Missile Defense Advocacy Alliance (MDAA) Capitol Hill Forum with Major General Roger Teague, Director of Space Programs in the United States Air Force Acquisition Office; Richard Matlock, Program Executive for Advanced Technology at the Missile Defense Agency; and Riki Ellison, Chairman and Founder of MDAA, on "Developing a Space-Based Sensor Layer for Missile Defense."

MR. ABEL ROMERO: Good afternoon, I'd like to welcome you all and thank you for being here today. We definitely appreciate you showing up and paying a little bit of attention to an important topic. For those of you who are unfamiliar with our organization I want to take just a minute to talk about some of the things that we do.

My name is Abel, I'm the director of government relations with the Missile Defense Advocacy Alliance. One of our priorities here in the Hill is to be a resource for Congressional staffers on these issues. In the past year, if you haven't taken the opportunity, I highly encourage you to check out our web site. We've got a number of great new updates on there, in addition to missile defense news, we keep that very up to date.

Many of you have copies of our new publication, "U.S. Ballistic Missile Defense." That's something we plan to put out periodically. Hopefully we'll have an update to that in the first quarter of next year, so please be on the lookout for that as well.

Beyond that, we also strive to highlight the importance of our military folks that actually carry out this mission. Riki Ellison, our chairman and founder, travels around the world on a regular basis meeting with those folks and highlighting what they do and why it's important. We just wrapped up our tour of the Pacific, which included events with our allies in Korea and Japan. We also were out in Guam to recognize what they do and why it's important.

Today our chairman and founder Riki Ellison will be our moderator as well. I'll turn it over to him and allow him to talk a little bit more about today's event.

MR. RIKI ELLISON: Thanks, Abel. Thanks, everybody. What a great turnout. I appreciate you coming in today.

This is going to be a casual conversation that we're going to have. I really believe we're in a sweet spot. I believe there's phenomenal momentum going forward with space.

I think some of you might have heard the president-elect's comments last night of putting our military in "big leagues," quote on that, and doing a Reaganesque movement of "peace through strength." Again, space supremacy, space superiority, I think is going to be a main component of the upcoming administration to rebirth and re-strengthen the military in that kind of way. You look at how important space is and you see kind of a perfect storm coming forward.

You see an aggressive new approach from a new administration. You see General Hyten, who was the space commander, is not the STRATCOM commander. You see General Robinson, the Air Force commander, now at NORTHCOM. You see Lieutenant General Sam Greaves, who was the acquisition for space in LA, is now becoming the MDA director. You see the third offset that the current secretary of Defense is talking about in terms of space.

So it looks like these pieces are falling together. Now we have an opportunity to talk about it and to move forward with it. I think there are some major challenges that we face with that, and certainly our near peers are challenging our capabilities in space, both geosynch and low Earth orbit. And we don't have that many of those assets up there.

We are challenged by the cost of getting those things up there. We are challenged by our land-based terrestrial radars that are going forward at a good sized pace for discrimination. And we're really challenged on using the space domain on the missile defense area to reduce the shot doctrine.

As Abel said, I was just over in Korea and in Japan and in Okinawa. There is an overmatch. We're in an overmatch situation. We'll never, ever equal our opponents on interceptors. That's not the point. But there's an overmatch.

What they're missing, number one, is the intel and the reconnaissance that we don't have persistent sensors over that region that could reduce the shot doctrine and give them a lot of flexibility on using less of our system and reducing that cost. So this is a great way to reduce the shot doctrine on that aspect of it.

I had the opportunity to be at LA Space Command a week or two ago with Sam Greaves. The movement that they're looking at is trying to take advantage of the commercial space sector of the Iridium constellation and other constellations where we can put up a lot of different satellites and fuse those together in our command and control at a much cheaper cost than we do with the Air Force. So there's a push and I think we've already done that with the Kill Assessment Satellite System that we'll put in place. So there's a want to put up, as the Navy has it, distributed lethality, but a distributed capability of satellites so it's going to be much more difficult for our opponents or threats to be able to take those down, on that aspect of it.

So we're real honored today to probably have the two best people on these two different programs of MDA and of Air Force. I think both your budgets will be increased next year, so there's some great opportunities here. We're going to have each of them speak for about 15 minutes and then they can answer your questions as they see fit.

I'm going to introduce our first speaker, Major General Roger Teague. He is in charge of the acquisition for U.S. Space, U.S. Air Force, here in Washington, D.C.

GEN. ROGER TEAGUE: Riki, thank you. Good afternoon, ladies and

gentlemen. Riki, thank you for the kind introduction and, of course, the invitation to be here today with a distinguished colleague like Rich Matlock. It's a pleasure to be with you all and be able to discuss these important issues.

Certainly missile defense is a complex problem and a national security imperative. From that aspect of it, space-based sensing absolutely underlies everything that we try to do to make sure that we've got eyes on target, so to speak, and that we're able to sense and then most importantly collect that information and disseminate it into the war fighters' hands as quickly and as rapidly as we possibly can so we can do something about it. But nonetheless, it starts in space and our ability to detect those missile threats that might be posed against the U.S. or our allies.

Over time we've seen our target sets continue to evolve, and the threats are certainly proliferating around the world. The missile threats are both increasing in their number, their lethality, and their range. I don't have to tell any of you that. And certainly the hypersonic threat is of continued, growing concern. So it's important that our future systems and capabilities be planned well now, that we're mindful of that growing threat, and that we're taking the appropriate steps as we plan our future systems and our architectures to incorporate, to the very best that we can in our new baselines and our new programs, the kinds of capabilities that are going to be able to effectively deal with this growing threat environment in the future.

Fortunately, we've had a long and distinguished partnership with the Missile Defense Agency to deal with this threat, one that we're very, very proud of, and I know that we're going to continue to work effectively and collaboratively in the future. We have been partnered -- certainly as you look at systems like the Space Based Infrared Systems program. I'll talk for a few minutes about that. But we've enjoyed a strong partnership with the service program, particularly with missile defense, and it will continue to pace that system and in and of itself will continue to be foundationally the first step as a part of this missile defense architecture to ensure that we have the ability to deal with those growing threats.

Of course, SBIRS has been on-orbit since 2006 as part of that growing and evolving architecture. I'm very, very proud of the capabilities that have continued to grow from the SBIRS system. Of course, its primary mission areas are missile warning, missile defense, battle space awareness and technical intelligence.

It's more than just a bell ringer, though, for missile defense. It has got impressive capabilities that continue to evolve, and that's our job right now, to extract those capabilities. As we've gotten our first two geosynchronous satellites on-orbit as well as the HEO payloads on-orbit, we now are faced with the daunting challenge of extracting even more information and disseminating that information out quicker with regard to the kind and type of threats that we face. We believe as we continue to grow these capabilities, especially in our ground processing and command and control capabilities, that all of our mission partners across all four mission areas will continue to grow and benefit from those capabilities.

I'm very proud, the Air Force is very proud, last week that U.S. Strategic Command, General Hyten and his staff, declared the SBIRS Block 10.3 ground system was accepted for operations, which was an important step in that program's continue evolution in delivering a capability. It had been originally born back when I was fortunate to be associated with the SBIRS program. As we continue to evolve that capability it represents the future and really gives us a strong foundation that will allow us to continue to grow and evolve that capability.

We believe, first and foremost, of the capability that has been delivered so far. We've seen significant performance increases across certainly being able to release messages quicker, reducing our event error to include starer sensor data, improving cueing data for missile defense systems, and allowing for command and control and mission planning of taskable sensors. And then finally, a real benefit that we saw was the ability to consolidate all of our ground processing stations for all sensors and types into a single facility, thereby increasing collaboration, coordination and communication. All the benefits that you might expect are now being realized there on that operations floor there at Buckley. So we're very, very proud of that operational declaration by U.S. Strategic Command.

Of course, data dissemination is really what it's about in our business. When you look at all the sensors, and we've got incredible capability on-orbit, the ability to collect that information rapidly and disseminate it into war fighter's hands is what this business is all about. Certainly that is the case for missile defense. I think that the new SBIRS systems and the SBIRS program is taking the appropriate steps to continue to grow those particular capabilities.

First, we've got the TAP Lab, it's the Tools, Applications and Processing or TAP Lab that was recently stood up in Boulder, Colorado. Really, that is a prototyping and development environment that's needed and has been effectively used for rapid prototyping and algorithm maturation to allow us to continue to mature those products in a more rapid fashion, as well as again driving the innovation and collaboration. And then of course the tools and the techniques and the products that are developed at TAP are fed to the OPIR Battlespace Awareness Cell, or OBAC, which exists down at Buckley Air Force Base. So they work hand-in-hand and really gives us a chance to, if you will, test before we fly and to continue to understand how we can close the OODA loop and reduce the cycle time and make decisions faster. That's what this business is all about.

SMC under General Greaves' leadership has recently released a broad agency announcement for continued work. They intend to award about $47 million worth of contracts over about the next five years for work supporting both the OBAC as well as the TAP Lab for work like that to again continue to partner with small business, industry, academia for small projects that allow us to again spend quickly and be able to mature the technology that much faster. Right now we've got evaluations going on for 10 proposals as part of our first round of contacts with industry, again trying to get those awarded here in early 2017.

Looking forward for the future with the SBIRS system, of course we're very proud of the fact -- I mentioned before that we've got the first two geosynchronous satellites on-orbit. We're waiting for the next geosynchronous satellite launch here on the 19th of January. There's a lot of excitement within the OPIR business for that satellite to get on-orbit and start contributing to the constellation.

With that, we're now looking, as you might imagine, with the launch of the third geosynchronous satellite, we need to start looking at what are those systems that are going to replace it? We're working that very aggressively through the department right now to understand what those future systems ought to be, what their capabilities might be, and how we might be able to best tap into the emerging technology that we see. In terms of on-orbit, what does that space layer need to look like and how does it fit within General Hyten and now General Raymond's Space Enterprise Vision? What kind of capabilities might we need to have on-orbit to be able, again, adapt to that growing missile threat that we're seeing?

Fortunately, through the continued Congressional support that we've enjoyed over the last six years or so, SBIRS has had a strong Space Modernization Initiative, or SMI, line that has allowed us to do exactly that, to be able to have, if you will, the seed corn from the money that we need to be able to pursue and invest needed technological kind of advancements and tech maturation initiatives for both data processing and data dissemination, but also the prudent measures that we need to be able to continue to mature our technology for on-orbit capabilities. So we're looking -- again with Congressional partnership and support -- we're looking at being able to continue that kind of work in addition to, and have it directly feed into what our future architectures and our future systems will be looking at in terms of the future capabilities that we believe can be reasonably achieved. Again, being able to have confidence that when we pursue those systems that we'll be able to get them delivered on time.

As well, SMI has been focused on advanced and demonstrating critical technologies that are going to benefit the entire OPIR capability, to include large format digital focal plane arrays, resilient algorithms for both staring and scanning sensors, resilient optics, advanced data processing, and a capability to handle large increases in data. Finally, I think the most important and maybe overlooked sometimes aspect of this is the ability to have an open architected ground processing capability, which is absolutely essential. When we look at -- SBIRS is a system of systems in and of itself, but when you consider the broader aspect of these kinds of systems and the ability to transition and disseminate data across multiple agencies and other services, it's essential that we've got a ground command and control and open architected system to allow us to do that. That's going to be an important feature that the SMC team is building into that.

Again, all of this is supported through collaboration with our mission partners and we couldn't be a prouder partner to be able to work with Missile Defense Agency in dealing with this growing threat, and certainly providing the capabilities that we can, not only with the SBIRS system, but to work together as we look at what the future ought to

look like for our entire missile warning architecture and missile defense capabilities. So we are discussing areas for continued potential synergy and making sure that we are mindful of as we look at that remote sensing requirement to make sure that we're mindful of that as we consider what our future systems ought to be looking at, and where we can working to unify our technical requirements and make sure that they incorporate where possible those missile defense systems and capabilities that are going to be needed to help them be successful. So in all, I do think that we've got a great story here. While the threats are real, I'm very confident that our partnership is going to see us through. Just as it has in the past, it will continue to grow and we will continue to benefit, and our nation will benefit, from the capabilities that this partnership is driving towards.

So again, thank you all very much for being here and I look forward to your questions.

MR. ELLISON: Thank you, Roger. Our next guest -- Vice Admiral Syring had wanted him to specifically speak on this subject material, so we're really honored to have the Program Executive for Advanced Technology for the Missile Defense Agency with us today.

Rich.

MR. RICHARD MATLOCK: Thank you, Riki. I really want to thank you for giving me this opportunity to spend some time with you today, and with certainly one of our great leaders in the Air Force General Teague, who we've been working with for a long period of time to make sure that we bring the most capable missile defense to our nation.

He discussed a little bit about our emerging threats and our evolving threats. I don't want to take up much of my time describing, as he did so eloquently, the foundational piece of our architecture, which is the Space Based Infrared System and the overhead infrared architecture, which really inaugurates our mission with the warning and the direction of where these missile systems will be coming.

I thought I'd focus my remarks on a couple of things. One is, where are we today and what are we doing about this threat that we see emerging? And, what is the role that space will play? A very large role, I believe, in the future of our missile defense architecture.

I see many familiar faces here in the audience today. Many of you wore uniforms or were key supporters throughout the whole missile defense generation since the Strategic Defense Initiative Organization. So you're familiar with where we were in terms of our thoughts about space earlier and where we're heading to now. But I want to give you some feel for why it's so important that we make this broader shift from a terrestrial-based system to a system that primarily fights from space over the next few years.

Of course our missile defense system, as you all know, is focused not on our near peers but on rogue nation states who attempt to threaten us through the use of ballistic missiles as a way to make our world more challenging. We've seen over time that these countries are certainly acquiring a greater number of missiles, increasing their range and incorporating countermeasures, things that spoof our overall sensor architecture. They're making them more complex, survivable, reliable and accurate. And we've seen recently in some of our near peer testing, more maneuverability, which over time we may see that also migrate to a challenge for us in the rogue threat.

So our nation today, beyond of course the inaugurator, which is our overhead architecture for determining missile launch, is primarily terrestrial-based. We have our nation's architecture deployed worldwide to protect the homeland, our deployed forces and our friends and allies from ballistic missiles of all ranges and types -- ballistic missiles of all ranges and types. The architecture has consisted largely of terrestrial sensors deployed on land, deployed on our ships, and interceptors also deployed in silos, in trucks and in ships.

These are all knitted together by a global management command and control system. It is a very large, complicated and complex system deployed over 11 time zones, 11 to 15 time zones, or so. As we examine the impact of the evolving, more maneuverable, more complex threat on this, we begin to see gaps emerging in the future to our system, which is primarily based on our lack of persistent global sensor coverage, reliance again on a single phenomenology to detect, track and discriminate, as well as we are primarily operating exclusively in the midcourse phase of the trajectory. We do have some terminal phase defenses, but the bulk of our investments are focused on that midcourse phase, which can be challenging from a homeland standpoint because of the long range and the ability for countermeasures to be deployed to spoof us over that long range.

So the agency -- my role, as Riki mentioned, is to be the program executive for advanced technology, which means I get a cool job. I'm developing new technology with you and for you to bring our system along, to leap ahead of the threat. We're making our investments in technology that we believe will potentially anneal these gaps that may emerge, as well as trying to significantly drive down the cost of our ballistic missile defense system.

It has been a challenge for us. As we look to bring this cutting edge technology to fruition here, we want to make sure that we are doing those two things: making sure our system is capable of leaping ahead of the threat; and being less expensive over time. The nation will invest a lot of treasure in this, and we want to make sure that we're being most effective.

So we're tackling this challenge in a couple of ways, or in a multi-pronged way I should say. One way is to, of course, reduce the number of interceptors that our war fighters have to fire against each one of what is declared a credible lethal object, a potential re-entry vehicle coming in from this threat cloud. And then the second piece of

that is to try and reduce the number of credible objects. We'll do that in a couple of way.

Our first major thrust is establishing the technological foundation for killing multiple objects from a single interceptor. Primarily right now we're focused on ground-based interceptors. As you can imagine or as you probably know, each of our ground-based interceptors has a single bullet on the end of that. We call it the Exoatmospheric Kill Vehicle. We're doing some work right now with the folks to try and make that kill vehicle more reliable over time, but we're also focusing some of our energy right now on technology which will allow us to shrink down those kill vehicles and get more kill vehicles on a single interceptor. So if you think about that and the challenge of discriminating over long range with a sensor system which isn't yet globally persistent, then the idea that we might have several objects indiscriminate coming in allows you to understand how important this math is to us to have more capability on each interceptor.

The major challenge of reducing the number of credible objects is we've got to find a better way to discriminate what are the bad things and what is the junk in an incoming threat. So as you can imagine, as each on of the incoming threat missiles deploys its re-entry vehicle or re-entry vehicles, there's also opportunities for -- in the future we imagine -- to spoof our sensor system. And our sensor system, again, relies today on one single phenomenology, radio or radar sensors. So as we look to the future, we're making investments in bringing electro-optical sensors into the game plan which will make it more difficult for our enemy to spoof it, and give us that capability to discriminate better this set of objects.

So we've been looking at advanced sensors, both passive and active. We've been using unmanned aerial vehicles, primarily Reapers, over the last few years to look at how these sensors perform. Again, Reaper is in an elevated (sense ?) which allows us to get primarily above the atmosphere and get a better capability from an electro-optical standpoint.

We've done testing in the Pacific over the last few years with MDA-modified Reapers that take the sensor system that they have there currently, make some modifications to help us be more accurate in tracking as well as add more capability from a sensing standpoint, and we've been able with single and double stereoscopic viewing from a couple of Reapers, been able to simulate launches from our Aegis weapons system. So we're achieving sensor capability for what we call quality of service from these sensors, which will allow us to launch the Standard missiles from the ships beyond the sight of the radar. So beyond the sight of the radar is a key element for us and makes that system much more capable. We're finding that bringing electro-optical sensors in here is giving us great opportunities.

Now what we plan to do of course over the next few years is to take advanced sensors that are generations beyond that we have in the laboratory today, and using this technique of airborne sensors, begin to explore that capability to handle large raids with these sensors and examine how they might operate in a command battle management control system that has both radar and electro-optical sensors. Of course, eventually our

goal must be to deploy this technology in a globally persistent space-based sensor layer -- a globally persistent space-based sensor layer.

Finally our vision is to substantially reduce the number of lethal objects by destroying the threat in the boost phase, before it can deploy the lethal re-entry vehicles and any countermeasures that are designed to spoof our sensor network, as well as deployment objects which might follow along. So adding a boost phase layer to our missile defense architecture will dramatically reduce the role of terrestrial interceptors as well as the infrastructure necessary to support them. But more than that, it gives us a layered defense that isn't just in the midcourse primarily, but gives us capability in the boost phase to knock these things, to de-structure or thin the raid, and make the challenge much less stressful for our ground-based interceptors in the midcourse and near terminal phase.

So we're doing that in a couple of ways, but my primary focus right now is in directed energy research, which is tackling this major challenge. We're doing it in a very structured way. Our goal eventually is to integrate a high-powered solid state laser on a long endurance unmanned aerial vehicle operating in the stratosphere, where the atmospheric disturbance of the aircraft and the laser is significantly reduced. This year we plan to competitively award airborne laser demonstrator contracts to two or more of the major primes to integrate and flight test the system, a lower power version of this system, as early as 2021.

For those of you that are perhaps not quite as long in the tooth as I am, I've got 40 years of government service in this year and 30 years of that has been with missile defense. So I've had an opportunity to be involved in missile defense pretty much since its inauguration. During the Strategic Defense Initiative era all of our architectures pointed to a missile defense system that was occupying the high ground of space.

So between 1985 and 1992 we invested a significant portion of our annual budget in major acquisition programs like the Space Based Interceptor. I was the technology director out in Los Angeles for the Space Based Interceptor program at that time, and its successor, Brilliant Pebbles. We've called this many things.

I think SBIRS-Low was one of them. We called it the Space Surveillance and Tracking System. I think we called it the Ballistic Early Warning System. We had a whole number of things. SMTS was in there too as well.

MR. : Brilliant Eyes.

MR. MATLOCK: Brilliant Eyes was the last version. And we had, of course, the Space Based and the Airborne Lasers. We also reduced technical risk through technology programs like the Clementine satellite to the moon, the Lightweight Atmospheric Projectile, the Miniature Sensor Technology Integration Satellite series, the Delta, the Midcourse Space Experiment and the NFIRE experiments, which proved the physics of boost phase intercept. But of course, for several reasons, various reasons, the

acquisitions programs that I mentioned were cancelled or eventually phased out for various reasons. But much of the technology has found its way into our existing interceptors and interceptor sensor programs.

But if we're to meet the evolving threat, we will eventually require that the prepo9nderance of our missile defense architecture operate, if not reside, in space. So today we are integrating -- for example, I think it was mentioned earlier here, we are integrating space-based kill assessment sensors hosted on a commercial platform for a launch over the next couple of years. And there is an interesting paradigm for us as we think about how we get to that space-based layer.

Over the next decade I envision deploying precision tracking sensors in a globally persistent space layer. As I mentioned earlier, we'll do this of course with partners, like the Air Force and commercial space or other interested -- probably with the capability to accomplish missions that are beyond even missile defense. Personally, I believe that a continuing presence in space will allow us to consider eventually introducing a boost phase weapons layer in our later BMDS, substantially increasing its performance and effectiveness. But again, we'll be doing all of that with strong partners. Our strongest partner, of course, as in the past and currently will be with the Air Force.

MR. ELLISON: Thank you. I'm going to start off the first question and then we'll open it up. But like you said back in 1984 there was a vision, there was a tangible technology reach. I'd like to ask the two of you what can we get accomplished five years from now in space to protect, defend, and to do global persistency?

Is that available, to be able to do fire control off of that capability in five years? What can we walk away with with a reasonable upgrade to the budget? So if you were not limited to your budgets today, what would you see as doable?

MR. MATLOCK: I believe that the technology that we've been demonstrating here over the last few years, and relying on the large investment that we're seeing in commercial space, one that's expanding in a huge way, (not ?) exponentially but certainly in a large way here over the last few years, we think there's going to be an opportunity for us to take that environment and bring in capability quickly -- quickly. Now we don't have a program of record today for space-based sensors or for deploying a space-based sensor layer, but I think that as we look to the future and look to the space vision, there are going to be great opportunities for us in the near-term to do that. So I don't see this as a thing that we've got to wait 20 years for. I think that over time we can get there fairly quickly.

GEN. TEAGUE: I would agree. I think there's a couple of continued evolutionary improvements that we're going to see within the SBIRS system, principally with the delivery of the Block 20 ground capability -- Block 10. You'll see the final performance capability intended for the SBIRS system delivered with Block 20 in the 2019 timeframe. That really gives you automated staring capability, in addition to additional event processing capabilities. That's within the SBIRS system.

Understand fully that there are limits there with regard to addressing the full threat with regard to missile defense needs or missile defense capabilities that are critical to meeting this new threat that's rising. But it's an important step because once you have that foundationally that allows you to explore from an architectural perspective, what is that follow-on or what are those new additional space layer capabilities? When are they needed? How does it fit within our overall space enterprise?

Those conversations are going on right now. So the fact that that, again, collaboration and cooperation exists today, we're going to be able to continually effectively plan and lay out those programs, obviously affordable programs, as best we can to address the rising threat.

MR. ELLISON: Alright, we'll open it up for questions.

MR. : You mentioned the OODA loop, so the question I have is given how rapidly both the missile and space superiority threat are evolving, and how long it takes us to acquire any major system, at least for the foreseeable future it appears the threat will be inside our OODA loop rather than the other way around. Do either of you have any idea on what could be done to change that and try to get a little bit more ahead rather than constantly reacting?

GEN. TEAGUE: I think certainly from the Air Force perspective we're addressing that. You've seen, again with Congress' cooperation, we've seen a real emphasis on defensive space control capabilities that would allow us one, to be able to better defend ourselves, to be able to take action so that -- it's all about increasing resiliency, right? Whether or not it's leveraging commercial or civil or whatever, the other partnerships that we might be exploring, it's all about increasing resiliency in both our satellite-based capabilities as well as our ground systems.

So I think the fact that we're working towards that end and with that as an objective in a (global ?) manner is foundational to what we're trying to do to, if you will, defend ourselves first and foremost; and then be able to explore or identify what kind of additional capabilities do I need to help me compress that OODA loop even tighter, knowing that with fundamental foundational kind of defense capabilities, then what do I need to do in addition beyond that to help mitigate any, if you will, so that U.S. forces retain its advantage? That's really where I think the partnership that we continue to explore here with regard to what our future architectures would look like is going to be critical to our planning going forward.

MR. MATLOCK: Precisely, I think also we do, in the Missile Defense Agency, of course with great support from the department and from the Hill, we have additional authorities which allow us to explore this in a rapid way. So I think that a combination of the partnerships that General Teague talked about, as well as the ability to move quickly on things, will help us there.

MR. JAMES ASKER (ph): James Asker from Aviation Week. Over at Air Force Global Strike Command they've declared that the Strategic Air Command is back, or at least (we've kind of entered into a Cold War 2.0 ?) at some point. Do you think at the Missile Defense Agency it's time for a Star Wars round two now that the technology is a little bit more mature and perhaps a little more ready?

MR. MATLOCK: Well, I don't know if I want to make a policy statement about whether we're ready for Star Wars II or not, but I do think that the balance -- we continually explore the balance of bringing capacity and capability or modernization to our overall game plan. So over time -- the balance from the SDIO days was where the primary focus was on bringing in new capabilities and new technology. Of course, over time we've shifted to bringing more capacity and more capability to the war fighter. So I think that I'm encouraged by where the technology investments are taking us that we're making today in the Missile Defense Agency. I think that over time now we'll begin to see how we can move those more quickly into the operational systems.

MR. ASKER: Do you think the U.S. government could at least achieve the aims of Star Wars in terms of protecting the homeland and U.S. allies?

MR. MATLOCK: Well, when you say Star Wars, strictly it means covering a Soviet threat of thousands of missiles. I don't see that on the horizon either from the now defunct Soviets or from us. But I do believe that as we look at where the threat is coming from and how it's emerging and evolving, that we're going to need more capability and that we're going to need to move to space in order to assure that we don't have any gaps in our system in the next decade as this threat emerges.

MR. MARK STONE: Mark Stone, missile defense analyst since the four year anniversary of Reagan's Star Wars speech back in '87. Given increasing reliance and capability in space, what are you looking at in terms of dealing with hostile environments and ASAT activity from a system or system of systems perspective of ensuring the actual effective missile defense capability, given contested space?

GEN. TEAGUE: I talked to that a little bit ago. We are certainly mindful of and recognize the growing threat environment. Those actors that chose to pursue that path have our attention.

But that said, the United States has an inherent right to defend itself and we are actively pursuing capabilities that give us resiliencMR. ELLISON: resilient capabilities, resiliency in our systems that are both space-based as well as ground-based capabilities, so that we are able to survive and operate through any kind of threat environment that might present itself. And that's critical. We understand the importance and criticality of these kinds of systems like SBIRS that are here to protect us all, to give us that unblinking eye of warning that we need to protect not only this homeland but our allies.

MR. STONE: Does that also include protecting the weapon aspect in space, not just the sensors that you were speaking of? So putting interceptors or putting energy

weapons in space, are those going to be protected to ensure that they're actually available when needed and an enemy doesn't take them out just before they launch an attack against us?

MR. MATLOCK: We don't have any space-based interceptors today, but I would expect that as General Teague mentioned, whatever assets we deploy will be protected, whether they're space-based or terrestrial-based.

MS. COURTNEY ALLISON: Courtney Allison with Inside the Air Force. Mr. Matlock mentioned the space-based sensors that would be hosted on commercial platforms. I wonder if you see that being the beginning of more partnerships to launch payloads. At the same time, General Teague, how closely will the Air Force be watching that relationship, and are hosted payloads factored into the future SBIRS architecture in any way?

MR. MATLOCK: I think there is a great opportunity for us with the Space-Based Kill Assessment to begin to explore how we might use commercial platforms, and the opportunity that that provides to us for getting some capability and some functionality in space. So as that system is integrated and launched we'll obviously want to see how valuable that is to us and what that means in terms of some of the other functionality that we think we need to get into space more quickly. But I think right now from an architectural standpoint we're looking at a broad set of architectures, an architecture which doesn't necessarily contain just one element in one particular location or set of orbits. So as we look at what functionality we need to bring and when we need to bring it, we're exploring how might we be able to fit in with the existing architectures as well as explore with partners like the Air Force and commercial space, our ability to instantiate that in a way that makes sense.

GEN. TEAGUE: Courtney, I would just add that dispersion is an important attribute of resiliency. As we look at what our future architectures and capabilities are, it's going to be important that certainly having a hosted payload to be able to provide capabilities beyond our current system is an important aspect of not only the Space Enterprise Vision, but an important measure of resiliency. So again, I've got a capability that if I happen to lose one node or one sensor, that I have additional capability that would continue to perform the mission. So absolutely we're looking at it.

MR. : General, you mentioned the development of hypersonic missiles by our adversaries. I was hoping you could both expand on that a little bit? Is the speed of directed energy something needed to combat that, or are there other ways to counter that?

MR. MATLOCK: Right now we're examining a number of architectures which would allow us to tackle that challenge. A non-kinetic capability is one of those that we are looking at. I think in the near-term we'll be exploring what sensors we need in order to track those more effectively. Because of the nature of their trajectories, it presents some challenges, so we'll be looking probably at some demonstrations in the near-term which will help us understand that piece of the challenge more directly. And we'll be

exploring with industry and others in a broader way what a complete architecture might be and what systems we have today which might be able to address that threat with some modifications, as well as bringing in some of these newer technologies, like non-kinetic.

MR. JIM ARMOR: Jim Armor, Orbital ATK. You talked a little bit about the process, but is there a decision process to get to a program of record by year, or sort of approximately. Is there a decision process to get to a decision process maybe? Could you talk to that?

MR. MATLOCK: Every year we take the strategic guidance we get from the department and assess how do we make sure that we're able to make that guidance real through our program -- missile defense program, for example, in those areas which we can affect. So we examine what we're doing now, what the threat looks like, and what this guidance is, and then we make investments based on getting that capability over time. I can't tell you when we're going to make the decision to go to space, whether it's tomorrow or next week or two years from now. But certainly I think we understand and we're making investments from a technology standpoint now which will enable that.

MR. ARMOR: But you haven't targeted like FY '20?

MR. MATLOCK: No, other than these technology investments that I mentioned here in terms of getting some demonstrated capability from an advanced sensor standpoint using these unmanned aero vehicles as a way to do that, as well as looking in a structured way to begin to look at some of these really interesting solid state laser technologies that we're exploring, as well as others we're exploring now and bringing that capability along. So those have targeted dates and we have programs in place technology-wise to do that. But we haven't decided on a program of record yet of what that would be for getting that globally persistent space layer.

MR. ASKER: Could you give us a little bit more of a sense about what the Air Force and also MDA's thinking about what this space layer might be? We've seen some multiple different small sats and things like that, providing that constant orbit. What sort of orbital regimes do you think you'll put these satellites in?

How high up will they be? How many are we talking? Do you want to cover the entire globe or just the hot areas? Can you give us some picture of what you're trying to achieve here?

GEN. TEAGUE: I would just counter or just offer that certainly any of those kinds of discussions are pre-decisional work. We're evaluating alternatives right now. Any number of different architectures and systems and capabilities are being explored. There hasn't been any firm decision made on any of that.

But it's important that as you look to grow your capability, grow your resiliency, but also maintain affordability as a primary goal, there's a natural resistance among those three elements, those three goals, to be able to achieve a system. As you look at the

entire missile defense scenario, it's important to be able to keep eyes on target throughout and to be able to maintain custody of any threatening object or missile and be able to take action appropriately. So the ability to have the kind of system, the capabilities in the right orbits, in the right place at the right time, is paramount.

Missile warning and missile defense is not -- or I can certainly say missile warning, and I'll let Mr. Matlock talk a little bit more with regard to missile defense capabilities, but it's certainly a global capability. U.S. forces and allies operate around the world. So we want to make sure that we've got adequate warning capability to provide them the information they need so that they can take appropriate actions.

MR. MATLOCK: I think, certainly, what he said. We're working with the Air Force and with our partners to look at what architectures would make sense. So to say that we've settled on any particular architecture -- again, it kind of gets back to the discussion we had a little bit earlier about what functionality do we need to place where and when and how would that best be affected from a resilience as well as performance standpoint?

So we have not settled on any particular architecture for any piece or functionality of what we're doing right now. But we are looking at several things like the Space Based Infrared System as well as the work that we're doing to deploy kill assessment functionality in the manner that we're doing today. So there's a wide spread of things that we're looking at there, James, and we haven't settled on any particular thing yet.

MR. ASKER: Do you think the government will come up with an architecture and say, we want you to build this, or do you might leave it more open to industry to come to you with their proposals for how you might best cover the globe?

MR. MATLOCK: We have strong partnerships with our industry partners here and we'll look to them to help. They're going to build -- whatever system we envision they're going to put together for us. So we'll look to get their advice and thoughts on how to do this most effectively with the greatest resiliency and the most capability.

GEN. TEAGUE: We reach out. The Air Force reaches out to industry regularly to get industry feedback, ideas and potential solutions as we try to address the future scenarios, the future threats, that we face. It's important that we maintain that partnership, that dialogue, going forward because the solutions are in industry. In response to operational requirements, it's important that we collectively state our requirements with clarity, but we certainly understand that the solutions to these problems lie within our partners in industry.

MR. : Jeff, from Boeing. You've both done a great job describing really how the Air Force works with MDA to help them on battle management time critical operationally relevant timelines. Can you continue to elaborate sort of going the other way on how there may be some lessons from MDA on enhancing space resilience by doing things in really operationally relevant timelines battle management C2 kinds of

things?

MR. MATLOCK: I don't know that I can pick out any particular example, Jeff, of where we've said we learned from this that we should do that, or otherwise. I think what we're finding every day, since our system is deployed, is that our partnership with the Air Force and others is important in terms of making sure we learn what we need to learn about how you deploy an interesting engineering concept to the war fighter and make it work. How do you sustain it and maintain it over a period of time and how do you improve it?

GEN. TEAGUE: Jeff, I think you've hit on an important notion there because it is all about battle management command and control. It is about having the ability for open architected kind of ground command and control capabilities to be able to facilitate the rapid exchange of information, thereby enhancing the decision timeline. That's why I think that partnership and the dialogue and the discussion is so critical to what we're doing to be able to achieve those objectives.

MR. ELLISON: I have just one little question. Do you think at some point that mutually or near peers and us are going to not want to do kinetic energy intercepts in space? Are we moving towards soft kill and electromagnetic kill? (What are the weapons in development ?) instead of doing kinetic energy, or is that revolution happening or not happening?

MR. MATLOCK: I thought I saw Brian here somewhere. That's a policy question. That is a policy question. I don't know how best to answer that. I think those are things that we're going to have to wrestle with over the next year or so as we get a change in the administration to look at what posture we're going to take. I'm sure that our brethren over there in policy will take on those challenges.

MR. ELLISON: Do we have any other questions? Thank you for joining us today. Have a Merry Christmas, Happy Holiday. Thank you, Richard and Roger, for being here and talking with us.

(Applause).