

**UNITED STATES NUCLEAR STRATEGY AND POLICY**

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**HEARING**

BEFORE THE

**COMMITTEE ON ARMED SERVICES  
UNITED STATES SENATE**

ONE HUNDRED SEVENTEENTH CONGRESS

SECOND SESSION

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SEPTEMBER 20, 2022  
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# **UNITED STATES NUCLEAR STRATEGY AND POLICY**

**TUESDAY, SEPTEMBER 20, 2022**

UNITED STATES SENATE,  
COMMITTEE ON ARMED SERVICES,  
WASHINGTON, DC.

The Committee met, pursuant to notice, at 9:30 a.m., in room 216, Hart Senate Office Building, Senator Jack Reed (Chairman of the Committee) presiding.

Committee Members present: Senators Reed, Shaheen, Gillibrand, Blumenthal, Hirono, Kaine, King, Warren, Peters, Rosen, Kelly, Inhofe, Fischer, Cotton, Rounds, Ernst, Tillis, Sullivan, Scott, Hawley, and Tuberville.

## **OPENING STATEMENT OF SENATOR JACK REED**

Chairman REED. Good morning. The Committee meets today to receive testimony on the United States nuclear strategy and policy. I would like to welcome and thank the expert witnesses before us today. Ms. Madelyn Creedon is a Research Professor at the George Washington University Elliott School of International Affairs.

She brings more than 30 years of senior leadership experience across the Department of Defense (DOD), the National Nuclear Security Administration (NNSA), and the Senate Armed Services committee, where she handled the strategic forces portfolio.

Ms. Creedon currently serves as the Chair of the Strategic Posture Commission, which was created in the Fiscal Year 2022 National Defense Authorization Act.

Ms. Rose Gottemoeller is the Steven C. Hazy lecturer at Stanford University. She served most recently as the Deputy Secretary General of NATO [North Atlantic Treaty Organization], and previously as the Undersecretary for Arms Control and International Security at the Department of State, where she was the chief U.S. negotiator of the New START [Strategic Arms Reduction Treaty].

She is also a member of the Strategic Posture Commission. Mr. Eric Edelman serves as Counselor at the Center for Strategic and Budgetary Assessments and on the Board of Directors of the United States Institute of Peace.

He brings decades of experience at the highest levels of the Defense Department and State Department and has written extensively on arms control issues and strategic stability.

Mr. Franklyn Miller is the Principal of the Scowcroft Group. He served for more than 30 years in the Department of Defense and the White House as an expert on nonproliferation, nuclear deterrence, and arms control policy, especially with regard to Russia. He

also sits on the Strategic Posture Commission. Thank you again to our distinguished witnesses for appearing before the committee and for your decades of service to our Nation.

Our objective today is to discuss the rapid changes in nuclear deterrence, strategy, and arms control we are witnessing around the world. Successfully maintaining our nuclear deterrent is a mission fundamental to our long term strategic competition with China and Russia. This mission has been made especially clear throughout Russia's assault on Ukraine. Russia has conducted out-of-cycle nuclear exercises, issued inflammatory statements about tactical nuclear strikes, and is essentially holding the largest nuclear power plant in Europe hostage to shield its forces. Vladimir Putin's behavior has been reckless to a very dangerous degree. More broadly, Russia has modernized much of its nuclear arsenal, is developing a suite of weapons outside the terms of the New START to threaten the United States and Europe. These weapons, such as cruise missiles, long range torpedoes, and hypersonic are intended to evade missile defense systems and create a destabilizing challenge.

China has also made significant changes to its nuclear approach. Not constrained by the New START, Beijing has built hundreds of new ballistic missiles and the intelligence community assesses it may have a stockpile of more than 1,000 warheads by the early 2030. In the past two years, we have also seen China develop missile field in hardened silos throughout the country. This development, along with China's development of air delivered weapons and ballistic missile submarines in the South China Sea, fundamentally changes the nature of Beijing's nuclear doctrine.

As I mentioned last week at the nomination hearing for General Cotton to be STRATCOM commander, we need to seriously consider that we are entering a new trilateral nuclear competition era. The Cold War was essentially a bilateral competition between the United States and the Soviet Union, and deterrence theory and communication methods were developed based on two rivals. Those rules now must change with the ascendancy of China and its growing nuclear arsenal. I would like to know our witnesses' views on how we might balance strategic stability with both China and Russia, while exploring what can be done to possibly bring both into an arms control framework.

Similarly, I would like your thoughts on whether the force structure we are investing in will be able to deter future threats from our competitors. In addition to China and Russia, we must also managed the challenge posed by Iran.

In the four years since then President Trump pulled out of the Joint Comprehensive Plan of Action, or the JCPOA , Iran has made key advances in its nuclear program. It has decreased its breakout time to several weeks from a year under the agreement, and Iran announced in July it has detected a capacity to build a nuclear weapon, including the ability to enrich uranium to 90 percent, which is well beyond the 4 percent allowed under JCPOA. Iran has also hardened its infrastructure and replaced damaged equipment with more advanced models. While an agreement to return to Iran to the JCPOA may be closed, the final outcome has not yet been determined. I am interested to know your assessment on Iran's nuclear program and whether you agree that returning Iran to the

JCPOA remains in the vital national security interest of the United States.

Finally, I will recall the testimony of Professor Paul Bracken from Yale, who testified before the Strategic Forces subcommittee last year. He noted that we are now in a second nuclear age with multiple countries and decision makers involved, a much more complicated environment than the Cold War. Professor Bracken testified that this second nuclear age will still have to think our way through it. Indeed, I hope today's hearing will help us think about and better understand the complexities we are now facing. It is vital that we develop the force structure, policy, and arms control strategies required to overcome the challenges ahead. And I look forward to the witnesses insights into these issues, and I thank them for their participation. And now let me recognize the Ranking Member, Senator Inhofe, please.

**STATEMENT OF SENATOR JAMES M. INHOFE**

Senator INHOFE. Thank you, Mr. Chairman. Also want to welcome our witnesses and thank you all for your long service to our Nation. Today we are facing greater nuclear threats than at any time since the worst days of the Cold War, threats that are expected to become even worse in the coming years. China's massive military investments, especially its stunning nuclear breakout, will reshape the global balance of power in ways that we have never seen before. Putin's unprovoked invasion of Ukraine in his pursuit of new nuclear capabilities clearly demonstrate that Russia remains a primary threat to the West.

The United States has never faced two nuclear armed peer adversaries. That is worth repeating, because it is a reality. The United States has never faced two nuclear armed peer adversaries. It is clear to me that we are not prepared for this reality. Despite ongoing efforts to modernize, our own nuclear forces are older and less capable than they have been in the past. Our supporting infrastructure is literally crumbling. Thankfully, the Biden administration did not adopt some of the more radical options discussed during the recent Nuclear Posture Review. However, the administration's decision to discard planned enhancements to our forces even as China and Russia grow their arsenals, was disappointing to say.

Based in part on the advice of numerous senior officers, we have taken bipartisan steps to reverse those faulty choices, but we have much more work to be done. Each of you represents decades of experience in nuclear issues, and I am glad you are here to offer us your perspective on the challenges that we face and how we can best prepare our Nation for dealing with a dangerous future.

So I look forward to your testimony. Thank you, Mr. Chairman.

Chairman REED. Thank you, Senator Inhofe. Ms. Creedon, would you begin, please.

**STATEMENT OF MADELYN CREEDON, RESEARCH PROFESSOR,  
GEORGE WASHINGTON UNIVERSITY ELLIOTT SCHOOL OF  
INTERNATIONAL AFFAIRS**

Ms. CREEDON. Good morning, Chairman Reed, Senator Inhofe, and distinguished members of the committee. It is always an honor to appear before the Senate committee on Armed Services, particu-

larly in the company of such distinguished panelists. Thank you for the invitation and the opportunity to discuss the future of United States strategic relationships with Russia and China, the United States nuclear modernization programs, how these programs will enable the United States to meet future deterrence requirements, the future of arms control post New START, and how China's rise can be taken into consideration in future arms control agreement.

These are important, complex topics that should be discussed more openly and more frequently. So to start, I want to be clear today that I share with you my own personal thoughts and do not represent or speak on behalf of any organization or entity. The world today is a more dangerous, more chaotic, and more uncertain place than at any time since the end of the Cold War. Russian President Putin's distorted version of Russian history and his aggressive, unprovoked attack on Ukraine has resulted in a previously unthinkable land war in Europe. The United States now finds itself, for the first time, in what can only be described as a three peer or near peer multipolar environment, complicated by North Korea.

Overlay the regional competition of India and Pakistan, their nuclear arsenals, and their respective complex relationships with Russia and China, and the chance of nuclear use is high. The Doomsday Clock tool is now set at 100 seconds to midnight.

In contrast, in 1991, at the end of the Cold War, the clock setting was 17 minutes to midnight. Russia and China engaged in significant military modernization over the last 15 years, and both have expanded dramatically the size and variety of their conventional capabilities and nuclear arsenals.

China has been focused on growing and improving its conventional space and cyber capabilities, including the recent test of a fractional orbital bombardment system (FOBS) that ended with a hypersonic glide vehicle impacting a target in China. China is amid a surprisingly rapid expansion of its nuclear capabilities, including a true nuclear triad.

China has thousands of missiles of all ranges and is expanding its dual use capabilities. Although estimates vary, China is projected to have somewhere between 1,000, 1,200, or maybe even more nuclear weapons by 2030. Russia has developed a wide range of non-strategic, dual capable, and novel nuclear systems, in addition to the mostly complete modernization of its strategic nuclear forces, including the SARMAT, a new merged ICBM [intercontinental ballistic missile] and a new ballistic missile submarine. Russia also has invested substantial sums, modernizing its conventional and non-kinetic systems, as well as its cyberspace and counterspace weapons. Recall that Russia tested a kinetic A-SAT weapon in November of last year, generating thousands of pieces of space debris and possibly even putting the International Space Station at risk. And of course, for all its conventional modernization, we have seen its fairly dismal performance in Ukraine.

North Korea is also increasing its nuclear saber rattling via a new policy, reinforcing its commitment to never give up nuclear weapons, clearly stating its preemptive nuclear use policy, and declaring that nuclear weapons would be used if the regime leadership were threatened.

This nuclear policy law is yet another DPRK [Democratic People's Republic of Korea] mechanism to seek acceptance and recognition of its status as a nuclear weapon State permanently. Against this most troubling and dangerous picture, there are six things to keep in mind.

First, to maintain a capable, credible, safe, secure, and reliable United States nuclear deterrent, the ongoing nuclear modernization program, which is replacing all three legs of the triad, air, sea, and land, plus the nuclear command and control system, as well as other supporting systems, must be fully funded, including taking into account inflation, as there is little to no margin in any of these programs. Maintaining the current systems until the new systems come online is essential. The current systems are past their lifetimes, have already been life extended, such as the *Ohio*-class Ballistic Missile Submarine, and the new programs will most likely be late, and the hand-off from old to new will be difficult. Three, the infrastructure across the entire complex is mostly old but being replaced.

The NNSA complex needs new or expanding manufacturing, and material processing and handling capabilities such as plutonium pits, uranium processing, lithium, tritium, and electronics. The DOD complex also needs new and expanded infrastructure. People, people is number four and probably the most important, recruiting and retaining people at all skill and technical levels is essential, and just about every aspect of the nuclear complex is struggling. Five, we have to ensure that the future systems are modular and adaptable because they will be in the inventory for decades and must meet future threats. And finally, don't give up on arms control, strategic stability, transparency initiatives, setting norms, building relationships where possible, and maintaining non-proliferation and threat reduction programs.

A whole-of-government approach is needed to find the new ways to reduce tensions and prevent an all-out arms race, which is unaffordable and hopefully something no one wants. With these six ideas, I conclude my remarks and look forward to your questions. Thank you.

[The prepared statement of Ms. Madelyn Creedon follows:]

PREPARED STATEMENT BY MADELYN CREEDON

Good morning, Chairman Reed, Senator Inhofe, distinguished Members of the Committee, it is always an honor to appear before the Senate Committee on Armed Services, particularly in the company of such distinguished panelists

Thank you for the invitation and the opportunity to discuss the future of United States strategic relationships with Russia and China, the United States nuclear modernization programs, how these programs will enable the United States to meet future deterrence requirements, the future of arms control post New START, and how China's rise can be taken into consideration in future arms control agreements.

These are important, complex topics that should be discussed more openly and more frequently.

To start, I want to be clear that today I share with you my own personal thoughts and do not represent or speak on behalf of any organization or entity.

The world today is more dangerous, more chaotic, and more uncertain than any time since the end of the Cold War. Russian President Putin's distorted version of Russian history and his aggressive, unprovoked attack on Ukraine, has resulted in a previously unthinkable land war in Europe.

A global pandemic from which we are slowly emerging, and which killed 1 in every 500 people, has called into question the degree of reliance previously placed on the global supply chain.

The combined aftereffects of COVID 19 and Russia's invasion of Ukraine have generated inflationary rates not seen since the 1980s.

The United States now finds itself in what can only be described as a 3 peer or near peer, multipolar environment, complicated by North Korea. Overlay the regional competition of India and Pakistan, their nuclear arsenals and their respective complex relationships with Russia and China, and the chance of nuclear use is high.

The doomsday clock tool is now set at 100 seconds to midnight; In contrast, in 1991 at the end of the Cold War the clock setting was 17 minutes to midnight.

We live in a world that depending on your point of view, is either on the cusp of a new arms race or already in one. A world in which norms are being flaunted, agreements violated or abrogated, where only one nuclear arms treaty remains in force—the New START. Even New START is challenged, given Russia's recent decision to suspend inspections.

Progress toward the nuclear disarmament goals of the treaty that underpins efforts to prevent the spread of nuclear weapons—the Treaty on the Nonproliferation of Nuclear Weapons has reversed.

President Biden has said he is ready to “expeditiously” negotiate a framework to replace New START, which expires in 2026, even as bilateral talks on strategic stability have stopped. Is Russia even interested in further discussions? China has shown little to no interest in any arms control-like discussions.

Russia and China engaged in significant military modernization over the last 15 years, and both have expanded dramatically the size and variety of their conventional capabilities and nuclear arsenals.

Russia has developed a wide range of nonstrategic, dual capable and novel nuclear systems in addition to the mostly complete modernization of its strategic nuclear forces, including the SARMAT, a new, MIRV ICBM.

Russia also invested substantial sums in modernizing its conventional and non-kinetic systems as well as its cyber, space and counter space weapons. Recall that Russia tested a kinetic ASAT weapon in November of last year, generating thousands of pieces of space debris possibly putting the international space station at risk.

The unprovoked invasion of Ukraine has been a real-life test of Russia's conventional modernization program. Consumption of what are now seen as underperforming conventional capabilities may well bring increased reliance on nuclear capabilities, and greater instability in the future.

China has been focused on growing and improving its significant conventional, space and cyber capabilities, including the recent test of a fractional orbital bombardment system that ended with a hypersonic glide vehicle impacting a target.

Now China is amid a surprisingly rapid expansion of its nuclear capabilities including a true nuclear triad. China has thousands of missiles of all ranges and is expanding its dual use capabilities. Although estimates vary, China is projected to have between 1000 and 1500 nuclear weapons by 2030.

Russia of course is the near-term nuclear threat but over the longer-term China will pose the greatest threat to the United States. Beijing has a stated goal of being a world class military power by 2049 and is employing a whole-of-government approach to exert its influence globally.

North Korea is also increasing its nuclear saber-rattling via a new nuclear policy law reinforcing its commitment to never give up nuclear weapons, clearly stating its preemptive nuclear use policy, and declaring that nuclear weapons would be used if the regime leadership was threatened. This nuclear policy law is yet another DPRK mechanism to seek acceptance and recognition of its status as a nuclear weapons state.

While none of this is new news, the timing of the law, and the possibility of an underground nuclear test, during increased nuclear tensions with Russia, is unfortunate.

The United States has also embarked on a challenging nuclear modernization program.

As you well know, the United States modernization program covers all legs—sea, air, and land—of the nuclear triad, the NC3 system, as well as the continued life extension and now development of new nuclear weapons based on United States testing pedigrees.

There is little to no margin in any of these programs.

Moreover, much of the necessary infrastructure is old, there are continued supply chain issues, significant workforce challenges and the industrial capacity is limited.

Looking ahead, inflation could well delay progress in the modernization programs. Unless the modernization funding at least keeps pace with inflation, there is a real probability that the existing systems, which have already been life extended, may not last.

Until the hand off from old to new is finished, maintaining the current systems is essential and must be funded adequately. We shouldn't underestimate how hard this hand-off will be—placing significant demands on people and handling and support equipment.

Infrastructure investments across the enterprise must also continue, including major projects at NNSA such as the Uranium Production Facility (UPF), the Savannah River Pit Production Facility (SRPPF), and new lithium and tritium facilities.

Underpinning all the nuclear enterprise is the scientific and technical expertise that must be sustained, particularly the experimental and computational capabilities at the NNSA.

A question going forward is how to keep the existing modernization program of record threat relevant. At a minimum, the replacement programs and the infrastructure must be substantially more flexible and modular than the systems they replace.

Moreover, the warhead design and manufacturing process must be faster, more efficient, and more linked, and use modern digital approaches and advanced manufacturing techniques, such as additive manufacturing. The whole process from design to manufacture takes too long and costs too much.

Nuclear deterrence remains the ultimate underpinning of deterrence, but integrating deterrence across the whole-of-government, engaging where possible to increase transparency and reduce risks, seeking international norms or agreements if useful, and clearly and openly analyzing and discussing this uncertain and dangerous world are all essential.

Thank you and I look forward to your questions.

Chairman REED. Thank you very much. Ms. Gottemoeller.

**STATEMENT OF ROSE GOTTEMOELLER, STEVEN C. HAZY LECTURER, STANFORD UNIVERSITY FREEMAN SPOGLI INSTITUTE FOR INTERNATIONAL STUDIES AND CENTER FOR INTERNATIONAL SECURITY AND COOPERATION**

Ms. GOTTEMOELLER. Thank you. Thank you, Mr. Chairman. And good morning to you, to Ranking Member, Mr. Inhofe, and to the distinguished members of the committee. I am delighted to be here today. It is very much my honor to appear. You have asked me to comment on the future of arms control, in particular my role on arms control agreements in the context of a possible New START follow on, as well as how China's rise will be taken into account for any future arms control agreements beyond New START.

I am pleased to do so, but I do want to underscore that I agree with my colleague, Madelyn Creedon, in each of the six points that she has just laid out. I think they are an excellent roadmap for how we need to proceed, and I particularly underscore her emphasis on all the necessary points with regard to nuclear modernization.

So I am going to abbreviate my prepared remarks in the interest of time, but I do ask that they be placed on the record.

Chairman REED. Without objection.

Ms. GOTTEMOELLER. Thank you, sir. Now, turning to my points, I wanted to note that while the Russians are continuing to comply with the New START, the central limits of which is 1,550 warheads and 700 delivery vehicles, that is the missiles and bombers on which they are deployed, then this will be a significant advantage to the success of the United States nuclear modernization.

Of course, we must watch carefully for any sign of Russian non-compliance with the treaty. If they continue to comply, the treaty

gives the United States a significant level of predictability about the size and composition of the Russian strategic nuclear forces.

Therefore, we will enjoy a somewhat stable and predictable environment in which to carry out our own nuclear modernization. And I repeat, it is an urgently needed one. I underscore every point that Madelyn Creedon has made in that regard.

My concern is rooted in the fact that the Russian Federation has been embarked on a nuclear modernization for over a decade. They have hot production lines for both their missiles and their warheads.

In my view, if suddenly released from New START limits, they could easily outrun us in missiles and warhead production because we are just at the beginning of rebuilding our own missile and warhead production capacity.

This fact is the important reason to seek a follow on to the New START, which expires in February 2026. At that time, we will still be rebuilding our production capacity and be in the midst of our nuclear modernization program. A predictable and stable nuclear environment with the Russians will continue to be vital to its success.

As for the Chinese, like others, I am greatly concerned about their nuclear modernization and the opacity with which they are conducting it. They clearly seem to be moving away from their dependance on second strike retaliation as a core tenet of their nuclear doctrine.

However, we do not yet know exactly where they are planning to go. Are they rushing to parity with the United States or is something else afoot? Our most important objective with the Chinese must be to influence that direction of travel. Therefore, we should engage as early and as frequently as we can in talks, both to clear up the opacity surrounding their nuclear forces and to convince them of the value of nuclear restraint.

To be honest, I am confident that we can respond, if we must, to a Chinese nuclear build up. The competition that concerns me more is in the arena of high technology, artificial intelligence, biotechnology, quantum computing, and other areas. If the Chinese outrun us in that arena, then we will be left in the dust, I am concerned, in the coming decade.

In sum, the United States should not be the one to launch a nuclear arms race, but it must be ready to respond to others who do. This point relates not only to the continued strength and viability of our nuclear deterrent, but also to our ability to compete successfully in technology and innovation in the century to come. The last thing that the United States needs as it is trying to prevail in new technologies is a nuclear arms race. One final point, Mr. Chairman, that does not appear in my testimony, I am horrified this morning at the news of Russia's dangerous strike at the nuclear power plant in Southern Ukraine, but I am not surprised. They have been writing of such targets in their military journals for years. But this matter gets at the question of how can we negotiate with such people? My answer comes down to the point that we can't always choose our negotiating partners. We must look to our own national security interest. In my view, it is squarely in the national security interest of the United States to negotiate constraints and restraints

on nuclear weapons, and we should continue to do so, both with the Russians and now in the future with the Chinese.

Thank you for your attention. I look forward to your questions. [The prepared statement of Ms. Gottemoeller follows:]

PREPARED STATEMENT BY ROSE GOTTEMOELLER

Good morning, Chairman Reed, Ranking Member Mr. Inhofe, and Committee Members, it is my honor to appear before the Senate Armed Services Committee today and I thank you for the invitation. You have asked me to comment on the future of arms control; in particular, my views on arms control agreements in the context of a possible post New START world with Russia, as well as how China's rise will be taken into account for any future arms control agreements beyond New START. I am happy to comment on these matters, as well as any other particular issues that you wish to raise with me. I will abbreviate my prepared remarks, however, in the interest of time, and ask, with your permission, that they be placed in full on the record.

As the Trump administration debated whether to extend New START in November 2019, I argued that the success of our United States nuclear modernization depended on the Treaty<sup>1</sup>. The Russians had already completed over a decade of their own nuclear modernization program, and continued to build missiles, including several concerning new types<sup>2</sup>. By extending New START, I underscored, we could hold the Russians to the central limits of the Treaty—1,550 warheads and the 700 delivery vehicles (missiles and bombers) on which they are deployed.

Of course, we would have to watch carefully for any sign of Russian non-compliance with the Treaty. If they continued to comply, the Treaty would give the United States a significant level of predictability about the status and size of the Russian strategic nuclear forces. Therefore, we would be able to enjoy a stable and predictable environment in which to carry out our own urgently needed nuclear modernization.

At the time, one of the concerns I had was that the Russian nuclear modernization already well underway had given the Russians hot production lines for both their missile and their warheads. Russian missile production and warhead manufacturing were up and running at high capacity, having been modernized to enable the Russian triad modernization. New machine tools had been acquired for missile production plants and warhead production facilities had been updated.

By contrast, the United States, at the beginning of its nuclear triad modernization, was scrambling to find missile and warhead pit production capacity. The U.S. had significant work to do before it could begin the active production of new intercontinental ballistic missiles (ICBMs). Furthermore, warhead pit production required new facilities that would take years to build.

In this situation, I was concerned that if the New START suddenly went away, then the Russian Federation could quickly outrun the United States in deployed nuclear warheads. It could immediately upload more warheads on its existing missiles, and it could quickly produce more missiles capable of carrying more warheads.

In fact, this scenario was beginning to take shape with the emergence of the SARMAT heavy ICBM. This is a modern version of the SS-18 missile first deployed in the 1970s, which was capable of carrying over ten warheads per missile. As long as the SARMAT fell under the limits of the New START, the Russians would be constrained from deploying too many of them and from loading them with too many warheads. The Russians have indicated that they consider the SARMAT to be an ICBM that by definition falls under the limits of the Treaty.

Another concerning development in 2019 was the emergence of a Chinese nuclear modernization program. In the 50 years since the United States and the Soviet Union, later Russia, had been negotiating about bilateral nuclear restraint, the Chinese had never been part of the process. They had expressed restraint through a national no-first-use policy and dependence on a second-strike retaliatory posture, keeping their nuclear arsenal small.

But their effort to acquire a nuclear triad during their modernization process, adding strategic strike submarines and long-range bombers to their ICBM force, seemed to augur a major shift in their nuclear policy and doctrine. Perhaps the Chi-

<sup>1</sup><https://www.nytimes.com/2019/11/08/opinion/dont-let-the-new-start-treaty-lapse.html>

<sup>2</sup><https://www.atlanticcouncil.org/in-depth-research-reports/issue-brief/russias-exotic-nuclear-weapons-and-implications-for-the-united-states-and-nato/>. The heavy ICBM SARMAT and hypersonic glide vehicle AVANGARD would fall under the limits of the New START once deployed.

nese had even begun striving for nuclear parity with the United States and Russia, which would mean a big build-up in their nuclear forces, including the number of deployed nuclear warheads.

In the four years since 2019, nothing has happened to assuage my concerns. In fact, just the opposite has occurred: The Russian Federation is still capable of producing new nuclear warheads and missiles, but now it is also engaged in a bloody war with Ukraine of its own making. Its leading figures, especially President Vladimir Putin, have engaged in egregious nuclear saber-rattling that has been unheard of since the Cuban Missile Crisis, sixty years ago this October. Russia is behaving like a big nuclear pariah state.

My concerns about China also have deepened, with the discovery of an estimated 300 ICBM siloes dug in the desert north and west of Beijing and continued emphasis on nuclear modernization. These signs of its nuclear ambitions are very worrisome—even more so because China has not shared information about its modernization program. Its nuclear intentions remain opaque at a time when its conventional deployments in air and sea have become more active and its threats of military action—especially against Taiwan—more bellicose.

At this moment of crisis in Europe and the Indo-Pacific, neither Russia nor China seems much invested in nuclear stability and restraint. It is a dangerous time, but one that argues strongly for carrying forward a careful but intensive modernization of our U.S. nuclear weapon systems. As President Barack Obama first said in his Prague speech in April 2009, as long as nuclear weapons exist, the United States must maintain a safe, secure, and effective nuclear arsenal.

The modernization program for the nuclear forces of the United States is moving into a more active phase, with steadier funding. I know that this committee keeps a keen eye on the budget

for nuclear modernization, and I thank you for it. Decisions are finally being made about building up production capacity for both missiles and warhead pits. Replacing the submarines, intercontinental ballistic missiles, and bombers will take well over a decade, but the process is vital to ensure that the United States remains secure from nuclear attack during a fraught period of global competition.

In particular, the United States must watch China. As noted above, China has gone from a nuclear posture depending on a small force of missiles intended for second-strike retaliation to something else. Still, there is no need to panic. Even if it quintuples its stockpile over the next decade, as some experts are predicting, China's number of warheads will still be well below the numbers in the United States arsenal in 2030.

Washington must remain alert as well to what Russia is doing. The country is a highly capable and experienced nuclear power with a leader, Vladimir Putin, whose belligerence is breathtaking. His nuclear threats are unlike anything seen in the over seven decades since nuclear weapons were last used to attack Hiroshima and Nagasaki at the close of World War II.

But a modernized U.S. nuclear force posture will help keep these threats in check, ensuring a strong deterrent, one in which Washington can be confident. The fact that New START continues in place ensures that the United States has a predictable and stable environment in which to carry forward its nuclear modernization. The Russians cannot outrun us by quickly deploying more missiles and warheads as long as the Treaty remains in force. The fact that our nuclear modernization will be far from finished when the Treaty does go out of force in February 2026 is the most important reason, in my view, to work hard to replace New START.

People often ask me how we can bear to negotiate with Russians when their regime is perpetrating a bloody and needless war in Ukraine. My answer is in three parts. First, we cannot always choose our negotiating partners. Hostage negotiators know this: they must deal with dreadful terrorists or criminals to secure the release of innocent victims. If it is in our interest to negotiate, then we should be ready to do so.

Which leads to my second point: it is squarely in our national security interest to negotiate a follow-on to New START. As I noted above, a new treaty will ensure that we have a stable and predictable environment in which to carry forward our nuclear modernization and complete it in the 2030s.

Which leads, finally, to my third point: a completed nuclear force posture modernization will ensure that we have the industrial base in place should others choose to launch a nuclear arms race. Today, we are working hard to ensure that we have adequate production capacity to build new ballistic missiles and warhead pits. We are not finished with that process, however, and new production facilities for some components of the nuclear force posture will only fall into place later in this decade or into the next. Therefore, it is also in our national security interest

to sustain legally binding reciprocal limits on the nuclear forces of Russia and the United States. Put most bluntly, we are not ready for a nuclear arms race.

China is well below the New START limits today, but if they try to build up to 700 delivery vehicles and 1,550 deployed warheads, Washington will see it coming with enough time to respond. The United States, in other words, will have sufficient strategic warning of a Chinese sprint to parity.

In the meantime, our immediate objective with China should be to seek greater understanding of what they are expecting to achieve with their nuclear modernization. We need to understand why they are building so many ICBM silos in their western regions: is it to play a shell game, as the USSR did in the 1950s and 1960s? Or is it to challenge the United States to a peer nuclear competition?

Indeed, we need reciprocal understanding, since the Chinese no doubt have their own concerns about the United States nuclear modernization program. If we can launch into a balanced discussion that moves beyond the formulaic to produce mutual predictability, then we will have achieved significant gains in confidence in both countries. Of course, we are nowhere near that state of mutual confidence and understanding today, thus we need to keep a sharp eye on developments in the Chinese nuclear force posture.

Secure on the nuclear modernization front, the United States must renew its attention to the technological revolution. China's intention is to dominate the new technology space<sup>3</sup>. It has the clear goal of being the world leader in artificial intelligence (AI) by 2030, and it is putting substantial resources into achieving that objective. Beijing has already put AI to work in tightening the security bubble around China's society and economy, gaining an enormous amount of experience with the technology in the process. If the United States is not careful, China will outrun the United States not on the nuclear front, but in AI innovation, leading to a dangerous gap in military capabilities. And AI is only one arena where the Chinese are seeking dominance. Beijing also has biotechnology, quantum computing, and other sectors in its sights.

Choosing to focus on this technological competition is not easy at a time when the Russian Federation is pounding Ukraine in an unprovoked and unwarranted military invasion, China is menacing Taiwan, and both are modernizing their nuclear forces. I strongly believe, however, that the future security of the United States as a whole depends on our ability to stay in the technology race, to compete, and to succeed.

In sum, the United States should not be the one to launch a nuclear arms race, but it must be ready to respond immediately to others who do. This point relates not only to the continued strength and viability of our nuclear deterrent, but also to our ability to compete successfully in technology and innovation. The last thing that the United States needs, as it is trying to prevail in new technologies, is a nuclear arms race.

The wisest choice for Washington, then, is to modernize its nuclear force posture as planned while putting its main emphasis on developing and acquiring new technologies for military applications. If we are forced to enter into a nuclear arms race, then we will be sidetracked in a direction that is not in the U.S. national security interest. If we must engage in a nuclear arms race, we will, but we should do everything that we can to avoid it.

As I close, I would like to make one final point. I am horrified at the way in which Russia is perpetrating dangerous strikes near nuclear power plants—at Zaporizhzhia, but also at a nuclear power plant in southern Ukraine, far away from the front lines of fighting. I am horrified but not surprised. Russian military experts have been writing of such targets in their military journals for years. But these attacks naturally lead to the question: how can we negotiate with such people?

My answer comes down to the point that we cannot always choose our negotiating partners—we must instead look to our national interests. It is squarely in the national security interest of the United States to constrain Russian nuclear weapons, and a proven way to do so is at the negotiating table.

Chairman Reed, Ranking Member Mr. Inhofe, distinguished Members of the Committee, thank you for your attention to my remarks and I look forward to your questions.

**Chairman REED.** Thank you very much. Let me now recognize Ambassador Edelman.

<sup>3</sup>For my views on this matter, see <https://www.foreignaffairs.com/articles/russia-fsu/2022-03-09/how-stop-new-nuclear-arms-race>.

**STATEMENT OF ERIC S. EDELMAN, COUNSELOR, CENTER FOR STRATEGIC AND BUDGETARY ASSESSMENTS, DIRECTOR, UNITED STATES INSTITUTE OF PEACE**

Mr. EDELMAN. Thank you, Chairman Reed and Ranking Member Inhofe, Members of the Committee. I very much appreciate the invitation to appear before you today on this distinguished panel to talk about the challenges that the United States faces in continuing to deter nuclear war and preserving the tradition of nonuse of nuclear weapons that has prevailed globally since 1945.

In deference to time and the fact that my colleagues and you, Mr. Chairman, and Senator Inhofe, have already addressed many of the challenges that we face that are addressed in the joint statement that my colleague Frank Miller and I submitted to the committee, I would ask that you include that in the—

Chairman REED. Without objection.

Mr. EDELMAN.—record of the hearing. And I am just going to limit my comments really to emphasizing one of our preliminary conclusions that Frank, and I reached, that echoes very much what my colleague on this panel, Madelyn Creedon, has said, which is the importance of moving forward with the modernization of our nuclear triad.

This is something that the Senate, in its wisdom, when it ratified the New START in 2010, called for. And it is even more important today in light of the fact, Mr. Chairman, that you and Senator Inhofe and my two predecessors on this panel have adverted to.

I would like to make the point that we frequently hear that the modernization of U.S. nuclear forces is either triggering or is participating in an arms race, with the notion that it is an action, reaction parallel effort on both sides, and that U.S. efforts to modernize will only make things worse.

In fact, the historical record I think is pretty clear that although there were elements of arms racing in the arms competition between the United States and the Soviet Union in the Cold War, by and large, other factors on both sides drove the development of the nuclear forces that each side developed.

And rather than the sort of image of apes on a treadmill that is sometimes used to depict that, I think former Secretary of Defense, the late Harold Brown in the Carter administration captured it best when he said, when we build, the Soviets build, when we stop building, they keep building. And I think that very much describes the situation we find ourselves in today.

The United States has actually been quite slow to modernize its nuclear triad. We have only really begun in earnest in the last few years, in the face of this very, very dramatic buildup that we have seen on the other sides. And it is absolutely imperative in order to sustain deterrence, that we maintain a force that is flexible, survivable, responsive, and has the range. And today, as Madelyn suggested, our margin for error—because we have essentially one program to modernize each element of our triad, as opposed to the multiple programs that our adversaries are fielding for different elements of their triad, we have very, very little margin for error.

So with that, I would conclude my oral comments, and I look forward very much to engaging with you and the other members of the committee.

Chairman REED. Thank you, Ambassador. Mr. Miller, please.

**STATEMENT OF FRANKLIN MILLER, PRINCIPAL, THE SCOWCROFT GROUP**

Mr. MILLER. Thank you, Chairman Reed, and Ranking Member Inhofe, and Members of this Committee. It is a pleasure and an honor to appear before you again. And I should say that the views expressed here this morning are my own, and they don't represent those of any organization with which I am affiliated.

As you have noted, sir, we are in a unique and unprecedented time. We need to deter two nuclear peer potential enemies. And Professor Bracken notwithstanding, and I testified alongside him at that hearing, we do know how deterrence works. The United States needs to hold at risk what potential enemy leaders value most. Often we are tempted to assume Xi and Putin think as we do. But as the Scowcroft Commission noted almost 40 years ago, and I quote, "deterrence is not and cannot be bluffed. In order for deterrence to be effective, we must not merely have weapons, we must be perceived to be able and prepared, if necessary, to use them effectively against the key elements of an enemy's power. Deterrence is not an abstract notion amenable to simple quantification. Still less is it a mirror of what would deter ourselves. Deterrence is the set of beliefs in the minds of the enemy leaders, given their own values and attitudes about our capabilities and our will. It requires us to determine as best we can what would deter them from considering aggression, even in a crisis, not to determine what would deter us." Ambassador Edelman and I have stated in our written submission that we believe the United States needs to be able to deter both China and Russia simultaneously. Dictators can agree secretly to support one another and spring that on an unknowing world at short notice. The Nazi-Soviet pact of 1939 is the prime example.

This is something we cannot ignore in our planning, even if we believe the event is unlikely. The forces we currently deploy under the New START will not be adequate for this dual deterrence task. The 1,550 weapons limit was agreed to in 2010, a period in time when Russia was a competitor, not a potential enemy ravaging another European State and threatening to use nuclear weapons on the battlefield, and China was not even a real part of the discussion.

As the Commission knows full well, the world is very different now. Our goal must be a secure and effective deterrent, which is sized appropriately for the two nuclear peer task. There is no replacement for such a capability. Arms control treaties, if they provide for a secure and effective deterrent, can help mitigate arms competition, but only if those treaties are observed.

They are not a substitute, however, for the deterrent. And the prospects for arms control in the near future are dim. Russia is wholly untrustworthy, and China is scornful. The Putin government, as a matter of policy, has systematically violated either covertly or overtly all of the arms control agreements it is bound by save for one. And the Chinese Government, believing that transparency and verification are signs of weakness, refuses to enter into arms control talks.

So I repeat, there is no substitute for capable and adequate deterrent, which in the current and projected future environment requires an ability simultaneously to deter both Moscow and Beijing from attacking ourselves or our allies. Our current modernization program is absolutely necessary.

I believe, however, that in the out years it may likely require that the SSBN [submarine, ballistic, nuclear] and air breathing programs be augmented. And as Ambassador Edelman and I wrote in our written submission, I believe that a nuclear sea launched cruise missile is important both for regional deterrence and for reassuring vital U.S. allies.

I look forward to answering and expanding on any of these thoughts during your questions. Thank you.

[The joint prepared statement of Mr. Eric S. Edelman and Mr. Franklin C. Miller follows:]

JOINT PREPARED STATEMENT BY ERIC S. EDELMAN AND FRANKLIN C. MILLER

#### INTRODUCTION

Chairman Reed, Ranking member Inhofe, members of the Committee, thank you for the opportunity to address the challenges that the United States faces in continuing to deter nuclear war and preserving the tradition of non-use of nuclear weapons that has prevailed globally since 1945. Today the United States faces the most complex configuration of questions about nuclear weapons than it has ever faced since the onset of the nuclear age. Some of these developments are the result of quantitative and qualitative changes in the composition of the nuclear arsenals of the major nuclear weapons states, some from the aspirations of new or prospective nuclear powers, and some arise from the advent of new technologies whose interaction with nuclear weapons may create new uncertainties about strategic stability.

#### DETERRENCE AND THE NEW GLOBAL ENVIRONMENT: WHAT'S NEW?

The most important new factor is the potential that the U.S. will have to deal with two near nuclear peers simultaneously. For the 40 years of the Cold War the United States was preoccupied with the threats represented by Soviet nuclear forces. Even after the People's Republic of China tested a nuclear weapon in 1964 the dangers presented by its nuclear forces were mitigated by what most observers concluded was China's reliance on a minimum nuclear deterrence strategy and then later by the Sino-Soviet split and the ability of United States diplomacy to seek better relations with each of the communist power than they had with one another. Today, as Chairman Reed noted last week "We need to seriously consider that we are entering a new, trilateral nuclear competition era" in which the United States and its allies must "deter not one, but two near-peer nuclear adversaries," a challenge, we would note that it is unprecedented.<sup>1</sup>

The PRC arsenal which experts had estimated to consist of roughly 200 warheads for many years has expanded significantly. Today China disposes of roughly 350 warheads—but that arsenal is expanding rapidly. The most recent report of the Department of Defense on Chinese military power suggests that by 2027 China will have some 700 warheads enroute to nearly 1000 by 2030. Although projections of the growth of nuclear arsenals are always subject to uncertainty commercially available satellite imagery of missile silos being excavated in northern China as well as the PRC's efforts to expand plutonium production certainly suggest that these projects are well rooted in reality. It is no wonder that STRATCOM commander Charles Richards described the growth of China's arsenal as "breathtaking" and former Vice Chairman of the Joint Chiefs of Staff General Hyten called it "unprece-

<sup>1</sup>Karoun Demirjian, "U.S. General Warns of China's Expanding Nuclear Arsenal," Washington Post, September 15, 2022, <https://www.washingtonpost.com/national-security/2022/09/15/china-nuclear-weapons/>; Hal Brands, "U.S. Isn't Ready for Nuclear Rivalry with Russia and China," Bloomberg Opinion, January 30, 2022, <https://www.bloomberg.com/opinion/articles/2022-01-30/u-s-isn-t-prepared-for-a-nuclear-war-with-russia-and-china?leadSource=uverify%20wall>

mented” and suggested that prudence required the United States to plan against this growing threat.<sup>2</sup>

China’s quantitative and qualitative nuclear modernization entails not just the growing size of its intercontinental ballistic missile threat but the development of a full nuclear triad on a timeline that is much earlier than most observers anticipated and capabilities that could call “strategic stability” into question. The key developments include the PLA Air Force’s H6N air refuelable bomber armed with air launched ballistic missiles that are likely dual capable as well as the prospective development of the H20 long range strategic bomber. In addition, the deployment of the type 094 SSBNs armed with JL-2 SLBMs provide the PRC with its “first credible, sea-based nuclear deterrent.” Finally, the test last year of what seems to be a Fractional Orbital Bombardments system raises the prospect of a short or no-warning attack—an extremely destabilizing development.<sup>3</sup>

In addition to the buildup of its strategic nuclear forces the PRC is also augmenting its theater nuclear capabilities with the DF-26 dual capable intermediate range ballistic missile System (IRBM) which the DOD China Military Power report notes is China’s “first nuclear capable missile system that can conduct precision strikes, and therefore, is the most likely weapon system to field a lower-yield warhead in the near term.” Chinese writings suggest that “the most important type of future regional wars will be conventional conflicts under conditions of nuclear deterrence, deterrence and actual war-fighting will exist at the same time, and their function will be mutually complementary.” In light of the recent Russian invasion of Ukraine and accompanying threats to use so-called “tactical” nuclear weapons we need to consider whether the PRC will see its full suite of nuclear weapons as providing it with a powerful counter-intervention capability to deter the United States and its allies from defending Taiwan in a crisis. ballistic missile System (IRBM) which the DOD China Military Power report notes is China’s “first nuclear capable missile system that can conduct precision strikes , and therefore, is the most likely weapon system to field a lower-yield warhead in the near term.” Chinese writings suggest that “the most important type of future regional wars will be conventional conflicts under conditions of nuclear deterrence, deterrence and actual war-fighting will exist at the same time, and their function will be mutually complementary.” In light of the recent Russian invasion of Ukraine and accompanying threats to use so-called “tactical” nuclear weapons we need to consider whether the PRC will see its full suite of nuclear weapons as providing it with a powerful counter-intervention capability to deter the United States and its allies from defending Taiwan in a crisis.<sup>4</sup>

<sup>2</sup>Office of the Secretary of Defense, *Military and Security Developments Involving the Peoples Republic of China 2021*, (Washington, DC: Department of Defense, November, 2021), p. 92; Demetri Sevastoulo, “China’s Nuclear Build-up: One of the Largest Shifts in Geostrategic Power Ever,” *The Financial Times*, November 15, 2021, <https://www.ft.com/content/d7c50283-18c8-4f2e-8731-970d9a547688>; Henry Sokolski, ed. *China’s Civil Nuclear Sector: Plowshares to Swords*, Occasional Paper 2102, Nonproliferation Policy Education Center, March 2021; John Grady, “Hyten: China’s ‘Unprecedented Nuclear Modernization’ Chief Concern,” *USNI News*, September 14, 2021 <https://news.usni.org/2021/09/14/hyten-chinas-unprecedented-nuclear-modernization-chief-concern>.

<sup>3</sup>OSD, *Military and Security Developments Involving the People’s Republic of China, 2021*, p. 49; SIPRI Yearbook 2022: *Armaments, Disarmament and International Security*, (Oxford, Oxford University Press, 2022) pp. 380–390.

<sup>4</sup>OSD, *Military and Security Developments Involving the People’s Republic of China, 2021*, p. 49; SIPRI Yearbook 2022, p. 93; Yu Xijun, ed, *The Science of Second Artillery Campaigns*, quoted in Jennifer Bradley, “China’s Nuclear Modernization: Ways Beijing Could Adapt its Nuclear Policy,” *National Institute for Public Policy*, Occasional Paper, 2:7, July 2022, pp. 27–28; Evan Montgomery and Toshi Yoshihara, “Leaderless, Cut Off, and Alone: The Risks to Taiwan in the Wake of Ukraine,” *War on the Rocks*, April 5, 2022 <https://warontherocks.com/2022/04/leaderless-cut-off-and-alone-the-risks-to-taiwan-in-the-wake-of-ukraine/> and Evan Braden Montgomery and Toshi Yoshihara, “China’s Post-Minimalist Challenge: Implications for U.S. Assurance and Deterrence,” *forthcoming*.

Russia, of course, remains today the only existential challenge to the United States because of the size of its nuclear arsenal. The extensive modernization of Russian nuclear forces over the past decade and a half, as well as the promiscuous Russian nuclear sabre-rattling (both before and after the February 24 unprovoked, premeditated Russian invasion of Ukraine) represent an especially important challenge for United States nuclear policymaking. Although the United States has argued that MIRVs are destabilizing, and we have de-MIRVed our own ICBM force Russia continues to modernize its forces with MIRVed missiles. New variants (both road mobile and silo-based) of the TOPOL-M missile are being deployed. The Russians are about halfway through the modernization of their SSBN fleet and the air leg of their nuclear triad features upgraded TU-95 and TU-160 bombers armed with the new KH-102 nuclear armed cruise missile that will serve as a bridge to the future PAK-DA next generation bomber that is expected to enter into production by the end of the decade.<sup>5</sup>

Russia, of course, also maintains a large stockpile of theater nuclear weapons—perhaps 10 times the number of similar weapons in the United States inventory. Russian theater nuclear forces are unfinished business of the Cold War—a fact recognized by the Senate in its Resolution of Ratification of the New START in 2010 which, as a condition of ratification, insisted that it is the policy of the United States to negotiate an agreement “to address the disparity between the non-strategic (tactical) nuclear weapons stockpiles of the Russian Federation and the United States.” Unfortunately, this disparity remains unaddressed and Russian threats to use such weapons in Ukraine underscores the importance of doing so. States to negotiate an agreement “to address the disparity between the non-strategic (tactical) nuclear weapons stockpiles of the Russian Federation and the United States.” Unfortunately, this disparity remains unaddressed and Russian threats to use such weapons in Ukraine underscores the importance of doing so. States to negotiate an agreement “to address the disparity between the non-strategic (tactical) nuclear weapons stockpiles of the Russian Federation and the United States.” Unfortunately, this disparity remains unaddressed and Russian threats to use such weapons in Ukraine underscores the importance of doing so.<sup>6</sup>

President Putin announced, with great fanfare in 2018, several exotic nuclear weapons including “a new heavy intercontinental ballistic missile (ICBM); a nuclear-armed hypersonic glide vehicle (HGV); a nuclear-armed, air-launched hypersonic missile; a nuclear-powered, nuclear-armed cruise missile; and a nuclear-powered, nuclear-armed submarine drone.” Most of these, like Russia’s theater nuclear weapons are not covered by the New START. The precise purpose of these new weapons remains unclear and some of them seem to reflect the pursuit of capabilities which the U.S. considered but decided not to pursue because they were too dangerous (nuclear powered cruise missiles). Nonetheless, they create additional uncertainty about “strategic stability” and must be addressed if there is to be any follow-on agreement to New START.<sup>7</sup>

The challenge of deterring two near-peer or peer nuclear competitors will require some rethinking about U.S. nuclear posture, declaratory policy, and potentially arms control. It does not, however, mean that we must reinvent the proverbial wheel—a theme to which we will return below.

In addition to the challenge of deterring Russia and China, the United States must also contend with the challenge of the growing DPRK nuclear arsenal whose diversification and sophistication is outstripping what earlier forecasts might have suggested. Open-source estimates suggests that the DPRK possesses 20 to 60 warheads (with the capability of producing roughly 6 warheads a year) although most observers seem to believe the number is closer to the lower than the higher end of the spectrum. That said, North Korea continues to produce fissile material and to diversify its means of delivery by developing ICBMs and SLBMs. Recently the DPRK adopted a new law on nuclear weapons that suggests it has developed an automated launch system that would enable a retaliatory strike even if Kim Jong Un were killed or incapacitated much like the old Soviet Dead Hand or Perimetr system. Recent activity suggesting an imminent nuclear test should serve as a reminder that the scale and scope of the North Korean nuclear effort will remain a persistent challenge for U.S. policymakers. Recent activity suggesting an imminent nuclear test should serve as a reminder that the scale and scope of the

<sup>5</sup> SIPRI Yearbook 2022, pp. 355–368.

<sup>6</sup> SIPRI Yearbook 2022, pp. 365–366; The text of the Resolution of Ratification can be found at <https://2009-2017.state.gov/documents/organization/154123.pdf>

<sup>7</sup> Matthew Kroenig, Mark Massa, Christian Trotti, “Russia’s Exotic Nuclear Weapons and Implications for the United States and NATO,” Atlantic Council, Issue Brief, March 2020 <https://www.atlanticcouncil.org/wp-content/uploads/2020/07/Russias-Exotic-Nuclear-Weapons.pdf>

North Korean nuclear effort will remain a persistent challenge for U.S. policymakers.<sup>8</sup>

Whether or not Iran and the United States ultimately agree on steps to resuscitate the Joint Comprehensive Plan of Agreement (JCPOA) that country's progress enroute to a nuclear weapons capability continues apace. Even if the JCPOA is revived many of the limitations on Iranian enrichment capacity and capability will begin to expire within a few years and all the limits will end in 2030. At that point Iran will be a latent, if not declared, nuclear power. That could well be the death knell of the Nuclear Nonproliferation Treaty and the non-proliferation order it created—arguably the most significant accomplishment of arms control and a crucial element of United States grand strategy since 1945. Russia, which has traditionally cooperated with the United States on non-proliferation policy, even in the worst days of the Cold War has recently shown its willingness to subordinate commitment to the NPT order to short-term considerations by blocking consensus at the NPT Review Conference to protest the final document's reference to “concern” about the situation in Ukraine. A more proliferated world will mean even more challenges to nuclear deterrence, notably to the United States but to Moscow and Beijing as well.<sup>9</sup>

The role of new technologies like artificial intelligence, hypersonics, and cyber capabilities may complicate nuclear deterrence in ways we are only beginning to understand. Cyber intrusions into nuclear command and control systems, for instance, could undermine important assumptions that underpin our concepts of nuclear deterrence like assured second-strike retaliatory capability. Although there is a lot of hype about hypersonic weapons (it is good to remember that ICBMs enroute to their targets travel at hypersonic speeds) it is also the case that combined with other technologies—like the Fractional Orbital Bombardment system that China tested in 2021 it could provide nations with a “decapitation” option that would also undermine many assumptions about deterrence and force governments to adopt very risky launch on warning postures. Russia, and now perhaps North Korea, may have incorporated automated launch systems into their nuclear forces. Artificial intelligence may be seen by some as an antidote to decreasing warning times, but it seems highly inadvisable to put our trust in computer systems to decide whether we launch nuclear war today. These kinds of question will require the kind of sustained intellectual effort that we undertook in the Cold War but largely abandoned after 1992.

Finally, as if all of the above challenges were not enough, we must also think through the potential of a combined Russia-China attack scenario. This may seem far-fetched to some but the historical record of alliances of strange bedfellows which emerge at extremely short notice (the Molotov-Ribbentrop Pact provides one example) means that it cannot be excluded and planning against such a threat could prove extremely difficult.

#### WHAT IS OLD BUT STILL RELEVANT?

Facing these daunting challenges some observers and officials have concluded that the lessons of deterrence learned during the Cold War are no longer valid and that new circumstances require a root and branch rethinking of deterrence including the novel challenge of simultaneously deterring two near-peers. Some argue that the United States should move away from the long-term tendency to focus on what potential enemy leaders value rather than counter-value strategies and must accept that extended nuclear deterrence for U.S. allies is unlikely to hold up in the future. Before we dispense with the hard-won intellectual achievements of the Cold War and discard approaches that successfully prevented the kinds of great power con-

<sup>8</sup>David Sanger and William Broad, “How U.S. Intelligence Agencies Underestimated North Korea,” *The New York Times*, January 6, 2018, <https://www.nytimes.com/2018/01/06/world/asia/north-korea-nuclear-missile-intelligence.html>; SIPRI Yearbook 2022, pp. 417–418; Josh Smith, “New North Korea law outlines nuclear arms use, including preemptive strikes,” *Reuters*, September 9, 2022 <https://www.reuters.com/world/asia-pacific/nkorea-passes-law-declaring-itself-nuclear-weapons-state-kcna-2022-09-08/>; Michelle Nichols, “North Korea ‘Paves the Way’ for More Nuclear Tests, UN report says,” *Reuters*, August 4, 2022 <https://www.reuters.com/world/asia-pacific/north-korea-paves-way-more-nuclear-tests-un-report-2022-08-04/>

<sup>9</sup>See the two recent reports by David Albright and his colleagues at the Institute for Science and International Security, [https://isis-online.org/uploads/isis-reports/documents/Analysis\\_of\\_Sept\\_2022\\_IAEA\\_Iran\\_Verification\\_Report\\_Sept\\_12\\_Final.pdf](https://isis-online.org/uploads/isis-reports/documents/Analysis_of_Sept_2022_IAEA_Iran_Verification_Report_Sept_12_Final.pdf); [https://isis-online.org/uploads/isis-reports/documents/The\\_IAEA's\\_Iran\\_NPT\\_Safeguards\\_Report\\_Sept\\_12\\_2022\\_Final.pdf](https://isis-online.org/uploads/isis-reports/documents/The_IAEA's_Iran_NPT_Safeguards_Report_Sept_12_2022_Final.pdf); Francis J. Gavin, “Strategies of Inhibition: U.S. Grand Strategy, the Nuclear Revolution, and Non-Proliferation,” *International Security*, 40:1, pp. 9–46 [https://www.belfercenter.org/sites/default/files/files/publication/004-ISEC\\_a\\_00205-Gavin.pdf](https://www.belfercenter.org/sites/default/files/files/publication/004-ISEC_a_00205-Gavin.pdf); <https://www.state.gov/nuclear-non-proliferation-treaty-remains-strong-despite-russian-obstructionism/>;

flicts that made the first half of the 20th Century the most destructive in human history, we think it is worth reasserting some continuing hardy perennial verities.<sup>10</sup>

First and foremost, it is still the case that deterrence requires holding at risk what potential enemy leaders value. Doing so is very difficult because understanding exactly how foreign policymakers understand the world and reach judgments about it is intrinsically problematic. As Henry Kissinger has noted “deterrence seeks to prevent a given course by making it seem less attractive than all possible alternatives. It therefore ultimately depends on an intangible quality: the state of mind of the potential aggressor.” As a result, the United States must be able to show that even in the worst case we are still capable of inflicting unacceptable damage after having absorbed a surprise first strike. With two near peers this will have unavoidable implications for the size of America’s nuclear force.<sup>11</sup>

American treaty allies still rely heavily on the U.S. nuclear guarantee. The proof of that proposition was recently demonstrated by the universal opposition of our NATO and Asian allies to mooted changes in United States declaratory policy considered as the Biden administration prepared its nuclear posture review. Moreover, undermining extended deterrence remains a clear objective of both Russia and China. As long as the United States hopes to maintain one of its most important comparative strategic advantages in the long-term competition with Moscow and Beijing it must still assure allies that we will defend them against conventional and nuclear aggression. The credible threat of nuclear retaliation against an aggressor will necessarily remain a part of the equation.<sup>12</sup>

#### PRELIMINARY JUDGMENTS

These reflections lead us to some preliminary judgments recognizing that much additional thought must be devoted to understanding the requirements of deterrence under today’s unique conditions.

First, we must proceed with modernization of all three legs of the nuclear triad. This was actually a condition that the United States Senate attached to the resolution of ratification of New START in 2010 and the headlong modernization efforts by our two leading adversaries requires that the U.S. maintain a robust, redundant, survivable, responsive, controllable, visible deterrent force that is capable of penetrating enemy defenses to hold their forces and leadership at risk.

We must avoid a situation in which our retaliatory force can only be used to threaten adversary populations. In order to be able to absorb a first strike and retaliate against an aggressor while also holding in reserve sufficient forces to deter the other near peer may, in the future, require larger numbers of deployed warheads than currently allowed under New START. In the midst of Russia’s ongoing aggression against Ukraine this will undoubtedly be very challenging, and it is hard to be optimistic about the prospects for arms control in a period where Russian nuclear threats hang heavy in the air.<sup>13</sup>

We must be sensitive to both strategic and theater nuclear balances. Russia and China will seek to stress and undermine United States extended nuclear deterrence,

<sup>10</sup> <https://breakingdefense.com/2022/08/the-nuclear-3-body-problem-stratcom-furiously-rewriting-deterrence-theory-in-tri-polar-world/>; Francis J. Gavin, “Time to Rethink America’s Nuclear Strategy: How to Learn the Right Lessons of the Cold War,” *Foreign Affairs*, September 5, 2022 <https://foreignpolicy.com/2021/03/23/its-time-to-fold-americas-nuclear-umbrella/>; Stephen M. Walt, “Time to Fold America’s Nuclear Umbrella Over Its European and Asian Allies,” *Foreign Policy*, March 23, 2021 <https://foreignpolicy.com/2021/03/23/its-time-to-fold-americas-nuclear-umbrella/>; for an effort to capture the achievements of Cold War strategists and explain why practitioners diverged from the late Cold War writings of nuclear strategists see Eric S. Edelman, “Nuclear Strategy in Theory and Practice: The Great Divergence,” in Hal Brands, ed., *The New Makers of Modern Strategy: From the Ancient World to the Digital Age*, (Princeton, NJ: Princeton University Press, 2023) pp. 665–691 forthcoming.

<sup>11</sup> Henry A. Kissinger, *The Necessity of Choice* (New York, NY: Harper Brothers, 1961) p. 12

<sup>12</sup> Keith Payne, “Rethinking Deterrence: How and Why?,” *National Institute for Public Policy, Information Series*, No. 533, September 7, 2022; Demetri Sevastopulo and Henry Foy, “Allies Lobby Biden to Prevent Shift to ‘No First Use’ of Nuclear Arms,” *Financial Times*, October 29, 2021 <https://www.ft.com/content/8b96a60a-759b-4972-ae89-c8f7bb36878e>; Eric Edelman and Franklin Miller, “President Biden, don’t help our adversaries break NATO,” *The Washington Post*, November 4, 2021 <https://www.washingtonpost.com/opinions/2021/11/04/president-biden-dont-help-our-adversaries-break-nato/>

<sup>13</sup> On the case for nuclear modernization—particularly the land-based leg of the Triad see Frank G. Klotz and Alexandra T. Evans, *Modernizing the U.S. Nuclear Triad: The Rationales for a New Intercontinental Ballistic Missile*, (Santa Monica, CA: RAND Corporation, 2022); Mark Gunzinger, Carl T. Rehberg, and Gillian Evans, *Sustaining the U.S. Nuclear Deterrent: The LRSD and GBSD*, (Washington, DC: Center for Strategic and Budgetary Assessments, 2018); Stephen Cimbala and Adam Lowther, “Nuclear Modernization and the Sentinel ICBM,” *Aether: A Journal of Strategic Airpower and Space Power*, 1:2, pp. 57–68;

much as they did in the Cold War by “seeking to de-couple” the defense of the U.S. Homeland from defense of our allies. We cannot allow adversaries to make nuclear threats to deter United States counter-intervention in Europe or Indo-Pacific without the means to answer in kind rather than relying on coercive diplomacy backed by the threat of strategic nuclear forces. It is for that reason that we support the lower yield options developed in the 2018 Nuclear Posture Review and believe it is unfortunate that the Biden administration seems intent on killing the SLCM-N. We would urge the Congress to restore funding for that program whose utility has been attested to by both Chairman Milley and Admiral Richard.

#### CONCLUSION

Nuclear deterrence today faces very real and novel challenges, but that does not mean we need to start from scratch. There is much about what we have learned about deterrence that remains valid. “United States conventional and nuclear capabilities together must provide Russia and China with seamless and overwhelming disincentives to their initiating attacks or engaging in nuclear escalation in the event of conflict.” We must maintain a relentless focus on the survivability of United States second strike nuclear retaliatory forces even if it proves uncomfortable from the point of view of arms control. And we must continue to focus on tailored deterrent strategies for a range of nuclear armed adversaries, Russia, China, (as well as potentially a combined Sino-Russian coordinated strike), North Korea and prospectively Iran. point of view of arms control. And we must continue to focus on tailored deterrent strategies for a range of nuclear armed adversaries, Russia, China, (as well as potentially a combined Sino-Russian coordinated strike), North Korea and prospectively Iran. point of view of arms control. And we must continue to focus on tailored deterrent strategies for a range of nuclear armed adversaries, Russia, China, (as well as potentially a combined Sino-Russian coordinated strike), North Korea and prospectively Iran.<sup>14</sup>

As the Scowcroft Commission noted some 40 years ago:

Deterrence is not, and cannot be bluff. In order for deterrence to be effective we must not merely have weapons, we must be perceived to be able, and prepared, if necessary, to use them effectively against the key elements of [an enemy’s] power. Deterrence is not an abstract notion amenable to simple quantification. Still less is it a mirror of what would deter ourselves. Deterrence is the set of beliefs in the minds of the [enemy] leaders, given their own values and attitudes, about our capabilities and our will. It requires us to determine, as best we can, what would deter them from considering aggression, even in a crisis—not to determine what would deter us.”<sup>15</sup>

Chairman REED. Thank you very much. I thank all the panelists for their excellent testimony. Ms. Gottemoeller, we know China is moving rapidly to become essentially a peer competitor in the nuclear arms race.

How can we engage them? And I think—at least I believe we should try to engage them and Russia in arms control talks and have perhaps an agreement. And what might be the starting point and what might be the endpoint?

Ms. GOTTEMOELLER. Thank you, Mr. Chairman. I would say that with regard to China, my colleague Frank Miller is quite right. Thus far, they have been difficult to engage, there is no question about it. I do find, however, that there is a considerable amount of work that has gone on behind the scenes in China, because I work quite a bit on so-called second track activities where it is clear to me that they are studying the matter, so to say. The key thing is for them to get the political go code from Xi Jinping and from the top Chinese leadership.

<sup>14</sup> Keith Payne, “Rethinking Deterrence,” National Institute for Public Policy, Information Series, No. 533, September 7, 2022, p.6

<sup>15</sup>The Report of the President’s Commission On Strategic Forces, (The Scowcroft Commission) April 1983, pages 2–3 <https://web.mit.edu/chemistry/deutch/policy/1983-ReportPresCommStrategic.pdf>

So I continue to believe that it is necessary to work very hard to engage them. And as I put it in my own remarks, to really understand what is behind that opaque curtain they have draped around their nuclear modernization. I know that they are modernizing. We can see that in their triad structures. And I know they are building up warheads. My argument, sir, is that we have some time to consider this matter. We will have strategic warning if the Chinese decide to sprint to parity. You mentioned yourself, as did Mr. Inhofe, that we expect to see China reach 1,000 warheads about 2030. More or perhaps less, but we don't expect to see them sprint to the level of the approximately 4,000 warheads that the United States has at the moment.

So I think we have some time to watch and to try hard to work with them and to get them to recognize the value of negotiated restraint. So I think that that is the most important point I would say about China.

Chairman REED. Ambassador, your comments on this issue?

Mr. EDELMAN. Chairman Reed, you know, I am somewhat skeptical about the willingness of the People's Republic of China to engage in this kind of discussion with us. And partly because, like my colleague, I broke my pick on this, you know, in the Bush administration.

When President Bush, George W. Bush, met with Hu Jintao, they agreed that there should be a dialog between the then second artillery division and STRATCOM. And despite multiple efforts, including my own, we were never able to get there during the remaining three years of the Bush administration.

I know that in the Obama administration, very serious efforts were undertaken by then Deputy Secretary Jim Steinberg to engage in this kind of discussion, all without result. And there has certainly been no willingness publicly on the part of the Chinese to even entertain the notion of arms control, you know, negotiations.

In fact, they have held those out as something that goes on between the United States and Russia, but not something that they participate in. So, you know, the best I think we can do is to work in the track two domain.

And I would note that in the history of the United States, Soviet arms competition, it took a very, very long time, more than a decade, really, of Pugwash conferences and others to lay the groundwork before we got into serious arms control negotiations with the Soviet Union in the late 1960s. So that would be the best case, in my view.

Chairman REED. Well, but it is an area, I think, we must pursue in terms of the multiple approach towards the threat, not only being—having deterrence, but also talking about it. And maybe it will take 10 years, but those are probably 10 years of worthwhile investment.

Ms. Creedon, you have experience with the National Nuclear Security Administration. You talked about some of their problems. How serious is the challenge NNSA faces in terms of modernization, of keeping up with the effort?

Ms. CREEDON. Thank you, Senator. I think the problems with modernization actually exist across the board. So DOD has then,

NNSA has them. With respect to NNSA specifically, the most significant problem at NNSA really is the infrastructure. A lot of it is very old. Almost all of it has either been replaced or is in the process of being replaced. It is a huge construction effort that is going on and with a lot of delays. The second thing is really people.

The complex is really struggling to attract, retain people, and get good people trained up. So it is significant. Thank you.

Chairman REED. Thank you. Mr. Miller, very quickly, my time is expiring. You have spent years studying the Soviet Union and Russia. Can you comment very briefly about the recent events and how it would affect arms control? Putin has made wild statements about using nuclear weapons or other people have. And just a quick sense of what you feel.

Mr. MILLER. So I believe, Senator, that Putin understands that our retaliatory capability is adequate today to prevent him from attacking ourselves or our NATO allies. I think that we need to continue to modernize our force to be able to do that into the future.

And if there is arms control in the future, somehow it needs to get a handle, as this committee and the Senate said back in 2010, to get our arms around their short range nuclear weapons, which is the one he is threatening to use against Ukraine. But I think the key is to be able to maintain a credible deterrent against him and against Xi Jinping.

Chairman REED. Thank you very much. Senator Inhofe, please.

Senator INHOFE. Thank you, Mr. Chairman. Maybe it is my age, but I enjoyed some of the reflections from the past that we shared this morning. Ambassador Edelman, and when you said when the Soviets build—we build when the Soviets build. When we quit building, the Soviets built. How prophetic that was. Mr. Miller, numerous senior military officers have testified of their support for the continuing the sea launched cruise missile program as a means of offsetting the growth of Russia and China's nuclear arsenals.

And I agree with this support. I would ask you, first of all, do you believe that we should continue this program, and you should be able to continue other enhancements as well. Now, you offered in your opening statement to elaborate a little bit on this subject, and I will give you that chance to do it now.

Mr. MILLER. Thank you, Senator Inhofe. Yes, I agree that a nuclear sea launched cruise missile is important, both to deter Russia and China, each of which have large tactical nuclear arsenals, and to reassure our allies who are faced by those specific tactical nuclear arsenals.

So it is a program that I think is modest, but I think it makes a useful contribution. And I don't think it creates any sort of an arms race potential because we are basically at very low levels there, and both Russia and China have much higher levels.

Senator INHOFE. Yes. And I agree with that excellent statement. This question would be for all witnesses, considering what we know about China's nuclear breakout and Russia's large non-strategic nuclear weapons arsenal, do any of you believe that the United States should not continue modernizing its own forces? I would like to have each one of you respond to that.

Ms. CREEDON. Senator Inhofe, I completely agree. The U.S. must continue its modernization programs of all three legs of the triad.

Ms. GOTTEMOELLER. I do agree that the United States must continue its modernization programs at pace across the program of record.

Mr. EDELMAN. Senator Inhofe, as I said in my opening oral remarks, I think it is imperative that we do so to sustain deterrence into the future.

Senator INHOFE. Excellent.

Mr. MILLER. Senator, I absolutely agree. And as I said in my remarks, I think in the out years, in the 2030s, we may need to augment that program by buying more SSBNs and more long range standoff weapons, and I am happy to elaborate on that at some point if you want.

Senator INHOFE. Thank you very much. And I appreciate the specifics by each one of you. Thank you, Mr. Chairman.

Chairman REED. Thank you very much, Senator Inhofe. Senator Shaheen, please.

Senator SHAHEEN. Thank you all for being here. Just to follow up on Senator Inhofe's question about the importance of modernizing in order to hopefully provide the deterrence that we need as we look at the capabilities of Russia and China. What do each of you consider to be the biggest threat to modernization? I will ask you to begin, Ms. Creedon.

Ms. CREEDON. Probably two things. The first is money, and the second is a sustained commitment on the part of everybody, the administrations, this one, successive ones, as well as Congress, and also the commitment of the American people to truly be able to sustain a deterrent.

Senator SHAHEEN. And do you believe that that commitment is there now?

Ms. CREEDON. I do. And it has been there for a couple of years. I continue to think that at times it is more fragile than others. Right now, I think it is quite strong. But this is a very long term program. And the handoff between the old and the new isn't really going to happen for another 10 years. And then we have got a very long period of time where it is very difficult to handoff.

Senator SHAHEEN. Ms. Gottemoeller, do you have any difference in your thinking about what the biggest threat is?

Ms. GOTTEMOELLER. Well, again, Senator Shaheen, I agree with my colleague Madelyn Creedon with regard to the long term commitment of the U.S. public and also of our Government from one administration to the next, very much, so when it comes down to ensuring a clear budgetary path, as I said, maintain our intense modernization at pace so we don't have dips and ups and downs and delays.

But the other thing I would worry about, and I mentioned it in my remarks, is our industrial capacity. We have not had ability, I would say, to really turn out missiles and warheads now for many years in a steady pace.

And so we need to rebuild our industrial capacity to be able to do so. And I support the efforts that are underway to improve our industrial facilities for both missiles and warheads.

Senator SHAHEEN. Thank you. Do either of you have anything different than those responses?

Mr. EDELMAN. Senator Sheehan, I don't have anything different. I agree with what both Madelyn and Rose have said, but I would add that I think the education of the American public about these issues, which I think is extremely important since we really haven't talked about them very much as a Nation, in all honesty, since 1992, since the end of the Cold War.

And in that regard, I think I commend the committee on holding this hearing, because I think at least that helps begin a process, but it has got to continue. We have to talk about this more to the public so that they appreciate what is at risk.

Senator SHAHEEN. Mr. Miller.

Mr. MILLER. Let me agree with my colleagues but let me point out also that the industrial base includes the private sector. And I think that in the area of shipbuilding, submarine building, building missiles, we have lost a great deal of talent and we need to worry about that, particularly about recruiting people through the STEM [science, technology, engineering and mathematics] programs, so that we have enough welders and enough engineers and enough designers to carry these programs through into the future.

Senator SHAHEEN. Well, thank you. I think that is a very important point. And I would just argue before this committee that one of the things we need to do is to reauthorize the Government programs and encourage innovation and encourage the private sector to do the things that we need. Programs like the SBIR [Small Business Innovation Research] and STTR [Small Business Technology Transfer] Program.

But I want to go back to you, Ms. Gottmoeller, as somebody who has spent a fair amount of time at NATO. Is there a role for NATO as we look at the nuclear deterrence, the need to try and bring China into some of these discussions. Do we think there is anything that NATO can do there to be helpful?

Ms. GOTTEMOELLER. That is a very interesting question, Senator. I do believe that NATO can play a role here. First of all, NATO is very concerned about the necessity of getting constraints on non-strategic nuclear warheads and the missile systems that deliver them. Frank Miller pointed this out a few moments ago. As—this is the objective that has to be at the top of the priority list in our next arms control negotiations. The allies completely agree with that and are prepared to be supportive, in my view, including the kinds of cooperation with the United States that may be necessary to establish a monitoring and verification regime for such a treaty or agreement that would involve bases in Europe.

I do believe that they are ready to work with us on that. Second, your question about China is very interesting because China and NATO have established some political military dialog and it is my understanding that in fact that dialog has been rather rich and ongoing with regard to arms control topics. So perhaps there could be a role for NATO in that regard also reaching out to China.

Senator SHAHEEN. Thank you. Thank you all very much.

Chairman REED. Thank you, Senator. Let me recognize Senator Fischer, please.

Senator FISCHER. Thank you, Mr. Chairman. First of all, I would like to thank the panel for being here today. And to all of you,

thank you for your very strong comments of support for nuclear modernization.

And Ms. Creedon, I specially took note when you said we also have to factor in inflation, when we look at what is needed in order to keep up on schedule with regards to nuclear modernization. So thank you for that.

Also, in looking at a nuclear arms race and looking at the New START and what is there, Mr. Miller, I liked your comments about Russia is not trustworthy and China is scornful. We all know that. None of us want to see an arms race. But I would say to you, I think we are seeing one. We are seeing it with our peer competitors, and that would be Russia and China. They are in a race with us in trying to outpace the capabilities that we have. So I also appreciated many of the comments that we have heard so far with regard to that, where we look at comments from members in the past, from Ash Carter, for example, who said in the last 25 years we have only made modest investments in basic sustainment and operations, and we haven't built anything new in 25 years. And we are seeing tremendous advancements from the Russians and the Chinese with what they are building, what they are testing, and what they are capable of or will soon be capable of. Mr. Miller and Ambassador Elderman, I saw in your prepared statement you referred to China's test of a fractional orbital bombardment system as extremely destabilizing development. And you go on to describe, "a decapitation option that would also undermine many assumptions about deterrence and force governments to adopt very risky launch on warning postures." We have heard similar testimony to that from Admiral Richard, but I don't remember us ever digging into this at any of our hearings.

So I kind of wanted to go off on that today and have you explain this problem that we are facing. Give us a little more detail on that and walk us through why you feel that this system would be so destabilizing. Ambassador, would you like to start?

Mr. EDELMAN. Thank you, Senator Fischer. I am happy to start and then let my colleague do clean up on aisle nine.

So, the basis of deterrence, we discovered after long and hard efforts during the first 15, 20 years of the Cold War, was for each side to be able to have an assured second strike capability, a retaliatory capability that would allow it to ride out a first strike and then inflict unacceptable damage on its adversary.

In order to do that, you have to have robust nuclear command and control. And the danger that the FOBS [fractional orbital bombardment system] test I think represents to us, the maximum danger, is that it could be, we don't really know why the Chinese did it, but it could be because of the path it takes which evades our early warning systems and finishes, as Madelyn pointed out, with a hypersonic glide vehicle—it could essentially be the basis of a no warning attack on the national command authority.

Senator FISCHER. It is a first strike use, and it is also a surprise attack where we wouldn't have that warning, correct?

Mr. EDELMAN. Correct. And that is the danger in it, because the assumptions of stability are the ones that I articulated that we have to maintain. But if I have misstated anything, I know my colleague will correct me.

Mr. MILLER. Eric didn't misstate anything. I mean, we faced short warning threats in the past from Soviet cruise missiles, submarines off our coast way back in the old days, *Yankee*-class ballistic missiles, submarines, but we would know about the launch of those weapons, and we would be able to track them.

In this case, as Ambassador Edelman said, we would not have that kind of warning if this system de-orbited, and we wouldn't be able to tell where it was going. So everything that you have said, and that Ambassador Edelman said is correct, Senator.

Senator FISCHER. Do you believe that it is necessary for us to continue to look for other options that we could have in order to maintain a very strong deterrence, including being able to identify such surprise attacks so that we wouldn't see this decapitation happen to us, and that would then be off the table?

Mr. MILLER. Yes, ma'am. I think we need to do that. And I think we need to continue to build a strong and robust nuclear command and control system. We have allowed that system to wither after the Cold War ended. The Department of Defense is now working to improve that. But that is an absolute priority.

As Madelyn Creedon indicated, that is often forgotten. We talk about the triad, but command and control is at the heart of all of that.

Senator FISCHER. I don't forget it. NC3 is extremely important. Thank you, Mr. Chairman.

Chairman REED. Thank you, Senator Fischer. Senator Kaine, please.

Senator KAINE. Thank you, Mr. Chair. And thank you to the witnesses for your wonderful testimony and your service. I want to ask some intel questions to begin. Isn't it the case that our ability to deter is advanced significantly if we have the most comprehensive awareness of the nuclear capacities of our adversaries? Is that fair to say?

Mr. MILLER. I would say that what we have to have is the most exquisite understanding of what the potential enemy leaderships value. We know about their weapons systems. The weapons systems are at the command of their national leaders.

So we need to know what to hold at risk, which canonically has been the leadership itself, those structures that keep them in power, selected parts of their military forces, the industrial potential to sustain war, so that they know if they aggress against us or our allies, that terrible things will happen to their ability to have a country.

Senator KAINE. And in addition to wanting to know that about our adversaries, if the goal is to deter nuclear war, it is also important to have good intel about other nations that are not adversaries. So, for example, India and Pakistan are nuclear nations. They are not adversaries.

But if the goal is to deter nuclear war, having exquisite information about their plans and nuclear capabilities is important. And it is also important to have information about our allies, NATO allies, what their intentions are. This information is extremely valuable. It is extremely valuable, and it is very dangerous if it gets in the wrong hands.

There is a prosecution going on right now in West Virginia of somebody who works over at the Navy Yard who was trying to pass U.S. nuclear secrets to a Nation that is not an adversary. Brazil, as is publicly reported, seeking huge dollars for it. The Federal judge in that case just threw out a plea agreement where the individual, Mr. Tobey, would have been sentenced to 17 years in Federal prison.

The judge threw that out as insufficient. So obviously information about U.S. nuclear capacity in the wrong hands is extremely valuable and it is very dangerous of that information gets out. And I guess I would like to explore the danger of information getting out that we have about not our own capabilities, but other nations.

If having exquisite information about adversaries or allies or other nations is important to us to further a deterrence goal. If our information, for example, about adversaries exquisite capabilities were to be released, I could imagine very significant dangers. I mean, adversaries would understand what we would know about them. They could change their plans, they could obscure what they are doing. They could make it more difficult for us to come up with the right modernization to deter them. Similarly, information we have about allies' nuclear capacity. If those were to get into the wrong hands, they could be used by other adversaries to target them.

So I guess I want to ask you, given that having exquisite information about the nuclear capabilities of other nations and their intent, and their thoughts about deterrence, given how important that is, you would agree with me that this kind of information, if it is held by the United States Government, is highly, highly valuable and we should do everything we can to make sure that it is not released to others without authorization, correct? Ms. Creedon.

Ms. CREEDON. Yes, sir, very much so. And I would also add, there are other things that are of equal importance.

So, for instance, cyber capabilities, space capabilities, all the things that underpin our deterrence and that we need to know about so that we can have a strong deterrent and also to be able to counter and protect against some of those things which are not openly known that others are doing.

Senator Kaine. Others who want to weigh in? Ms. Gottemoeller.

Ms. GOTTEMOELLER. If I may briefly comment, Senator. It is a fine balance. I agree with you, absolutely, that information must be defended and without authorization must not be released. In certain circumstances, information can have a deterrent effect, of course.

And I wanted to add to my answer to Senator Shaheen a moment ago that one of the things that has happened lately is the NATO allies have all move forward on modernization of their dual capable aircraft.

Some such as the Germans, we were not expecting them to move forward so smartly. So having them move forward and talk about it publicly is good for deterrence in Europe. So sometimes the information is valuable in that realm.

Senator Kaine. And usually if that information is going to be shared, there would be a strategic discussion about the value of it being shared, not shared—and I think, Ms. Creedon, you opened off

and said it was a chaotic world these days. Information like that, if it is going to be shared, should be done so strategically and not in a one off chaotic way, correct?

Ms. GOTTEMOELLER. Absolutely, sir. And authorization, proper authorization from the Government in charge of the information responsible for it is always necessary.

Senator KAINE. Thank you. I yield back.

Chairman REED. Thank you, Senator Kaine. Senator Rounds, please.

Senator ROUNDS. Thank you, Mr. Chairman. First of all, to all of you on the panel, thank you very much for taking the time to come in and to share with us your thoughts today. In the 2022 NDAA [National Defense Authorization Act], Congress created a Strategic Posture Commission to review many of the important issues that we are discussing here.

I know that three of you are members of the Commission with Ms. Creedon also chairing that group. Ms. Creedon, could you give us briefly an update on how the Commission's work is going? And is there any assistance that this committee can provide to help assure the Commission's success?

Ms. CREEDON. Well, thank you for that question, Senator Rounds. So clearly the Commission got off to a fairly slow start. We had a lot of logistical issues. But I would say the folks at Washington headquarters services and the Pentagon and others, and also staff of a number of the committees were very helpful getting us around some of the initial security and ethics sorts of things.

The Pentagon also worked really quickly to get our FFRDC [Federally funded research and development centers] on board. We still have a lot of ongoing logistics issues that are continuing. I worry with those if we will actually be able to make our due date or not.

They are just difficult, and they seem to be never ending. On the other hand, the Commission has managed to meet three times, but we have had one classified session and one unclassified session, one virtual one.

And so that has all been going pretty well. We have certainly had challenges, mostly with the arrangement the department has put in place to screen briefings and documents in advance. So right now, all DOD documents and briefing material provided to the Commission must be reviewed by the Office of Policy to determine if they are releasable to the Commission.

We have been told that as a Legislative Branch body, we are being treated as a Congressional committee with respect to the information that DOD will provide. So we are very early in the process. The Deputy Secretary of Defense wrote a memo to all duty components in early August, and she stated in her memo that DOD components are directed to provide full and timely cooperation with the Commission through the DOD liaison in fulfillment of the Commission's statutory duties and responsibilities as appropriate and consistent with applicable laws and regulations.

So right now, at the moment, we haven't had a substantive issue, but as I have told DOD, I am not optimistic, but I will certainly remain hopeful that the Commission receives what it needs to accomplish its statutory tasks.

Senator ROUNDS. Thank you. I think, clearly there was a reason why we put emphasis on it in the 2022 NDAA. I simply draw attention to the fact that it is something that we all are looking forward to receiving.

So, and we thank you for your work. I would offer this question, and I know that we are going to run out of time, but I am going to try it anyway. It seems to me that we are really beating around the bush when we start talking about negotiating a New START, unless we have China involved in this as well. I am just going to ask the panel briefly if I could, isn't it really futile to do a New START unless we have all three of the major powers involved in actually agreeing to something? And right now, it doesn't appear that Mr. Putin has necessarily followed through with everything that you would normally consider to be acceptable behavior, particularly in Ukraine.

So just briefly, what is the use of a New START unless we get China involved in this as well?

Ms. GOTTEMOELLER. Perhaps I will start, Senator, if I may. I want to underscore that I do believe it is necessary to get China to the table, but the size of their strategic forces still remains well below that of the United States and the Russian Federation.

We have, under the New START, 1,550 deployed warheads, we and the Russians, with additional warheads, approximately 3,000 each, in addition. So our numbers are much higher. And so I think we can negotiate on the basis of equality. I think we need to strive to negotiate with the Chinese on the basis of equality also.

And for that reason, I have been urging that we get into negotiations with them as soon as possible in areas where we have some equality of capability. That is what will bring them to the table. Intermediate range, ground launched missiles, for example. I think that is an excellent area to try to begin to actually constrain and reduce with regard to the Chinese.

In the meantime, however, we cannot let their modernization go unanswered. We have to figure out what they are doing, and they have to really, I think, talk to us about it, because otherwise we must suspect the worst, as all of us around this room suspect the worst. So we need to understand what they are up to, and as I said in my statement, work with them to convince them of the value of negotiated restraint.

Otherwise, we are going to have, I fear, an all-out arms race. And so I think that is a very concerning matter. But I think there are two separate things. There are negotiations to reduce and constrain where there is some equality of capability. And then there are some very direct, tough discussions about what they are up to.

Senator ROUNDS. Thank you. Mr. Chairman, my time has expired, but I simply I would thank the panel for your work, and I would certainly appreciate your response.

Chairman REED. Thank you, Senator Rounds. Senator King, please.

Senator KING. Thank you, Mr. Chairman. This morning we have used the word deterrence about 50 times. It is the bedrock of our strategy with dealing with nuclear weapons going back 70 years. Here is my concern, terrorists with nuclear weapons. Deterrence depends upon the other side having a fear of death and a fear of

destruction and a fear of the loss of their country and their infrastructure and their capital city. What about people who, A, don't care about dying, and B, have no capital city?

While we were talking here this morning, I Googled building a nuclear weapon, and I even misspelled building but still got dozens of responses on Google. How to build a nuclear bomb and other weapons of mass destruction, a Book.

YouTube, making a nuclear weapon. My personal favorite to YouTube, so you want to build a nuke? We need another theory or an adjunct to the theory of deterrence to deal with the threat of terrorists with nuclear weapons. We have got countries, Iran and North Korea probably the most likely, building with fissile material.

And Iran's a week or two away from enough from fissile material. How do we deal with this threat? Mr. Miller, your thoughts? It seems to me this is a whole new category that, frankly, I don't think we are addressing.

Mr. MILLER. So, Senator King, I think I would have two groupings or maybe three, Russia and China, classic deterrence. I think that a North Korea or an Iran would fall into the case of a classic deterrence situation, because, as you say, there is a leadership, there are capital cities, there are valued assets.

Senator KING. I am talking about—

Mr. MILLER. I understand—

Senator KING.—15 people in a tramp steamer headed for New York harbor.

Mr. MILLER. Yes, sir. I understand. And so the third category is terrorists. And I think that is outside the realm of nuclear deterrence. That is the realm of special operations forces. It is the realm of intelligence. It is the realm of conventional forces. It is the realm of prevention. It is the NPT.

It is working with allies and like-minded States to prevent those people from getting the fissile material and from getting the weapons knowledge. But as you pointed out, you can get the weapons knowledge. But that is different than classic deterrence.

Senator KING. I agree. That is the problem. The theory of deterrence doesn't apply to this situation, which I think is one of the most serious likely threats. I would suggest perhaps a Manhattan Project to figure out how to detect nuclear material from space or from a distance as our best defense, because deterrence won't work. Other want to address this question? Ms. Creedon.

Ms. CREEDON. Yes, sir, if I may. So for many, many years, the United States and Russia engaged in a cooperative threat reduction program, which made very substantial gains in securing the materials, the uranium, plutonium. Because at bottom, nobody can make a weapon without the materials, plutonium and uranium.

So the focus on materials continues to this day. There is a very large program at NNSA, the Defense Threat Reduction Agency at DOD has them, DHS is focused on them, and it ranges from all sorts of detection capabilities to even interdiction capabilities.

Senator KING. Do you think it is adequate or is this something that should be ramped up?

Ms. CREEDON. So, I think it is quite good. What I worry more about is that it is not well understood and like other things, I think

there is this personal opinion. Of course, I also think there is a little bit of a maybe a boredom, maybe a tiredness with the threat of nuclear terrorism. It hasn't happened.

We always thought it was going to. It hasn't happened. So I worry that the fear of it, the threat of it isn't taken seriously and it has to be. So all of these programs—

Senator KING. People that attacked us on September 11th killed 3,000 people. They would have killed 3 million if they could have. And I think this is something we have to take extremely seriously.

Let me ask another question in the little bit of time left. It seems to me, Mr. Miller, that hypersonics changes the strategic balance altogether. And you suggested, I think it was you that was talking about the danger. You can have a nuclear weapon essentially dwelling in low earth orbit over Washington. The analogy to the sword of Damocles is inescapable. Does this—it seems to me, we can talk about the technology of the command and control, but if the President, the vice President, and all the leadership of Congress is gone, we are decapitated, there is no one to make the decision to launch, which undermines the deterrence because of the lack of a second strike, as you outlined. Should we have the vice President live somewhere else in the country? Should we disperse our leadership in some way? Because I think you raise a very important point. Without the threat of a second strike, of a retaliatory strike, deterrence doesn't work.

And if part of that is command and control, and I don't mean technology, I mean people, maybe we ought to think about having the vice President live in Kansas City.

Mr. MILLER. I won't speak for Kansas City, Senator. So I will be very careful in answering your question, because once upon a time I was involved in Continuity of Government programs. We need a survivable Continuity of Government to include nuclear command and control.

Even a fractional orbital ballistics system would not come out of the clear blue sky, and it would not come at a time of total peace. In a time of building tension—

Senator KING. What if the weapon is up there permanently? It is just in low earth orbit, just like Starlink, only it has a nuclear weapon that it can then—in my calculations, it would take about 10 minutes to hit the earth out of—from 1,200 miles.

Mr. MILLER. Someone would need—someone who owns it would need to make the decision to attack us. And presumably, presumably, that would not come at a time of total peace.

In a time of building tension, I think it is incumbent on the Government to establish a survivable nuclear command and control system, which may include dispersing senior

officials to more remote locations in Washington, D.C.

I think the Government has practiced that in the past. It can always be improved, but I think the point that you raise is particularly important.

Senator KING. Thank you. Thank you, Mr. Chairman.

Chairman REED. Thank you, Senator King. Senator Tuberville, please.

Senator TUBERVILLE. Thank you, Mr. Chairman. Thanks for being here today. Just to follow up a little bit on, Senator King

here, the direction he was going. You know, we operate on the assumption that we, I mean in the President has 30 minutes to respond to a nuclear attack. But with the advent of hypersonics, where do we stand with that today? Anybody want to answer?

Ms. GOTTEMOELLER. Perhaps, Senator, I will just add one remark, which is that ballistic missiles, ICBMs, are hypersonic. What is different today is the maneuverability and the end game. So that is what poses the—so in some ways, we are not facing a new threat because we have a hypersonic threat coming at us, but we are facing a new threat in the fact of this maneuverability.

So I think that where the emphasis has to calm is on resilience in our command and control system, particularly in our command and control system for the strategic nuclear forces. And Mr. Miller has already referred to that, but I really just wanted to underscore that message.

Senator TUBERVILLE. Thank you.

Ms. GOTTEMOELLER. If I may just add one more thing. Exercising—exercising this capability, which we don't do enough of.

Mr. EDELMAN. Senator, I just would like to add one comment here, which is we had discussed earlier the—with Senator Fischer, the fractional orbital bombardment system, which has a hypersonic glide vehicle on the end of it, which is the problem that you have with no notice attack.

It is not just China. It was the Russians who first experimented with this in the 1960s and 1970s. It was constrained by the original START. The Russians have allegedly had abandoned it, but it was mentioned by President Putin in 2018 when he talked about other exotic nuclear capabilities.

So it is not really clear whether the Russians have totally abandoned this idea or not. So it is not just something we need to worry about with regard to China. We also need to worry about it with regard to Russia in my personal view.

Mr. MILLER. If I could, Senator. This is not the topic of this hearing, but you have talked about hypersonics. I think we need to pay a lot more attention to conventionally armed hypersonics. The Russians and Chinese have conventionally armed hypersonics would pose a terrific threat to our naval forces, to our surface forces at sea. We are on the cusp of deploying some hypersonic systems ourselves, which would be absolutely critical to taking down the A2—I am sorry, the anti-access area denial defenses that the Navy has been complaining about for 15 years. But we are proceeding with deployment at a snail's pace.

But if our Navy is going to be able to operate in the South China Sea in a war or in the Baltics, we need to take down those antique surface and anti-air defenses. And I think the committee, in its own different work, needs to look very much at those conventional hypersonic systems, and to push the Pentagon to speed their deployment.

Senator TUBERVILLE. Thank you. The last couple of years, Admiral Richard has made his top unfunded priority, the sea launched missile. Hopefully, we get that approved this year. Mr. Miller, could you talk about that a little bit more, about the importance of it?

Mr. MILLER. I think, Senator, that we need something that our allies see is theater based that is around. That we can't keep saying, don't worry, we have got these systems in Omaha and in the States and deep at sea in the ballistic missile force.

That we have something that we can show them and that we can show the Russian and Chinese leadership that we have capabilities that would match what they have, and therefore, that would deter them from using those theater and tactical nuclear systems.

Senator TUBERVILLE. Thank you. Mr. Miller, do you believe that pulling out of the JCPOA accelerated Iran's breakout timeline, or do you believe the Iranians planned to follow this pathway all along? Do you think they plan on doing in any way?

Mr. MILLER. I don't know what direction they are going in, but as others of your colleagues have said, they are particularly close to having a nuclear weapon, one way or another.

Senator TUBERVILLE. Thank you. It was good to hear people talk, some of you talk about recruitment of STEM programs. I come from the educational field. We are struggling. Huntsville, Alabama, is looking for engineers every day. We do a lot, obviously, with our defense. And we are doing a few things to help accelerate engineers. We have got to do that. We have got a majority of our kids in this country can't even read, much less do math or science.

So hopefully we will come up with some better programs to accelerate that and come up with more engineers in the future because we are going to need them. Thank you very much.

Chairman REED. Thank you, Senator Tuberville. Senator Warren, please.

Senator WARREN. Thank you, Mr. Chairman. So there is no question that we are confronting a challenging security environment. But the justifications we keep hearing for buying nuclear weapons sound like a drumbeat for a new Cold War, which strikes me as incredibly dangerous for the United States and for global security.

One of the most common tactics used by boosters for more nuclear spending is to rattle off the number of weapons held by our adversaries and to cite projections of how China, in particular, could increase its stockpile of weapons in the coming years. Now, according to this so-called logic, any time a foreign power is catching up to us numerically, we are supposed to shovel more money to defense contractors to get our own numbers up. Ms. Creedon, you have decades of experience working on nuclear weapons policy.

And of course, the size of a country's nuclear stockpile is one key piece of information. But do you think the best or only way to measure U.S. power is counting our ability to match potential rivals warhead for warhead, launcher for launcher?

Ms. CREEDON. Thank you, Senator Warren. As you all know, this is a very complicated question, and it goes far beyond just who has 24 and who has 50. At a very basic level, substantial imbalances would be worrisome, but it is not just about nuclear weapons. It is about everything that we have. It is about the whole concept of integrated deterrence.

And it is about the quality of our weapons across the board. It is about the quality of our people, the training of our people. And at the end of the day, we have guidance from our President as to what we hold at risk in a variety of different circumstances.

And it is, can we meet our own goals and objectives? Can we defend our country? And do our allies feel confident in what we have so that they are safe under the nuclear umbrella? So it is way more complicated than just numbers.

Senator WARREN. I appreciate that answer. And I am concerned that focusing so much on the wrong measure may be good for defense contractors' bottom lines, but it is incredibly destabilizing. But there is an area where I think we actually should be doing more talking about the number of weapons we hold, not for the purposes of inviting an arms race, but to avoid strategic miscalculation.

The Obama administration took an important first step in this regard when they declassified the size of our nuclear arsenal. Disclosing this information helps U.S. diplomats make the case to countries around the world that the U.S. is continuing its efforts to reduce nuclear arsenals and it enhances our credibility in calling for other nuclear powers to be equally transparent.

Ms. Creedon, when the Trump administration came in, they denied requests to declassify this same information. Do you think that the Trump administration's decision was helpful or harmful to nuclear deterrence and nonproliferation?

Ms. CREEDON. So, Senator, I am very supportive of the declassification of the broad numbers, the total stockpile. Rose and I were in the Obama administration together when many of these decisions were made. And so clearly we supported this. I think it is important for transparency.

I think it has the potential to reduce some arms racing based out of unknowns, if you will. But on the other hand, you know, people will do what they want to do. But I still think it is important for us to be transparent, because even though it wasn't reciprocated during the Obama administration and this administration has done it one more time, I still think it is important. I mean, we do need to lead in these areas.

Senator WARREN. You know, we have to keep in mind that Russia and China don't trust us either. And when we hide this kind of information, we only add to their paranoia about our national security strategy.

Thankfully, the Biden administration has reversed this harmful Trump administration approach, and it has started to put us back on the right path by declassifying the size of our nuclear stockpile.

So let me ask you one more question, Ms. Creedon. Would it be helpful or harmful to continue the declassification of this information going forward?

Ms. CREEDON. So right this minute, Senator, I think it would continue to be helpful on an annual basis.

Senator WARREN. Good. You know, some are saying we should go back to the Trump era policy of keeping this information secret. I think that would be a mistake. When we keep this information classified, we give away our ability to pressure other nuclear powers to disclose information about their nuclear weapons.

And I see it as you know, this may be a small step, but these are among the small steps that we need to take to rebuild our reputation with our allies and with our enemies. The Trump administration undermined our credibility significantly by withdrawing the

United States from the Iran deal and from the INF [intermediate-range nuclear forces] treaty. We need to continue to embrace arms control as part of our deterrence strategy.

And I am very concerned that we are moving in the wrong direction when it comes to finding areas to collaborate on shared interests on nonproliferation. Thank you. Thank you, Mr. Chairman.

Chairman REED. Thank you, Senator Warren. Senator Cotton, please.

Senator COTTON. Ambassador Edelman, sorry I wasn't here at the beginning, but I think I heard you reference a fairly well-known phrase about the Russians, when we build, they build. When we stop, they build. Did you use that phrase?

Mr. EDELMAN. I quoted the late Harold Brown, Defense Secretary in the Carter administration, who famously made that a marginal note on a memo on the nuclear balance.

Senator COTTON. Good. Thank you. I just want to make sure that we got for the record, that that was not Eric Edelman statement. As insightful as you always are, but that was a statement from Jimmy Carter's Secretary of Defense.

Mr. Ambassador, we heard a lot of talk today about a new Cold War, as we always do when the conversation turned towards nuclear weapons. I think I am on safer ground saying you were around for the end of the Cold War.

Mr. EDELMAN. Yes, sir. You are dating me. I was.

Senator COTTON. Could you just remind some of those who maybe weren't in office, who won the Cold War?

Mr. EDELMAN. You know, I think the truth is we all won the Cold War, including the people of the Soviet Union, who had a very brief respite from totalitarianism, only to now have an authoritarian regime emerge in the last 20 years. But it was, I would say that the conditions for the end of the Cold War were set by United States policy, working with its allies.

Senator COTTON. Yes, and can you mention specifically the role that nuclear weapons, and more broadly, military strength played in the free world winning the Cold War?

Mr. EDELMAN. Well, I think we successfully deterred any major aggression by the Soviet Union, certainly against our treaty allies. And that, it seems to me, was a great achievement. And it was underpinned by nuclear deterrence.

Senator COTTON. Another thing we have heard a lot of talk about this morning, as we always do when we talk about nuclear weapons, is a dreaded arms race. Ambassador Edelman, can the United States avoid an arms race simply by not competing? Or is it a matter of whether we are going to win or lose an arms race if our adversaries are rapidly building up their arms?

Mr. EDELMAN. As I said in my opening remarks, our allies—our adversaries have been building a pace over the last 15 years, and we have been rather slow. I think all of the members of the panel here would agree that we have not been moving as quickly as we should to modernize our force.

I think when it comes to the arms race issue, I think it is fair to say that we do not have to match everything that Russia does. There are things Russia is doing that I would not advocate that we match or do.

For instance, we considered back in the bad old days of the Cold War a nuclear powered cruise missile, and we abandoned the idea because it was too dangerous. If Russia wants to build a nuclear powered cruise missile that, you know, spews nuclear radiation across Northern Russia when it is tested, you know, they can do that. We don't need to match it. But what we do need to do is make sure that we have the fundamental—meet the fundamental requirements of deterrence, which as Frank and I outlined in our opening statement, requires the ability to have an assured second strike capability.

And I think all of us on the panel have said this morning that that ultimately requires the modernization of our existing triad.

Senator COTTON. Mr. Miller.

Mr. MILLER. Senator, if I could make four quick points. I think with respect, Senator Warren mischaracterized the entire situation, the concern about the Russian and Chinese buildup is the intent behind those leaders trying to build a large nuclear force and why. And it is obviously, it is one of intimidation. Second, there is no arms race. They have been modernizing their forces for the last 15 years. We are just starting to enter that game. And we are not talking about matching their numbers of warheads. What we are talking about is modernizing our aging systems, which Ash Carter made clear to this committee, if we don't modernize, those systems go away. So we ought to stay in the deterrent game by modernizing our forces, putting in new forces to replace old ones, or we get out of the game. And finally, to Eric's point, we don't need to have parity with the Russians. If they want to build more weapons, to build the—make the rubble bounce, that is their problem.

What we need to do is have sufficient warheads in our capacity to hold what they value at risk and to hold what the Chinese leadership values at risk. And in my judgment, 1,550 does not allow us to do that.

Senator COTTON. No, I don't think it does. Your answers there bring back another nugget of wisdom for the ages. That if we don't mistrust each other because we have all these weapons, we have all these weapons because we mistrust each other. And I would say that Vladimir Putin and Xi Jinping have given the free world many reasons to distrust them for a very long time. Thank you all.

Chairman REED. Thank you, Senator Cotton. Senator Kelly, please.

Senator KELLY. Thank you, Mr. Chairman. Ambassador Edelman, Ukraine seems to be launching a rather effective counter offensive against the invading Russian forces. And it appears that the tide might be turning somewhat in their favor. Well, we are going to have to see.

News reports suggests that the Ukrainians victory at Kharkiv, in that region a couple of weeks ago resulted in the Russian military retreating and then leaving behind a large amount of equipment, including tanks and howitzers and other artillery, as well as Russian troops just abandoning their posts.

Certainly what we want to see. I think it is clear that this invasion is not going well for Putin. It is not going as he had hoped. And the question now is how will he respond? Some are ques-

tioning whether he is capable of using a nuclear weapon, even a low yield tactical weapon for a psychological effect.

Ambassador, under what conditions would you assess Russia would use a nuclear weapon in Ukraine? And if so, what type and how?

Mr. EDELMAN. Senator Kelly, that, you know, is a hypothetical question that requires a lot of speculation because we just don't know the answer, because the answer is inside Vladimir Putin's head.

I think most likely we would see something, and this is something that Rose has written about, some kind of demonstration shot probably over the Black Sea. Russian doctrine talks about using these kinds of demonstrations of capability, or possibly a very low yield strike with a theater weapon, you know, on some transportation hub.

Senator KELLY. You are talking like half kiloton sized?

Mr. EDELMAN. Might be a little larger than that. But, you know, but it would—you know, this gets into the question of what we call tactical nuclear weapons. You know, your description of whether it is tactical or strategic is equal to the square root of your distance from the weapon. So, you know, I think it is a mistake to just, you know, call these merely tactical weapons, given the impact that they could have on a place like Ukraine, even at very low yield.

Senator KELLY. Do you think it should affect our calculus going forward?

Mr. EDELMAN. I think it has to affect our calculus. I think President Biden spoke to this the other night. And I think actually he spoke reasonably well to this question, which is to advise President Putin not to consider this as an option and that the consequences would be incalculable.

Senator KELLY. Thank you, Ambassador. Ms. Creedon, as the chair of this committee's Emerging Threats and Capabilities panel, I have been focused on how technologies like artificial intelligence and quantum computing can make our weapons more effective.

And earlier this year, I spoke with the National Nuclear Security Administrator Jill Ruby, about how we could leverage emerging technologies to make our nuclear weapons safer. And I know that you have a lot of experience in the NNSA, as well as in the Defense Department and on this committee, so I would like to ask you kind of a related question.

How are novel technologies like AI, unmanned systems, hypersonics, cyber space related systems, changing the worldwide nuclear risk environment, and potentially complicating deterrence?

Ms. CREEDON. Well, Senator, thank you for that question. I mean, obviously, this is one we could spend several days on. But from a deterrence and also from a safety and security perspective, things like AI, things like cyber certainly cut both ways. They can actually pose a—they could pose a threat and they can also help the U.S. understand what is going on. So I will use one very small example here as a bit of a hypothetical, and it does relate back to Senator King's question. And it is like, are we still focused on threat reduction and are we still focused on nonproliferation? Historically, one of our issues has been we haven't been able to address a proliferant or find until they have done something. One of

the hopes of particular AI is because of the machine learning, because of the management of the large data sets, we might be able early on to be able to detect where anomalies are, where is some entity, where is a country doing things that are not normal that because of what they are doing or what they are buying, it may indicate that they are a nuclear weapons aspirant.

So I think there are opportunities here. It is just a very—a very new world.

Senator KELLY. All right. Thank you. And thank you, Mr. Chairman.

Chairman REED. Thank you, Senator Kelly. Senator Hawley, please.

Senator HAWLEY. Thank you, Mr. Chairman. Thanks to the witnesses for being here. Ms. Gottemoeller, if I could start with you. You argued in your written testimony that Russia has a distinct advantage over the United States at present in terms of its ability to upload nuclear warheads and its ability to produce new warheads and missiles to carry them. And you write further. I am going to quote you now, “the United States is not ready for a nuclear arms race and won’t be ready until our new production facilities come online in the late 2020s or 2030.” Have I got that right? Is that an accurate statement?

So let me just ask you about this, are you worried, given all that, about China’s upload and production capabilities relative to ours, given that Beijing is in the midst of a very pronounced nuclear build up?

Ms. GOTTEMOELLER. Sir, China’s nuclear capabilities are in the course of being modernized. There is no question about it. But the Russians are master ICBM guys and they have been for decades now, and they have been deploying heavy missiles that can carry a lot more warheads, such as the SS-18 missile.

Now the SARMAT is being prepared for deployment. I will just note, by the way, that both the SARMAT new heavy ICBM and the Avangard Hypersonic Glide Missile will fall under the central limits of the New START. So they will have some constraints on them in that way.

But I just want to note the mastery of upload, plus the large number of warheads that the Russians have. The Chinese certainly have that capability and that understanding of how to go about it. They just don’t have the warheads that the Russians have.

Senator HAWLEY. Let me ask you this, you also say in your written testimony that the U.S. should not be the one to launch a nuclear arms race, but it must be ready to respond immediately to others who do. Is it fair to say that our ability to deter Russia or China from engaging in an arms race rests in part on our expanding our own nuclear forces?

Ms. GOTTEMOELLER. Sir, I am not sure we need to expand our nuclear forces, but we do need to modernize them. And we do need to put in place the industrial capacity to be able to build warheads and build missiles. And I really underscore this point, that our industrial capacity has been allowed to lapse.

And that goes—I agree with my colleagues who have spoken about the necessity of the expertise in addition to the missile facilities, the warhead facilities. We need the experts who are every-

thing from the welders that Mr. Miller referred to, up to the high level engineers who help us to design and build our nuclear warheads.

Senator HAWLEY. Let me ask you about a follow on to the New START. Is your argument that a follow on is in part a way to help delay further Russian expansion until we have restored our own production capability?

Ms. GOTTEMOELLER. It gives us predictability, sir, about what the Russians are up to into the decade. I am assuming that an agreement or treaty to follow New START would go into the 2030s, and our modernization is extending into the 2030s till almost 2040. To buy that kind of predictability into the next decade, in my view, is an important goal and in the national security interest of the United States.

Senator HAWLEY. Given that, I mean just given the strategic balance there, what would Russia's interests be? I mean, why would we expect Russia to adhere to any such treaty, given their current, you might argue, strategic advantage in this area? I mean, why not just wait this out and then come to the table later with even more leverage?

Ms. GOTTEMOELLER. Just as we are concerned about Russian capabilities to modernize, they are very concerned about our ability to modernize. They think of us as 10 feet tall. So I think we need to live up to that reputation, to be honest, sir, and get on with our own modernization. But that is the reason, I think, that they would come to the table. They want to make sure that we are not building up in a way that they cannot stomach. So that is the main point.

Senator HAWLEY. That is helpful. Thank you very much. Mr. Miller and Ambassador Edelman, if I could turn to you, you write in your joint statement that being able to absorb a first strike and retaliate against an aggressor while also holding in reserve sufficient forces to deter other near-peer competitors, may in the future require larger numbers of deployed warheads than currently allowed under New START. Can you elaborate on that for me? Both of you—either of you.

Mr. MILLER. Yes, sir. So New START was done in 2010 when Russia was not a threat and China wasn't in the picture. Fast forward 12 years, Russia is a threat, China is a threat. The 1,550 metric, in my judgment, does not apply to say a couple of years from now when we have to deter simultaneously Russia and China.

Senator HAWLEY. Ambassador, anything you would like to add?

Mr. EDELMAN. Yes, Senator. But I think before you joined us, we talked a little bit earlier in the hearing about the requirement, a fundamental requirement of deterrence is to be able to absorb a first strike and have sufficient forces in reserve to inflict unacceptable damage on the adversary. If you posit a Russian first strike and are riding it out, our retaliation under 1,550, I think, would essentially leave us denuded of any, you know, reserve to deter the PRC.

And we also, as my colleague has pointed out earlier, we can't completely rule out at some point that Russia and China, given their limitless partnership, as Xi Jinping and President Putin have described it, working together against the United States. Right now, you see Xi distancing himself a little bit from the failures in

Ukraine, but we don't know what, you know, what will happen 5 or 10 years from now.

Senator HAWLEY. My time has expired, but this is a very, very important topic. And I want to ask you more about how we can increase our arsenal without getting into the kind of arms race that I was just talking about with Ms. Gottemoeller. So I will give that to you for the record and maybe a few other questions too. Thank you all for being here. Thank you, Mr. Chair.

Chairman REED. Thank you, Senator Hawley. Senator Hirono, please.

Senator HIRONO. Thank you, Mr. Chairman. I want to thank the panelists for a very enlightening discussion. So this is for the panel. During last Thursday's SASC [Senate Armed Services Committee] hearing, my colleagues and I asked several questions related to the potential reestablishment of the Navy's sea launched cruise missile nuclear program, SLCM-N.

And I have expressed my concern regarding the necessity for restarting such a program, and that the development of such a low yield or tactical nuclear cruise missile could lead to a dangerous new kind of nuclear arms race.

Given the importance of nonproliferation, are there other weapons or tactics that the U.S. can use to accomplish the same strategic objectives as SLCM-N without creating new nuclear weapons? Anybody on the panel, care to respond?

Mr. MILLER. I can start, Senator. With respect to a new nuclear arms race, we are talking about Russia, which has dozens of new tactical nuclear systems. The same is true of China. The United States has some air delivered bombs in Europe, period, full stop. The development of a limited number of sea launched nuclear cruise missiles would not contribute to an arms race.

It would serve as a modest offset to Russian and Chinese systems already deployed. And I think that would serve as an enhanced deterrent and as a reassurance to our allies in Europe and in Asia, many of whom have called on us to deploy such a system.

Ms. GOTTEMOELLER. Senator, if I may, I would like to comment briefly. I actually disagree with my distinguished colleague on this one. I do think that our air launched cruise missiles, which we are modernizing in a very intensive way, and I expect to see that to be a very significant capability, provide that kind of flexible forward deterrent capability if we need it.

So I do not see the need for a nuclear armed sea launched cruise missile. I do believe in the role of conventionally armed sea launch cruise missiles. They are really a foundational capability for the U.S. Navy.

I also think that when we think about this question, we need to take into account the operational challenges that the Navy faces in certifying its ships and submarines for nuclear curage, and how difficult it can be to sustain ops tempo when these nuclear capabilities have to be taken into account.

And that is the conduct of a naval man, obviously, or a naval woman is something I think that the Navy is competent to comment on. But that is my impression that there is a certain heavy lift that has to be done to redeploy nuclear weapons of this class on naval platforms.

Senator HIRONO. And that I think you are—not I think, I know you are in agreement with Secretary Austin. All of you have noted that it is really important for us to modernize our nuclear triad. So do you believe that the U.S. should prioritize modernizing the nuclear triad over expanding its nuclear arsenal with the program such as SLCM–N?

Ms. CREEDON. So I will be happy to jump in on that one. So right now, the clearly the most important thing is the modernization of the program of record, which does not include the SLCM–N. That said, there are other issues associated with the SLCM–N that certainly need to be addressed.

So operational issues with that, how it would be used in a deterrence value, how our allies would see it. But the other thing is a more practical thing, and that is really with the industrial base. So the warhead for the SLCM–N would be the exact same warhead that is now being modernized for the new cruise missile. And there is only so much capacity for warhead production at NNSA.

And so if you were going to extend the production run for the 80–4, which is the warhead, to make more, then you have to ask yourself, well, what else are you giving up in the context of our overall arsenal. So, you know, there is a lot that needs to be understood with respect to this before there is a decision to really build and field this.

Mr. MILLER. So I think it is important to understand that SLCM–N, if it exists, is in the out years. Clearly, building the triad systems now is the priority. And Ms. Creedon just has talked about the warhead issues. But in fact, from the early 1980s until the end of the Cold War, we deployed nuclear armed cruise missiles on our submarines and for some period of time on our surface ships, and the Navy was perfectly capable of doing that. So the Navy could, if it was in the national interest, do that again. That decision again remains in the out years.

Senator HIRONO. Thank you for that clarification. I just want to mention, Mr. Chairman, that I really appreciate the fact that our panelists have said that the nuclear arms discussion is not just about parity, that it is basically a whole-of-government approach that we need to employ, and that this requires very strong diplomatic efforts as we add intel efforts, as we try to determine what is actually going to deter China, North Korea, or Russia. Thank you, Mr. Chairman.

Chairman REED. Thank you, Senator Hirono. Senator Peters, please.

Senator PETERS. Thank you, Mr. Chairman. And thank you to each of our witnesses here today for an interesting conversation. I want to talk a little bit about cybersecurity, which has been raised. Ambassador Edelman, in your joint statement with Mr. Miller, you discuss the potential of cyber-attacks to disrupt our second strike retaliatory capability, interfering with nuclear command and control.

This obviously adds a whole new dimension to the concept of deterrence and warfare generally. If you could talk a little bit about that, and specifically, do you believe that cyber warfare will also impact initial launch sequences and potential vulnerabilities that our adversaries would have?

Mr. EDELMAN. Senator Peters, thank you for the question. I mean, there are a lot of unknowns about how cyber warfare will interact with, you know, nuclear weapons systems. But one of the reasons why I am such a strong advocate of modernizing the ICBM leg of our triad with the new Sentinel ICBM is that when we built the Minuteman III in the late 60s, it was in the pre-internet age. And so to be able to have confidence that we have a system that is, you know, not only fit in a cyber environment, that we can preserve our command and control of it, but also electronic warfare and other things, we need to go ahead and modernize. You know, I am not an expert on cyber, so I don't want to, you know, pretend that I know that much about how it might interact.

But obviously, we have to be very vigilant about that aspect because, again, going back to earlier discussion, nuclear command and control is absolutely essential to underpin deterrence.

Senator PETERS. Well, as we talk about that—and Ms. Creedon, I think you answered a question with one of my colleagues that related artificial intelligence and the new systems that go forward.

One thing we know about the future of warfare is the speed of decision making will continue to advance rapidly, particularly when you get autonomous weapons systems that will be flying and may make kill decisions by taking a human out of the loop because speed will be the difference between staying alive and dying.

What happens is we see the integration of AI systems not just in our systems, but in systems that the Russians or North Koreans or other will put into effect. It seems to me that that opens up the opportunity for a catastrophic miscalculation that may be hard to unwind. What are your thoughts, Ms. Creedon, on that?

Ms. CREEDON. Well, I certainly agree with that. And just as a very fundamental philosophy, I would certainly hope that AI was, in terms of autonomous warheads, autonomous weapons systems was never applied to nuclear, because I think it is absolutely essential that there remain people in that loop for nuclear. If I could, though, I also would like to point out something different.

And that is really the internal cyber thing that we have to worry about. And that is in the context of our industrial base of new warheads. That making sure that as we build our own systems, that they are sufficiently robust from attacks and that we are sufficiently cognizant of all of the electronics that go into these so that we know their pedigree, and that we are not setting up our vulnerabilities for future cyber-attack.

Senator PETERS. Yes. Yes, please.

Ms. GOTTEMOELLER. Just a quick comment, Senator Peters. I agree with what Ms. Creedon had to say about never having the absence of a man in the loop for nuclear decision making. This is an area that I think is very important to pursue in discussions with the Russians and the Chinese. We need some normative standards set here. Of course, it is something you can never monitor and verify in the way you can an arms control treaty. But just having them agree with us that this is an area that should be immune to attack I think is very important.

Senator PETERS. Appreciate that. And I agree. And it should probably be a part of an arms treaty. Obviously, verifying that may be very difficult, but there is certainly a big movement to figure out

how we deal with lethal autonomous weapons, because we know that other countries may not be constrained by some of the ethical constraints that we place. But at some point, if they go that distance, we will be under a lot of pressure to make sure that we can respond.

Otherwise, we put our men and women at great risk to a system that can operate in a nanosecond. So to what extent should that be part of nuclear treaties that we think about this? Because clearly this is coming. This is not—this is not if, this is when.

Ms. GOTTEMOELLER. I think going forward we should be looking to many different instruments, treaties and agreements constraining nuclear weapons, but also agreements with regard to normative principles of this kind. But it probably doesn't need to be in the same document, but we need to have a set of documents that—and one of them must clearly address this kind of issue.

Senator PETERS. Okay. Thank you. Oh, yes, Ms. Creedon.

Ms. CREEDON. I just want to add something, because earlier we had a discussion about where is the future of arms control and whether we need one very large treaty or more new bilateral treaties. This is one, I think, that really does lend itself to a much larger bilateral international agreement, that countries could agree that this is not, in other words nuclear AI, nuclear autonomous vehicles, is not somewhere to pursue, somewhere to go.

Senator PETERS. Great. Thank you very much. Thank you, Mr. Chairman.

Chairman REED. Thank you, Senator Peters. Senator Sullivan, please.

Senator SULLIVAN. Thank you, Mr. Chairman. And I want to thank our panel, many of whom I have gotten to know well over the years. Served with some. And Dr. Gottemoeller, nice to see you again after our Aspen meeting. I want to continue this discussion on the trying to break out—but I want to ask the question in the context—I have been focusing a lot on the implications of a war in the Taiwan Strait.

One thing, I think that a lot of people are missing, but I would like your review on it or your views on it, is this breakout, I think is actually very related to Taiwan. Meaning if the Chinese are going to look to possibly invade Taiwan at the end of this decade or earlier, they are going to want to have some kind of nuclear deterrent posture with us.

So I think it is actually driven by that. But what do you think? And maybe we will start with you, Mr. Miller, and just go down the line quickly. The breakout hasn't been discussed in the context of an invasion of Taiwan, and I think it is directly related.

Mr. MILLER. I believe it is directly related, but I think that today China already has the capability to destroy our population base, our cities. The question is, where is Chinese strategy going in the future? Are they seeking to have some sort of a counterforce capability in that overall deterrent threat against us into intervening in Taiwan? But I think that is the driver. I think you are absolutely correct. And there is a bit of their needing to have force to deter Russia as well, because there is a rivalry there.

Senator SULLIVAN. Ambassador.

Mr. EDELMAN. Senator Sullivan, I agree with you. And this is something that Frank and I addressed in our formal statement submitted to the committee. The attention in the Chinese buildup has gone largely to the strategic and particularly the FOBS, which we had a discussion of earlier.

But there is also a buildup of tactical forces opposite Taiwan. And I think we have to pay attention both to the strategic balance, you know, globally, but also the theater balance, in part because I think the Chinese are trying to do what the Soviets did in the Cold War, which is put stress on the reliability of our extended deterrent guarantees and intimidate our allies and intimidate us with an essentially an effort to make sure we don't exercise a counter intervention capability if they try and invade Taiwan.

Senator SULLIVAN. Let me let me follow up with the question again for the whole panel. And if you get—the two who didn't get to answer, my first question, I want to take it in order, but because it is a follow up, Ambassador, to your question. I was kind of dismayed to see that President Biden is, like President Obama was at the end of his tenure, is toying with this no first use idea. Biden's nuclear review omits no first use. But it seems like they are still toying with this idea. What do you think that does, as it relates to our allies, particularly our allies in Asia, related to your point with regard to not just Taiwan, but an administration that once again is toying with this concept?

And can I get each of yours definitive answer, it can just be one sentence, on whether you agree with a no first use doctrine, or you think it would undermine deterrence and our allies? So, Ms. Gottemoeller, can I start with you, doctor—?

Ms. GOTTEMOELLER. Yes, certainly, Senator. Good to see you again after our meeting in Aspen. By the way, I am not a doctor, so you can just say, Ms. Gottemoeller or just Rose.

Senator SULLIVAN. You never go wrong when you call someone doctor or ambassador, I found in this job.

Ms. GOTTEMOELLER. Well, thank you very much. I would just underscore what you had to say about what is evidently in the nuclear posture of view of the Biden administration. It hasn't been publicly released yet, but the fact sheet we have out of the DOD clearly does not refer to any kind of no first use policy.

Senator SULLIVAN. Okay. So, you are against that? You would be against—?

Ms. GOTTEMOELLER. What I agree with is the notion that is in fact sheet that says the possibilities of nuclear use are extremely remote. And I absolutely agree with that. As far as what was put down on the Posture Review, it looks like it doesn't touch the no first use issue.

Senator SULLIVAN. Ms. Creedon.

Ms. CREEDON. So, Senator, I certainly agree that the conditions are not appropriate for a no first use policy. Ironically, this was something that the Obama administration wrestled with at the end and determined that the conditions weren't there then, and the conditions now are even worse.

Senator SULLIVAN. It just keeps popping up, though, I mean, as you know. Ambassador, Mr. Miller, I just want to—and any other comments on allies, Taiwan, or—

Mr. EDELMAN. Just a brief one. This is something Frank and I have actually written about in the past. I don't see the value of a no first use pledge. I don't think our adversaries would take it seriously to begin with. I don't think it really buys us anything. But it would be, I think, discomfoting to our allies and undermine extended deterrence.

Mr. MILLER. So I used to joke that Woody Hayes said that a forward pass would have three things happen, two of which were bad. A no first use policy has four things that would happen, and they are all bad. One, our allies would be disheartened because they would believe the nuclear umbrella is shrinking. Two, those allies who are capable of building their own nuclear weapons will take a step closer to building their own nuclear weapons because they won't believe in us.

Three, the Russians and Chinese will never believe that we have adopted that policy. And four, the Russians and Chinese will not change their own first use policies based on a United States no first use pledge. So I think it is a terrible idea, and I have opposed it all along.

Senator SULLIVAN. Excellent answer. Thank you, Mr. Chairman. Great panel.

Chairman REED. Thank you, Senator Sullivan. Senator Rosen, please.

Senator ROSEN. Thank you, Chairman Reed. It is really a great hearing. I want to thank all of our witnesses for their expertise, your service, and for being here today. But I am going to talk a little bit about, of course, some things in Nevada because Nevada National Security Site, of course, right in our backyard.

So Ms. Creedon, the remote sensing laboratory both at Nellis Air Force Base and Joint Base Andrews provides radiological emergency response teams along the West and the East Coast, respectively, who stand ready to deploy anywhere in the world. These personnel and those of the Nevada national security site are the Nation's experts in detecting, locating dirty bombs, loose nukes, sources of radiation, and determining the origin and attribution through nuclear forensics.

I was recently speaking with NNSA about the remote sensing laboratory and the radiological sensors we have provided Ukraine as Russia has seized control of several Ukrainian nuclear power plants as part of its invasion, and of course, we know continues to threaten them.

So, Ms. Creedon, from your time at NNSA and DOD, can you speak to the interagency and multinational effort that is occurring to prevent a nuclear disaster from happening in Ukraine?

Ms. CREEDON. Thank you, Senator. As you have noted, the remote sensing lab is an incredibly capable lab. It is a very small lab as far as these things go, but it is a very capable lab.

But it works also in a much larger system of laboratories at the Department of Energy and the NNSA, as well as with cooperation from the State Department and DOD, to put together and develop, do the research, do the deployment, do the acquisition of a whole suite of sensors for radiation detection on the ground, on personnel.

We have radiation detectors in space. But it is essential that we understand what is going on there from a public health perspec-

tive, if the Russians, as Rose mentioned earlier, do something really awful at these two sites, including the second one that they have now shot at.

Senator ROSEN. Thank you. I want to continue on this. So Ms. Creedon, the United States must deter two nuclear capable competitors for the first time in history, a fact which is widely discussed including here today of course. So Ms. Creedon, how does having to defend against multiple nuclear capable competitors affect the Nation's strategic requirements? And should we reorient our postures as a result?

And when you look at the range of diverse and increasing nuclear risks potentially around the globe, how do we—how should we be prioritizing these threats? Which ones are most concerning to you?

Ms. CREEDON. Well, certainly taken together, Russia and China, particularly on the trajectory that they are both on with respect to their nuclear systems, the variety of their nuclear systems, and the number of their potential systems do present a threat to the United States.

But my first priority for the U.S. is to make sure that the current modernization program is continued on pace, on track, that it is funded, and that it is supported. And the second thing is that the systems that we have now, which are very old, that they be sustained because, you know, my assumption is that some of the new ones could very well be late.

And sustaining these old ones is absolutely essential. But I also think we need to look broader. So our deterrence is more than our nuclear deterrent, even though our nuclear deterrent is at the heart of it.

So we do have to look broader to look at how does the U.S. present a full deterrence picture to the—to all of our adversaries, at the same time assuring our allies that we are, in fact, committed to them and protecting them and that we have the capability to deter. So it is way more than just the nuclear part of it.

Senator ROSEN. Thank you. Ambassador Edelman, same question to you. How should we be prioritizing these multiple threats, in your opinion?

Mr. EDELMAN. Well, I think we have to prioritize first the threat that remains the only existential threat to us today, which is Russia. But China is moving apace. And so, as my colleague Mr. Miller said, I think we have to rethink what might be required to hold both at risk simultaneously.

And we do have lesser included cases that, you know, have been mentioned during the course of this hearing, including North Korea and Iran, as well as the terrorist threat that Senator King mentioned. And I would add on that point, it does seem to me that we need to think about—because nuclear weapons, while, as Senator King pointed out, you can look up pretty easily on the internet how to build a nuclear weapon in theory, we are lucky that it is actually not that easy as an engineering feat to do. So, the most likely path for terrorists to get their hands on nuclear weapons is to get them from a State actor that has them. And I think in that regard, North Korea is a particular—particularly worrisome threat, but

Pakistan is as well. And in fact, if I had to pick one place where I would most be worried about it would be Pakistan.

And it is one reason why I, for one, am very sorry that we no longer have a presence in Afghanistan, because to me that is the most likely route, the loss of control of nuclear weapons in Pakistan, that terrorists get their hands on one.

Senator ROSEN. Thank you. I know I am out of time, so I am going to be submitting some questions for the record based on the discussion here today, what legs, for Ms. Creedon, of the triad do we recommend that we focus our investments on. And of course, building on Senator Peters' cybersecurity question. So, thank you.

Chairman REED. I thank you, Senator Rosen. Senator King has requested an additional question. Senator King, please.

Senator KING. Ambassador Edelman, what is our doctrine with regard to response to a use of a tactical nuclear weapon? The President made a statement to Mr. Putin. Is that it or is there a doctrine? What is our deterrent strategy for the use of a low yield nuclear weapon, either as a demonstration in the middle of the Arctic Ocean or in terms of a strike on a city in Ukraine.

Mr. EDELMAN. Senator, I think, you know, our deterrent posture has always been based on the notion of calculated ambiguity. That we would determine at the time of use, you know, how we would respond to a weapon and a use of a weapon. And I think that remains very useful today.

I think this goes back to some of the foundational thinking about deterrence in the Cold War, and in particular the work of Thomas Schelling, who famously, in *Strategy of Conflict*, wrote in 1960 that the risk that leaves something to chance in the mind of your adversary, the notion that if they do this, they are moving down a road the consequences of which they cannot calculate, is perhaps the strongest deterrent that we have. And in that regard, I thought the President's statement to Scott Pelley on 60 Minutes on Sunday was exemplary.

Senator KING. Mr. Miller.

Mr. MILLER. So, Senator, I think it is a great question, but at the end of the day, it comes down to the President of United States. All of our jobs, and I have devised for plans, I have helped make sure that they were implemented correctly, is to provide the President options, period, full stop. Whoever the President is—and Mr. Sullivan and I, Senator Sullivan and I have worked together. We provide the President options, and you don't box a President in as to what option he is going to take. So there is no open and shut, black and white answer to your question.

A President at the time, if an adversary enemy used a nuclear weapon, would decide what to do, whether it was a short range weapon, a medium range weapon, or a long range weapon.

Senator KING. And I love your comment, Mr. Ambassador, that your determination of what is tactical depends upon the square root of your distance from the explosion. I think that is a very astute observation. Thank you very much. Thanks to all the panel. Really fascinating hearing and great insights.

Chairman REED. Well, thank you very much, Senator King. And ladies and gentlemen, thank you for an extraordinarily informative discussion. The purpose was to reinvigorate and reengage individ-

uals in a serious discussion of the new nuclear challenges we face, which are different than the Cold War.

And, but they are just as potentially consequential. And you have applied some incredibly important insights to this discussion. This is the beginning, not the end. We have to keep this topic, as some have suggested, on the front page and seriously think about what is similar to the Cold War and what is very much different.

One issue that has come through very clearly, though, is the need for modernization of our triad together with our industrial base. And I concur entirely with that. I think also, too, there was a, I think, discussion about arms control is something that is a very difficult process, but something that should be pursued. As I think Ambassador Edelman pointed out, it took 10 years of—around the table before the Russians decided that it was in their interest to settle it. It might take that long with the Chinese. But I think we have to continue to do that.

With that, let me thank you all for excellent testimony, and adjourn the hearing.

[Whereupon, at 11:32 a.m., the Committee adjourned.]

[Questions for the record with answers supplied follow:]

#### QUESTIONS SUBMITTED BY SENATOR JONI ERNST

##### DETERRENCE REQUIREMENTS

1. Senator ERNST. Ambassador Edelman and Mr. Miller, the nominee for Commander of United States Strategic Command recently committed to directing a study of strategic deterrence requirements vis-à-vis China and Russia, if confirmed. What specific questions should a study by United States Strategic Command consider and address?

Mr. MILLER and Ambassador EDELMAN. It is essential for deterrence to remain effective and that will require that we continue to study and evaluate the policies and most valued assets of the leaders of potential enemy nations. Every administration since the dawn of the nuclear age has done this. We believe General Cotton will review the plans we have with respect to holding potential enemy leader's valued assets at risk, that he will then assess the capabilities of our current and planned forces against those assets, and based on all of that work he will make recommendations to his chain of command on any changes he might deem necessary.

2. Senator ERNST. Ambassador Edelman and Mr. Miller, with regard to deterrence requirements vis-à-vis China and Russia, what initial changes would you recommend to United States nuclear force levels, force structure, and force posture to achieve an appropriate mix of capabilities, in a resource-constrained environment?

Mr. MILLER and Ambassador EDELMAN. Senator, as we indicated during the hearing and have suggested in writing elsewhere, we believe that in the near future we will need to consider increasing United States strategic force levels to allow us to deter adequately a simultaneous threat from both Russia and China while allowing for a sufficient reserve to deal with North Korea.

##### LIMITED NUCLEAR OPTIONS

3. Senator ERNST. Ambassador Edelman and Mr. Miller, as you know credible deterrence requires alternatives to suicide or surrender. Could you speak to the importance of limited nuclear options in our future strategic posture?

Mr. MILLER and Ambassador EDELMAN. Senator: limited nuclear options have been an essential and persistent element of United States efforts to deter major conventional and limited nuclear attacks against the United States or its allies for over 40 years going back to efforts under both Secretaries McNamara and Schlesinger. This will continue to be the case for the foreseeable future.

4. Senator ERNST. Ambassador Edelman and Mr. Miller, in addition to those supplemental capabilities recommended by the 2018 Nuclear Posture Review, what flexible nuclear options should we consider?

Mr. MILLER and Ambassador EDELMAN. Senator: We believe the United States capability to deter major conventional or limited nuclear attack would be enhanced by the addition of a nuclear sea-launched cruise missiles when those systems might become available towards the end of this decade or the beginning of the 2030s. This would augment existing options using dual capable aircraft and the B-61 gravity as well as the AGM 181 air launched cruise missile (LRSO) when it becomes available later in this decade.

5. Senator ERNST. Ambassador Edelman and Mr. Miller, the National Defense Strategy Commission concluded that we might “struggle to win, or perhaps lose” a war with China or Russia. Do you agree that the President must have flexible nuclear options to prevent conventional defeat?

Mr. MILLER and Ambassador EDELMAN. Yes.

#### ARMS CONTROL

6. Senator ERNST. Ambassador Edelman and Mr. Miller, to support our future strategic posture, what changes should we seek in future arms control treaties with Russia, such as by adjusting constraints on force levels or force structure?

Mr. MILLER and Ambassador EDELMAN. Senator: it is difficult for us to envision any possibility for negotiating a new arms control treaty with Russia for some time to come. Should such a negotiation prove feasible at some point, however, we believe two criteria must be met:

- first, the treaty must constrain all United States and Russian deployed nuclear weapons, to include short- and medium-range systems as well as exotic new nuclear systems. The current New START does not constrain Russian tactical and theater nuclear weapons nor does it constrain exotic ones such as the trans-oceanic nuclear-tipped torpedo or a Fractional Orbital Bombardment System (which was constrained under the START 1 but is not covered under New START);
- second, the treaty must allow the United States sufficient nuclear capabilities to deter effectively both Russia and China simultaneously as well as allowing for a reserve for North Korea.

