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U.S. MISSILE DEFENSE DEVELOPMENTS: HOW FAR? HOW FAST?

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P R O C E E D I N G S

MR. PIFER: Good morning. Let's go ahead and get started. First of all, welcome to the Brookings Institution. I'm Steven Pifer. I'm the director of the Arms Control and Non-Proliferation Initiative, and it will be my pleasure to moderate today's panel discussion on U.S. missile defense developments: How far? How fast?

Before introducing the panel, let me just make a couple of acknowledgments. First I'd like to thank the Union of Concerned Scientists which is cosponsoring today's panel, and in particular I'd like to thank Stephen Younger of the Union of Concerned Scientists for all of his help in making this happen.

SPEAKER: Young.

MR. PIFER: Young actually.

SPEAKER: Younger as well.

MR. PIFER: All right. Let me also acknowledge the support of the Ploughshares Fund and the Carnegie Corporation of New York for their support for the Arms Control and Non-Proliferation Initiative.

Now over the last several years, when one talks about American missile defense it seems to focus on two tracks: First, the question of ground-based midcourse defense for the United States based on ground-based interceptors deployed in Alaska and California intended to defend the United States against a limited ballistic missile attack; the second track is aimed at defending American allies and American forces who are deployed against ballistic missiles of less than intercontinental range: Short range, medium range, and intermediate range.

And the focus in the last several years of that program has been on the European Phased Adaptive Approach, which the Obama administration announced in 2009 based on the Standard Missile 3. But there's also, as I think we'll hear about too, the Pentagon is looking at cooperative efforts both in the Persian Gulf and in Northeast Asia.

There's a lot going on now in missile defense. It's believed that sometime this month the Defense Department will conduct a critical test of the

ground-based interceptor, the Capability-Enhanced 2 kill vehicle, an important test to a program that's had a difficult history the last several years.

And also, in Congress you have suggestions about how missile defense might be reconfigured. Some suggestions for a third site for ground-based interceptors on the east coast, and then more recently suggestions that the European Phased Adaptive Approach phase 3 deployment in Poland should be accelerated in part as punishment to Russia for its aggression against Ukraine.

Today's panel is going to discuss the program's status and a whole set of key questions regarding it, and I think we have an excellent group to explore these issues. I will not do long introductions because you have their bios in the program. But in the order they'll speak, we have first Peppino DeBiaso. He's from the Office of Secretary of Defense. He is the director of the Office of Missile Defense Policy. Our second speaker will be Phil Coyle. He's a senior science fellow at

the Center for Arms Control and Non-Proliferation. Then we'll have Cristina Chaplain. She's a director at the General Accountability Office. Laura Grego, who's a senior scientist at the Union of Concerned Scientists. And finally, Dean Wilkening, who's a physicist at Lawrence Livermore National Laboratories.

After the panel makes their opening comments, we will open the floor for your questions. So, Peppino, please start us off.

MR. DEBIASO: Thank you, Steve, and appreciate the opportunity to come and address the panel and the question on U.S. missile defense deployments: How far and how fast. Given that I just have a few minutes to outline current U.S. missile defense activities, where we're at, how we got here, where we're going, I'm going to go through it pretty quickly, hit the way tops, and then there will be, I gather, plenty of time for questions and answers, discussion, debate afterwards.

Let me just start off with a couple of general observations about U.S. policy on missile

defenses. It's remained fairly consistent since the release of the 2010 Ballistic Missile Defense Review. Most of you are probably familiar with that. That document really has served as the touchstone for our activities, both with regard to homeland defense and with regard to regional missile defenses, for the past four years going on five and has been reflected in all the key strategic guidance documents; in the 2012 New Defense Strategic Guidance document and more recently in the 2014 Quadrennial Defense Review. So, there's a connection here between our broader defense strategy and what we're trying to accomplish with missile defense.

Just quickly, of course, the QDR highlighted three elements of U.S. defense strategy: Protect the homeland, build security globally, and project power and win decisively. The relationship between missile defense and those major elements of missile defense is fairly straightforward. The homeland defense, the Ground-based Midcourse Defense System of which there are 30 interceptors; 26 at Greely and four at

Vandenberg, are clearly focused on protecting the United States' population territory against limited attacks that, in particular, is countries that we worry about or have significant developmental activities underway for long-range missile programs like North Korea and Iran.

With regard to building security globally, we'll talk in a bit more detail. Fairly active U.S. approach working with partners and friends in the three key regions that we worry about in Europe; in the Middle East, and in the Gulf as a second region, and then in Northeast Asia where, as I said, we've got pretty active sets of cooperation and activities going on really as part of our broader security partnerships and alliance commitments.

And then lastly, the relationship between BMD and projecting power, again, from our perspective, is fairly straightforward. We're today continuing to provide substantial capabilities to U.S. combatant commanders, our warfighters in places like European Command, Central Command, and Pacific Command.

Each of those combatant commanders now have substantial ground in maritime missile defense capabilities that contributes to our ability to protect ourselves, our forces, our bases, and maintain U.S. global presence in those regions, and in particular help us start to deal with some of these newer challenges like anti-access and area-denial strategies we see other countries pursuing.

Given the consistency in our policy since at least 2010, our focus in the department really has been on the implementation of policy or of these programs. In the case of homeland defense or GMD, that means staying ahead of the threat relative to where we think North Korea and Iran could go here in the foreseeable future. It's an important phrase, "staying ahead of threat," because it does shape and drive how we evolve homeland defense capabilities.

In the context of regional defenses, it means putting special emphasis on cooperative relationships and burden sharing. Missile defense, especially the regional defenses, Patriots, Standard

Missiles, AEGIS, THAADS, are the classic, high demand, low-density system.

There's a lot of demand out there both on the part of our friends and our partners and allies as well as the warfighter, and not enough capacity. So, emphasizing the mobility dimension of those defenses helps us accomplish the missions in those regions a little better in terms of our ability to swing capabilities from one (inaudible) to another depending upon the particular crisis.

The regional threat that we're coping with is -- I won't dwell on it. I'm happy to have that discussion, but thousands of certainly short and medium-range ballistic missiles (inaudible) technologies continue to advance. Adversaries are going in the direction of mobility. They're using concealment and deception efforts to mask their activities. They're developing capabilities to salvo launch two, three, four, half a dozen at a time.

So, these are all going to be challenges that certainly our regional missile defenses have to

deal with it. But the fundamental purpose of working with partners is so that at the end of the day their capabilities, our capabilities, working together in an integrated or interoperable fashion produce a capability that would be much better than had we just gone this alone or we'd done it in a bilateral context.

Just quickly, the wave tops on -- a little deeper dive on homeland defense. You're all familiar with the secretary's decision back in March of last year to augment U.S. homeland defenses in large part because of some of the trends we were seeing. TD-2 had just completed the 12-year developmental cycle successfully starting with the first launch of the TD-1 back in the summer of '98 and concluding with the successful three-stage missile or space launch vehicle, whatever it was that they launched, back in December of 2012.

Some of the activities we've started to see were -- the administration officials talked about this North Korean rogue mobile missile, but the

(inaudible). So, as a result of those factors coming together, one, and two, recognizing the challenge, the time it takes to build, develop, and test missile defenses, the secretary concluded it was the right time to begin to augment homeland defense.

Couple of quick decisions. It involved the deployment of a second Tippy Two radar in Japan; very critical radar. This is one that will not only help the Japanese in their own regional defense, but contributes to U.S. homeland defense. The secretary talked about funding 14 additional ground-based interceptors that brings the current total from 30 to 44.

Related to that, as you know, MBA, I think Steve mentioned, has this important test coming up here in the not-too-distant future of a redesigned kill vehicle, the CE-2. So, this will be, obviously, an important test. It follows a successful test of the CE-2 non-interceptor.

And I believe they did, at the beginning of the year, to try to determine if they had been able to

address some of the problems associated with that. As I understand it, some of the vibration in the kill vehicle -- I guess, Admiral Syring, the Director of MDA, feels confident that they at least demonstrated their ability to dampen some of that vibration. The secretary, at the time of the March decision last year, also initiated -- terminologies varied a little bit, but a new design for a kill vehicle. A common kill vehicle, EKV, redesign. Even today I'm not quite sure. The terminology floats back and forth a little bit. But it is recognition that the United States really does need to get on with the next generation of kill vehicle regardless of where we end up with the current GBI kill vehicle systems which were deployed in a fairly accelerated fashion a number of years ago.

It was a recognition of the need to move on to the second generation of kill vehicle. This is part of sensible, prudent, spiral development. And so, that program is underway. There's funding for it at this point.

In addition, Congress has directed the

Missile Defense Agency to go explore the possibility of a third site in the United States, sometimes referred to as an east coast site, but the sites that have been identified actually go beyond the east coast. And the reason that drove Congress to do that is the view that this third site would help in dealing in the future with a long-range Iranian ballistic missile to the east coast.

The administration position is it's doing the site surveys, it's conducting the environmental impact statements, but it's made no decision to proceed with the deployment. In fact, senior officials have said the next dollar the department should be spending on missile defenses ought to be to getting the GBI healthy, sustainability, reliability, improving the kill vehicle, and looking at sensors as that's where more bang-for-the-buck is likely to be found.

Quickly turning to regional defenses, again, three major areas where there's an awful lot of activity. I'll try to step through those fairly

quickly, but if you go back to the BMDR, we outlined an approach -- for regional missile defenses we have to recognize that each of the regions of concern -- Europe, the Middle East and Gulf, and Northeast Asia -- have a different set of variables. Just a different geopolitical region, different threats, different allies, different partners, different levels of capacity that friends or partners can contribute, so that we would have to tailor these approaches in our missile defense cooperation to each of these three regions.

With regard to EPAA, most of you are familiar. Three phases; it did have four at one point. I won't talk about the discussion on that right now, but at least with regard to phase one is underway. Radar in Turkey, Aegis shipped in the (inaudible) with SM-3 interceptors. NATO has worked through issues like command and control. So, there's actually a NATO role in how we might transfer authority of that capability between EUCOM and SACEUR as it transition between U.S. command and European command, and we work

through all the details, the rules of engagement, and so forth.

Phase two and three, Aegis Ashore in 15 and one in 18 in Poland, one in Romania and one in Poland, are on track. Both supported by the administration; funding is there quickly. There's been some discussion about accelerating the phase three of the system that we've interacted a fair bit with our European allies. None of them have said that they think that is a useful measure to do right now. There are a wide range of activities that the administration and the department have underway with regard to responding to Russia, much of which has been in the press here in the last 12 hours.

So, at this point, the Department of Defense doesn't see any reason to accelerate phase three. Probably not a good use of the money, and the question becomes exactly what would that system be used for in the context of a Russian regional conflict.

Asia pacific, just quickly, a fair bit of interaction with the Japanese who are helping us co-

develop the follow-on SM3-IIA missile which will actually be part of the EPAA as well as our -- contribute to U.S. maritime capabilities. The Japanese have a very substantial missile defense layered program with PAC-3s and SM-3s on their ships.

We're working fairly closely with both the Australians and the South Koreans to explore whether there are opportunities there. Most of that discussion is in the consultative stage.

But again, the same goal in that region is to integrate the missile defenses that the U.S. has in those regions with those of our partners to the extent that that's politically doable -- sometimes it is, sometimes it isn't because of the nature of the relationships in those regions -- so that at the end of the day there's a more effective, seamless set of regional capabilities.

And lastly is the Middle East and Gulf. Very strong programs of missile defense cooperation with the government of Israel, obviously almost across the board from short-range artillery all the way

through their concerns with longer-range, medium-range ballistic missiles coming out of places like Iran.

Very active approach underway with the Gulf cooperation. Countries the U.S. has been spending a lot of time and effort working with as partners in that region who are actually acquiring rather advanced U.S. missile defense systems; Patriot, PAC-3s, and THAAD and so forth, the Emiratis, and KSAN, and so forth.

Again, the effort there to work first in a bilateral matter with each of the GCC states who are interested, and then over time to try to get Gulf states to work in a more collaborative fashion because as we build that regional architecture in terms of air and integrated air missile defense, we'll tend to reduce the seams and gaps that result when you're only doing bilateral relationships.

It's a political challenge because, those of you who are familiar with the Gulf, there's tensions that exist amongst those countries. And so, the politics tend to be the most significant obstacle to

that, but we'll continue to push pretty hard.

And so, with that quick one over the world, I'll stop there.

MR. COYLE: Thanks for including me in this event, Steven, and -- oh, thank you. Thanks for including me in this event, and thank you all for coming. I'm going to restrict my comments to the ground-based system. That's the one that deserves your attention most.

There's an old saying often applied to government. "Why is it that there's never enough time to do it right, but there's always enough time to do it over?" That saying applies to the ground-based midcourse system. Over time, the performance of this system has been getting worse, not better.

Since 1999, there have been 16 flight intercept tests, eight of those successful; fifty percent. Not bad, but not good enough. Since post-2002, there have been nine flight intercept tests, and three of those were successful, so thirty-three percent. And since December 2008, there have been

four flight intercept tests and only one successful; twenty-five percent.

So, the performance of the GMD system in these flight intercept tests has been getting worse with the passage of time when it ought to be getting better. I hope the next test is successful. If it is, it will have been -- it will be the first success in 5.5 years, which is way too long. And I'm sure that the Missile Defense Agency is doing everything they can to have a successful test. But if it is successful, what will that tell us?

And it's only two flight intercept tests so far. The Capability 2 EKV failed both times. So, if the next test is successful, the batting average for CE2 will be one for three. Not bad for baseball, but not good enough to justify putting more of those interceptors in the ground, especially when those interceptors have no demonstrated capability to do target discrimination. That is, to discriminate real, possibly stealthy, reentry vehicles, and I mean reentry vehicles from space debris, missile junk,

chaff, decoys, and perhaps in the presence of radar jamming.

That's why the National Academy recommended the design of a new, bigger, and more capable kill vehicle. And the Director of Operational Test and Evaluation has also recommended that a new design be considered.

So, why should we deploy more of these CE-2s now that MDA has decided to redesign the kill vehicle? Well, we shouldn't deploy more of these flawed interceptors, and MDA should redesign the kill vehicle. The trouble is that MDA hasn't bitten the bullet yet and decided to redesign the GMD interceptors as the National Academy recommended. Instead, MDA is making fixes on the margins on the existing EKV rather than designing a truly improved interceptor as the Academy recommended.

So, do we need an east coast site? Not only do we not need an east coast site, we don't have the interceptors and sensors required for an east coast site to be viable. The reason the National Academy

recommended an east coast site was to open up the battle space and provide more time for target discrimination against incoming missiles from Iran. An east coast site doesn't help much with North Korea.

But the idea here requires what they call a shoot-look-shoot strategy. Namely shooting several times at the same target and looking at it between shots to see if it's been destroyed. But all this takes time and can't be done with the existing interceptors or sensors.

And unfortunately, without the proper interceptors and sensors, floating satellites and high altitude UAVs which we don't have, shoot-look-shoot is a fantasy without the equipment, the rest of the architecture, that would be required. And so, it would be just a waste of money. Could sit there as a monument for many years waiting for these other pieces of the architecture to catch up, but that's what it would be.

Should we accelerate the European Phased Adaptive Approach in Poland? No, I don't think we

should. The EPAA is aimed at Iran, not Russia. Russia already hates the EPAA because it involves new military bases in former Soviet territories close to Russia. So, accelerating the EPAA might make Russia hate it even more, but I don't think much. Accelerating the EPAA would have no real impact on Russia.

However, Iran might misunderstand and see the acceleration as a threat to Iran and an expression by the U.S. that it does not intend to honor the ongoing talks that are working to reduce the scope of Iran's nuclear program to clearly peaceful, civil power purposes. It also could make Russia a less-willing partner in these talks with Iran than Russia has been, and this would be a most unfortunate outcome from sword-rattling meant to somehow punish Russia for the Ukraine.

I look forward to your questions.

MS. CHAPLAIN: Hello. The GAO was asked to look at a number of issues related to missile defense including EPAA and GMD this year, and we issued about

five reports to Spring that I've been asked to talk briefly about.

Before I do, I just would like to remind everybody we are an independent audit organization. We don't advocate policy. We focus more on the how things are being done, and we do our work at the request of Congress. But we have been in missile defense for over a decade, and we have a lot of things to say about it.

For GMD this year, the thing we stressed the most was the ongoing issue of concurrency, what we call concurrency, and how they acquire the GMD system. That's the overlapping of key acquisition activities designed with production. And some degree of concurrency is okay in major weapons programs; you do have to buy some long lead items ahead of certain activities. But the degree to which concurrency was present in GMD was extreme, and it had very severe consequences that we're still wrestling with today.

Over $30 billion has been invested in GMD, and we're essentially still in the design phase.

We're still producing prototypes. We've had to exert $1.3 billion just to recover from the last flight test failures.

We've already discussed the issue of vibration and the CE-2 today. Those are the kinds of things you want to shake out early in weapons development. You want to do that early so that you don't get caught in the production cycle and find you have an issue that's going to require you to go back in and fix all the interceptors.

So, that's where GAO's been with GMD. That's where we were again this year. We brought it into all our work. We'll be examining the extent to which concurrency is still present and the efforts going forward for redesign.

For EPAA, we continue to hammer the need this year for robust management tools for EPAA. DOD's (inaudible) policy and the need to be flexible and is a little resistant to the tools that we're recommending that be imposed on EPAA. But in our view, it's a very complex set of acquisitions.

The success of EPAA depends highly on the integration of a lot of systems, and for those to work you do need some tools in place to make it happen, one being a master integration schedule, for example. They do have a good integration plan, and they have a very robust test plan for EPAA, but we would like to see activities brought together with timelines so that we know the -- really pinpoint the progress we're making and what things we're still waiting for for EPAA. Because our reports did point out a number of delays for key capabilities related to integration, particularly with upgrades for the C2BMC battle management component of it.

We'd also like to see updated cost estimates for EPAA. It was good that DOD produced the cost estimate. It's a few years old now. We don't have phase four. It might be a good idea to update that.

In one of our reports we stress the need for the cost estimates for individual components to be very complete, particularly with ONS cost for components like Aegis Ashore. They represent billions

of dollars, so it's important that the Congress know really what we're paying for these activities.

We also stressed in our reports more robust implementation planning. When the first phase was rolled out there were a lot of good things that happened, but there were some issues that weren't really anticipated in advance. Housing wasn't complete, sharing the data with allies, things of that nature.

Another tool we'd like to see in place that's fairly robust is performance assessments. And they haven't been as robust as we've thought they should be so far. There's also an issue related to that with the deletion of important tests for EPAA. Just to give you an idea, Aegis Ashore went from 7 planned tests to 2 planned tests. The SM31B went from 11 planned intercepts to 7. So, the less testing you do the less knowledge you have, and you don't want to find yourself rolling out systems without knowing fully that they can work as intended.

The third theme we've had in all our reports

this Spring that we continue to have almost every year is the flexibility that's afforded MDA, those cause issues. They don't have to follow the same rules as other weapons systems. They're deferred from entering into the formal acquisition process. So, things like independent cost estimates aren't required of all the major systems for MDAA. Analyses of alternatives, the requirement setting process is not the same as it is for other weapons systems. Cost reporting is not the same.

And together, this kind of flexibility, while it enables MDA to meet some very tight deadlines, it does create and contribute to high-risk acquisition strategies, a lack of transparency, and difficulty measuring progress and cost schedule and performance. And while the data's improved in recent years on those fronts, it still takes a very knowledgeable team, people who've been involved in this work for 10 years perhaps, to be able to read through the lines and really assess the progress MDA has made and where the cost growth has been.

And as I mentioned earlier, compounding problem for MDA is the external pressures placed on them. So, the very tight deadline set for GMD in the very beginning almost gave them no choice. They did have to follow a high-risk strategy if they wanted to meet that deadline, and they did have to overlap activities. But it's just like Phil said; you're trading time. You're going to have to pay that anyways later on.

And we see that with the EPAA. We saw the deadlines were set for EPAA without really knowing the full scope of work that was needed to execute that. So, we would like to see more flexibility for when the phases are due and when systems are delivered just so that we assure that we're getting what we paid for and things can work as intended.

So, this concludes my talk for now.

MS. GREGO: Thanks so much for inviting me and organizing this event, and I appreciate all the service of my fellow panel members. And if you don't already know Union of Concerned Scientists, we're a

nongovernmental, nonpartisan organization. And we aim to bring to bear the perspective of a well-informed citizen based on rigorous technical analysis. We actually do have an advocacy mission, so I'm going to amplify some of Cristina's comments, and I'll go ahead and advocate.

The UCS has long been skeptical about how the possible benefits of national missile defense are weighed against its risks and its costs. And I'm going to focus today again about how the benefits are shaping up and why.

Where we are today is largely a result of setting a fairly risky course in 2002 when the Bush Presidential Directive instructed the Pentagon to produce an initial strategic missile defense capability by 2004 to defend against a perceived, imminent missile threat. This was a politically-based timeline, not technically based. That is, it wasn't set by the expected level of technical difficulty of the task.

To meet this deadline the administration,

with the cooperation of Congress, eliminated treaty restraints, ratcheted up spending, and set-up a special system for research and development with lowered oversight and accountability. Because of the political climate at that time, it was difficult to challenge this exceptional status missile defense was given. And while the 2010 Ballistic Missile Defense Review promised to slow down this accelerated pace and to improve oversight, progress has proved mixed. And to date, no one has really mounted a serious challenge to this exceptional status that missile defense has been granted.

While the Bush administration might have considered bypassing that oversight process crucial to the goal of getting something in the ground quickly, it has had real and serious consequences as my fellow panelists have discussed already. And again, focusing on the Exoatmospheric Kill Vehicle Development Program, I think, is not a one-off problem; it's symptomatic of the whole approach.

Because of those short timelines, the GMDs

interceptors were built out of existing technology without a real developing cycle. The early CE-1 kill vehicles, which were essentially developmental versions, were deployed at a steady pace starting in 2004. However, the first flight test -- not intercept test -- of a CE-1 kill vehicle wasn't until December 2005 after the system had already been fielded essentially, with the first intercept test scheduled for a year later.

Although there was success in that program early, the Missile Defense Agency recognized they needed to refurbish those CE-1 interceptors. And the GAO estimated that that would cost between $14-25 million per GBI of those already-fielded interceptors. However, one of those CE-1 kill-vehicle-equipped interceptors failed its test last summer, and the test review board found several issues of concern with the design of the kill vehicle which appeared to affect both the CE-1 and the CE-2 kill vehicles.

And the CE-2s had a similar story with interceptors being fielded without having actually

been tested first. After a lengthy investigation, it seems that the Missile Defense Agency believes it's identified the core problem. And as Phil discussed, this has paved the way for a test this summer to see if that has actually worked.

As Cristina mentioned, the GAO has warned over and over about the concurrency of the system compromising its integrity and increasing the technical risk. At present, as she mentioned, the price tag to fix the CE-2 EKVs that have already been produced stands at $1.3 billion.

You can see that the Missile Defense Agency hasn't been required to pursue independent cost estimates and has struggled to provide adequate information to Congress for them to be able to provide effective oversight. But despite these many problems, Congress and taxpayers are being asked to fund the purchase of 14 additional GBIs to counter the perceived maturation of the North Korean threat.

I'm sympathetic to the need to respond to outward threats. This doesn't seem to be any

different than the way things have been going. Buying 14 more interceptors that don't work very well, doesn't present an additional capability, I don't think it's a wise choice.

Although one of the six policy priorities of the Ballistic Missile Defense Review is before new capabilities are deployed they must undergo testing that enables assessment under realistic operational conditions, the system hasn't been tested under a range of lighting conditions. It's never been tested against an ICBM range target or a warhead that's tumbling nor in the presence of extensive launch debris. And the kill vehicle is in the process of a complete redesign. This isn't fly before you buy.

The other point I wanted to draw your attention to is that the dearth of oversight and accountability also makes the missile defense system more vulnerable to being changed on the fly by, for example, entrepreneurial Congress members who find technical or political deficiencies of the system. It's not to say that Congress couldn't be a cradle of

great ideas, but those ideas do need to be evaluated in a rigorous way.

As Cristina mentioned, normal major military programs are required to perform things like an analysis of alternatives to evaluate the benefits and risks of these ideas as well as to pursue independent cost estimates. Missile defense is exceptional, and it doesn't have to do that necessarily. So, one example of this working this way is the effort to move forward the idea of an east coast missile defense site. The Missile Defense Agency didn't ask for it, and it didn't prioritize an additional site, but has been commanded by Congress to undertake preparatory work for such a site.

So, there wasn't a process or a rigorous debate about why we should consider funding a new site that would cost billions of dollars to build and equip and would most certainly take funds away from getting the existing system to meet its delayed milestones. That the east coast site has any traction at all is a symptom of how badly the oversight and accountability

has been working.

And I would argue that the exceptional status and low bar of accountability also allows the missile defense system to be proposed as a way to work a thorny foreign policy problem like the Ukraine. The suggestion for a return to the Bush plan to put land-based GBIs in Europe or the acceleration of the scheduled deployment of the Aegis Ashore site in Poland is symptomatic of the same thing.

It's been over a decade of working under this special status, and it's not working well. I would argue that the Missile Defense Agency should be held more accountable to Congress in the ways that other major Pentagon programs are, and that Congress should exercise its stewardship responsibilities thoughtfully and rigorously. And that our job, as U.S. citizens and those of you who are policymakers, should take a hard look at the current strategic missile defense program and insist on making informed decisions about what's worth keeping and what's not productive for our interests.

And that's the conclusion of my remarks. Thanks.

MR. WILKENING: Thank you, Steve, and thanks to Brookings for hosting this event. I will keep my remarks very short because most of the other panel members have touched on things I was going to say.

Let me start by saying I think one of the problems with the GMD system, the homeland missile defense system, is that we have tended to exaggerate the ICBM threat to this country for a long time.

If I go back to the Rumsfeld commission report, the conclusion was that within five years of a decision to do so, states like North Korea or Iran could have ICBMs. Well, that was 16 years ago. So, either you conclude that North Korea did not have an intent to build ICBMS, or it's more difficult than people were led to believe. I think it's the latter. I think North Korea has been trying to build a long-range missile for some time.

So, to some extent, I think that mentality still is infecting the current debate. On the other

hand, there are uncertainties about how soon the threat may materialize, and people come down in different places as to how risk-averse or how risk-acceptant they want to be with respect to strategic surprise.

Protecting the homeland is obviously a completely legitimate objective. Should be probably our top priority. And I think today the administration seems to be moving in a direction where that is the top priority. They're really putting a tremendous amount of effort into trying to fix some of the problems with the homeland missile defense system.

As Phil and others have pointed out, the test record has been rather abysmal with the GMD system. That's for the simple reason that it's a prototype system. As Laura just said, it was rushed into the field for political reasons. It is unfortunate, in retrospect, that the system was not redesigned eight years ago, six years ago, but there were other priorities.

I think when Obama came into office there

was a strong emphasis on redesigning the European missile defense architecture from the so-called third site -- what was called the third site at that time to what now became the EPAA.

So, for whatever reason, GMD languished. And we've seen, at least on the test range, the results of continuing to spiral-improve a prototype, which is a hard thing to do.

So, fortunately we're in the position now where we're trying to redesign. The MDA and the Defense Department is committed to a redesign of the kill vehicle, which is probably long overdue. Whether we have the budget to do that and to fix any problems that currently exist with the CE-1 and CE-2 variants of the ground-based interceptor remains to be seen. There are tremendous budget pressures on the Missile Defense Agency as with the whole department in general.

But in my view, the technology is inherently good. Look at the test record of the other hit-to-kill systems. THAAD is 11 for 11. THAAD went through

an abysmal period. The program was almost cancelled in the late nineties. I think it was zero for six or one for six, something like that. So, it was pretty bad. They almost cancelled the whole program. They redesigned the system, and now it's 11 for 11. SM-3 is 28 for 32-34, something like that. So, these systems have been working quite well. So, in my view, there's nothing wrong with the inherent technology of the hit-to-kill systems.

Unlike Phil, I think the EKV does have some ability to handle countermeasures. I guess one of the big questions is whether this decision to deploy 14 more -- remember, that occurred in the midst of some fairly provocative acts by North Korea.

If we leave North Korea out of the picture, it would be preferred to have the 14 be the redesigned as opposed to CE-2s. But in fact, North Korea was very much front and center in the picture, and I think the decision was made -- I can't speak for those that made the decision, but my assumption is they did not want to accept any risk of surprise that, in fact,

North Korea might be able to move faster than other people thought.

And so, they chose to deploy 14 of the existing system; that happened to be the CE-2. And as Phil has just mentioned, we haven't had a lot of success with that. We'll see what happens in the next month or so when the next test occurs.

In my view, whether the test is successful or not is, in part, immaterial. We need to redesign that kill vehicle, get on with a block to a second generation, whatever you want to call it, as soon as possible. And my hope is that that will occur soon.

Let me leave it at that. I won't talk about the other regional missile defense issues. We'll save more time for Q&A.

MR. PIFER: Okay. Well, thank you very much. I think we've brought out a number of questions, a number of aspects of the missile defense programs; both the continental defense for the United States and the ground-based interceptor, but also regarding things like the SM-3 and regional defense.

So, let me, at this point, open up the floor to questions. My request would be is that you state your name and affiliation, keep commentary short, and at the end please have something that looks like a question mark. So, (inaudible)

MS. OSWALD: Hi, Rachel Oswald, Global Security Newswire. This question is for Mr. DeBiaso. Could you state what the Pentagon's response will be to an unsuccessful intercept test of the GBI system this month? Will you cancel the 14 ordered missiles or will you proceed with the procurement plan?

MR. DEBIASO: Well, first of all, we're going to await the outcome of the test before we decide exactly what the next set of decisions we'll be taking. So, I won't speculate if it fails. But a couple of observations. MDA has done a lot of good work over the past year. Confident that it has identified those challenges with the CE-2. We'll see. The test is coming up here shortly.

I think I would rephrase the question. Put it context of the mission is to protect the United

States from what, by all means, would be some kind of catastrophic attack. So, the notion that because we have a particular test failure we would walk away from that mission is, of course, ridiculous. There is no higher priority that the administration or the department can do than take the measures to address the challenges, if we don't face them today, that we are likely to face in the coming years.

So, we'll see what the test brings. But there is a recognition -- again, as I made -- I think some commentators -- panel -- had made this point as did I, that the decision to move forward with the next generation kill vehicle, the redesigned kill vehicle, is aimed at continuing to do the technology development work that leads to more effective, reliable kill vehicles to support the mission of homeland defense.

So, we'll await the outcome of the test. We'll see. There could be a lot of variables associated with -- in terms of its performance whether it results in the department vectoring towards doing

more with CE-2 or moving in a direction more aggressively with the EKV redesign.

MR. PIFER: Peppino, if I could follow-up with a follow-up question, I think Dean made the point that if you did not have a North Korea factor in the game that it might make sense basically to devote more of the effort to redesigning the kill vehicle as opposed to going forward and trying to fix the problems in the CE-2.

But does the administration -- again, I think your comment suggests that there still is a concern that the North Koreans could be closer than we think. What is the estimate for when North Korea might obtain an ICBM capability?

MR. DEBIASO: I'd make a couple of observations with regard to North Korean long-range missile threat. Dean rightly pointed out that Rumsfeld commission back in '98 said that we could see something within five years, and it took more than five years.

But in fact, we saw a couple of interesting

things. Starting with the TD-1 launch back in July or August of 1998, concluding with the successful TD-2 launch in December of 2012 where we saw multiple staging of a rocket, where we saw payload inserted into space, demonstrated a pretty substantial knowledge in terms of long-range missile.

We can debate whether it's a space launch vehicle or ICBM, but those of you out there who have been in the missile business, either on the offense or defense side, clearly understand that space launch vehicles are generally feeders into ICBM programs. In fact, Russian SLB program was a feeder into their ICBM program as it was for the U.S. back in the fifties. So, the technologies are fairly common.

So, they concluded essentially a 12-year RDT&E cycle with the TD-2. So, now we see at least some activity with this KN08 missile. Very debatable. There will be arguments about its reliability, is it real, and so forth. But for the department and for the administration, we have to treat these matters as though they will eventually materialize.

There is enough evidence out there to suggest that, yes, we need to take the measures now to ensure that we have a defense before that threat arrives rather than after. In fact, we're all here today discussing the issue of how difficult it is to build missile defenses and how long it takes to build effective missile defenses. So, all the more reason to make sure that we're undertaking the decisions now hopefully years in advance of actually seeing an operational system.

SPEAKER 2: (inaudible) with Reuters. Just following along that line of questioning, if there was a decision to, as you said, push forward more aggressively on the EKV redesign depending on what the outcome is of the test, what is your estimate for the quickest that new vehicle could be available? I've heard varying estimates from different companies.

And I also wanted to ask all of you actually whether there's any need for accountability on the failures and the problems with this program? I mean, there have been private contractors involved. There

have been decisions by the government in terms of how to proceed on these programs. To what extent is all this money that's been spent on things that don't work as well as they should -- to what extent is there some need for accountability?

MR. DEBIASO: Just on the issue of EKV redesign and whether shorter timelines and (inaudible), you'd have to ask that question of Admiral Syring of MDA. I couldn't tell you that as a policy official.

MR. PIFER: Can you address the accountability question?

MS. CHAPLAIN: I'll address it since we're the Government Accountability Office. (Laughter) We do like to see people held accountable, but I just think in this case there could be difficulties because whose fault really is it? Is it the government's fault for putting deadlines that were kind of impossible to meet and to impose changing demands on a contractor or is it the contractor's fault?

And I know MDA has struggled with that

itself through the years when some of the test failures were due to quality issues, holding contractors accountable for them. MDA had to change the way it approached that and try to hold contractors more accountable.

But generally, I don't see a whole lot of accountability, and I think it's very difficult to impose.

MR. WILKENING: On the accountability issue I would just say that we seem to be living in a time when there is very little tolerance for test failures. If we go back to the 1950s, some of our most advanced programs at the time were failing right and left; trying to put satellites in orbit, even getting a booster big enough to do so.

And you kind of wonder what would the reaction of both the public and Congress be if we had a string of failures like we had with the Redstone and the Atlas missiles and all of that. We'd be cancelling these programs right and left. We probably wouldn't have satellites in orbit today.

So, I would like to see a little greater tolerance for some of these test failures. You learn a tremendous amount. You learn more from test failures than you do from successes in a way. You should be pushing the envelope of these systems to really find out what their limits are; sensor limits, divert limits, reliability, whatever.

So, I am not as troubled by failures as I think a lot of people -- at least in the R&D phase. By the time you get to deployment you should have shaken that stuff down, and that's the problem with the GMD system unlike the others.

There is accountability in the sense that contractors almost lose these contracts. Lockheed Martin went through that with THAAD. They almost lost a contract which is billions of dollars. And when that kind of thing occurs, they sit up and take notice. They get very serious about, in that case, redesigning the system in conjunction with MDA.

So, this problem, the lack of accountability is not as great a concern to me, I think, as to some

others.

MS. GREGO: Just a short comment. I think one of the problems is that we elide the difference between a developmental program and an operational capability. And some of these failures are the kinds of things that you expect in a developmental program. But if we talk about the system as an actual defense, actual capability, which it frequently is, then you see a failure of an operational capability, which it really isn't.

SPEAKER 3: (inaudible) my question would be about midcourse discrimination because it has been highlighted by a few past reports, I think the National Academy of Science, as a key weakness of the system, and it's about all the U.S. (inaudible) the ability to choose between the warhead and the (inaudible) debris. So my question to all the panelists would be how concerned are you about this issue of midcourse discrimination? How hard, in your view, is the U.S. government trying to solve the issue, and how close is it to solving the issue?

Thank you.

MR. COYLE: I'm very concerned about this problem of midcourse discrimination. Everybody who has looked at this problem has said that you can't have an effective midcourse missile defense system without the ability to discriminate the real target from other objects that are in the cloud near it.

The Defense Science Board said if the defense should ever find itself in a situation where it's shooting at missile junk and space debris we're in trouble, because we don't have enough interceptors to be able to go after each one of those objects. So, it's a very serious problem.

We've got 20 CE-1s in the ground that have no demonstrated capability to do that. We have 10 CE-2s and a proposal for 14 more that have no demonstrated capability to do that. So, I am very concerned.

MR. WILKENING: On the discrimination issue, countermeasures and discrimination is one of the big challenges for midcourse missile defense. But the way

these conversations usually go is people treat it as though it's a binary issue. You can discriminate, you can't discriminate.

There are dozens of different types of countermeasures. Some of them are easy to deal with; some of them are much more difficult. The ones that are difficult, sometimes you can discriminate them with ten, twenty percent probably. Not one hundred, but it's not zero.

So, in my view, this debate is much more complex, and it's hard to give a simple answer. I think MDA is working this problem fairly hard. But if I was to come up with a simple answer that I think is true, I'd make the following statement: There is no countermeasure for which I cannot design an effective midcourse defense. And there is no midcourse defense architecture for which I cannot design a countermeasure. Both those statements are true.

So, it depends on who has the last move. It depends on the technical sophistication of each side. It depends on the intelligence you have about the

countermeasure they have about the effectiveness of your radars, your optical systems, et cetera.

And so, most public debates about this issue make it sound like you can or you can't. I think it's much more complex, and I think the problem's being worked, and I have reasonable confidence that the first generation ICBMs will see the GMD system, once it's properly designed, will be able to handle the countermeasures that may accompany those ICBMs.

MR. KIESLING: James Kiesling. Interested private citizen with background in the topic. Dean, you sat on the National Research Council BPAC Panel. Phil, you and others spent time looking at the questions raised by that panel. One of the major findings from the Defense Science Board and the National Research Council was basically the identification that MDA appeared to be the gang that can't shoot straight.

Fundamentally, the shortfalls and the intellectual capacity of the engineering team and the science team were felt to essentially preclude an

expectation of being able to solve the various problems that had been identified. What I would just simply say as a concerned private citizen, the public released information does not lead confidence that MDA has appropriately identified root causes of their failures, for example.

So, the basic question I have for the panel is what policy role about addressing this intellectual capacity to do this very difficult problem -- BMD has been compared as harder than the Manhattan Project. What are we doing to redress this intellectual capacity issue and oversight?

MR. WILKENING: I've said in writing in an article that I think the Missile Defense Agency needs to get really good scientists on its staff. That that is an important priority for government in general. For government to be a good buyer, a knowledgeable buyer, it needs to have good technical capability itself in order to known whether what the contractor's proposing to do makes sense or not.

For example, the Missile Defense Agency was

going full speed ahead on a satellite system, and it wasn't until the National Academy did their study and pointed out that the orbits were in the wrong place and, that as a result, that satellite system wouldn't work, that the system was cancelled.

You shouldn't have to do a big National Academy study every single time you're looking at various technical options. You ought to have the capability within the Missile Defense Agency to know, hey, look, that thing's been designed so that the orbit is in the wrong place. It's not going to work.

So, I think it's an important issue, and I've written so publicly.

MR. DEBIASO: Maybe just one other observation to (inaudible) there are checks and balances in the department and as it relates to missile defense. We've seen programs that weren't performing, behind schedule, weren't likely to meet some operational concept, the department cancelled and the MKV multiple kill vehicle program was over in the '09-2010, the kinetic energy interceptor, the KEI, the

ABL -- maybe longer than some might have hoped, but when you bring together the different organizations within the Pentagon, and there are many who are scrutinizing MDA, I think at the end of the day you end up with some type of checks and balances on these programs that -- PTSS, I guess, is what Phil was referring to.

MR. COYLE: Yeah.

I mean, there are four major programs over the past seven years that were canceled by the Secretary of the Defense. The analysis the Department of Defense has brought to me suggests that, look, this is not a viable path to go down.

MS. BERNSTEIN: Thank you. Leandra Bernstein with Ria Novosti.

Was certainly a relief to hear a number of the panelists say that they don't support an acceleration of phase three of the EPAA. But I would like to know the panelists' thoughts on how much of that program and the U.S. missile defense program in Europe is politically based and much of it is actually

security based, in particular with regards to the recent developments; President Obama asking for $1 billion for a European reassurance initiative which would include moving U.S. Naval ships into the Baltic and Black Seas, deploying them more regularly. So, if the panelists could address that?

MR. DEBIASO: Maybe just one observation on EPAA. I think there is a fairly strong security foundation for going forward with that. And maybe part of the evidence is certainly in the fact that we eventually got all 28 members of NATO to endorse over the past 33-34 years in terms of NATO Ministerials of support for EPAA, and beginning with -- the way to think about EPAA is -- the most simplistic context is expanding concentric circles moving up in phase one through phase three in a manner in which we would expect a threat to materialize coming out of the Middle East and Iran and particularly moving from short to medium, medium to intermediate range, to the extent that we can never calibrate how capabilities and threats evolve. And that's always a difficult

challenge.

I think the EPAA is reasonable a construct as any to try to match up with what would be the expected threat evolution in ballistic missile threats coming out of Europe. So, I think there's a fairly strong, security-based foundation for at least that part of the question.

MR. GARR: I'm Robert Garr with Center for Arms Control and Non-Proliferation, retired military. The statement was made that -- almost as an article of face, and of course we have to protect the United States and our population. No one could disagree with that.

What bothers me is that studies I've seen have suggested that attacking the United States with a weapon of mass destruction with an ICBM is probably the least likely way that a rogue state would do so. No less than Donald Rumsfeld pointed out that it would be far more likely to attack the United from a vessel 100 miles off the coast with a short-range missile or a cruise missile. It has a higher payload, more

accurate, less expensive. So, what are we doing about that threat?

MR. COYLE: To just comment, we don't have a defense against cruise missiles. "We don't have the interceptors. We don't have the sensor network that we need. The Pentagon is exploring the question, but we don't have a defense against cruise missiles.

MR. GARR: Well, that's really the basis of my question. Are we spending $40 billion to hedge against the least likely way that we're likely to get attacked by a weapon of mass destruction? The opportunity costs are terribly high in a period of such constrained defense budgets.

MS. GREGO: Just a short comment. One of my colleagues who's a historian, he tends to call the Ballistic Missile Defense System the new Maginot line, worrying that we are again finding the last threat. This is why we personally really advocate for bringing the missile defense enterprise into the light and not being such an article of faith, article of, almost, religion, and that it ought to compete with other

projects on its merits about what it can do to protect U.S. national security and what it can't do.

MR. DEBIASO: I'll just maybe offer a counterposing comment. Sure, there are a range of threats we need to be and are concerned with regard to the homeland, and certainly post-9/11 greater emphasis on those things that might be coming into the country through different means.

But we have to at least recognize that countries are investing enormous resources into their ballistic missile activities, and we can speculate a fair bit on what motivates them. Is it insecurity? Is it they're trying to deter some act or are they trying to increase their own freedom of action to coerce their neighbors?

But the fact is, countries continue to spend lots and lots of money on a wide range of ballistic missiles, and we see in particular two countries, North Korea and Iran, who, by all measures, in terms of the investment in their space launch programs and the activity they have in solid and liquid propellants

and multi-stage ballistic missiles, have a clear intent to acquire those kinds of capabilities.

So, the idea that we shouldn't be doing that is a non sequitur. We need to be addressing that ballistic missile threat. Should we be addressing for the challenges associated with cruise missile threats? That's a good question.

I guess I'll paraphrase a little bit Admiral Winnefeld who -- maybe it was last week at the Atlantic Council -- said, the United States is worried about that issue as well, and got activities and efforts underway to ensure that the United States -- because timelines associated with cruise missile attacks could be much, much shorter. So, I wouldn't do nothing more than at least echo his remarks that that's not an issue that the U.S. is ignoring at this point.

But it doesn't mean we ought to be ignoring the substantial interest shown by many, many countries in acquiring ballistic missiles of ever-increasing capabilities. They understand the value of a

ballistic missile. They understand its political value. They understand its coercive role it plays. They understand the role it plays during crisis, during conflict, and it certainly is driving that appetite.

MR. WILKENING: Just a short follow-up. There's a fair bit of activity on air defenses and homeland defense against chemical, biological attack, covert attacks, et cetera. So, it's not as though those other threats are being ignored.

The question is do we have the balance right, and are we spending the right amount of money for biological defense as opposed to missile defense? And that's a tough question to answer, and I don't have the numbers for how much we're spending in these other areas.

But as Peppino said, these states are spending a lot of effort trying to acquire missile capabilities, and there are some good reasons for it. So, clearly missile defense both in the regional and the national context is a legitimate enterprise. The

question is what's the right balance?

MR CAPACCIO: Tony Capaccio with Bloomberg News. For Mr. DeBiaso and Ms. Chaplain. Can you try again on the question of if the test fails that's coming up shortly, how big of a setback is it to not only the public perception of the ground-based system, but also the plans to go forward with the 14?

MR. DEBIASO: I don't have much more to elaborate than what I said earlier. But I'll quote Admiral Syring on -- actually, I'll put my former boss, Jim Miller, who was supposed to be here, as well as Admiral Syring.

And so, back when the decision was announced to go to the 14 back in March of 2013, Dr. Miller clearly made the points that we're still in a -- going to adhere to the fly before you buy principles that are articulated in the BMDR. Admiral Syring, now, I guess, in four, five times -- maybe four times he's testified to Congress in the past couple of months, has said an increase in the number of GBIs in the fleet assumes a successful return to intercept of the

CE-2 EKVs. It's a fairly clear statement by the senior officials that it's important to have successful tests before we go on.

MS. CHAPLAIN: Let's say it does depend on what the issue was. If it's a quality issue it might not be as big of a setback as it is if it's a design issue. But it would take a long time to figure that out, and that would hold up production even longer, hopefully. So, it is a big setback. You could be spending a year or more, like they've already have, assessing what went wrong. But again, that would depend on what exactly the cause was.

SPEAKER 4: Mr. Debiaso, (inaudible) shortly (inaudible)

MR. DEBIASO: Shortly. (Laughter)

MR. BEERY: Brian Beery, Washington correspondent, Euro Politics. A question on the European system. I think it's more for Mr. DeBiaso. I understand that NATO now has -- it's under the umbrella of NATO, and NATO has given its political endorsement. But in the practical deployment of these

systems in Poland, Romania, Spain, Turkey, how much is NATO, the NATO structure and management structures, involved in that? And to what extent is it still just the United States working with the host countries, the Polish, Romanian governments, et cetera?

MR. DEBIASO: There's a set of institutions set-up now within NATO that bring all of the NATO military authorities together. It's part of this -- under NATO's military committee structure that actually now is involved in developing command and control procedures for how missile defenses and NATO will be -- particularly in an operational context, how they will be employed.

For example, without going into too much detail, the procedures for the -- I may have mentioned it earlier -- for how we do something called transfer of authority. For example, when U.S. Aegis BMD ships are off conducting other missions under their EUCOM role, how those might be transferred to a SACEUR role, which is a NATO command and control structure. Procedures for how that transfer of authority takes

place have already been developed and implemented within NATO. Those are things associated with phase one.

Transfer of authority applies to systems that might transition between two commands. In the case of those elements that are single-focus, single-purpose, missile defense elements for which they can be used for no other purpose, the Tippy Two radar in Turkey, the Aegis Ashore in Romania and later in Poland, those from the outset will likely be under a SACEUR sort of command structure because there won't be issues of transfer of authority. The Aegis Ashore site in Poland won't be able to do other things, other missions, so it'll be there 24/7 as a NATO capability.

And so, as those new capabilities are introduced, NATO will continue to work out these rules of engagement, command and control procedures. Really as its done as an alliance for 60 years. It won't be a terribly difficult challenge for them to do that given that's the way they've done things for the past 6.5 decades.

MR. COLLINA: Thank you. Tom Collina, Arms Control Association. Question for Mr. DeBiaso. I'm assuming that the Pentagon will not deploy the 14 additional interceptors unless the Pentagon is confident that they will be effective. Because, of course, regardless of the threat, if you're putting a defense that is not effective, not particularly helpful. But given what Phil said about the test record, over two at best to be one for three, how does the Pentagon generate that sense of confidence in the effectiveness based on the test record? Thank you.

MR. DEBIASO: To be clear, the secretary's made the decision to go forward with the 44 GBIs. The question becomes, depending upon how the subsequent tests turn out, there could be an impact on the timing of how those interceptors get deployed. The expectation is that if there's a successful test that moving forward with the 44 GBIs, I believe by the end of 2017, remains the plan.

Maybe back to Cristina's comments, if it's not successful there'll be a whole host of questions

about what went wrong and how long does it take to determine the root cause of any particular problem. So, I think we're going to have wait until we get to that point in order to determine exactly what the impact might be on the timing of getting those additional 14 in silos as operational systems.

MR. COLLINA: Just to follow-up, my question is if it is successful and you're one for three, what is the basis of confidence that they will be effective? How are you confident based on even if it hits that the system will work?

MR. DEBIASO: I don't want to punt and say this is a good question for Jim Syring because it is, but I think between the CE-2 non-intercept test that took place this past January combined with a successful CE-2 test soon, then Admiral Syring would certainly be the individual who takes the recommendation forward to the Pentagon leadership and says, look, I'm confident that we've reached the point where this is a viable system.

So, the secretary will get his advice from

Admiral Syring, as he should as the developer of these capabilities. He'll get his advice from the other agencies within the Pentagon. There are a whole bunch of groups that look at these things; the CAPE, certainly NORTHCOM, the combatant commander, General Jacoby as the warfighter who has to take control of these and operate these is going to have an input into that discussion.

So, I think it's fair to say there will be a process that involves the analytic branches of the arm, the developer, as well as the warfighter making their recommendations that say, we're confident, and we're going to go forward or we want more time. Again, I have no idea what the nature of the outcome of that discussion would be at this point.

MS. CHAPLAIN: I would just add to that it's important we remember this isn't just the only test for the CE-2. There's a whole series of tests to fully prove out the capability that go into the early 2020s as planned. So, we're still just in the early stages of proving this thing out. There's more

complexity that has to be introduced. There's more capabilities that have to be introduced.

So, you could be successful. There's still a lot of work ahead, and that's been one of our concerns, that this testing has not been done yet, and it won't be done for a fair period of time.

MR. WILKENING: Just one extra footnote to this discussion. The confidence one has in a weapons system is not based solely on flight tests. There's a lot of ground testing, hardware (inaudible) testing, subcomponent testing that is folded into the assessment of whether the system works.

The one thing that's hard to test without a full flight test is the system integration where all the parts come together, and sometimes there are interactions between parts that weren't anticipated. This is true for our ICBM, our SLBM fleet.

If you take one of the most successful missiles we have, the D-5, we just had a tremendous flight test record over its history. There were a relatively small number of tests, 10-15, before that

system went operational. And you don't calculate the reliability of the system just by taking the square root of n and saying, gee, was that a success or failure. It's a more complicated process.

SPEAKER 5: On the discussion of ground testing, it's been identified that the GBI system has not gone through the ground testing that most interceptors of any type go through. So, trying to add that reliability and how do you, again, assess that confidence?

MR. WILKENING: Since I mentioned the ground testing, I don't know how much ground testing has been done on GBI. But with these current CE-1, CE-2 variants, I would not expect to have high confidence. Whether it's sufficient for the political decision to go forward to the 14, that's somebody else's call. But it has not proven to be the most highly reliable system, which is why I would strongly encourage us to go with the redesign program as soon as possible.

MR. CAPPEL: John Cappel from the Stimson Center. I was wondering if we could take this out a

little longer term, maybe 10-20 years, looking at missile defense as a technology. And my question is, in that longer term, assuming some of these testing and development issues are solved, how reliable will ballistic missile defense be?

Are we looking at it having the possibility of having the 11 for 11 kind of record that we're confident we have a ninety-plus percent chance of intercepting if there is a missile launch, or is it the measure, countermeasure game, more inherent technical challenges going to prevent missile defense, especially ballistic missile defense, from ever reaching an extremely high level of confidence that we can intercept?

MR. COYLE: I'm not too good at predicting the future. Midcourse missile defense is the hardest thing we've ever tried to do -- the Department of Defense have ever tried to do. It's really hard, and you see that in the test results. And I think the countermeasure question, and I don't just mean decoys now, will continue to be an important one. For

example, radar jamming is becoming more and more a feature of modern warfare.

And so, you can ask the question would North Korea or anybody else be so suicidal that they would attack the United States with no attempt to confuse the defenses or blind our radars or whatever, as for example blinding them with jamming, first? So, I think you're going to find that these issues don't go away.

MR. WILKENING: And it's a very good question about where the long-term competition will head. I think there's no question that on the test-range we'll see these systems work fairly well. Whatever you want to -- eighty, ninety percent success rate like SM-3. THAAD is 11 for 11, but no doubt that'll change before long. They'll probably have a failure somewhere along the line.

But the more interesting question is what's the outcome of the long-term measure, countermeasure competition? And that is a very difficult question to answer. There are lots of techniques to fool defenses

as I alluded to earlier with the answer to the countermeasure question. There are a lot of techniques that the defense can harness to defeat countermeasures. Depends on how much money you're willing to spend. It depends on how well you understand each others' capability.

So, I've thought about this question for the better part of a decade or so and have not come up with a simple answer for what the outcome of a long-term competition will be.

I'll tell you one thing that -- aside from the technology -- I don't see anything in the technology arena that's a silver bullet out there, lasers, rail guns, whatever. But the one issue I think that would be a game changer is if we can change the economics of defense, because right now defenses tend to be more expensive by, let's say, a factor of 5-10 than offensive missiles. And that is going to keep defenses in a rather limited role. We will always have thin defenses, limited defenses, and the like. We won't have defense dominance, if you

remember those kinds of strategies that were offered up 20 years ago or so.

If we can change the cost exchange ratio between offense and defense, that will be a real game changer. Having said that, I don't know of any technologies that I am aware of that will make that change, at least not for large-area defense like homeland defense of the United States. For terminal defense, point defense, defending an airfield, something like that, I can think of a number of things that would be game changers.

MS. YEN: I'm Shao Yen from Voice of America. I don't know whether anybody has asked the question. My question is how advanced is China's hypersonic weapons and whether Congress appropriated $70 million for the hypersonic missiles? Is this an appropriate level? Thank you. And also -- sorry, one more question -- would any U.S. cities be threatened by that?

MR. WILKENING: There are a number of countries, the U.S. included, that are exploring

hypersonic glide vehicles. It's not clear when these systems would become operational. I think you asked how fast they go. Well, they're hypersonic, so it's like Mach 5, Mach 7. It's pretty fast. Two, three kilometers a second.

If you can ever get a long-range hypersonic glide vehicle, you can attack whatever you choose to whether it's a city, a military installation, or whatnot, there are defenses that can handle these things as well. So, one shouldn't forget that.

MR. PIFER: Okay, I think -- I'm sorry with apologies. I think we've gotten everybody who had their first question. For those of you who have second questions the panelists may stick around for a few minutes. But it is 11:30, and we have to wrap up the panel at this point. So, let me ask you to join me in thanking the panel for conversation. They've covered a lot of good issues. (Applause)

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I, Carleton J. Anderson, III do hereby certify that the forgoing electronic file when originally transmitted was reduced to text at my direction; that said transcript is a true record of the proceedings therein referenced; that I am neither counsel for, related to, nor employed by any of the parties to the action in which these proceedings were taken; and, furthermore, that I am neither a relative or employee of any attorney or counsel employed by the parties hereto, nor financially or otherwise interested in the outcome of this action.

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