out there. He says, what I would like to do is offer you the help of the four-star level, you know, chiefs that sit on the Joint Staff. And any program you want to bring forward, you're welcome to do so.

NGI was one where I agreed that the feedback from the JROC was important. And what came out of that was we recognized that many of the requirements, as we had crafted them, were at the contract spec level. It was very hard for the warfighters to understand that. But when they raised it to an operation needs statement, and we took that the JROC – we had now an operational needs statement that NORTHCOM worked with us to create.

And then we got to the JROC, the singular point about schedule was what came out of the JROC. So the JROC actually said: You got to prioritize, first, emplacement over everything. That's a good outcome.

And so what we're discussing now is the future. And maybe what I need to do, particularly before we get to a budget release, is go back to the JROC. Because I have a lot of service equity, right? So Navy operating Aegis ships, receiving SM-3 missiles in their inventory. We're working with the Navy team on SM-6, incorporating capability into a missile that has other capabilities. That's important. Working with the Army on THAAD as they continue down the path of IBCS, with Patriot – THAAD-Patriot integration. Lot of service equity there. Space Force and Air Force on our sensors that are deployed globally. So there is reasons and rationales to why we would want to go to the JROC for that level of endorsement and understanding. And I think you'll see us do more of that downstream.

Mr. Karako: Yeah, but just to draw a bright line under this for the – for the folks who poke at MDA acquisition authorities in general, NGI was validated – the requirements were validated, blessed, by the JROC.

Vice Adm. Hill: Absolutely. Absolutely. And when you go back, though – just back to the oversight question and why the JROC's not a normal part of what we do – we have a whole institutionalized process that we go through. And I would say the result of that, for me, is good. But it is a lot of oversight, whether it's the Operational Forces Standing Committee – which is actually delegated down from the JROC. So it's the same group of folks that sits on the JROC. But what I like about the OFSC is you can get down into the dirty details of a system. You can get into, you know, secret timelines. You can get into acquisition range, and those sorts of things. That's not something I would take to a JROC, for example, nor do I think the JROC would want to see that.

But I have to have the warfighter engaged at that level to some degree so they understand where the systems trades are being done. Because you don't want to put everything in the missile, right? There are things that are set to be in the system someplace else. So those standing committees with the combatant commands, that touch everything from the technical approaches we're taking, to the acquisition approaches we're taking, to the testing – those standing committees are really important, along with our service level boards of director – boards of directors, which are normally held at the service acquisition executive level.

All of that is in the process that takes us to a Missile Defense Executive Board. So that process is great. I think it's great. It gives me the feedback that I need. It also gives me, you know, a constant view of the budget and where the priorities are. So I get a little concerned when I get pulled into other processes, because I'm still doing that process. That's what I'm

resourced for and that's what I'm built around. And when I start to go into other things it becomes a resourcing problem. And so, it is what it is.

Mr. Karako: Before we go deep into the program elements, let me pause on another kind of foundational thing. That's integration. It's another one of those favorite buzzwords. Everybody wants more integration. Everybody wants that magical remote that controls everything. And of course, there's a JADC2 strategy coming out to get some of this. It's also, by the way, right there in the definition of the BMDS. It's supposed to be an integrated and layered defense. But it's hard. And last time you were here two years ago you talked about how hard integration can be, putting together different frequencies and fire control systems and all that kind of stuff. So, you know, how – can you update us on how your thinking is to how much integration is possible and desirable to pursue for the MDS?

Vice Adm. Hill: Yeah, I think, Tom, if you were to ask me what does the Missile Defense Agency do really well, and you'd only let me give you one answer, it would be that nebulous, ambiguous term of integration. We bring together so many disparate, different systems that are phased on different timelines, that are funded at different levels, they're not lined up, they're not going to deliver at a specific date together. But we pull them into, you know, what we call the missile defense system increment deliveries. And so there's a time where we will snap the chalk line saying: This is that increment. And we'll have to throttle some programs, slow some down that are moving too fast, speed some up that are moving too slow.

So that, to me, is the power of the agency, is that integration-level work. And it can be defined many different ways, whether it's to take our existing radars today and integrate in the space domain awareness functions. Well, that integration is nothing more than leveraging what exists in the radars and making sure that the operators can do that. And we're doing that now for all of our radars, to include the spy radars onboard Aegis ships that are traveling around the globe to contribute to the space domain awareness problem. And so integration can be defined many different ways. And we'll probably just touch into some of that as we, you know, get through the other programs.

Mr. Karako: Sure thing. Well, let's start with one of the – it's a new line item in your budget this year. And that is defense of Guam. That's going to involve some integration across service elements, presumably. So, first of all, why is the defense of Guam getting so much attention? Why is it important? And how are you beginning to think about that?

Vice Adm. Hill: I think defense of Guam is important, first, because you've got U.S. citizens that live on that island, right? So that's one. It's a territory. The other thing is you need to protect the force. So you got to protect the people and you got

to protect the force. And so if you're going to station, you know, capabilities on that island, if you're going to protect the capabilities you have now – like ship repair, for example – you're going to want to defend it. And so then it becomes right back around to that architecture discussion, right?

So just given the – I'll use a big word – topology of the island, right, there's just a – you know, it's a challenging place to go put a system on, right? So I have moved away from thinking about a system. And I've had lots of conversations with Admiral Aquilino, and we have both looked at each other and said: You know, we're system agnostic, aren't we, because what we know we need is the architecture that's got sensing capability, that's got a resilient fire control and command and control network, and that has weapons associated with it.

So let's go build a story around that. And we'll figure out what those systems are. You know, because I'm getting a lot of the early questions. Who's going to be lead service? I really don't know at this point because we're not there yet, right? We need to come through that architecture work and we need to make a decision that hits his timeline. So his timeline draws you into a capabilities-based approach. Meaning you're going to look at the systems that can handle that threat. And it's a mix, right? It's ballistic, and it's glide, and it's cruise, right? So automatically drives you to the multi-mission systems that we've talked about.

And there is a handful of those regional systems that have that capability. So how do we get that onto the island, tie that to the sensors, and then what weapons shall we use? And so in fact right before I came over here I was doing the final review of our report to Congress on the matter. And we're sending that, you know, into the building for review. And this is where the excitement starts, because we still owe an answer back to INDOPACOM, you know, as a department.

My goal, though, is to make sure the secretary of defense, the deputy secretary of defense, has a maximum trade space on where we're going to go. And so we haven't gone in and said: You must have this system. But we do know we need sensors, fire control, and weapons.

Mr. Karako: And your procurement dollars are presumably not system specific but for something more generic.

Vice Adm. Hill: It would be for those things that we know will apply to all things. You know, so it could be display systems. It could be, you know, some sort of flexible launching system, because you know you're going to need that while we go work the details of how you lay down a sensor architecture in a pretty tough place. Which means, you know, different – (inaudible) – and things like that. So it won't be just some deck outs. You know, a lot of folks just think Aegis

Ashore right away. But that may not be sufficient for what we need. And so we'll come through all that.

Mr. Karako: Well, can you talk us – you know, leaving maximum trade space, but – and don't want to give away the details of your report yet. But there's only so many solutions. Aegis Ashore comes to mind, or some version of Aegis Ashore. There's also a kind of Patriot and other kind of things out there, in terms of the effectors. Can you give us insight into how the question is being asked for those solutions?

Vice Adm. Hill: Yeah. Yeah, so, being a – you know, an engineer, I tend to look at what's there today, right? So we know what's there today. So that's the architecture today that we should use as a point of departure. So then now you look at the threat set that's projected to be there in the timeline. What systems exist that have that capability now, and what systems that have that capability or don't have program of record that's going to address that? And there's a number of them. And so that's where we'll go.

So I don't think anyone will be surprised, you know, when we finally get agreement on what that architecture and that investment should be. But we do need to do the homework, starting with the threat, and how systems that exist today – how well they play in those three major missile areas, in ballistic, cruise, hypersonic. And that – part of our report to Congress will basically lay down to tech, control, engage. Here are all the systems that exist today, and how well they do in that area. And then what we need to do to pull them together.

Mr. Karako: And you said it doesn't necessarily need to look like Romania, with a single deckhouse in that way. So one of the big things we talk about here is the survivability of active air and missile defense elements from suppression. So if you were to, whether it's a Patriot or Aegis Ashore – let's just stay on Aegis for a minute – element distribution, that it's going to look very different from Romania and Poland, if we go –

Vice Adm. Hill: Absolutely. Right, so if you take the survivability question, right, I can imagine the Aegis combat system, all of its processing and its capability being underground, or being someplace else that is mobile, right, so that you never really know where it's at, right? So there are ways to do that. And it's not a big stretch. When you look at how we've gone from a ship-based application of Aegis to land-based, and how we separated the launchers from that deckhouse, it's not a big stretch and it's not new science to separate out the radar arrays from the combat system's core functions, and you can decide where you want those. And it's the same thing. It's a very similar story for THAAD, very similar for Patriot and IBCS. So we'll figure out how we're going to go work on that.

Mr. Karako: So, of course, there's a lot of Aegis in the area. But we also, of course, have THAAD on the island as well. Is it – is it going to be, do you think, all one or the other or is it a hybrid between the two service?

Vice Adm. Hill: I think that's in the option space.

Mr. Karako: OK.

Vice Adm. Hill: And so that's why a lead service question today is kind of just fun for me because I don't know what this is going to be at – I think it'll end up being a hybrid of some sort.

Mr. Karako: OK. Good. Now, John Grady, a reporter from USNI News, sent in a question to say why all this attention about Guam. There's other islands, like Diego Garcia. Is air missile defense for Diego Garcia, other things like that, also in your – in your writ?

Vice Adm. Hill: It's not. So when I go back to, you know, the three battles, as we call them – homeland, regional, and that force protection third area – that's where Diego Garcia and even, arguably, you know, Guam belongs there as well, right. So that is something new for the agency to take on something like Guam.

But it's in an area where my primary investment is not today. But we're going to leverage those regional systems, as I said earlier, because there's a lot of capability and capacity there that can feed for defense of Guam that the services could use for defense of, you know, a place like Diego Garcia that's out in the middle of nowhere. Those are hard places to protect.

Mr. Karako: Great. Well, staying with Aegis a little bit, you got Flight III destroyers coming forward, you got Baseline 9 and 10 going forward, and, of course, you just had FTM-31 Event 1, which was unsuccessful, unfortunately, but you also had a success in there and an intercept in there as well. What's going on within the Aegis BMD but also SM-6 stuff as well?

Vice Adm. Hill: Yeah. So when you think about where would the first regional hypersonic defense be and what should you protect first time coming out, and if you think of the INDOPACOM theater and you think about what's targeting a carrier strike group, we were pretty smart a few years ago to take on all types of ballistic threats to include the maneuvering ones.

And so when you look at that first layer being the sea-based terminal capability, which is leveraging the SM-6 because of its really capable airframe, that is that first layer. And so the second layer will be the Glide Phase Interceptor, right. So if we can kill a glide weapon in its most vulnerable place in glide, then that makes the terminal problem much easier. Because terminal is great, but it's really the last ditch, right. And so we

would not like to have the forces in that position, and if we – and because of the way we've constrained the design to the Mark 41 VLS launcher, it gives it flexibility. You know, the Army is procuring the Mark 41 VLS for other uses, and so the GPI will initially be tested on Aegis ships because we're going to leverage and engage on remote sensing capability that that system has. But then, eventually, that round will be useful for battery protection.

Mr. Karako: Great. Let me stay with, you know, the Aegis Ashore that's going on in Poland. How does that stand and what lessons are you taking away from the hiccups in the Poland case that are going to have applicability to other Aegis Ashores or other MILCON, generally?

Vice Adm. Hill: Aegis Ashore is just a great story, right. So if you go way back when we first started looking at it, it was called land-based SM-3 at the time, right, and the challenge was how do you take a system that's built on a ship and go put it on land, because that was the demand signal.

We came through that. There was a lot of great engineering that occurred to include bringing in people from NASCAR to figure out how we can modularize the system, get it containered up and then go build it and put it there. There was a transportability requirement at the time and so, you know, we built one, showed that we could build it. Then we took it apart and then we rebuilt it, and that's the system that's out at PMRF. And so we have, you know, a test site there at the Pacific Missile Range Facility.

Now, when we went to Poland and Romania, we needed to make sure that we built it for resiliency during all sorts of environments, right. So there's a lot of different protections built into those systems that we don't have in the system that we landed in Hawaii. Then you have the complexities of, you know, working with the military construction side and then how much engineering goes into the military construction.

So I would say one of the big lessons learned that I have, you know, during my short amount of time here looking at Poland was that we put a lot of the building automation, you know, into the military construction side, and that's tough and that's really what has slowed us down there.

So construction is proceeding. You know, we had the fallbacks due to COVID. I mean, the restrictions in Europe are really, really tough. But the great thing that we did over the last month was we raised the four radar arrays, we've emplaced those, and we put the fire-control director on the deckhouse. So it always looked like it was a finished site, you know, a couple years ago. Just it was – it was the issues of, you know, all of the automation that we needed to complete.

But now we have radar arrays installed. We have tested out fully the system. We're handling some obsolescence issues, since the system's been containerized for some number of years. And what's great about having the arrays up now and the fire control system is that really opens the door for install and check out of the Aegis system while we, in parallel, finish up the construction.

So working very closely with the Army Corps. They've tried a lot of different methods and means by which to, you know, get speed and focus on the areas that we need in order to do that installation. So we're in a really good place.

Mr. Karako: Now, you mentioned earlier the benefits of 2A FMS sales, so it's going to help them lower your unit cost and all that kind of stuff but also modernization. FMS, with UAE, has helped the Army get the Patriot modern interface, things like that. And the KSA FMS for THAAD is helping getting the GaN TPY-2. Are there any other planned upgrades of THAAD beyond that, though?

Vice Adm. Hill: Yeah. So the other thing, aside from the radar within the interceptor, we have a different seeker that we were able to – you know, because as we're modernizing, it makes total sense to go modernize that. So we have that capability coming in THAAD.

What you'll see in the '22 budget tied to layered homeland defense is to continue to improve the THAAD system, improve Aegis, and then invest in the command and control battle management side of that. That gives the warfighter, it gives the department, options on what to do in those areas. And in the end, if we decide not to proceed forward with layered homeland defense with those systems, we'll have a more robust regional capability.

So I think it's all a worthy investment. It makes those systems more lethal and more capable, more modernized over time, and it gives us options to use them in different constructs.

Mr. Karako: I know Patriot's principally an Army program, but MDA has config control for Patriot to make sure it's part of the BMDS, things like that. Can you talk about kind of the progress of LTAMDS and keeping Patriot's modernization synched up with everything else you're doing? Again, because it's in the – it's in the mix for Guam and other places.

Vice Adm. Hill: Yeah. Sure. It's sort of like the SPY-6 on a Flight III destroyer, right. So we don't need to come in with a heavy hand. The Navy's got the requirements right for SPY-6. Army's got their requirements, right, for LTAMDS, and we'll bring them in and integrate them. It's another one of those great integration stories.

When you look at the power of integrating THAAD and Patriot, what you can do through C2BMC, it's pretty amazing, because it comes quick, right? So we separated the launchers, tested THAAD – with THAAD. That gives you flexibility in a constrained space. Move the launchers where you need them. Keep the battery back further or move it forward. You have that flexibility.

Doing a launch on remote THAAD data for Patriot, great capability, and then controlling the Patriot launcher from the THAAD battery is where we're going this year as we complete that work, and then that's extensible, you know, globally. But the integration between THAAD and Aegis exists today out in other parts of the globe, and that's done through command and control and battle management.

So you don't have to worry necessarily that you've got these different fire control systems that may be competing with each other. You can decide different ways depending on the kind of battle you're fighting. Do you want to just pass tracks? Do you want to fuse those tracks? Do you want to pass measurement data from those radars to go build a track? There's lots of different ways to go do that, and we explore all that within C2BMC.

So when I say that we're coordinating with the JADC2, I think we're laying the foundations in a few areas, and probably the most challenging one is you can't assume a clean sheet of paper, right. You're going to have older systems that use different standards and different ways of, you know, passing information. But you want to leverage all of that. So you have different disparate systems is really the – is what C2BMC has been able to do.

Mr. Karako: So I see layered – you mentioned layered homeland defense is still there in the budget. But I think you emphasized at a recent hearing that, you know, the work that you're doing there could have regional applications as well. Congratulations on the 2A intercept for November and during COVID.

But that also, presumably, has applications not just for an ICBM but for a more stressing regional –

Vice Adm. Hill: Absolutely.

Mr. Karako: – intermediate range thing.

Vice Adm. Hill: That's exactly what it does for us and, you know, congressionally-directed defense of Hawaii scenario, long propagation, just given how we did the tests lacking some sensor coverage. Great COVID-19 story. Originally going to be done in May of 2020, executed in November. Had to respect the closures at the Republic of the Marshall Islands.

But when it was all said and done, we were able to do that against a – what we call a simple threat. And so the investments that we’re making in PB-22 prepares us to increase the threat complexity, which you would want to do whether it was regional or part of some layered homeland defense architecture.

But I think for the – for what we’re going to use those missiles for downstream, you want to have the ability to handle a more complex threat.

Mr. Karako: Well, I certainly hope you can do that for the regional benefit.

Vice Adm. Hill: Yeah. Absolutely.

Mr. Karako: But transitioning back to the homeland, that’s homeland cruise missile defense. General VanHerck from NORTHCOM’s put a lot of attention on this. I know you’re working with him on this. But step back to the architecture question. How are you thinking about the homeland cruise missile defense challenge for the multi-mission, hypersonic things as well as cruise, and the architecture?

Vice Adm. Hill: Yeah. The technical architecture, for me, could be pretty straightforward by leveraging a lot of our regional capabilities. And when you mentioned multi-mission earlier, I mean, that’s the first place where my head goes, right? Guam is almost like a microcosm of that, right? And so – but there are – you have a much larger landmass. You know, you have to decide what you’re going to defend. You have to decide where you want to look, your assumptions of where the threats are going to come from, right, and then how you’re going to go take those down.

So still a lot of work to be done there. I would say that, you know, General VanHerck, you know, continues to be focused in on the all-domain awareness because that’s a – that’s a good place to start, right? We want warning capability, because there are things that we can do from an engagement perspective today but you want to be able to grow that as you determine that you may have a much larger list of defended areas. So it’s still in the architecture level, but I think the – you know, his focus on sensor domain awareness right now – now, now, now – is what we’re – we’re trying to help him with that.

Mr. Karako: But you know, skeptics will say, look, we didn’t defend against Soviet SLCMs –

Vice Adm. Hill: Right.

Mr. Karako: – nuclear-armed back in the day, so why are we – why are we worried about this?

Vice Adm. Hill: Right.

Mr. Karako: What scenario are we worried about here?

Vice Adm. Hill: That conversation is still raging, and that's – you know, that's an area that I just – I just watch it with interest and still see what I can do to help. But it – and there are valid arguments on all sides, right, because likely a strategic cruise missile attack is going to come from a near peer. And so that does take us right back to the policy alignment, right? We need to have a – well, we just need to continue the conversations on how we should address that, and there are multiple ways to address it. It doesn't always have to be metal on metal.

But I tell you, domain awareness, pretty important. Early warning, important. So I think the investments that we're making there are good and reasonable while we work through the policy implications.

Mr. Karako: Well, General VanHerck certainly is emphasizing the – I think what the last NPR called non-nuclear strategic attack, conventionally armed, and he's worried about being launched from Russian bombers over Russian airspace. So lots going on there.

Vice Adm. Hill: Right.

Mr. Karako: But you mentioned domain awareness, and your UFR and his have the same \$27 million elevated radar – radar on a stick, as it were – to get you a little bit more attention. Do you have something in mind for that solution, and – or are effectors being thought about here in the near term as well?

Vice Adm. Hill: They are. I'm just not at liberty to talk about them today. But that contributes to his all-domain awareness in a very specific area.

Mr. Karako: Good, good. OK.

Let's go back to acquisition broadly. And this is, I think, one of your favorite topics. When you – two years ago you said, I think, it was your most important priority, was settling the transition and transfer thing. It's gone back and forth. It seems like there is a consensus that has built up, notwithstanding a 2002 memo, a kind of a consensus about you all keeping procurement and defining transition as O&S rather than procurement. Where is that today?

Vice Adm. Hill: Yeah. I think it has made good sense, and the decision made by Secretary of Defense Esper was – what I liked about it, it was very simple and clean, right? You don't save any money. You know, if you move procurement to a

service, you don't save anything. Plus, we have the contracts here. As I give it more thought, I would tell you that if you cut – and by the way, it wasn't across all systems at MDA. It was like cherry picking two missile programs, right? Why would you do that, right?

It would make sense if we never were going to change those missiles ever again. It would make sense if the threat wasn't going to evolve and you didn't need to do any upgrades to just let someone else go buy them. Sure. But that's not the world we live in. And when you look at what the production dollars actually support in addition to just building the production line and producing missiles in the end, the production readiness has a close tie to warfighter readiness and feedback from the warfighter. So if you move production over to a service, right, basically any feedback coming from the fleet or from the soldiers doesn't make it way back to the development side because, guess what, it's not on my priority list anymore because now a service is taking it on. So it doesn't make a lot of sense.

But then if you turn around and say, well, let's give credit where credit's due, which we – which we didn't do in the past – and you've heard me tell this story many times, right? When you go up to Fort Greely, do you see MDA people sitting on the console? No, you do not. You see the proud Alaskan National Guard there managed through the Army, right, whether it's the 100th Brigade and the 49th Battalion. That coordination with Colorado Springs, it's just amazing to see. When you go to the LRDR radar, with the lead service being the Air Force, for Space Force operations, right, that transition will occur. Aegis Ashore in Romania transitioned. Poland, going through that transition period with the Navy. You drive into Romania, you're going to meet a Romanian security guard and a naval security guard. It's really fascinating.

So I think we've succeeded in working with the services to provide the ops and sustainment support that they need in addition to what they already invest in, right? When you think about the numbers of soldiers it takes to go operate a THAAD battery, and the rotation of those soldiers, and where we're going to keep those soldiers, and how you care and feed for them, and do they have all the training that they need, that's a massive investment that nobody ever talks about. And in fact, the services don't get credit for it, but it's what they do. And so I don't want to do that, so I'm happy to turn over ops and sustainment. That's where it makes sense.

If you start getting into a production discussion, you know, you got to prove to me that it's – that there's real value in it for the warfighter because what happens in a lot of other programs when they transition to some other entity to do production, first thing that goes: availability and reliability. All the abilities just go down because you don't have the development engine anymore supporting the warfighter feedback.

Mr. Karako: And I think it was the threat upgrade to the SM-3 1B the other day, I mean, you all seemed to do that fairly quickly.

Vice Adm. Hill: Right.

Mr. Karako: Would it have gone as well if it had – if procurement of SM-3 1B had gone to the Navy, do you think?

Vice Adm. Hill: It's a very unique missile compared to the missiles that are managed by the Navy, so they would have to stand up an infrastructure for that. They'd have to stand up a program officer for that. They'd have to have the fleet interface established for that. That doesn't exist today because it exists in MDA.

I still don't understand the rationale of moving all that over. It makes no sense to me. Cleaving a program and production is like the worst thing you can do for anything. I mean, think about a car production line. I mean, have you seen that anywhere? I mean, it just doesn't make sense to go do that.

Mr. Karako: Staying with the 1B, a couple years ago you all moved to multiyear procurement.

Vice Adm. Hill: Yeah.

Mr. Karako: What did that get you? You know, what can we learn from that? And are there other elements that you could see moving into multiyear procurement?

Vice Adm. Hill: Yeah. I think what it gives you, it helps the government in terms of unit cost and it helps industry plan. So when you have a multiyear over some three-to five-year period depending on what the terms are of multiyear procurement, it gives industrial stability. And then it also now helps us to plan budget-wise. So you'll notice that on the unfunded requirements list you won't see a block 1B in there because that's under multiyear procurement, so I think it's a very powerful way to do business.

Mr. Karako: Well, let's move to sensors. You've already mentioned – oh, yeah.

Vice Adm. Hill: By the way, Tom, just to go back to the transfer thing, just to kind of close it up, there is nothing about the Army wanting to procure more THAADs from the MDA using our contracts, leveraging what we're doing, if they have an inventory need. They'll normally transmit that to us through their normal process. Same thing with the Navy. If they need more SM-3s, they're going to tell us and we'll go do it for them. If they want to transfer dollars over to do that, there's a mechanism to do that. But you know, the crazy solution of

actually cleaving that off and standing up those other program offices, that's what I've really been pushing back on.

Mr. Karako: Understood. Understood.

You mentioned HBTSS.

Vice Adm. Hill: Yeah.

Mr. Karako: We're sorry to see the STSS birds go in March, but they've done a lot over the years. Could you kind of talk a little bit more about where HBTSS is now? You have a couple contracts out there for on-orbit demos in '23 I think it is.

Vice Adm. Hill: Right.

Mr. Karako: How's that moving forward? And what's coming next?

Vice Adm. Hill: OK. So, as you know, we started off back – and I think this is 2013 or so – with just the concepts of why we needed this. So even back then, we knew where the threat was going, what the needs would be downstream. The biggest challenge that we had was to come through what we call clutter management – you know, all the phenomenology work that you have to do – because when you're in cold space looking down on the warm Earth with hot targets going across the warm Earth, what it takes to – the signal processing required to pull that out we needed to prove on the ground first. And so in the prior phase, before we locked in on going to orbit in '23, it was totally focused in on did we have the technology right, do we have the algorithms in place, can industry actually do this. And the answer was yes.

So now we got to go to space to prove to ourselves that it can be done in space, not just on the ground. And so working with the Space Force and with the Space Development Agency, we have an inclination that we're using that will maximize the use of those two units – by the way, being built by two separate companies but with the requirement to be interoperable – so it's going to be great. And we'll have those up, and we'll leverage our tests in the INDOPACOM. And then eventually downstream, as we populate more, we'll tie that into the Glide Phase Interceptor program.

Mr. Karako: So let me ask the multi-mission question here. It's got both the H and the B. Is that going to remain a multi-mission sensor?

Vice Adm. Hill: It is, because the – that's a great example and I'm glad you mentioned it that way. So I mentioned the dim targets earlier. So when you have a – when you have some pretty smart adversaries out there that start to adjust their propellant mixes to where they're colder when they're up in space, very hard

for some of the other space sensors to see them because they weren't designed for that. So now you need a sensor that can see that, that's got the kind of sensitivity that can go there, and that's what HTBSS does. It handles the dim ballistic targets, but more importantly it's going to handle the maneuver targets.

Mr. Karako: But of course, HBTSS is intended to be a proliferated LEO kind of constellation. Having said that, a couple years ago we had the former undersecretary of defense for R&E – your former boss – sit here and describe how, while all the focus is on PLEO, in principle we should be looking at other orbits as well for this mission.

Vice Adm. Hill: Sure.

Mr. Karako: Is that something that's a livewire in your mind?

Vice Adm. Hill: It is, and it's an important part of the Space Force architecture. So one of the reasons I said we stay close there is their architecture for the future will drive the outcome of how we proliferate HBTSS. The architecture that SDA is working today, that transport layer becomes very important to HBTSS because we like queuing sources. We'll be able to take queuing sources from ground-based radars and ship-based radars and other space assets, but once the transport layer with its comm links, you know, really fully populate out there, they become great queuing sources – that wide field of view going to the medium field of view, which is what HBTSS is. All fire-control sensors tend to need the broader surveillance sensors to provide the queue: Here's where the threat is, go look at that, and now give me the kind of quality that I need to shoot off of it. So it'll be a part of the architecture that will likely be multiple different orbits, and – but that's – there's a much broader picture there than just HBTSS.

Mr. Karako: But you also have SKA up there right now.

Vice Adm. Hill: Yes. Yeah.

Mr. Karako: What have you been learning from them? And is there any useful other technologies? I'm thinking like synthetic aperture radars. What's going on with SKA and what's next?

Vice Adm. Hill: Yeah. So Space-Based Kill Assessment was deployed and we have the full constellation up now, and what's really – what we're going to do in this year is to get to a hit assessment. And so you can see a flash. That's great, right? But I want to be able to tell General VanHerck you have a hit. And then we want to go from hit to you have a kill. And that's – it's more complex than it might sound like, but flash, that's not really useful. That can be maybe an awareness question. But once you can determine that you've had a hit, that's

helpful. That helps you adjust shot doctrine, potentially. And then if you have a firm kill, then you really have an impact on salvo policy. So that's – those are the stages that we're going through, and PB22 takes us to that firm hit assessment.

Mr. Karako: Great.

Well, let's bring it back down to earth. Of course, you mentioned LRDR. I noticed that the HDRH – the Homeland Defense Radar-Hawaii – was zeroed out again this year. It's in a UFR but for a smaller amount. So I was curious about what's going on with HDRH. But then also, at a higher level, you know, why do we need that space-terrestrial mix? Why do we need both ground-based radars and space things?

Vice Adm. Hill: Yeah. And I'll throw out one of those terms that just blows everybody's mind, right? The warfighter generally likes multiple phenomenology on any target, meaning different radar frequencies, a mix of infrared and radar. That's good to have. That gives you much more confidence that you know where this track is going.

So when it comes to the Hawaii radar, when you look – when you stand back and look at the globe – just go to Google Earth and look at where Hawaii is and then back yourself up, right? You're out there on your own. And so we can defend Hawaii today with the existing sensor architecture, but as you start to go into that more complex scene where you've got multiple countermeasures, multiple RVs, multiple maneuvering RVs, potentially nuclear, wow, you got to make sure that you can discriminate all of that so that you're getting the next-generation interceptor or the GBIs on target so that you can kill them in space before they ever come down and affect the islands.

And if you look at where those launch points are, just pick any country in the INDOPACOM theater and look at where those go. That's a scenario where, you know, you're going to end up with a lot of uncertainty in the track unless you got a sensor on it. And generally, the warfighters will want launch-to-demise coverage of that – of that threat.

Again, we can handle it today. But as we get more complex, that becomes very hard. And without a sensor on the islands, it's difficult.

Mr. Karako: So moving from hypersonic tracking to hypersonic defense, your team put out a very nice video of the intent for GPI, Glide Phase Interceptor. If I'm not mistaken, it kind of depicted the space sensors sending stuff to Earth and then heading back to the Aegis effector. Does that mean that onboard

processing and direct comms linked to the effector is not in the – is not in the mix still, or is it?

Vice Adm. Hill: It's not in the mix now. That's a hard one, right? It's both cultural and technical. So I'll start on the technical side.

You know, from an Aegis perspective, when you launch a weapon – you know, just pick any one of them – we're going to be talking to that weapon to help close the error, get rid of the uncertainty in the track, right? And so the ship's ability with its larger radar or taking data feeds in for engaging remote sorts of things has a much larger view of where the threat might be flying.

The missile has a very small seeker. So when you – when you launch a missile, you want it when it opens the seeker to see what it's going after. And if you – if you don't give it a good track, if we're not feeding that data from the ship, that's hard to do.

Now, in the future could space sensors do that and would you hand off that sort of control to the weapons? That's the dream. You'll hear other people talking about that. But there's not a single system that we do that way today. And you're not really saving much time. What you're giving up, though, is that commanding officer's release authority on a ship, for example, right? He's responsible for weapons release. Culturally, handing it off to somebody else sort of breaks that accountability. Technically, I don't know if it buys you much because we're talking milliseconds here when we come from space down into CTPMC (ph) into the ship, ship back up to the missile. It's milliseconds, and we're – we can control the missile based on that. And we've done that before. We've done launch on remote on space sensors before.

Mr. Karako: You had a broad area announcement earlier this spring. The responses were back a month or so ago. Do you have an idea about when awards might go out for that in the – in the near term?

Vice Adm. Hill: Right. So we'll do that at the end of this calendar year. We're shooting to kind of make those awards before the end of the fiscal year. It's going to depend on the complexity of them. I have not personally looked at the proposals, but we've got some really good ones on the table and we're going to evaluate them. And what we're really trying to do as you go into '22, for example, is get into a firm systems-requirements review.

So we have a top level of requirements that we have written for this missile. It's the first time in a long time where we have a competitive, you know, piece going on on a missile, and so we're pretty excited about that. So, you know, I didn't emphasize the competition with HBTSS. You kind of brought that up. But that's what we mean by two companies we are competing.

That's going to help reduce risk and deploy earlier. We mentioned that about NGI – two contractors, reduce risk, deploy earlier. And that's the same thing – that's the same approach for the Glide Phase Interceptor: bring on two, compete them, and deploy earlier because speed matters here.

Mr. Karako: Now you have a UFR for \$61 million for hypersonic defense. If you were to get that, what would that allow you to do that's not currently in the PB?

Vice Adm. Hill: Yeah, what that – so what we did to get to the Glide Phase Interceptor is we had to remove dollars that were in the longer-term science and technology program. So what that unfunded requirement does is reestablish that line so that we can reduce the risk for what would be maybe the Block 1 IIA Glide Phase Interceptor.

So, you know, we're not finished characterizing that environment. That's a tough environment to engage in. It's different, right? Kill vehicles up in space is one thing, warheads down in the atmosphere is another, engaging in glide phase. I'd have to see those proposals to see how they're going to do it. But there's investment to be made on materials in that area, secret technology, kick-stage technology. There's a number of things that we need to continue our investment in for the long haul. So it's more of a long-haul picture for hypersonic defense that's in the unfunded requirements list.

Mr. Karako: Well, on that question of the materials, you know, what's kind of the state – how do you think about the state of the industrial base for designing and manufacturing a hypersonic defense thing, right? Do we have enough tunnels, facilities? What are some of the factors that are going to affect you to go out and speed and not compete too much with all the offensive hypersonic folks that are out there?

Vice Adm. Hill: Right. Well, when you think of, you know, where the glide phase is – you know, roughly 40-50 kilometers up, right? Not a big challenge to get up there, right? So we know from a propulsion perspective we can get there. And we want to leverage as much existing technology to get there. Now, what we do when we get up there is the question, right? And it goes back to the details. Are we going to continue down a hit to kill path? Are we just trying to disturb it and move it off of the glide phase? Do we want to do something else that's not kinetic? And so that's our challenge over the next year, is to hone that down so when we roll into '22 we're going to a firm systems requirement view that we'll kick into a development program.

Mr. Karako: So, related to that, hypersonic defense, no matter what, is going to be a hard challenge. And so fundamentally it's still going to be about detect, control, engage. But you were just alluding to, you know, maybe it's not the same kind of control, and the same kind of engagement. You know, folks say, well, ground-based radars, they can fly around it. But what kind of utility is there?

I'm thinking about carving up this problem into little, small pieces and, you know, one bite at a time for the elephant. But how is it that we can have – piece together things that channel the threat and impose costs on the threat and not just, you know, create lots of kinetic interceptors to go get it.

Vice Adm. Hill: Right.

Mr. Karako: This is a threat management and shaping problem, to some extent.

Vice Adm. Hill: It is. And because of maneuver and speed aspects of this one, it's increasingly more challenging as we go. But what we've done today, in terms of providing warning to the warfighter of hypersonic glide, that is to take every single sensor that you've got and fuse that data. All right? And so we can do that today. So, even though we don't have, you know, the full space constellation that we would want, we can do that today based on our land-based sensors, you know, the ship-based sensors that are mobile, and we can fill in a lot of those gaps today.

You know, what that video – by the way, we built that video for ourselves. We built that to make sure we understood the concept of operations so that when we talk to industry, we can say this is what we want. And I think it's worth, you know, sharing within the public sphere, just so you can see how we're going to do it. And one of the options in there is if you don't have the space coverage you need and you don't have the land-based radar coverage that you need, what about that forward Aegis ship? We've already proven engage on a forward Aegis ship to the shooting ship in the rear, and so that's one of the scenarios in there. And then the layers of Sea Based Terminal along with the Glide Phase Interceptor. That's – because nothing's perfect. Right? They won't all arrive at the same time. But we're going to focus in on that interceptor. We have the space program moving.

Mr. Karako: But your video showed one of those threats flying around –

Vice Adm. Hill: Oh, yeah.

Mr. Karako: – one of those things.

Vice Adm. Hill: Right.

Mr. Karako: And so I look at that a different way, which is, it's going to have to expend energy –

Vice Adm. Hill: Yes.

Mr. Karako: – and slow down to do that maneuver.

Vice Adm. Hill: Yes.

Mr. Karako: And so, whenever you do finally kill it, you have affected the threat indirectly.

Vice Adm. Hill: Yeah, absolutely. So there's a couple ways. Right? So one of the reasons we're going after Glide – right? – pretty vulnerable there. So we'll hit that. And then it will likely change in terminal if we don't hit it. Right? Or if we knock it off course. So yeah, there's multiple ways to change the enemy's calculus.

Mr. Karako: Yeah. Now, you just alluded to this, and that's a lot of this is about sensors and killers, but what about the command and control? So you've got a UFR in there, both for a radar but I think also C2BMC references. What really needs to be done within C2BMC and command and control more broadly to adapt where we are today to what we need for hypersonic defense?

Vice Adm. Hill: Yeah. So you really need a flexible global architecture to bring in multiple disparate systems, which is what C2BMC does. Right? Eighteen time zones – those are hardened networks. You need to have that. You need to have the nodes that are available to the warfighter in all the appropriate places. Whether it's in an air op center or if it's in a maritime operation center, you need to have that data feed going there. So when you break down C2BMC – right? – command and control – right? – so you want the operators to have a good view of where they're at so they can control the environment. When you think about the battle-management aspects of it – right? – you want to have the timing down; you want to make sure you have the right kind of latency and that you have the fire-control-quality data coming in, and then of course the communications aspects of it.

So what needs to be done? We need to continue to bring in as many assets as possible for the missile defense mission, and then we want to link through to the other services using the JADC2 construct. And so what the UFR's really getting at is beyond just going in and having conversations and talking about interfaces and what can we do – it's about building JADC2 into the C2BMC lab or the C2BMC into the JADC2 lab. What that does is it forces our engineers to work together to deliver to the warfighter what they've been asking for for years, which is, I need to know what's going on; I have to have good command and control; I need to know where the fight is, and do I have a common operating picture? That's what we need to do for the future as it becomes more complex. We have that today, but I will tell you, as the threat continues to increase, it erodes our ability to have that situational awareness.

Mr. Karako: So NGI.

Vice Adm. Hill: Yeah.

Mr. Karako: Two contracts awarded, 2028 as a delivery date

Vice Adm. Hill: Yeah.

Mr. Karako: How do we get from here to there? Just putting the development and the details of NGI aside for a second, how do we get from here to there in terms of today's GMD system? SACD last year, they said, look, we want GMD service life extension –

Vice Adm. Hill: Yeah.

Mr. Karako: – program. So I'm (just wondering ?), what are you doing in that GMD SLEP? What do you envision in the coming years –

Vice Adm. Hill: Right.

Mr. Karako: – for further SLEP in terms of reliability, capability, et cetera?

Vice Adm. Hill: Well, Congress was very generous and we developed a long laundry list. We coordinated with industry. We coordinated with the warfighters. We brought in a lot of expertise, you know, just given the age of the system. Right? If you look at kind of the three classes of GBIs – the really old ones, the kind of midlife ones, and then the newest ones – you know, we're very focused in on those oldest ones because that's where you take the big reliability hit.

And it turns out that when you look at the reliability of those older missiles we don't have a lot to base it on, our estimates, other than analysis and some really smart people. What we get from the service life extension program is when you remove one of the old rounds and you send the EKV back to the OEM to upgrade it – change our processors, upgrade the threat library, when you change out the boosters so that you don't have to worry about the age of the propellant, and you update all the electronics and you reintegrate the round and put it back into the silo – you suddenly have capability that's very similar to the newest rounds, right? And so what that goes is it both builds your capability bases up, but it also adds capacity.

You know, because when you think about what salvo doctrine really is, it's a capacity question, right? You're not just shooting what you believe you need to do to kill it, but you're also doing it so that you have more rounds to continue the fight, right? So there's always a balance in how the warfighter comes up with that equation. We want to help them with that by really getting a firm view of what that reliability fall-off curve is, and can we close

the gap before first emplacement? And then first emplacement of NGI, of course, will be accelerated through the competitive process.

Both companies came in and proposed earlier emplacement which then backs into earlier, you know, flight testing, faster development, investments in the industrial base to handle all the material and parts requirements. So it's a very healthy program. And I was pretty excited that, you know, in the middle of an administration change that we were able to get those awards out. It just tells you the – I think the general public's view on protecting the country, that it's a priority. And so that's the signal.

Mr. Karako: So you've certainly empathized your desire to – back to the rigorous acquisition, JROC blessing the requirements for NGI. But you've also emphasized your desire to keep that competition all the way through CDR, the Critical Design Review Board. Tell us why that is so important, to your mind?

Vice Adm. Hill: Yeah. So it kind of goes to what critical design review is, right? That is the major technical detailed review, with all of its requirements going on, entrance and exit criteria, that then leads you to bend metal. You're going to build something coming out of CDR. So what you want to do is have a design that closes – to use the words of my favorite program manager, Tim McCray (sp). So you got to come through preliminary design, when you're still arguing do I have the right sets of requirements, do I have that preliminary design that closes, that makes sense? And then by the time you get to critical design review, you have all your parts selected, you've done all of your element and component-level testing. So you get all that done earlier, as you get to the critical design review.

If you have two companies doing that, that generates the industrial base machine that will provide what we need to bring those two missiles forward. It also gives you flexibility to maybe go to two production lines, right? So by going to CDR you open up your trade space. It's a big investment. But now along the way you may decide that one is not performing, in which case you can down select. Or you're not meeting the required knowledge points. The way the program's laid out, you have to meet very specific technical requirements along the way. And if you can't meet them, we have the option as the government to dump that contractor.

So that's pressure on industry, and I think it's good pressure. All of them will tell you they like competition. I like competition. And I think we will see a much stronger industrial base. The kind of technology that we'll be using throughout this has got extensibility into other programs across the department. So I think it's a very healthy approach and, you know, it's challenging though. You got two program offices that have to be firewalled.

Mr. Karako: So closely related to this, and you put out a bunch of RFIs and draft RFPs, not just for NGI but for other pieces of the GMD enterprise. Could you talk to us about what you envision for GMD futures and what you're really trying to do there?

Vice Adm. Hill: Yeah. What we're trying to do is there's a couple precepts that I think are really important. One is we want to get out of what has become an older, you know, lead service integrator or construct, right? Not many folks are doing that anymore. What we wanted to do, though, is have the large areas that define the total system – you know, that we want to go compete those so we can – because we know there's a market there. We've done all of our market studies and we know that there's capability out there in industry to do the ground systems, right, the weapon system piece of that.

We knew that there would be a competitive environment for the NGI. We also know that we need to tie all that together through systems integration testing and readiness. And so we have, you know, that sinner contract, the ground program, we got the NGI program. But we'll have to do some sole sources along the way, right? We want to make sure that the OEM for the EKV, you know, stays healthy, stays around. Same thing for the booster provider. We want to keep them around. That's important. And then you want to have a company that can continue to take care of the existing fleet.

And so I think we have a great construct. You know, a lot of folks will tell me, oh, it's because the government should be the owner of the technical baseline. I agree with that, but how you define that's really important. If the government bites off too much – what I mean by “the government,” you know, people in the program office, you know, now doing the work that industry ought to rightfully be doing – I don't want to be in that world. And so I think we've got a great construct set up with our UARCs and FFRDCs to help us, you know, really manage these contracts as they go through to delivering integrated capability.

Mr. Karako: Well, speaking of futures, you know, I was struck when you were talking about, like, future Aegis Ashore having distributed elements, distributed sensors, as opposed to having the older kind of view. It shows, I think, a lot of commonality between the distributed ops that the Navy and the Army and other folks are doing. And a lot of participation there. But, you know, another thing that's really going on in the service operational concepts is, like, the Air Force's Skyborg and Valkyrie and all these drone programs.

Looking forward, MDS 2030 and beyond, you know, what's the – what's the new CONOPs, new things that we're not really thinking about, but that – is the MDS going to look very different than the way it does today?

Vice Adm. Hill: I think it will look different. What's really kind of fascinating to me when people hear Missile Defense Agency, they think missiles first. Not the threat missiles, the fact that we're building missiles to take down missiles. The future will be a mix of kinetic and non-kinetic. It will be a mix of hard kill and soft kill because of where the threat is going. The threat will drive us to do something different, right? So we can't have – you know, General VanHerck likes to say this, right – the expensive boutique missile as the answer to everything. We're going to do some great things with the next generation interceptor, but I think we are making investments in that area. Most of it's in an area where I can't talk about here, but the future of the Missile Defense Agency will be different because of the threat.

Mr. Karako: With airborne boost phase, is that in the mix as well?

Vice Adm. Hill: It's not out of the mix but it's not program of record.

Mr. Karako: Good. Good. Well, hey, you've been very generous with your time. I just wanted to kind of leave off with a close out for anything else you want to cover. You know, anything else that we didn't hit or that is your vision and intent for the agency you want to hit upon?

Vice Adm. Hill: Tom, I think you did a great job kind of walking us through everything. You know, I'll go back to the importance of command and control battle management. You know, our ties into the Joint Force, that engagement with the JADC2 team is really important. The importance of ground-based, of course, defense, the investments being made there both in a service life extension program for the existing fleet and for NGI. What we have in Aegis, we are going to complete the European Phased Adaptive Approach construct with Aegis Ashore in Poland. We're going to make that happen.

The numbers of ships, that coordination with the Navy is just important. We'll continue to work with them, but the next generation – you know, the glide phase interceptor for hypersonic defense will emerge in the Aegis program but be extensible to other services and for other uses. I remain incredibly impressed by the THAAD team every day. And so the work that we're doing there to improve its capability, to help the Army deploy where they need to deploy, is great. The work we're doing in the international side. So I think the international components to all of these systems become very important. It's how you, you know, get that lift when you're in a regional fight, when you've got other friends helping you who have similar systems that are interoperable.

I'll land on Formidable Shield '21 off the coast of Hebrides. Perfect example of multiple disparate systems linked together and operating. We started off

at the Maritime Missile Defense Forum many years ago focused in on just, you know, point to point test between different systems. It was all in the lab. Then we got brave and said, let's go to sea in 2015. And we characterized the sensors of some of the international navies. And in this last test, we actually successfully got a queue from the Dutch ship to a U.S. ship to do a launch. And that's pretty stunning and pretty amazing work. So when you talk about, you know, being able to tie in multiple disparate systems, and then do it operationally, pretty amazing work. So that was a huge lift. And, you know, just hats off to the 6th Fleet team and the ships.

Mr. Karako: No, I appreciate it. I had some international questions and kind of ran out of time. But thank you for being so generous and we'd love to have you back in the future.

Vice Adm. Hill: OK, I'll look forward to it. Thanks for the time today. Appreciate it.

Mr. Karako: All right. Thanks.

Vice Adm. Hill: Thanks, Tom.

(END)