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GOLDEN DOME: EARLY ASSESSMENT AND OPEN QUESTIONS

Wednesday, August 19, 2026

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PANEL

MODERATOR: MELANIE W. SISSON

Senior Fellow, Strobe Talbott Center for Security, Strategy, and Technology,
Brookings

STEVE FETTER

Professor, School of Public Policy, University of Maryland

DAVID MOSHER

Director of National Security Analysis, Congressional Budget Office

MICHAEL E. O'HANLON

Philip H. Knight Chair in Defense and Strategy, Senior Fellow, and Director, Strobe
Talbott Center for Security, Strategy, and Technology, Brookings

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SISSON: Well, hello, my name is Melanie Sisson. I'm a senior fellow here in the Foreign Policy program at the Brookings Institution, and it's really a pleasure to welcome you here today to hear from some leading minds on matters of missile defense and nuclear policy. We have Dave Mosher there in the middle, who directs the National Security Division at the Congressional Budget Office, where he led the recent CBO analysis of Golden Dome's potential costs.

Steve Fetter is a professor in the School of Public Policy at the University of Maryland and a longtime authority on nuclear weapons policy and arms control. And then, of course, we have our very own Mike O'Hanlon senior fellow and specialist on all things defense security, and nuclear policy as well.

So Dave, I actually wanna dive right in and start with you and spend some time on the CBO report, which is titled Potential Costs of a National Missile Defense System which you get credit for being very direct and straightforward about what you're doing, but maybe not for any flowery language.

And we will, of course--

MOSHER: We don't do flowery.

SISSON: --get to the costs, but first, let's start at the conceptual level. And if you could tell us a little bit about what is Golden Dome actually meant to do?

MOSHER: So unfortunately, this is a little confusing. The impetus of it was an executive order that the president signed in his early days in office called Iron Dome for America.

So it was sort of, Israel had success with its Iron Dome system, and he wanted sort of protection of the United States. So it, that's the executive order. It was renamed within a few months to be the Golden Dome, or at least referred to as Golden Dome. So people associate Golden Dome with the executive order, but then they created a Golden Dome office to build something and had a leader that they set out for in May of that year, and it's unclear what they're building for Golden Dome within the office.

So Golden Dome they're building is perhaps different than Golden Dome, the executive order. And so that, that-- just wanted to sort of clarify terms. The Golden Dome executive order itself, which is what we costed because that was, luckily, that was our tasking -- because we couldn't have costed what they're building 'cause no one really knows what they're building yet-- was to cost that.

But it's a very broad and sort of ambitious order. It, I would say, is a lot like Reagan's vision of making nuclear weapons impotent and obsolete, was his phrase when he did the Strategic Defense Initiative in 1983. It goes back to providing a protection of the entire country against threats. In some ways, it's less ambitious because it is the, the numbers of weapons are a lot smaller than there used to be. So in that sense, you may not need quite as large a defense. But in some ways it's more ambitious in that it includes China as part of this, and it also includes a whole range of threats that were not part of the original Reagan view. There, it was a ballistic missile defense. This is against ballistic missiles, hypersonic weapons, cruise missiles, so sort of any aerial threat is literally what it says, and drones. And it's also not clear, and seems to encompass both nuclear and conventional weapons. So it, in that sense it's much more ambitious.

SISSON: Okay, so a national missile defense that covers short range, medium range, intercontinental, hypersonic, cruise, and even down to drones.

MOSHER: By what they say is in, protect it from all aerial threats, so, and lists most of those.

SISSON: And the broad national coverage is really everything from Hawaii, Alaska to Maine, or just continental, or we don't know yet?

MOSHER: Well, it, again, the executive order suggests that it's the entire country, and it's protecting not just infrastructure, and it mentions a whatever, securing our second strike, so that would suggest protecting our silos, maybe protecting our submarine bases, our command facilities. But it also talks about being able to protect against countervalue attacks, and in the nuclear parlance that's sort of population and it talks about protecting our citizens.

So I, we have taken it as a very broad mandate, a very broad vision.

SISSON: Okay. And so take us a little further into that. There isn't an architecture that's available from the administration itself. So CBO, you had to essentially build one. Tell us about how you did that and what you built.

MOSHER: Right. So our architecture was informed by, as I said, the executive order and and we t- We started with-- So the executive order laid out some specific things. It said the defense should be layered. It said that it needs to have space-based interceptors for boost phase intercepts, so boost phase space-based interceptors.

Back in the day, those were the brilliant pebbles of the sort of SDI era. And it was going to have... It talked about some terrestrial-based layers, so ground-based interceptors. It talked about building specifically the, what's referred to as the HBTSS, the Hypersonic Boost Tracking Surveillance System, which really is a system designed to track hypersonic weapons from space.

So we included all those elements, and we then tried to think about sizing of it. We were very clear that what we have here is not a-- it wouldn't meet the full threshold of protecting against all very large attacks. But we sized it to protect what we thought was sort of a, a plausible, relatively large attack from a North Korea or a modest attack from Russia or China. Perhaps it could be an accidental launch.

SISSON: Okay, great. Well-

MOSHER: I can get into the details more later, but that's sort of the ... the, the thought.

SISSON: I'm sure we will. Great. Thanks. Mike, Dave just mentioned back in the day, so let's take a look back a little bit. I would imagine that to most people, the idea of a national missile defense probably sounds sensible, like a good idea.

Why would we not want to have that kind of protection? And so maybe one of the questions they have is actually why don't we have one already?

O'HANLON: Well, first of all, Melanie, thank you for doing this, and thanks to my good friends Steve and Dave for being part of this discussion, for what you've done with your work driving this debate, which needs to be really accelerated beyond what it's been so far.

There's been too much mystery about this latest incarnation of national missile defense. As you know, Melanie, we do have a very limited national missile defense in Alaska and California, a total of 40-some interceptors that would be designed to deal with a potential North Korean launch, roughly of the size that the CBO study contemplated, sort of 10 ICBMs, because I think the idea is you might shoot three interceptors at each incoming warhead.

And as far as we know right now, the North Koreans would have one warhead per ICBM. I think that's the current understanding. In theory, you could have more than one, plus decoys to confuse a defense trying to deal with the midcourse phase of flight, as these two know very well, and so do you.

By the way, if you'll permit me, just a very quick anecdote. It's really a personal treat to be up here with both these guys. But David and I were analysts together at CBO 30 years ago, working on nuclear weapons issues, working on some of these same issues. And back in those days, you mentioned the larger arsenals of the day and so forth. Our softball team under Coach Wayne Glass was called Preemptive Strike.

And and so this is sort of going back to our earlier Strangelovian days. And the, the George H.W. Bush administration had a more modest version of Reagan's vision that they called GPALS, Global Protection Against Limited Strikes. And so these ideas have been around for a long time.

Back in the George H.W. Bush period, we did not really have a deployed missile defense, so it was his son who began the deployment. Bill Clinton actually, however, was the president who developed a lot of the technology, even while the ABM treaty was still in place, the treaty that limited very severely the kinds of missile defenses you could have, but which George W. Bush pulled out of in the early 2000s. So that's just a, a few snapshots at the history over the, you know, decades that we've been thinking about this issue.

It really, again, as Steve, who's worked on this for a long time and written beautifully about it, as he knows full well, the debates really began in the 1950s and certainly in the 60s, as soon as we had long-range missiles. And prior to that, of course, we had NORAD based out in Colorado, which was designed to deal with Soviet bombers, but then later the full range of possible threats to the United States from abroad. And initially, it was the Soviet Union, but then, of course, we realized we really couldn't defend against an enemy with tens of thousands of warheads. And so we scaled it back to deal with potentially a Chinese, but more likely a North Korean threat, maybe a potential long-term future hypothetical Iranian threat.

And you'll remember that the Obama administration worked hard to try to mitigate Russian worries that any defense that we might place partly in Europe to deal with missiles launched from Iran could theoretically take out an incoming Russian ICBM or two, and this caused great angst for the Russia of the 2010s. And again, President Obama's team tried to figure out a way to make that defense look less threatening. Frankly, it was never really threatening against a Russia-scale sized threat. But the Russians-- and this is sort of a, a paradigm you have to keep in mind with missile defense. The Russians always tended to exaggerate whatever we could do and understate what their own capabilities were, which is why the possibility of deploying a defense tends to run the risk of creating an arms race.

Because whoever is having the defense deployed against them tends to overestimate, and whoever is building the defense tends to compensate in the other way. And so when you do the math, you never quite think you have enough defense against the other side's offense.

The other side's offense never thinks it has quite enough capability to saturate and overwhelm the defense.

So you have to think hard about how to maybe have a limited defense without running the risk of an arms race. Or, for making matters even worse, the potential that in a crisis, somebody would feel like they've got to launch sooner than they otherwise would, because if they, heaven forbid get hit first, and the other side has a defense to pick up the scraps of whatever's left out of their offensive force that's been preempted, then maybe they feel more of a need to go first, and then you have higher risk of nuclear war happening in a crisis.

So again, I know a lot of people in the room have been through these debates over the years, and I won't try to claim I'm giving a comprehensive history. But those are a few snapshots of some of the ideas that are out there. I'll just say one more thing by way of this warm-up or my own overview of the issue, which is that my friend Jim Lindsay and I wrote a book about a quarter century ago arguing basically in favor of the system that we have now.

And I'm still in favor of a limited national missile defense, maybe with a little bit more capability to include capabilities against hypersonics or drones. The drone defense problem is hard because, of course, the threat's localized and the launch could even be from the territorial United States, so how do you build a perimeter defense against that? Maybe you need to leave that out of the, this discussion and have that be more about where individual parts of the country that might need drone defenses, you know, contemplate pursuing that separately.

But at this point I am of the view we should probably somewhat expand the Alaska-California system, including with better space-based sensors. I'm not at all persuaded yet that we should put space-based interceptors in orbit as a way to create an additional layer of capability. And I'll just mention one reason why I'm wrestling with this one, and it's in the CBO report. It's the absentee ratio, which means that if you're in low Earth orbit, few hundred miles above the Earth, where you have to be if you're gonna be close enough to shoot at an ICBM while it's in flight, if you're gonna be there, you're constantly moving relative to the Earth.

You can't stand still because you would fall back if you tried. The only place you can sort of stand still over one place on Earth is geosynchronous orbit, which is way out at 22,000 miles, too far away to put interceptors. And so you have to have a lot of interceptors in orbit just to have one that's guaranteed to be in the right place at the right time to shoot at a missile.

The CBO report assumes that phase, that period of time would be in the boost phase, the rocket burning phase of the ICBM, which is only three to five minutes. You can also try to intercept in the mid-course phase, which lasts a lot longer, gives you a lot more time, it reduces the absentee ratio, but it gives the other side the chance to deploy decoys.

Because out there in the vacuum of outer space, everything travels at the same speed if it starts at the same speed. And so you can put up mylar balloons and things like that and put them up in the, by the dozens and hundreds, and it's very hard to figure out which is the decoy and which is the warhead. So you sort of pick your poison. If you're trying to shoot down an ICBM in boost phase, the absentee ratio can be very high. When I say that, I'm talking about you might need dozens or hundreds of interceptors in space to have one in the right place, depending on your assumptions about the, the system and so forth.

If you're in mid-course, the absentee ratio might be more like five to one or ten to one. And so you only need 10 times as many interceptors as you may need to shoot at the incoming objects. But the math is still very difficult, which is why I remain a little bit of a skeptic on the idea of space-based interceptors.

Having said that, there's a lot of interesting technology being developed. Defense industry is working hard at this. There are some systems that are appealing, but they're also quite expensive

SISSON: So Steve, Mike introduced a number of reasons why, in fact, such a system might not be such a good idea.

Can you pick up on a few of those and elaborate, whether it's on the technical elements and the challenges that exist there or to unpack perhaps the ABM Treaty and the logic behind it, why we would have signed this and how you see that fitting in the current landscape?

FETTER: Well, intercepting a intercontinental range missile is a real technical challenge. It's often described as hitting a bullet with a bullet, but actually it's much more challenging than that because the warhead and the interceptor are going 10 times faster than a bullet. And as Mike has mentioned, the bullet might be accompanied by lots of things that look like bullets, and we have not solved what's called the discrimination, a problem, being able to tell the difference between decoys and warheads.

And that challenge is amplified if the missiles are armed with nuclear weapons, because nuclear weapons are incredibly destructive. So if a conventional warhead gets through a defense, a building is damaged or destroyed. If a nuclear weapon gets through a defense, a city is destroyed, and a million people are killed.

So, the United States has been working on this problem for a long time as, as Mike mentioned, really since ballistic missiles were created. So over sixty years, and we've spent hundreds of billions of dollars on it. This has been very serious efforts, and what we have to show for it the only system that has been deployed for a national missile defense is the ground-based missile defense system that's deployed in Alaska, about forty interceptors.

And in the tests that have been conducted of that system there have been successful intercepts in only fifty or sixty percent of the tests, and those tests have not been very realistic. They were conducted under conditions ideal for the defense, and they didn't include countermeasures like the decoys that we might expect Russia or China, or even North Korea to deploy.

Now, you know, you might say "Well, isn't fifty or sixty percent better than nothing?" And unfortunately, it may not be better than nothing, and that is because of how adversaries potential adversaries like Russia and China will respond to the deployment of a defense. And we can already see those responses.

So in 2018, President Putin gave a speech in which he announced the development of several new nuclear weapon systems, including a, a big ICBM, the largest ever, a hypersonic glide vehicle, a nuclear-powered, nuclear-armed intercontinental range torpedo, a most-- sort of most crazy of all, a nuclear-armed, nuclear-powered cruise missile with unlimited range.

And Putin was very explicit about the motivation for all of those systems. He said it was in response to the deployment by the United States the development of missile defenses. And China's been less explicit, but I think it's reasonable to assume that the large expansion that we are seeing in the Chinese nuclear arsenal, which includes three hundred and fifty new ICBM silos, is motivated at least in part, by US missile defenses.

If we expand these missile defenses further we can expect additional responses. And it's not clear that at the end of the day, that we will be any less vulnerable to a nuclear attack after these actions and reactions. And I think you can see that most clearly for the space-based interceptor deployment, which I think the only thing I would disagree with Mike is that not dozens or hundreds of interceptors in space are needed per missile that you want to intercept, but it's more like a thousand that you'd need to deploy in space to take one shot at one missile.

And if you wanna take two shots, which would be prudent, or three, then you need two thousand or three thousand. And the cost of that is going to be vastly greater than the cost for Russia or China to deploy an additional missile. And so I think it's easy to see how this would lead to an arms race, and in fact, that was the rationale for the Anti-Ballistic Missile Treaty in the 1960s.

And in fact, you can find a very excellent memo that was written by then Secretary of Defense McNamara explaining why the deployment of a missile defense, an imperfect missile defense, would not make the U.S. more secure because at that time, the Soviet Union would likely respond by deploying more missiles, and at the end of the day, we would be less secure rather than more secure.

I would only add that in the case of the space-based interceptors, these will pose a potent anti-satellite threat, and that will provoke additional reactions by Russia and China.

SISSON: Mike, do you have, do you share Steve's view about success rate? When you think about what a system like this would need to achieve to be considered successful, do you have a percentage?

Is it a hundred percent of incoming missiles a hundred percent of the time? Is it something less than that? What would you look to?

O'HANLON: I think it depends on the scenario. For example, let's say, heaven forbid, we wind up in a conventional war against China over Taiwan, and we're winning, and China decides its best recourse, because it cares so deeply about Taiwan, is to make us worry about an all-out nuclear war.

But rather than conduct a first strike at scale, which would create the very outcome that we're all trying to avoid, China wants to play brinkmanship. So they launch one nuclear-armed missile at one isolated military base, and they hope that they will destroy that base and kill the several thousand people working there.

Maybe this is Guam, for example, and might kill more than a few thousand people in that case. But let's say they try to calculate where to detonate the warhead at the right altitude, so they minimize the blast, except for the one airfield they're trying to take airplanes out of. I would like to complicate China's calculations in that scenario with a limited missile defense.

Another scenario is Kim Jong Un, who's been developing ICBMs. I don't think Kim Jong Un wants war with the United States. I don't think he wants to die by a nuclear retaliatory strike that we would surely conduct if he attacked us. But I worry that if somehow we wind up in an accidental war with North Korea, somebody-- and accidental wars are not that common, but let's just say there's a crisis that escalates, and we somehow wind up in a conventional war-- and then Kim Jong Un thinks the best way to force us to stop marching north with our armies is to detonate one nuclear weapon someplace. Maybe an airburst over the ocean, but maybe an airburst over a military base. Well, it's probably gonna be in the theater, which means theater missile defense would be more relevant than what CBO is costing here. But maybe he wants us to think that he could hit North America, too. And maybe he decides to aim it for central Kansas. Nothing against central Kansas, but it wouldn't cause as many casualties. And so maybe he thinks that's the way to scare us just enough that we'll back down, and he's pretty sure he's gonna be overthrown unless he does something like that kind of a Hail Mary. I'd like a missile defense for that.

Bottom line-- one last reason why I'd like a limited missile defense, even a little bit more than we've got now. Steve mentions that perhaps China's building up partly its offensive forces, partly as a reaction to our interest in defense, and he's right. That's a possibility. It's also true, however, that China just doesn't wanna be in the junior leagues of nuclear weapons any longer, and that they would like rough parity with the United States and Russia in long-range nuclear offensive arsenals. So what are we gonna do about arms control in this world where we've got two aligned countries who are not formal allies with each other, but are aligned against us in many ways, now each approaching the same size nuclear arsenal that we've got?

You could just throw away arms control altogether. You could try to limit everybody to the same number, but then China plus Russia winds up with more than the United States plus France and Britain. Or you could say, let's just do, as Amy Nelson and I have argued, let's just do transparency in arms control, declare our offenses and defenses, do on-site inspections, tell people about our plans, and then the United States can have a mix of offense and defense that essentially gives it parity with a Russia plus China.

I'm not suggesting this has to be a huge system, but maybe maybe two, three, four times the capability we have now. And you do that, and then you stick with the offensive arsenal we've got now, and you let China expand its offense a little bit, recognizing that the alternative is probably to get into an all-out arms race.

But the defense helps you, not just at a technological level, but at sort of a psychological and strategic level, to say we've still pretty much got parity even against a combined Russia and China. So these are the ways I try to think about the purposes of missile defense in the modern era. It's not against an all-out Russian attack with every, every single thing they've got.

And I don't know too many people who are working this system who really believe that kind of vision is realistic, who really believe the executive order that President Trump made in January of '25 really could ever be brought to fruition. But there are other more modest architectures that I think are worth talking about.

SISSON: And just to clarify, in the Kansas scenario is your thinking that threat would be dealt with in theater also? Or if you are thinking about having a national missile defense construct, how's-- what would the success rate have to be to make you feel like Kansas was protected?

O'HANLON: Well, that's a great question 'cause it also sets up Steve to comment, 'cause he's done important work on this, talking about how you could, in theory, keep airborne interceptors in northern Japan that, especially in a crisis, you would just keep afloat all the-- or airborne all the time, that could try locally to intercept those North Korean ICBMs before they got out of the atmosphere.

And that would be a more efficient way. North Korea has the disadvantage of being small and near a lot of oceans and American allies, so we're well suited geographically to try to build that kind of a defense. And technologically, it's probably at least as doable as Golden Dome. So, yeah, that would be a system that I would wanna consider as part of the overall mix. And I wouldn't wanna prejudge just how much of the system needs to be here in, in its entirety in the United States.

SISSON: Thanks. So I know the audience has already had a lot of numbers thrown at them. We're gonna throw a couple more, Dave, and have you talk about the actual cost estimate that the study produced, please.

MOSHER: So, thank you. Our estimate, this is all in constant 2026 dollars, but we estimated that the implementing defense that would at least go partway to achieving the vision of Golden Dome would be 1.2 trillion dollars for purchasing it and then over twenty years of operations.

Michael talked about space-based interceptors as did Steve. The space-based boost phase interceptor piece of that took up seven-- about sixty percent of that total. So I think about 740 billion of the 1.2 trillion is for the space-based interceptor system. And that's driven in large part because you have to, in order to stay close to down and relatively low altitude so that you can do an intercept in a very short period of time, you're encountering more drag from the earth's atmosphere, and those satellites have to be replaced fairly often.

So, based on what we've seen that the Space Force is developing for other systems, five years seem to be about the life that we envision, so that you basically would have to replace that constellation three times over the course of those twenty years. So that's kind of what drives that space-based interceptor number.

And then we had, because the Golden Dome talked about having multiple layers, we had the ground-based interceptor system that Michael talked about, except we expanded it from one site to three sites and had sixty interceptors at each of these new ground-based interceptors. And then in part, to deal with some of these other challenges like hypersonic weapons and cruise missiles, we had four of these, we're calling them wide-area lower systems, which were basically based on the Aegis system and standard missiles, and it would be a late mid-course.

So as the missiles that survived, warheads that survived the boost phase and survived the ground-based interceptors that we have in Alaska that ground-based missile defense, the ones that survived and got closer, we could attempt to get with standard missiles. And then we had with them a things like the lower tier, like a THAAD system, et cetera, for protection. Then we had, so there were four of those that covered the country, and then we had 35, what we call regional sectors, and those provided air defense against cruise missiles. They also provided defense against hypersonic weapons, because hypersonic defense is relatively going-- likely to be a relatively short-range affair.

That is, you need to be pretty close to the system, to the area you're defending with hypersonics. Each one of those systems had radar associated that were appropriate. Each

of them had command and control systems. And so that was how we structured it, basically. And I can talk in more detail about what's in each, but that was basically the idea.

One thing to note is that you can't have, like the base in Alaska with the radar and a and interceptors without defending them against cruise missiles and other threats because the interceptors there only work against long-range systems. So we had at each of these a collection of THAAD and Patriot systems to protect against shorter range ballistic missiles and cruise missiles. And then, of course, you have to protect against the threat of drones either launched from outside the United States or inside the United States. They're small, they're easily launched. The Israelis and the Ukrainians have both had great success at launching drones from inside the territory of their enemies and attacking important systems. So we provide a, a drone defense for each of the critical nodes of these layers.

SISSON: When you were building this, which sounds like quite an endeavor, were there portions where, you know, you internally had to debate sort of the, the specs that you were using in the sense that you were worried that, Or how did you test whether or not this was a sensible approach, essentially?

MOSHER: So yes, there was a lot of discussion and thinking. In the end, what we were trying to focus on were systems that largely existed today. So every one of those systems I've mentioned, for the most part exists today. The new ground-based interceptor is gonna replace the ground-based interceptor. It's called the Next Generation Interceptor. We assume that those... It's in development. We assume that those are successful and deployed. I think all the radars that we had in mind, the long-range discrimination radar, which we would put at each of the sites sentinel radars for the lower tier ones. We use the Aegis radar basically like a deck house, like Aegis Ashore we have in Romania, a system there, and a system in Poland, it would be very much like that. So based on existing systems as much as possible, So we tried to do that. We talked, we considered areas that would be concerned that would be, that needed to be covered protecting the, the, the critical nodes.

Again, trying to use concepts as much as possible that existed today and systems that that existed. We did not include any directed energy systems, although the executive order suggests that we should be looking at those. Those just didn't seem near term enough and maybe they'll never be able.

We also didn't look at space-based interceptors that weren't boost phase 'cause that was called for directly in the executive order. But there's some sort of intriguing concepts, as Michael talked about, with lower absentee ratios where you could look at intercepting in mid-course. We didn't analyze that, so I can't tell you, you know, would that be effective or not, how many you would need.

There are some space ground based moving target indicator is something that is the the executive order talks in sort of general terms about a custody layer of systems. In the Space Force original conception of their seven-layer proliferated warfighter space architecture, PWSA, was going to have a custody layer, but with radar, but we think those were more-- we don't know what those were, and we actually didn't look at that in this particular one because that's sort of out a little bit

SISSON: So this is a lot of money regardless of some of the, the questions you might have had about which specifics you included or didn't.

And Mike, you've voiced some skepticism about this vision ever becoming fully realized. So, starting with you and then over to Steve, even if we don't get the full system might there still

be value in the process of pursuing it? Are there elements of the development, slices of a cake, if you will, that would be useful to have even if we don't ever get to enjoy the full cake?

O'HANLON: Well, I'm in favor of all the R&D that's being done on everything right now because even though, as we've all been discussing, space-based interceptors are a daunting proposition I don't wanna exclude the possibility forever. I don't think it makes a lot of sense based on what I know right now about the technology in today's world and today's strategic environment, more likely to fuel an offense-defense arms race than to benefit us.

But I'm open-minded about changing my mind on that, but I'm certainly open-minded about space-based sensors being improved, about the kind of ground-based architectures that Dave talked about for dealing with different types of airborne threats, not just ballistic missiles of the standard variety. And I think North Korea is probably still Exhibit A in terms of the worst case scenario that you'd wanna mitigate against or hedge against, but there are these scenarios that I just alluded to with China or Russia, where you could imagine somebody trying to set off one or two bombs at just the right place where they think they cause just enough damage and fear to change our willingness to keep fighting or to change our willingness about negotiations, imagining that you're in some kind of a war.

It would be one of the most fraught actions in the history of human civilization, probably one of the most foolish, but human beings continue to prove that they're capable of doing things that we don't think people should still be capable of doing in the twenty-first century, and I wouldn't wanna dismiss that possibility.

And so I do favor a limited national missile defense against accidental launch, North Korean launch, or possible one-off attempts at intimidation in the course of a conflict, more because I wanna deter those conflicts in the first place than because I really think this is a place we're gonna wind up.

But because the risk of war against Russia or China or North Korea would be so civilization-threatening I, I would wanna make sure that deterrence was as good as we could make it. There're a lot of ways defense could make deterrence worse or weaker. But I think if we keep debating this, we might get the right formula where it can at least marginally improve things.

SISSON: Steve, thoughts on whether there are slices of the cake that you think would still be worth having?

FETTER: I think we need to rely primarily on a combination of deterrence and arms control to reduce the risks of nuclear use. Any large scale nuclear use against the United States would be suicidal. Russia or China would know it would provoke a devastating retaliation, and so that acts as a powerful deterrence.

And the nuclear weapons states have all acknowledged this by stating several times a nuclear war cannot be won and must never be fought. And so for fifty years, we worked with the Soviet Union and then with Russia to try to manage these risks by limiting the number of nuclear weapons trying to reduce the risks of accidents and misunderstandings through hotlines and risk reduction centers and declarations and notifications.

And so we need to get back on that track. And if the ambition really is to be able to intercept one or two missiles, are there measures that we can take, confidence-building or arms control measures, that would demonstrate that to Russia and China that our defensive

capabilities were limited, we didn't intend to nullify their deterrent capability entirely, and thereby minimize the m- the worst reactions?

And, you know, with regard to China in particular, I worry about reactions like the one we may be currently seeing by China of building a launch on warning capability, of not only building these three hundred and fifty silos, but then preparing to launch them on warning of an attack. And the risks of that should be obvious in a crisis.

And I would not feel more secure, , if our development of de- defenses provokes those kinds of reactions.

SISSON: Let's stick with China for a second and just flip the script here. How do you think that we would respond, react, if we saw China developing a program like this, much less, let's say we had intelligence indicating that it was close to being fielded? How-- What would we do?

FETTER: Well, the United States has been concerned about the development of missile defenses by Russia, and maybe now China, for a long time, and we focus primarily on countermeasures the development of very effective countermeasures to missile defense. That was our primary reaction to the Soviet deployment of missile defenses.

And we have excellent countermeasures that can penetrate a missile defense. So I hope that would be our primary reaction, but you could also expect that the United States might expand the number of weapons that it deploys or rely more on launch on warning to ensure that enough warheads would penetrate the kind of measures that would not contribute to stability.

MOSHER: If I-- Melanie, one thing ... the expansion of our ICBM force from single warhead to MIRVs, three warheads on them, was also a response to concern about Soviets. So it wasn't just countermeasures in the sense of decoys, et cetera, it was natural expansion.

SISSON: Of the real, yeah, capability.

We will do one question that was submitted ahead of time by an eager, an especially eager audience member, and then we will open the floor to the folks here in the room.

So, this question is: What are the practical implications of implementing the Golden Dome for America, given cost and operational considerations, i.e., how many and what type of cities/which ones could reasonably be covered with defensive fires capabilities, and by when?

MOSHER: Ah. So, back in the day when Michael and I were working at the Congressional Budget Office I was doing a study on... actually, Michael may have left by then. I was doing a study looking at missile defense, and I said to my boss at the time, Bob Hale, who later became a comptroller at DOD I said, "Bob, I think what we need to do is have a map that shows the probability of survival by congressional district." He didn't think that was very funny at all.

I was of course kidding, but you do have to think about these things. And even in the regional systems that we have, we're not covering all of the United States. We're covering most of it. I think I'm trying to remember, each one covers roughly one thirty-seventh of the area of the United States, so if you had thirty-five of them, you're, you know, not covering

everything, and you're gonna have overlaps 'cause you... so, but not everything is being covered, so what, what do you what do you do?

And I think that becomes-- that's a political decision, and the more that you have sort of these national layers, like the ground-based interceptor, it may be at more sites, that debate doesn't have to happen as much. But when you start deploying these lower-tier systems, there, there are s- there are some concerns a-about that.

One of the things that... Michael mentioned research, and I wanted to make sure what we sort of emphasized is our estimate doesn't include the money for research to improve the systems. And I taught a course in missile defense at Georgetown, and one of the things I always tell my students is, "Once you've built your missile defense, you've just started." Because your adversary is inevitably gonna take countermeasures and, you know, whether we're talking about anti-submarine warfare or protecting the United States from ballistic missiles or protecting our troops, your adversaries will do things to try to counter the Maginot Line. The, you know, the Germans came up with a brilliant plan to counter that.

So it's a measure- countermeasure dance or whatever, a dynamic that's gonna occur once you've deployed it. So anyway, just wanted to make, make clear that.

SISSON: Other thoughts here, or should we turn to the to the room?

O'HANLON: Great answer.

SISSON: Okay. So I will invite questions here in the room. Please, you have one minute to form your question. At the one-minute mark, I will actually rudely interrupt you to bring that to a close. Please identify yourself in doing so, so that our panel knows to whom they are responding. If you specifically want to direct a question to one individual, you're of course welcome to do that or to invite the full panel. That's up to you.

So, questions, please. All right. We have a person here in glasses and a blue blazer.

AUDIENCE QUESTION: Thank you. William Winker. Question for the panel here. Given the problems that we have with the feasibility of it, do you consider it not a good thing that the that the temptation is not increasing of using nuclear weapons and that the typical thing of mutual assured destruction is still the thing today as it was back then?

O'HANLON: I think there are very powerful arguments against ever using nuclear weapons. And even though we've seen them trotted out a little bit in conversation and in threat-making in the last few years, especially with Vladimir Putin over the Ukraine war, I think it would be a huge leap beyond that actually to see them used.

But I don't rule it out. You know, I-- Five years ago, I might have ruled out the idea of large-scale land warfare in Europe ever again, and I would've been wrong.

MOSHER: I just, on mutual assured destruction, you know, we had this concept that a certain percentage of society needs to be destroyed, or it was kind of the McNamara, that criteria that he had. And I think that what really it is-- and I think MAD still operates today, and I think it will until we get to a world where there are some the defenses are so good that we no longer need, or that nuclear weapons are no longer effective-- is that it doesn't take-- It depends on what would deter you. So if you're a country and you are willing to, sort of super motivated to fight this fight, you may be willing to absorb a couple nuclear warheads

on the way. But most of the time, societal destruction is something that, because nuclear weapons are so damaging, they're just in a different class from everything else.

And, I mean, just look at sort of -- so imagine-- in Ukraine today, we're seeing the effects of a conventional conflict, right? And, you know, bombs are destructive, but as Steve said, it's an apartment building and glass nearby. And I'm not minimizing the terrible things that happen when that bomb hits, but it's not the city and a million people and the fallout and all the things that come from that. So those are-- that's a very different psychological effect that people have. And so I think assured destruction and both sides feeling that way is gonna be here for a long time. And I think that as Steve has mentioned, other countries will do what they can to get to the level of assured destruction they believe they need against a country that's developing missile defenses.

So there is this response- counter response that, that is likely to happen. I don't know if I fully answered your question. That's kind of my sense. And it's in the eye of the beholder often. Which is one thing that to keep in mind is deterrence is not some abstract mathematical concept. It's very much a psychological concept, and it's really I, m-me and my psychology is trying to determine what you and your psychology would deter you. So it's sort of this psychological game that goes on and it's always very imprecise. But nuclear weapons being as destructive as they are kind of raises the threshold for you know, acceptable damage.

SISSON: And Dave-

MOSHER: Unacceptable

SISSON: Dave will correct me if I'm misremembering this, but I believe the McNamara threshold was destruction of twenty-five percent of the enemy's population and fifty percent of its productive capacity.

MOSHER: Something like that, yeah. I-

SISSON: If you do that math, it's more than sobering.

MOSHER: It's a lot, yeah, and those led to very large arsenals in the United States at least and-

O'HANLON: And that's without counting nuclear winter. The planet basically self-destroying.

MOSHER: Right.

SISSON: Yes, we have a person here in a beige T-shirt and a-- Yeah, you got it.

AUDIENCE QUESTION: Hi. Thank you. Good morning. I'm Vivian Maschi with Aviation Week. Thanks for your comments here.

I wanted to ask you, you know, General Guetlein is the senior official in charge of the Pentagon's development of Golden Dome. He's had a few public appearances over the past year where he shared a little bit about what they're working on.

I was curious what each of your takeaways are from his public comments about the progress being made and the Pentagon's approach to Golden Dome. What are each of your opinions on it? Thank you

MOSHER: So General Guetlein has actually made comments on our study, and his basic comment is, "They're not costing what we're building." And I have no basis by which to, you know, refute him on that because I don't know what he's building. But if you look at their budgets, over the next five years, they're planning to spend, in 2026 dollars, about 15 billion dollars a year on average. If you were to build a system like I've talked about building, we're talking about 60 billion dollars a year on average. So whatever he's building is... The, the Golden Dome part of that is much smaller.

It's possible that they're drawing, that they'll have the services pay for, you know, that the money may come from a different pot. But it takes a lot of money from a, a lot of services to get you to 60 billion. So it seems like what he's building, at least in the short term, is more modest than what we've costed. But I don't know anything more than that. And I, you know, if he shared details that get beyond that, I'd love to hear them because we're still looking for that.

SISSON: We have a person here in a checkered blue blazer

AUDIENCE QUESTION: Hi, Mr. Mosier. Will Kadie, steer PR. Thank you for your breakdown on the one point two trillion. I'd just be curious, of that forty percent that wasn't for space-based interceptors, how much has CBO factored for C2 architecture in general and just offensive or defensive cyber capabilities?

MOSHER: Ah, an excellent question. We actually have a little trouble estimating the costs of those sorts of elements in part because they aren't well defined yet for this system in part because it's really hard in the budget to find a lot of these items. So we do include some funding for it, but I wouldn't, you know, say, "Hey, this is the answer." I think it's an area that we're sort of blind and don't have a lot of visibility, and it's probably better than blind.

But I mean, we're sort of-- we see some budget items, but we haven't included a lot there. Each of the systems I've talked about, for example, with the Navy upper tier— Sorry, old language. With the the Aegis Ashore concept, that has a lot of command and control built into it. There are the, the Space Force is building their transport layer, which will be important for moving data around. But what we don't know is there are some things, for example, this hypersonic tracking system.

If you're gonna do intercepts against hypersonic, you need a very low latency, very slow, very few delays in your, in your signal, and that you have to pay a premium for that sort of thing. So what we don't know is how much the defense would rely on super low latency kinds of communications and and so there's a lot that's unknown there.

It was easier for us to talk about the interceptors that were already built in the radar than we, you know, 'cause that, that's an easier thing. Yeah.

SISSON: All right, we have a person over here in a cap and glasses

AUDIENCE QUESTION: Hi. Thank you. This is a little bit more of a general question. My name is Tavian Goodman. I'm here with the United States Capitol Historical Society, excuse me. Carl von Clausewitz in his book on war discussed about how 200 years ago, in the

Prussias of the world, war was often a costly thing and they would seldom send a huge amount of individuals into war in order to settle disputes. Napoleon of course changed that, and I'm certain everyone here in the room knows about that. But as I hear about this cost estimate for the dome and consider things such as the war front in Ukraine and consider the amount of human capital really it takes to wage war at this point I'm wondering if there is a threshold that you all see as in terms of fiscal capital and human capital where it may indeed be too costly for us to wage such a you know, conventional war the way we're talking about it today.

And I would love to hear all of your thoughts on that, if that's an appropriate question to ask

O'HANLON: The cost of conventional war could be astronomical because there's no way to be confident it stays conventional if it involves the United States and/or Russia and China, or for that matter, North Korea.

And Annie Jacobsen, our fellow Princetonian, wrote a book recently that did very well called Nuclear War: A Scenario, and she basically talks about how a limited nuclear strike led to the annihilation of the human race, and she got the science right. There was nothing about her scenario that was badly researched.

I'm not saying it would happen that way, but that began with one or two nuclear strikes of the type that I was alluding to before. But it could also happen with the China-US fight over Taiwan that starts conventional and then goes nuclear. So at some point in that situation, I stop counting dollars.

I'm just counting lives and the survival of the species. But, you know, you could make the number as big as you want to. World GDP is what? 100 trillion a year. Certainly this-- we could have devastation on a scale of hundreds of trillions of dollars.

SISSON: Steve, I'm gonna piggyback on that to ask you, often when we talk about conventional war scenarios, we think about escalation to nuclear exchange.

And so on this question of escalation management, about the likelihood of things going worse and not sort of pulling back from the brink, do you-- how do you think about that? Are you an escalation control or management optimist or pessimist? Well,

FETTER: I think I can also tie this into the question about cost, because we've been talking about cost kind of in isolation, the \$1.2 trillion for a Golden Dome.

But I think the real question is, if you had a trillion dollars to spend, what should you spend it on? What-- In what way could you most reduce the risks or improve the security of the United States? Reduce the risks, including the risk of nuclear escalation. And that might be by improving the defense of Taiwan so that there isn't a war over Taiwan, or improving defenses in Europe so that Russia is never tempted to attack one of the-- one of our NATO allies.

So I think in just in general, I think when we think of scenarios, if we can think of scenarios where we would say, "Oh we might be losing. We'll have to escalate to the use of nuclear weapons," my response would be, "No. Think about how you avoid ever getting to that point, and what systems you have to build so that you avoid that scenario altogether."

SISSON: Questions. We have a person here, glasses and a white shirt with stripes, I think.

AUDIENCE QUESTION: Hi. Yes Courtney Albion with Air and Space Forces Magazine. I had a two-part question. First Mr. Mosher, I was wondering if you've had, you know, additional conversations with the Golden Dome team or with the Pentagon since your report was released that have kind of, altered at all some of your assumptions about the architecture and the cost.

And then also something that General Guetlein has said in some of his public comments is that the architecture will incorporate, you know, some advanced technologies like directed energy, which I think you addressed somewhat AI, advanced computing that could also, you know, drive down cost over time.

For the maybe broader panel, do you have a sense without knowing the specifics of the architecture, you know, of whether that type of technology could actually change some of the the cost equation here?

MOSHER: Right. So we have to date, not been able to talk to the Golden Dome office. They- - we've asked them for briefings, and we have not gotten any. They've not been willing to do so. So I know nothing about what they're actually building except what I read in publications like yours. So it hasn't changed. And remember, we were not costing what the Golden Dome office is building. We were trying to estimate what the cost would be to implement the executive order. So even if I knew a little bit about what they were doing, it wouldn't change our estimate of the executive order.

Now your point about technology is a good one, and actually if you-- and the place where you'd see kind of more of that, I think, is in the space, or at least that's where the hope is in, in, in reducing space-based interceptor costs, et cetera. That's a possibility. But the problem is the, the physics are such that you need a certain satellite within a certain distance of a missile anywhere on Earth to make sure that you intercept it because you have such a limited amount of time, and that physics won't be changed with technology.

I mean, inconceivably, if we had lasers in space, we could do something like that, but lasers have their own limitations, and we haven't built any yet that, that would function. So particularly with the president's desire to deploy something as soon as possible, directed energy seems like it would be a next generation or a generation after that.

So technology could do some and our estimate, actually, I would argue for space-based interceptors is perhaps on the optimistic side, in the sense of with traditional technologies, we probably are assuming that things are detected quicker than you might otherwise. So in a sense, we're building new technologies into both we have a lower launch cost than you can get now and we also have a very fast detection and so it allows us to reduce the number of satellites.

So we have some of that already built in, not across the board. We tend to be, as an organization, sort of a show me, you know, and you sort of see that across CBO's estimates. We tend to estimate what we see. New technologies might provide opportunity for that, and I think we mentioned that as a possibility, but it's not what you would have in the near term, which is when they're trying to build.

SISSON: We have a question over here in the front, please. Yeah, Oh, wait for the microphone if we could. Thanks.

AUDIENCE QUESTION: Tom from Netherlands Embassy. I was struck by also what you mentioned about needing, of course more conventional defenses of the sites involved in the

Golden Dome program even if you go with the North Japan bases, for example, given DPRK's arsenals. You know, with what's happening, conflicts in Ukraine and in the Middle East and the impact on the availability of interceptors and THAAD systems, is this at all factoring into projections for the Golden Dome, or are the timelines completely different and, you know, are we talking about a different era here?

MOSHER: So I guess in our estimate we are somewhat time agnostic about when it would happen, but clearly there's an emphasis on doing it soon. The challenge is exactly what you mentioned. The very systems that at least the ground-based layers we're-- are involved in, except for the next generation interceptor, which is only operates off the atmosphere against ICBMs.

But the Standard Missile-2, the Standard Missile-1B, the THAAD interceptors, the MSE Patriot interceptors, the radars for those systems, those are all being stressed and depleted in our in-- originally in Ukraine and then with U.S. and Israeli actions in, in, in the Gulf. So they are very clearly linked in terms of when you could possibly develop the Golden Dome system.

I think that's would be a trade that you'd have to decide. We have a certain production capacity. We're trying to expand it. Where do those missiles go first? And so that becomes a real sort of a trade, a kind of a real world trade of, am I replenishing my military stocks for conflicts abroad, or am I doing it for a system like this?

And sort of maybe you can move things around a little bit, but it's a fundamental challenge.

SISSON: Why don't we try for one more? We've got a person in the back, white shirt with a blue lanyard.

AUDIENCE QUESTION: Hi. Valentine Arends, Dutch Public Broadcasting. I was wondering, with a lot of discussion being about the war in Iran and in Ukraine as well with lower cost cruise missiles as well as drones I was wondering where do you think the priorities lie right now?

Is there enough attention towards preventing a nuclear intercontinental ballistic missile threat at this point?

MOSHER: I, so I can't answer... I mean, I don't know definitively, right? I we just don't know. What I can tell you is that the Golden Dome budget-- let me dive into budget arcana here for a moment. The president's request for the budget for the Department of Defense includes, is the number, the poster number is 1.5 trillion. But 340 billion of that is not in the base budget that Congress would normally appropriate. They're trying to get it through the reconciliation process, which allows them to do it with just a a Republican majority. That money almost all of the Golden Dome money for 2027 is in that that piece.

That piece seems to be running into a bit of of bumps to get that big chunk of money through the Golden Dome... Sorry, through the Senate. The House seems to be willing to start it. But that, that piece of bill has not started in the House. They haven't come up with a budget resolution to move that through.

So in a sense, we may see a real-world experiment. If they don't get the funding for that for Golden Dome, what will they do if they're moving money around from other services and

other accounts to try to... You know, will they give them the full 17 billion that they've asked for? Will they keep it at the one billion that's basically in, in the base budget?

But I don't know. You know, those are trades that I think as a department, as a Congress, as a country, that we're gonna have to be making over the coming years.

SISSON: Well, clearly we hope to see more from the administration on these plans in the near future. Not least because then we can get the band back together and have another conversation like this.

So with thanks to the Brookings audience as always, thanks for tuning in and for your really excellent questions. If you could join me in extending appreciation also to our really wonderful panelists. Thanks so much for sharing your thoughts.