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Feature Report

"*NDU Korea Futures 2025 Symposium*". Published by National Defense University; June 29, 2020

https://ndupress.ndu.edu/Portals/82/Documents/conference-reports/Korea-Futures-2025_Event-Report.pdf

Executive Summary: On February 6, 2020, National Defense University (NDU) conducted a symposium that brought together government and non-government experts to discuss the future of the Korean Peninsula through 2025. The objective was to explore the implications and consequences of differing Korean futures for the United States and the countries of Northeast Asia, not to predict which outcomes were most likely. The symposium was a follow-up to a previous February 2016 symposium "North Korea 2025: Alternate Futures and Policy Challenges."

The initial scenarios explored two branches: (1) would the Korean Peninsula unify or would it remain divided? and (2) would future relations between North Korea and South Korea be peaceful or violent?

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NUCLEAR WEAPONS AND DETERRENCE

Sandia National Labs (New Mexico)

Weapon Program Meets Safety, Design Requirements

By Sandia Labs

June 18, 2020

Review shows B61-12 Life Extension Program work can move forward confidently

Sandia has successfully completed another milestone in the B61-12 gravity bomb refurbishment program, demonstrating the Labs is meeting important nuclear safety and use-control requirements.

"The Combined Engineering Judgment is an important step toward ensuring the B61-12 Life Extension Program is on track, and Sandia is meeting design and development requirements for the weapon to take its place as part of the U.S. nuclear deterrent," said Delegated Chief Engineer for Nuclear Weapons Ernie Wilson.

The Combined Engineering Judgment review was conducted by Ernie and Mission Assurance Associate Labs Director Mark Sellers and presented to Labs Director James S. Peery in April.

Sandia is the design and engineering lab for non-nuclear components of the nation's nuclear stockpile, including the B61-12. In addition, Sandia serves as the technical integrator for the complete weapon, assuring that the system meets requirements as one unit and not just as individual parts.

Continuous data evaluation

The successful review was based on qualification evidence presented from an independent internal assessment by the weapons assessment team that has been evaluating data from day one of the B61-12 Life Extension Program.

A life extension program allows scientists and engineers to address the aging of nuclear weapons components by requalifying usable parts, remanufacturing old parts using the original specifications or redesigning parts with modern technology when the original technology is no longer available.

"It's that enormous amount of data that gives us confidence to execute this review and continue moving forward," said Scott Lindblom, a qualification manager in the B61-12 program at the time and now a senior manager. "This successful review validates Sandia's work on the B61-12 LEP up to now, and it brings in an independent review team to say, 'Yes, really, really, you are doing the right things.'"

The weapons assessment team is a group of about 10 Sandia weapons experts brought together to do an internal review of the weapons system that is independent from the design, development and testing teams, said Todd Simmermacher, a nuclear safety assessment manager. The team's work reviewing and assessing the design and qualification data is continuous from the beginning of the program.

That qualification data comes from tests of the whole weapon system and each component to ensure everything always works when authorized by the president and never under any other circumstances.

"The team is constantly reviewing and assessing the design and data to the best of our ability as the weapon's team produces it," Todd said. "The B61-12 evidence showed that the system is meeting its safety and security requirements."

Service life extended by decades

Impact, vibration, drops, extreme temperatures and massive electrical impulses are some of the physical tests conducted to show that a component and the entire B61-12 weapon system will operate as intended. Combining hours of computational analysis and advanced computer algorithms with that field-testing, including flight tests, ensures components, systems and warhead integration are safe and secure enough to prevent unplanned detonations or unauthorized use of the weapon.

The B61 first entered service 50 years ago. Numerous modifications have been made since, to increase safety and reliability. The B61-12 consolidates and replaces most of the previous variants, extending the bomb's service life by at least 20 years and ensuring its continued safety, security and effectiveness. The NNSA plans to produce the first unit of the B61-12 in fiscal year 2022.

Sandia's Combined Engineering Judgment review has added a high degree of confidence in the B61-12 engineering and design, Scott said.

It was the second such review and showed that the gaps identified earlier had been closed, he said. "Nothing was a surprise, and Sandia is moving forward on the B61-12 LEP with trusted data and design."

https://www.sandia.gov/news/publications/labnews/articles/2020/06-19/B61-12_CEJ.html

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Defense News (Washington, D.C.)

Pentagon to Increase Control over Nuclear Weapons Funding under Senate Proposal

By Aaron Mehta

June 30, 2020

WASHINGTON — The Senate Armed Services Committee has proposed a radical change to how the nuclear weapons budget is formed every year, one which would give the Department of Defense a far stronger hand in crafting the funding for nuclear issues.

The language, contained in section 3111 of the SASC's proposed National Defense Authorization Act, would insert the Pentagon-led Nuclear Weapons Council into the budget development of the National Nuclear Security Administration, a semi-autonomous agency within the Department of Energy that has oversight of America's nuclear warheads.

The move follows a contentious budget fight between DOE and Congressional supporters of the Pentagon earlier this year, which ultimately resulted in NNSA receiving a significant budget increase over what Secretary of Energy Dan Brouillette requested. During that situation, Brouillette clashed with Sen. Jim Inhofe, R-Okla, the SASC chairman who crafted the newest budget proposal.

In nuclear spending fight, it's Trump's Hill allies vs. White House budget office

The January flare up over NNSA's budget was "certainly the driving factor" in SASC's push to modify how the budget process works, according to a SASC aide, speaking on background ahead of NDAA negotiations. But the aide added that it has been "fairly clear" for a while that "the system as it's set up right now, in law and by practice, is not functioning very efficiently."

Under the proposal, NNSA's budget request would still be built within the DoE. But instead of the request then going to the Office of Management and Budget, which oversees the whole government budget process, NNSA's portion would be sent first to the Nuclear Weapons Council. The council would assess and make changes to the request in order to better align it with the Pentagon's views of what is needed, and send the document back to DoE.

The energy department would then be required to submit the language as marked up by the council to OMB. The SASC aide told Defense News that the request that arrives at OMB would be clearly marked as to what changes the DoD had requested, in order to have transparency on how the process shaped up.

The language would not change the OMB and the president ultimately have final say on funding levels for the agencies. But it would give the Nuclear Weapons Council — chaired by the undersecretary of defense for acquisition and sustainment, and made up of five other top Pentagon officials and the NNSA administrator — a newly enlarged voice on formulating the budget, one that critics worry would focus on weapon modernization over all other matters.

"If these provisions were to become law, other Energy Department national security missions, such as defense environmental cleanup, would be at greater risk from the budget axe," said Kingston Reif of the Arms Control Association. "Instead of giving the Council even freer rein, Congress should be seeking more transparency from the Council about its deliberations and how it goes about generating requirements for the nuclear arsenal."

The SASC aide countered that the language of section 3112, which would require NNSA's budget be submitted as its own entity, separate from other nuclear weapon related activities, was written with that issue in mind. The intent, per the aide, is to specifically avoid a situation where the Nuclear Weapons Council request higher funding for NNSA's weapons programs, which in turn could come out of defense cleanup efforts elsewhere at DoE.

Jurisdictionally, the development of nuclear weapons falls under armed services committee and so should not require approval from the energy committees in Congress, the aide said. The aide also stated that the language for the provision was based on language in place for years that allows the director of the Office of National Drug Control Policy to modify the budgets of programs within other government agencies related to drug policies.

Opposition lines up

None of that is making the proposal popular with energy department officials. Roll Call reported Tuesday that Brouillette, the energy secretary, wrote a letter to Inhofe flatly opposing the move on the grounds it "leaves the Secretary with responsibility for the program, while removing his or her ability to effectively manage it."

NNSA spokeswoman Ana Gamonal de Navarro said in a statement that the agency "strongly objects" to the language in the NDAA.

"Granting the Department of Defense authority over the Department of Energy's annual budget undermines DOE's position as a separate and equal Cabinet-level agency," Navarro said. "It also subjects the priorities of NNSA to DoD's discretion, potentially causing setbacks and underfunding of other critically important missions of the DOE's NNSA and Environmental Management programs. We urge Congress to allow DOE and NNSA to continue to work together to deliver a budget that will support our mission and commitment to the American people."

As the language heads to the full senate for a debate, supporters of the DoE are lining up to try and block the SASC language from moving forward.

Sen. Lisa Murkowski, R-Alaska, the chairwoman of the Energy and Natural Resources Committee, has teamed with the committee's ranking member, Sen. Joe Manchin, D-WV,. to oppose the language, according to Roll Call.

And on Monday evening, energy committee member Sen. Maria Cantwell, D-Wash., blasted the proposed legislation as "really egregious" language that would "wrestle away control of our nuclear arsenal and give it to the military."

As of now, there is no corresponding language in the House Armed Services Committee, which heads for markup on Wednesday. It seems unlikely the House, controlled by Democrats who have expressed skepticism about Pentagon nuclear modernization efforts in recent years, would mirror the SASC language.

The SASC aide said Inhofe had reached out to all the relevant players to try and preempt opposition, but "generally, the Department of Energy was unwilling to acknowledge that there had been any issue in the process," the aide said. "In this case we believe it was necessary because otherwise nothing was happening."

https://www.defensenews.com/smr/nuclear-arsenal/2020/06/30/pentagon-to-increase-control-over-nuclear-weapons-funding-under-senate-proposal/

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Air Force Magazine (Arlington, Va.)

HASC Funds Nuclear Modernization, With a Few Questions

By Rachel S. Cohen

June 26, 2020

Nuclear modernization concerns are again on the table for fiscal 2021 defense policy negotiations, as House lawmakers raise issues about the path forward.

The Air Force's three major nuclear weapon upgrade programs—the Ground-Based Strategic Deterrent, the Long-Range Standoff Weapon, and the B61-12 bomb—all received the funding they requested in the House Armed Services Committee's version of the fiscal 2021 defense policy bill. Those programs total $2.9 billion for the upcoming year, split between the Defense and Energy Departments.

That contrasts with last year's process, when Democrats tried to shrink GBSD funding in a move that irked Republicans and contributed to a broader clash over nuclear issues. Keeping nuclear modernization fully funded and on track is typically an area of bipartisan agreement. Still, some members of Congress last year sought an independent study on whether the Air Force could keep its current Minuteman III missiles around longer, an idea the service opposes because it says refurbishment costs would outweigh the benefits.

Developing more than 600 new land-launched missiles is slated to cost nearly $22 billion, and $4.5 billion for about 1,000 new air-launched missiles. The revamped B61 bomb could cost about $12 billion between DOD and DOE, while the future B-21 bomber's price tag is classified.

Now that House lawmakers seem to have reached an agreement about the need to fully fund nuclear weapons development (as the Senate Armed Services Committee also wants), they want assurance that the Air Force can pull it off. That has spurred some worry in the arms control arena that Democrats are stepping back from meaningful oversight.

House legislation "raises zero questions about the value of the modernization plan, only its achievability. Deeply troubling," Stephen Young, a senior analyst at the Union of Concerned Scientists, wrote on Twitter.

The strategic forces subcommittee pointed to a 2019 RAND Corp. report that warned of the difficulties Air Force Global Strike Command, a relatively new organization with a small, young workforce, will have in replacing all of its major systems around the same time. That also includes the B-21, which HASC is offering the full request of $2.8 billion in unclassified money for 2021.

Because of that looming workload, lawmakers want a report from the Air Force by Dec. 1 on how Global Strike is addressing the issues RAND raised.

"The report should also provide the number of unfilled personnel manning positions at the command and the GBSD program office, and the number of and type of personnel required to reduce schedule and technical risks to the major programs that the command and the program office are managing," lawmakers wrote.

Air Force Magazine reported in February that the service is waiting on Northrop Grumman, the missile's designer, to decide how many people would need to run the system before reviewing manpower needs.

GBSD won't be ready to use until 2029 at the earliest, three years after the U.S. comptroller general found that the existing Minuteman III nuclear missiles will no longer be fully capable. That concerns lawmakers whom the Air Force has repeatedly told there is no room for error in the land-launched missile's development schedule. The House wants a report from U.S. Strategic Command, which oversees the nuclear enterprise, and the Air Force on how the two are planning for a GBSD fielding delay of two years or more, and how to address the risks that slowdown would pose to Minuteman III.

"By 2030, the Department of Defense will develop and deploy a range of new, long-range conventional strike systems, of which some will be under the operational control of [the] commander of [STRATCOM]," the subcommittee added. "Given the strategic implications of these systems, the committee encourages the department to take additional consideration with regard to the strategic and legal implications of such systems."

HASC also calls for a report on the use of artificial intelligence in the nuclear enterprise.

The strategic forces subcommittee approved its bill June 22; the full committee will begin debating its legislation July 1.

https://www.airforcemag.com/hasc-funds-nuclear-modernization-with-a-few-questions/

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U.S. Naval Institute (Annapolis, Maryland)

Kanyon's Reach: Rethinking the Nuclear Triad in the Autonomous Age

By Lieutenant Commander Joshua M. M. Portzer

July 2020

Throughout history, weapon system advances have created paradigm shifts for militaries. Occasionally these shifts are tectonic, unlocking new domains for warfare. The aircraft carrier took air warfare across oceans. The satellite brought electronic warfare to space. The next harbinger of strategic warfare's future: autonomous unmanned undersea vehicles (UUVs).

Russia has developed a submarine-deployed autonomous UUV (AUUV) that can travel thousands of miles and detonate a nuclear payload of several megatons in a foreign harbor—a capability that will be operational by the late 2020s.1 A strategic nuclear weapon that is deployed and detonated undersea is a true paradigm shift: Never before has a country's nuclear kill chain remained exclusively undersea.

Kanyon

The "Kanyon" weapon system—also referred to as Status-6 or Poseidon—first emerged in footage on Russian television in 2015. It is a nuclear-powered (N)-AUUV that can travel thousands of nautical miles (nm) at approximately 100 knots and can operate at a depth of 1,000 meters. While it may carry a conventional weapons payload, its nuclear warhead is approximately two megatons.2 Russia designed it as a strategic weapon to take out ports and coastal cities. It may deploy on up to four submarines (modified Oscar II class) in both the Northern and Pacific Fleets, with each submarine carrying up to eight Kanyon weapons.3

Unlike any other nuclear weapon, Kanyon detonates underwater and is nuclear powered.4 Washington references it in its Nuclear Posture Review 2018 (NPR) as a "new intercontinental, nuclear-armed, nuclear-powered, undersea autonomous torpedo."5 Russian President Vladimir Putin included Kanyon in his 2018 national address, along with three other advanced nuclear weapon vehicles.6 Russia began undersea trials for Kanyon in December 2018.

The ramifications of Kanyon cannot be overstated. Consider the realm of nuclear treaties and deterrence. Kanyon could deploy by 2027. This is past New START's expiration, even if it were extended to 2026. As Kanyon is an N-AUUV, it does not fit New START's current weapons definitions, much like another new weapon, Kinzhal (an air-to-surface nuclear missile). Thus, it would not be subject to the treaty's restrictions in current form.7 Furthermore, Kanyon is impervious to ballistic-missile defense because it travels by and detonates in the ocean. There is no option to detect a Russian launch of this weapon and then execute a counterlaunch. The United States would not know of the threat until it had detonated.

The U.S. Navy should find this weapon horrifying. Naval Station Norfolk is the world's largest naval base and houses approximately 75 ships and 130 aircraft. A single Kanyon detonation at Norfolk could wipe out half of the United States' aircraft carriers and roughly a third of the surface Navy without warning. A coordinated attack against both Norfolk and San Diego ports would catastrophically cripple the Navy.

Deterrence Theory

Since the Cold War, a successful deterrence strategy has played a large part in staving off nuclear conflict between the United States and the Soviet Union/Russia. But what makes deterrence work? First, a country's nuclear deterrent threat must be credible. In other words, an aggressor must believe that a country can and will execute the threat with which it deters.8 A country's deterrent credibility increases if that country also enjoys primacy—meaning its nuclear forces are so great that no power could defeat them.9 Last, deterrence is strongest when the aggressor country is rational—meaning that the country acts using a cost-benefit analysis and with its own normative self-interest in mind.10

Kanyon calls these points into question. Consider an underwater nuclear attack against Naval Station Norfolk. Is a U.S. threat of a second strike credible? What if Russia denies the attack? Would Washington pull the trigger in the face of public Russian denial? And what of primacy? An attack on Norfolk would not destroy the U.S. nuclear arsenal; the United States could still volley a second strike. However, Kanyon is essentially undetectable. In terms of capabilities, then, the United States

no longer holds primacy in nuclear weapons (or even parity). The U.S. nuclear triad still relies on the air domain for terminal delivery, and all U.S. delivery vehicles are detectable by Russian military technology. Last, Kanyon and its sister superweapons are evidence that while Russia may act rationally, it is not acting reasonably.11

Deterrence depends in part on rational actors, but it also assumes actors will act reasonably, insofar as they value international norms. But rationality and reasonability often are confused.12 Russia's actions suggest that it is not acting reasonably. Weapons such as Kanyon show "Russia's clear motivation to develop new offensive weapons to negate any perceived deterrent advantage sought by the United States."13 Consider further that Russia wields 11 types of tactical nuclear weapons compared with the United States' one, including at least one weapon that violated the Intermediate-Range Nuclear Forces Treaty.14 The Russians have conducted multiple nuclear attack exercises against countries such as Sweden.15 While scholars might claim these are symptoms of Russia's anxiety caused by perceived disadvantages in relation to conventional Western forces, it adds to the argument that Russia is not interested in a gentleman's game of international norms. If satisfaction is demanded on the world's stage, Moscow is here to win big.

Options for Deterrence

There are U.S. options to address Kanyon. First, the United States could continue to decrease its nuclear inventory to "return to an overtly deterrent posture" of minimal weapons.16 Second, the United States could pursue diplomatic means to address these new weapons. Third, the Department of Defense (DoD) could pursue its own new nuclear weapons to counter the Russians'.

Regarding the first option: Further reducing the U.S. nuclear inventory would seem to be a strategic misstep. Aside from being contrary to DoD's national strategy and nuclear posture, it puts the nation in an uncomfortable position. If the United States reduces its inventory to a minimum number, then maintaining a deterrent posture arguably would require Washington to target cities and population centers.17 That is a problem, because the United States abides by the Law of Armed Conflict (LAC)—guidance that dictates how to conduct war.18 The LAC includes the rule of proportionality. Among other things, this stipulates that collateral damage cannot grossly outweigh the military advantage gained by an attack. In response to a Kanyon-vaporized carrier strike group, attacking population centers seems like "wanton destruction of lives."19 The International Court of Justice holds an indeterminate stance on the use of nuclear weapons, even if the nuclear state's existence is at risk.20 Regardless, as both Henry Kissinger and Brent Scowcroft observed, there is no inherent strategic stability with a low weapon count.21

Russia's "Kanyon" nuclear-powered and -armed autonomous unmanned underwater vehicle will be deployed on modified Oscar II-class (Project 949A) nuclear-powered guided-missile submarines in the Northern and Pacific fleets.

What of option two? Proponents of a New START II (or of prolonging New START) point to the weapons monitoring that both countries currently enjoy along with the predictability it brings. Further, extending the treaty for another five years gives the United States time to orchestrate a new treaty (or amendment) to include these new Russian weapons.22 Pursuing a new strategic relationship with Russia over "maintaining deterrence" also might allow Washington and Moscow to overcome barriers to cooperation that nuclear competition has built. This might allow the two countries to deal with new global threats together—threats that have occupied much of the post–Cold War international battlespace.

As with option one, there are several issues here (aside from one of the most glaring—the U.S. withdrawal from the Open Skies Treaty). First, Russia does not have a recent track record of honoring the spirit of weapons treaties. Putin has offered to extend New START without any

preconditions, but extending the treaty five years has no bearing on Kanyon.23 Critics claim declining a treaty extension is a destabilizing action. However, that critique misses the point that weapons such as Kanyon cause destabilization. Russia has demonstrated that it does not desire to "play" by international norms. Thus, the United States only hamstrings itself further by vying for either an extension of New START or a New START II treaty unless it receives significant gestures of goodwill from Russia. Second, Russia and the United States have attempted to deal with global issues side-by-side before. For example, cooperation over the Syrian civil war resulted in numerous proxy skirmishes between the two nations.

The Navy and N-AUUVs

Though controversial, there are merits to option three: matching capabilities. As observed during the Cold War, "parallel lines of technological development . . . encouraged a growing similarity of strategic doctrines."24 It is this phenomenon that led both countries to agree to a missile-defense treaty. Where initially there might be power asymmetry with the advent of new weapons technology (and thus, instability), similar developments in both nations may force a period of stasis.25

But why choose to develop an N-AUUV? First, it acquires all the advantages of Kanyon—it meets the paradigm shift. Second, it is the logical progression of submarine-delivered nuclear weapons. Submarines have long been considered the most survivable component of the triad, given their stealth and endurance. The United States must adapt to meet the evolving threat to continue enjoying the benefits of undersea-delivered nuclear deterrence. N-AUUVs enable this. Last, the Navy is beginning to look toward UUVs and autonomy anyway. The Navy's Undersea Warfare division asserts that UUVs will join the future undersea force. Consider too that then–Secretary of the Navy Ray Mabus stated that "while unmanned technology itself is not new, the potential impact these systems will have on the way we operate is almost incalculable."26 Former Secretary of Defense General James N. Mattis also wrote in the National Defense Strategy (NDS) that the United States must pursue "advanced autonomous systems" and that DoD will fund advances in "autonomy, artificial intelligence, and machine learning . . . to gain competitive military advantages."

UUVs are relatively cost-effective. They do not need to surface or pull into port regularly, can be scuttled in an emergency without worrying about loss of life, and are difficult to detect. Further, acquiring an N-AUUV answers a U.S. competitor opening a new domain to the nuclear kill chain. The NDS speaks to "long-term, strategic competition" by revisionist powers and that (through the Nuclear Posture Review 2018) the United States "must recapitalize on [its] Cold War legacy nuclear forces." If there was ever a moment for renewed parity between strategic competitors, surely this is it.

It is good to address the elephant in the room. It goes something like this: You are arguing for autonomous nuclear weapons. Are you crazy? As suggested earlier, autonomous weapons "once activated, can select and engage targets without further intervention by a human operator," but that does not mean that humans cannot intervene.27 Imagine a U.S.-operated N-AUUV. An operator on a submarine inputs prioritized target coordinates into the N-AUUV's program. She also inputs the desired attack time. The N-AUUV launches only when it is deemed necessary to strike. Once launched, the N-AUUV uses its navigation sensor suite to negotiate around terrain, mammals, and other obstructions to reach its target at the specified time, regulating its speed as necessary. If it finds an obstruction, it circumnavigates. If there is a weapon malfunction, it can scuttle itself deep in the ocean's abyss. Autonomy allows for intercontinental travel without a man-in-the-loop the entire time. But the N-AUUV does not have a mind of its own. Humans still must launch it. The kill decision still resides with those who are capable of sovereign, ethical decision-making.

The New START nuclear arms reduction treaty between the United States and Russia, signed by Presidents Barack Obama and Dmitry Medvedev in 2010, is expected to expire before Kanyon will be operational. Some proponents want to extend it, however Russia has a poor track record with international treaties: there is no guarantee it would abide by a new or extended one.

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Objections to New Nuclear Weapons

The first objection concerns a renewed arms race. The argument describes the development of new capabilities as "counterproductive, enhancing rather than countering Russia's destabilizing doctrine."28 Races contribute to the "classical security dilemma," whereby "everyone attempts to produce more security for themselves, which paradoxically leads to less security for all, because actions by the other party are seen as a threat and provoke counter steps."29 As such, a situation might unfold such as a "political miscalculation, technical failure, a provocative third-party's missile attack, or a terrorist nuclear explosion in either (or both) capitals [that] might trigger a nuclear holocaust."30 Further, the more destabilizing actions the United States enables and commits through such a race, the more challenges emerge in uniting an already fragile NATO.31

Regarding signaling to allies such as NATO—that point cuts both ways. How do U.S. allies view its restraint in the face of such radical weapon developments? Inaction could easily breed skepticism of U.S. commitment.32 Second, many developments in Russian nuclear weaponry come as a reaction to U.S. conventional force superiority—not strategic developments.33 Again, the Russians have developed 11 tactical nuclear weapons to the United States' one. Many advancements happened without U.S. provocation. Therefore, the United States has little to lose in answering Russia's most recent strategic nuclear weapons.

Third, consider this Cold War–era idea—the essence of a nuclear arms race is no different than in any other "to and fro" in arms development between two countries: politics.34 There are multiple reasons a nation may develop new weapons, whether to appease a political base or in response to anxiety, pressure from domestic defense industries, international posturing, etc.35 This is signaling on the part of the aggressor country. The United States does this when it sends aircraft carriers toward a belligerent country. Nuclear weapons certainly have dire consequences if they are used, but signaling threat through developing them need not be so different than deploying carriers.

Another objection amounts to, so what? Russia is developing more advanced nuclear weapons than the United States and may steal the label of primacy. It is not the first time Washington has been outdone by Moscow or appeared weak. Note that there was no nuclear first-strike against U.S. soil in 1957 after Sputnik went into space, and subsequently the West was forced to come to terms with its vulnerability to a Soviet thermonuclear attack.36 Nor was there a U.S. nuclear strike when the Soviets "surpassed the United States in overall levels and capabilities of its nuclear forces," or when the United States accepted defeat in Vietnam, instead of using nuclear force to further pursue an evasive victory.37 Yet here we are. The Soviet Union collapsed, and the United States enjoyed unipolar power through the turn of the 21st century.

This objection is well taken, but it is not quite right to draw direct parallels between the Cold War and now. The world looks different. For instance, U.S. international credibility is not what it has been in decades past.38 One might argue that U.S. military status paired with treaty organizations have allowed the United States' reputation to take blows such as Vietnam without toppling the world order. It would be fair to question whether Washington still has such cushioning.

Accordingly, not answering Russia's nuclear advancements today may be more costly than it would have been decades ago. Further, the Americans and Soviets understood that, should a conflict play out, "the impact on each side's vital interests would be high and symmetrical."39 With these new weapons, that does not necessarily follow.

The U.S. military must rethink the nuclear triad in the face of new weapon advancements such as Kanyon. Militarily speaking, the Navy owns this threat almost exclusively. It also holds a potential solution. To be sure, a weapons-development competition between the United States and Russia holds risks, but inaction allows the status quo to continue, which too brings a heavy price tag. That is in part how we arrived at the problem of Kanyon. Diplomacy and treaties hold their own unique value in the balance of world politics. They are a testament to the proverb that "the pen is mightier than the sword." But sometimes saber rattling is best answered with another, stronger saber.

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US COUNTER-WMD

University of Kent (Canterbury, Kent)

New Research Creates Neutralising Sponge for Dangerous Chemicals

By Sam Wood

June 16, 2020

Dr Simon Holder, Reader in Organic Chemistry at the University of Kent (UK) and Dr Barry Blight, Associate Professor of Chemistry at the University of New Brunswick (Canada), have developed a new method for containing and deactivating neurotoxic chemicals like VX and sarin.

These weapons, known as nerve agents or neurotoxins, are highly potent and fast acting. Small doses can cause rapid paralysis and death, as the chemicals disrupt the connection between the body's nerves and muscles.

These internationally banned liquids are aerosolised purposely to inflict damage on large geographical areas and are considered to be weapons of mass destruction (WMD's).

In a project funded by the Defence Science and Technology Laboratory (Dstl) of the UK Ministry of Defence, the Kent team investigated new methods of bulk decontamination of chemical weapons.

The result of the research was the "Metal-organic framework (MOF)-containing polymer sponge".

This is a sponge developed to swell and absorb dangerous neurotoxins and make them safer to handle, which also contains the MOF chemical catalyst, created to accelerate the chemical's breakdown, diminishing the neurotoxins into safer components.

To research this safely, researchers used substances to simulate the presence of neurotoxins without risking exposure to dangerous chemicals. Following this, Dstl tested the prototype material with the real nerve agent to confirm the effect.

"Less than five kilograms of the MOF-containing polymer sponge can absorb, immobilize, and safely destroy a 55-gallon drum of these toxic chemicals. It is very exciting to consider the potential this has in combatting dangerous chemicals in the future," said Dr. Holder, who is also director of research at Kent's School of Physical Sciences.

The research paper has been published in ACS Applied Materials and Interfaces: https://pubs.acs.org/doi/full/10.1021/acsami.9b18478#

Swell and Destroy: A Metal–Organic Framework-Containing Polymer Sponge That Immobilizes and Catalytically Degrades Nerve Agents

Authors: Yaroslav Kalinovskyy, Alexander J. Wright, Jennifer R. Hiscock, Toby D. Watts, Rebecca L. Williams, Nicholas J. Cooper, Marcus J. Main, Simon J. Holder, Barry A. Blight

https://www.kent.ac.uk/news/science/25749/new-research-creates-neutralising-sponge-for-dangerous-chemicals

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Defense News (Washington, D.C.)

US Air Force Delays Timeline for Testing a Laser on a Fighter Jet

By Valerie Insinna

June 30, 2020

WASHINGTON — The U.S. Air Force's long-planned test of an airborne laser weapon aboard a fighter jet has been delayed until 2023 due to technical challenges and complications spurred by the ongoing coronavirus pandemic, its program head said.

The Air Force's Self-Protect High Energy Laser Demonstrator program, or SHiELD, had originally planned to conduct its first flight demonstration in 2021, but the test has been pushed two years back, said Jeff Heggemeier, SHiELD program manager for the Air Force Research Laboratory.

"This is a really complex technology to try to integrate into that flight environment, and that's ultimately what we're trying to do with this program, is demonstrate that laser technology is mature enough to be able to integrate onto that airborne platform," he told Defense News in a June 10 interview. "But even things like COVID, and COVID shutting down the economy. That has impacts."

Beyond that, the future of using laser weapons aboard fighter aircraft is even more unclear. The goal of SHiELD was to give combat jets a way to counter missiles shot by an enemy aircraft or by air defense systems on the ground. But in May, Mike Griffin, the Pentagon's undersecretary of defense for research and engineering, noted that he was "extremely skeptical" that an airborne laser could be used for missile defense.

Asked what that meant for SHiELD, Air Force acquisition czar Will Roper acknowledged that the service is rethinking how it could best use directed-energy technologies. Perhaps the most optimal use for SHiELD wasn't onboard a fighter, he said.

"What I've told that team is, let's have a dialogue," Roper said during a June 9 event hosted by the Mitchell Institute for Aerospace Studies. "Let's understand the different power levels and what they should correspond to, and let's not make the highest power level that we can dream up and the mission that's the sexiest be the thing that drives us."

"What I expect to get laser weapons to the goal line has been the humble, but important and very worrisome small drone threat. They continue to show up, they're difficult to attribute — we don't know who is sending them to our installations and tests and things of that nature, and we can't afford to shoot missiles at them," he added. "So this is a perfect threat to make laser weapons real, and once they're real, we'll do what the military does. We'll look to scale the power."

Heggemeier said there are many ways the Air Force could spin off laser technologies developed by the SHiELD program, but it's critical the service continue with development so it can gauge the maturity and usefulness of the capabilities.

"I think it's important for us to first remember what the whole point of SHiELD is. The whole point of SHiELD is not an acquisition program where we're turning out hundreds or tens of these laser systems for operational use. What we're trying to do with SHiELD is exactly answer those questions of: 'Is laser technology mature enough to go on an airborne platform? Have we solved enough of those technical challenges that this is now a feasible thing?' Because there is that concern."

He also drew a distinction between the tactical, self-defense capability a SHiELD laser would give combat aircraft versus a more powerful laser capable of intercepting highly-advanced ballistic missiles, as the Missile Defense Agency has proposed.

"You're not talking about these really, really long ranges. You're talking about a shorter range and different targets just to protect yourself or your wingman," Heggemeier said. "Missile defense can mean a lot of things. Some of those missile defense missions are very, very hard, and some of them aren't quite so hard."

For now, at least, the Air Force's investment in directed energy remains stable. The service's budget lays out cash for high-energy lasers in multiple funding lines. For fiscal 2021, it requested $15.1 million for basic research and $45.1 million for applied research for high-energy laser technology, as well as another $13 million for high-power, solid-state laser technology. In FY20, the service received $14.8 million for basic research and $48.2 million for applied research for laser technologies.

SHiELD is comprised of three elements: the laser itself, which is being developed by Lockheed Martin; the beam control system made by Northrop Grumman; and the pod that encases the weapons system, from Boeing. Heggemeier said the pod is under construction, with integration of the laser and beam control system planned to start next year.

"A lot of the challenge is trying to get all of this stuff into this small pod. If you look at other lasers that are fairly mature, we have other laser systems that some other contractors have built that are ready to be deployed. But these are ground-based systems, and they are much, much more mature," he said.

In April 2019, the Air Force Research Lab conducted a ground test with a surrogate laser system — the Demonstrator Laser Weapon System, or DLWS, now in use by the Army. The demonstration involved the successful downing of several air-to-air missiles.

"It turns out the DLWS system, when you take everything into account, is a really good surrogate for the laser power on SHiELD," Heggemeier said.

Because both SHiELD and DLWS generate similar amounts of energy on target — in SHiELD's case, Heggemeier would only say that it amounts to "tens of kilowatts" — the surrogate test gave the lab a good idea how the laser physically affects a target.

In 2019, the team conducted a flight test of a pod with the same outer mold line as the one under development by Boeing. The pod was mounted to an aircraft — Heggemeier declined to specify the model — and flown around Eglin Air Force Base, Florida, to help measure how vibrations, the force of gravity and other environmental factors might influence the performance of the weapon.

Air Force Magazine reported in 2019 that aerial demonstrations of SHiELD would occur onboard an F-15 fighter jet.

https://www.defensenews.com/air/2020/06/30/us-air-force-delays-timeline-for-testing-a-laser-on-a-fighter-jet/

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US ARMS CONTROL

IAEA (Vienna, Austria)

Safeguarding the Future: IAEA Looks for Improved Solutions for Passive Loop Seals for Nuclear Verification

By Alexander Enders

July 1, 2020

Used around the world, metal cap seals are an important part of the toolkit of the IAEA's nuclear inspectors, tasked with verifying that nuclear material and facilities remain in peaceful use. Seals are a solution to a basic problem: how can an IAEA inspector close a container, a hatch to a room, or a cask with nuclear material in it, return three years later and know whether it was opened or not? The IAEA is seeking new and innovative technology, materials and solutions that could improve this tool; for example, by enabling inspectors to verify on the spot whether a seal had been tampered with.

Every year, IAEA staff perform over 2000 inspections around the world. During these inspections, over 15 000 metal cap seals are distributed and verified. Each of these seals is numbered and has a unique marking that inspectors record before applying them. During an inspection, seals are checked, replaced and brought back to IAEA headquarters to verify their integrity and authenticity.

This simple, robust and reliable metal seal has proved its usefulness. Now, over forty years since its first introduction, the IAEA has issued an Expression of Interest for new suggestions and ideas to improve what is known as the 'passive loop seal'. Are there new materials, new technologies or new methods that could make the metal cap seal even better? Are there ways for an inspector to identify the authenticity of the seal in the field without having to break it and bringing it back for verification at IAEA headquarters? Or are there new materials that could make the indication of tampering even more obvious?

"The IAEA is always looking for new technologies that increase its confidence and effectiveness to carry out its safeguards mission. The metal seal has proved to be an essential element for inspectors, by providing a low cost, secure and reliable method for containment of nuclear material or equipment. We are now looking ahead for other sustainable, technical solutions to broaden our range of passive sealing methods," said Alexey Anichenko, Director of the Safeguards Technical and Scientific Services Division at the IAEA.

Individuals or companies who may have a new and novel solution to this age-old challenge are asked to submit a technical (paper-based) proposal by 27 July 2020. Following an evaluation of the submitted proposals, the IAEA may request the submission of conceptual prototypes.

https://www.iaea.org/newscenter/news/safeguarding-the-future-iaea-looks-for-improved-solutions-for-passive-loop-seals-for-nuclear-verification

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Radio Free Europe/Radio Liberty

Pompeo Calls on UN Security Council to Extend Arms Embargo on Iran

By RFE/RL

June 30, 2020

U.S. Secretary of State Mike Pompeo urged the UN Security Council on June 30 to extend an arms embargo on Iran, warning allowing it to expire in October would cause instability in the Middle East.

"Don't just take it from me or the United States, listen to countries in the region, from Israel, the Gulf, countries in the Middle East who are most exposed to Iran's predations are speaking with a single voice: extend the arms embargo," Pompeo said.

The United States has formally asked the 15-member Security Council to extend the UN embargo, which is set to be progressively eased beginning in October under UN Security Council Resolution 2231, which enshrined the 2015 nuclear deal between Tehran and world powers.

Veto-wielding Russia and China have said they oppose the U.S. move and have questioned Washington's right to use a disputed legal move to force a return of UN sanctions on Iran.

"Having quit the JCPOA, the U.S. is no longer a participant and has no right to trigger a snapback at the Security Council," Chinese envoy Zhang Jun told the Security Council session, referring to the 2015 nuclear deal by its acronym.

The United States pulled out of the nuclear agreement in May 2018 and reimposed sanctions as part of what it calls a "maximum pressure" campaign on Iran. In response, Iran gradually started breaching its nuclear commitments.

Washington has argued it can trigger a "snapback" mechanism on UN sanctions and the arms embargo because it was a signatory to the agreement in 2015 and Iran has since not fully complied with its commitments.

Iranian Foreign Minister Mohammad Javad Zarif told the Security Council the removal of arms restrictions was "an inseparable part" of the nuclear deal.

"Any attempt to change or amend the agreed timetable is thus tantamount to undermining Resolution 2231 in its entirety," he said.

Buying Weapons

If the embargo is lifted, Iran would likely seek to purchase fighter jets, tanks, naval assets, and other weapons from China and Russia to rebuild its aging military hardware. However, given the dire state of its economy there are questions over whether Tehran has the funds to make significant weapons purchases.

Faced with the UN arms embargo, Iran has long sought to develop ballistic missiles as a deterrent and employed a relatively inexpensive strategy of asymmetric warfare and use of proxy forces around the region.

The UN arms embargo has not prevented Iran from supplying weapons to allies across the Middle East, including to Syria, Iraqi militias, Lebanon's Hizballah militant group, and Yemen's Huthi rebels.

The Security Council gathered to hear a UN report that found cruise missiles and drones used in attacks on oil facilities and an airport in Saudi Arabia last year were of "Iranian origin."

"Iran is already violating the arms embargo even before its expiration date. Imagine if Iranian activity were sanctioned -- authorized -- by this group if the restrictions are lifted," Pompeo said.

If the United States is unsuccessful at extending the arms embargo, Washington has threatened to trigger at the Security Council a return of all UN sanctions on Iran under the nuclear deal.

That policy is likely to be fraught with difficultly because the U.S. quit the deal and faces resistance from other countries, including allies.

Britain, France, and Germany are concerned about the arms embargo being lifted but have said they are trying to reach a compromise out of concern Iran will completely exit the nuclear deal and act on threats to pull out of a key nonproliferation treaty.

However, European parties to the nuclear treaty also say they will not back U.S. efforts to unilaterally trigger a return of all UN sanctions on Iran.

https://www.rferl.org/a/pompeo-address-un-security-council-on-iran-arms-embargo/30698081.html

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COMMENTARY

Space News (Alexandria, Va.)

Time to Move ICBM and Missile Defense Units to the Space Force

By John "J.R." Riordan, Daniel "Sphinx" Dant and Timothy "Stepchild" Cox

June 26, 2020

The integration of ICBMs and space operations creates synergy and also signals a commitment by the U.S. to deterrence in and out of the space domain.

The Air Force personnel who control land-based intercontinental ballistic missiles (ICBMs) and the Army personnel who operate national missile defense systems will not be part of the U.S. Space Force.

That is a mistake.

ICBMs are very large rockets, designed to rapidly reach targets many thousands of miles away by transiting space on a ballistic trajectory. They are the same technologies which are used to launch satellites onto orbit. In fact, many of the launchers in use by the space program from its earliest days up unto the present were either retired ICBMS or technology which was directly evolved from them.

Missile defense interceptors, on the other hand, are smaller rockets which deliver an exo-atmospheric "kill vehicle" to near-earth space in order to engage and destroy ICBM warheads outside of the atmosphere. These kill vehicles are technological siblings of direct ascent anti-satellite (ASAT) systems like those currently deployed by potential U.S. adversaries Russia and China.

Both ICBMs and ground-based interceptors are dual-use technologies, which will do their mission in the space locality (near-earth space) occupied by many of the systems conducting other Space Force missions. Both systems are, for all intents and purposes, space warfare systems.

Since mass to orbit (space launch) or mass through ballistic delivery (ICBMs) follows the same physics and space personnel are trained in this domain, it follows that space personnel are already optimized to integrate these missions.

The Space Force will be the lead for developing new rockets to lift satellites into space. As ICBMs and missile defense systems are upgraded or replaced there will be acquisition pressure from Congress for the services to work together to find a common lift vehicle for satellites and nuclear warheads.

Don't believe it? When the Air Force, Navy and Marine Corps all needed a new fighter, the DoD was forced to integrate the acquisition programs to save money. The result is the F-35, arguably a great jet, or really three great jets that in a previous time would have been considered three completely different aircraft. The end result was increased overall costs.

Neither the space lift mission nor the ICBM mission, both somewhat neglected over the last few decades by the Air Force, can afford to be compelled into a joint service compromise where both systems are diminished to ensure conflicting equities are met.

The only way to avoid such a scenario is to place both missions in the Space Force. Placing the ICBM mission in the Space Force disperses the nuclear triad from two services to three. This is important for ensuring that nuclear systems are prioritized. The Air Force currently splits its support between nuclear bombers and ICBMs, tending to favor the aircraft and flight personnel over the missiles and the personnel who operate them, but never really having enough resources to handle both.

By dividing the Air Forces nuclear missions between the two services, there would always be a four-star on the Joint Chiefs of Staff to advocate for each leg of the nuclear triad. Additionally, the ICBM force has a cadre of maintenance specialists who are experts at maintaining rockets, a mission area which by necessity will be growing rapidly within Space Force in the coming decades, as indicated by recent language in the National Defense Authorization Act calling for tactical space launch capabilities.

ICBMs and ground-based missile-defense systems would open the Space Force to criticism that it should not be involved in terrestrial strike missions. But it is going to happen eventually, and not just in the United States.

This does not mean that all future terrestrial strike and defense operations will be nuclear centric, but simply that much of the employment doctrine, technology and thought processes are immediately applicable to other kinds of space warfare including terrestrial attack from orbital platforms.

Certainly, none of this sounds desirable, but it is unavoidable so the nation cannot just ignore it.

Currently most field grade and senior space officers will have some ICBM operations experience owing to the fact that until very recently, the Air Force considered ICBMs a space mission and cross-trained personnel to do both. In another five years, the vast majority of space operators will have had no interaction with a combat system capable of inflicting kinetic damage on an enemy. That is not a desirable knowledge and experience gap for a military organization dedicated to the profession of arms.

Concepts, thought processes and functions such as shot doctrine, target selection or weapons mix are not instantly developed or learned. ICBM and missile defense forces already have these developed and can provide a foundation for the space force.

There is also the issue of ICBM operators within the Air Force. For a long time, these personnel have been treated as second and even third-class citizens by the Air Force. Over the past 30 years they

have been bounced from Strategic Air Command to Air Combat Command to Air Force Space Command before ending up in Air Force Global Strike command.

In each of those organizations there was at least one other mission area which was prioritized ahead of ICBMs. In the Space Force, ICBMs could form the foundation of a new major command focused on terrestrial strike capabilities. This would allow proper emphasis and professional development for the personnel assigned.

More importantly, this mission transfer enables deterrence and strike operations from the space domain through an organization dedicated to crafting the doctrine, tactics, techniques and procedures needed to provide a credible space threat to adversaries in peace and war. Likewise, ground-based missile defense forces could be integrated with missile and space warning to form the core of a major command dedicated to terrestrial defense against space threats.

The need to fill joint billets is also an important consideration. The ICBM and missile defense forces would add more than one thousand combat operations officers to the new service at no additional cost to the DoD. Thousands of enlisted combat operations, security forces, and maintenance personnel would need to transfer as well. These personnel will be critical for filling joint billets at regional and functional warfighting commands, organizations that will require Space Force representation to ensure mission success.

Finally, the additional personnel, billets and infrastructure that comes with the Air Force ICBM force and Army missile-defense force strengthens career development within the Space Force. More leadership opportunities, career fields, mission areas and assignment locations enhance the force structure by providing a wider range of experiences to influence service culture and doctrine.

As space warfare operational art develops, it will be vital that any ICBM operation, nuclear or otherwise, be coordinated by space warfighters.

ICBM and space operators currently lack a common frame of reference, even while operating in some of the same geological and astrometric spaces. The service which presents space warfighters is the Space Force, so all military space warfighting specialist should be in the Space Force.

Not only does this approach create synergy but also signals a commitment by the U.S. to deterrence in and out of the space domain.

The military space enterprise is currently in a period of disruptive flux, stemming from the creation of the Space Force, the Space Development Agency and the U.S. Space Command. Now is the time to make this integration. Not doing so is a mistake that U.S. adversaries are watching closely.

John “J.R.” Riordan is a retired Air Force colonel. He previously served on the Senate Armed Services Committee staff where he participated in the establishment of the United States Space Force. Daniel “Sphinx” Dant is a senior director at L3Harris and a retired Air Force colonel and space weapons officer. Timothy “Stepchild” Cox is a retired Air Force lieutenant colonel and defense professional with decades of military air and space experience.

The opinions expressed in this article are those of the authors.

https://spacenews.com/op-ed-time-to-move-icbm-and-missile-defense-units-to-the-space-force/

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War on the Rocks (Washington, D.C.)

When It Comes to Missiles, Don't Copy Russia and China – Leapfrog Them

By Jeff Becker

June 30, 2020

Nearly five years ago, a SpaceX Falcon 9 first-stage booster dropped tail first from the night sky, igniting one of its nine liquid oxygen/RP1 engines and softly touching down at a landing zone eight kilometers north of its launch site at the Kennedy Space Center nine minutes after delivering a communications satellite to low-Earth orbit. Everyone in the world could see that rockets designed to prioritize affordability and reusability rather than raw performance were possible. They also promised to put humans in space sustainably by completely transforming the economics of reaching orbit.

A short three months later, another Falcon 9 — serial number B1021 — also landed, this time on a robotic ship hundreds of kilometers from the launch site deep in the Atlantic Ocean. B1021 would fly again less than a year later, marking the first time a first-stage rocket would be used twice for an orbital mission. By 2020, the upgraded Block V versions of the Falcon 9 have re-flown as many as five separate times for orbital missions, and can even be reused for manned missions — an unparalleled series of triumphs in space launch technology.

Meanwhile, China and Russia were making large strides in space exploration's darker twin: missile warfare. The mass production and fielding of highly mobile medium- and intermediate-range ballistic missiles have transformed the armed forces of China, Russia, and other American adversaries. Over the past two decades, China has built the largest intermediate-range ballistic missile force in the world. In fact, it constructed a new and independent service — the People's Liberation Army Rocket Force — to operate its missile forces as a "buttress for its position as a major power and a cornerstone for defending national security." Over the same period, Russia set about restoring the intermediate-range missile capabilities denied to it since implementing the Intermediate-Range Nuclear Forces (INF) Treaty — bringing the whole of Europe under threat of both nuclear attack and conventional precision strike from cruise and ballistic missiles from deep within Russian territory.

China's new DF-26 is a good example of the type of advanced and highly capable theater-range missile the U.S. military can expect to face over the next decade. Launched from road-mobile transporter-erector-launchers from within China, the DF-26 is able to carry a 1,800-kilogram nuclear or conventional payload as far as Guam, perhaps doubling the range of the current, shorter range DF-21, which itself has been fielded in relatively large numbers. In 2019, during a joint exercise in the disputed South China Sea, the People's Liberation Army may have tested an anti-ship variant, firing from the mainland to strike simulated targets at sea for the first time. Out to 2030, these weapons will deploy hypersonic glide and powered hypersonic cruise missiles in addition to their current mix of conventional warheads, further complicating the threat.

China intends to operate these missiles in conjunction with over-the-horizon battle networks designed to find, track, and defeat the U.S. military 1,000 to 3,000 kilometers distant from its borders. With a little imagination, one can envision hundreds of Chinese missiles attacking American runways, ports, and logistics infrastructure throughout the Western Pacific, extending a defensive perimeter over which the core attack capability currently in the U.S. military's inventory — land- and maritime-based strike aircraft — must flee eastward beyond their effective combat range while simultaneously inflicting a catastrophic, Tsushima-like defeat on the fleet at sea.

Building a Post-INF Treaty Missile Force

The United States is unlikely to convince China and Russia to both agree on a new arms control treaty to ban missiles with ranges between 500 and 5,500 kilometers. Instead, it should join both in fielding new weapons — particularly in Asia — to offset their large and growing arsenals. As the United States gets back into this competition, the U.S. military should consider several strategic factors before selecting new intermediate-range missile systems too early.

First, a future aerospace strike capability should be forward-looking. The United States should not simply restore a capability that existed 30 years ago in the Pershing II and Gryphon ground-launched ballistic and cruise missile systems. Many current efforts to re-establish intermediate-range strike options from land, sea, and air provide an interim capability to fill an urgent gap. However, none of these approaches would be unfamiliar to a missileer from the 1960s, and they do not provide the leap-ahead advantages the United States will need to deter and defeat peer adversaries over the next two decades.

Second, a future aerospace strike capability should minimize risks that political or operational challenges will render them ineffective. Most Army missile systems under consideration today rely heavily on forward basing and are dependent on the use of allied territory. This requires difficult and often-fraught forward-basing agreements with host nations. Submarine-based weapons like conventional prompt strike take up valuable payload module space that could be used for maritime strike and other sea control missions. Additionally, they represent a potential opportunity cost to the submarine force. Submarine-launched ballistic missiles tend to have large infrared and radar signatures and should be fired from long range, thus not making the most of submarines' stealthy ability to get close to the adversary. A family of new air-launched missiles such as the Air Force AGM-183 Air Launched Rapid Response Weapon or the Hypersonic Air-Breathing Weapon Concept are highly capable, but still need to be flown by relatively slow bomber aircraft — usually the venerable B-52. Although the weapons are very fast, it takes hours for the bombers to reach their launch locations, and still come with their own access, overflight, and escort protection requirement challenges.

Third, the U.S. military should not symmetrically mirror Chinese and Russian approaches to theater-range missile warfare and engage in a losing competition to build more missiles. The family of new American intermediate-range weapons will almost certainly be more expensive than adversary counterparts. As a think tank report noted, "If the United States wanted to develop an [intermediate-range ballistic missile] with a 4,000-km range equivalent to China's DF-26, such a missile may cost $21 million apiece and $1.1 billion to develop." The cost of Chinese and Russian systems is unknown. However, they will almost certainly be able to expand their missile forces faster and more cheaply than the United States can construct new production facilities and field new systems through its antiquated and outdated acquisition system. Once again, the U.S. military will find itself on the wrong side of a cost curve, emphasizing expensive and exquisite capabilities and ceding the advantage of mass firepower to adversaries.

Washington should consider how it can best convince Beijing and Moscow that their missile forces will be effectively answered, deterring them from pursuing regional objectives by force. A strategic examination of this expanded competitive space suggests that a future advanced aerospace strike capability should present U.S. adversaries with novel military problems. It should be grounded in emerging operational requirements while imposing significant costs on adversaries. Most importantly, it should avail of the unique and growing American technological advantage in advanced and hard-to-replicate reusable rocket technology.

Towards an Advanced Aerospace Strike Capability

What should an advanced aerospace strike concept that successfully addresses this military competitive space look like? A symmetric response, relying on evolutionary — or even backward-

looking — concepts based on single-use missiles is anchored in several outdated assumptions about the state of rocket and additive (3D printing) technologies, limiting the U.S. military's perspective on what is really possible. To illustrate this point, in 2016, I wrote here about the possible use of reusable booster technology for maritime operations, but noted the fact that private rocket companies had not actually reused a recovered rocket. It was not knownat the time if they could in fact be relaunched at all.

Since that time, not only has SpaceX demonstrated the ability to land an orbital-class rocket on its tail, it proved that it can do it again, and again, and again. With "flight proven" reusable rockets now a reality, range hypersonic weaponry may not be as expensive, exquisite, and rare in the future. This opens up the possibility to develop an entirely new class of weapon over the next decade.

An advanced aerospace strike capability should consist of hundreds of reusable first-stage boosters, evolved from, but far smaller than, today's Falcon 9 rocket. A first stage built around reusable rocket engines like SpaceX's Merlin, its more advanced Raptor, or Aerojet Rocketdyne's AR-22 (a Space Shuttle main engine derivative) would accelerate a second-stage "bus" to hypersonic speed — Mach 5 and above. At high altitude, but still within the atmosphere, the booster would release the bus carrying one or more munitions, including unitary warheads, unpowered glide bodies, multiple gliding reentry vehicles with a range of submunitions, aerial drones, powered missiles, or — more advanced and (as we shall see) cost effective yet — a bundle of maneuverable scramjet-powered cruise missiles. After deploying the bus, the first stage would return the launch site (or pre-planned divert sites), landing tail-first, to be reloaded and refueled with another pre-packaged payload bus for another sortie.

At Mach 5 and above, scramjet propulsion is possible. Using the first-stage boosters to get scramjet-powered munitions to operational speed would create further opportunities for low-cost hypersonic strike. Scramjet engines only operate at these high speeds and do not need the complex spinning turbines typical of their jet-powered counterparts. The shape of the engine inlet and ramps to the combustion chamber as well as complex cooling pipes within the body of the vehicle that are required to ignite the fuel air mixture and cool the engine are very difficult to manufacture with today's techniques.

However, 3D printers and additive manufacturing techniques are now capable of constructing complex components out of advanced metals. This technology may allow for the production of scramjets far more cheaply in the future. A reusable first stage could provide the energy to accelerate 3D-printed scramjet 'rods' to hypersonic speed atop the boosters, reducing the cost of intermediate-range hypersonic strike — perhaps comparable to the 30 to 95 percent reduction in the cost per pound to orbit that SpaceX is demonstrating in space lift. This combination of reusable rockets and hypersonic scramjet munitions would effectively combine the speed, range, and penetrating power of missile systems with the flexibility and cost-effective reuse of aircraft.

Don't Stop Firing Until the Enemy's Defenses Are Gone

Robert Rubel noted (albeit in a maritime context), that missile-centric warfare "requires … new ways of 'feeding the fight'" and that the number of missiles fired is central to the outcome. He goes on to note that in missile warfare "It is critical to get missiles into shooting positions as economically as possible, to maximize their number."

Once the U.S. military is able to refuel, rearm, and reuse booster stages repeatedly, intermediate-range missile forces in the inventory become more airpower-like in their ability to deliver higher volume and weight of fire more efficiently. Hundreds of these systems could potentially rain continuous hypersonic blows against an adversary from 5,000 or more kilometers distant. This

'missile treadmill' would set about delivering weapons, sensors, and other capabilities into the fight, largely immune from current and projected air defense systems.

Heavy theater bombardment allowed by advanced aerospace strike is a significant enabler for the rest of the U.S. military, allowing:

… other forces to fulfill their missions in a high-threat environment. By defeating or suppressing key adversary systems, theater-range missiles can create more favorable conditions for other forces to enter the operating area and conduct operations at lower levels of risk.

In addition to their obvious theater-strike and bombardment roles, such systems could be used in a variety of other missions across the range of military operations. Because they return to base, reusable boosters could be used in competition to conduct demonstration flights, much like bomber aircraft conduct deterrence missions today. They could quickly deliver aerial drones or other sensors and communications nodes into a denied area of interest, seeding a battle network at theater ranges in order to improve strike capabilities against moving targets.

Most importantly, an advanced aerospace strike capability based on reusable boosters would begin to place the U.S. military on the right side of the salvo competition with Chinese and Russian missile forces. SpaceX's Merlin engine price remains a mystery, but external analysis shows the unit cost to be somewhere between $1 and $2 million each. Engines generally make up 65 percent of the cost of the first stage of an orbital vehicle, resulting in a unit cost of $1.5-$3.7 million for the booster stage. Reusing the booster 10 times means the cost of delivering a payload would be roughly $150,000-$370,000 per mission, dropping even more for every successful mission after that. A reusable American analog to the DF-26 might conduct a mission with a cost comparable to between three to seven F-35 flight hours today, but with dramatically greater speed, range, and payload, and without putting a pilot at risk.

Transforming Theater Strike

For the foreseeable future, the United States will have significant advantages in strategic nuclear forces. However, this may not be enough to deter China and Russia from projecting conventional military power under cover of intermediate-range missile salvos. Decades-old skepticism of whether Washington would really go nuclear and risk Boston for a Baltic capital or perhaps Richmond for a reef in the South China Sea might feed Russian or Chinese adventurism. As such, without an American answer to conventional missile forces, the United States and its allies are inviting instability.

In the short term, the U.S. military should not slow or cancel the missile experimentation, development, and fielding efforts now underway. Each represents a critical step in deploying a class of weaponry that closes a significant gap that adversaries are intent to exploit. China, Russia, and others show little sign of slowing down.

The same technologies and capabilities that are transforming the ability of the United States to get to orbit cheaply have the potential to transform the competitive dynamics of the intermediate-range missile competition. A nudge now might ensure that the future intermediate-range/hypersonic capabilities of the U.S. military are not expensive, exquisite, and few, but provide sustained, mass firepower that will be needed to deter — and if necessary, win — a large-scale conflict with one of these two great-power adversaries.

The convergence of reusable rocket technology and additive manufacturing for hypersonic engines may mean that intermediate-range strike may no longer be too expensive and too difficult, but far cheaper and more responsive than we fully appreciate today. In this way, an advanced aerospace strike capability, especially when coupled with newly arriving directed energy defensive systems, could together tip the salvo competition in the U.S. military's favor.

Jeff Becker is a consultant to the U.S. Joint Staff J7, Joint Futures and Concepts. The views expressed here are the author's alone and do not represent the official policy or position of the Joint Staff, the Department of Defense, or the U.S. government.

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Modern War Institute (West Point, N.Y.)

The Future of Deterrence: Keeping Nuclear Weapons Holstered Was the Easy Part

By Iain King

June 19, 2020

The readier you are to respond, the less you have to. This is the paradox at the heart of deterrence.

Nowhere is this more apparent than in the nuclear realm, where being absolutely prepared to respond to a nuclear launch has ensured no such attack has happened. Since 1949, when Russia tested its first atomic bomb and became the world's second nuclear power, mutual deterrence between nuclear-armed states has meant these uniquely powerful weapons have never been triggered. For more than seventy years and counting, nuclear deterrence has a perfect record.

Given this success, it is tempting to apply the model to other defense and security threats—to deter them, as nuclear threats have been deterred, so they don't have to be fought. Deterring hybrid threats, in particular, has garnered a large literature, and several promising initiatives.

But we should not expect any of these initiatives to be as successful as the nuclear model. This is because deterrence in the nuclear domain exhibits ten features that make it unique. Against other challenges, including hybrid threats, these same features are absent—or are exhibited only to a partial degree. They need to be understood in order to fruitfully plan deterrence efforts in the future.

1. Nuclear is binary. There can be no half use of a nuclear weapon. This is not the case with other forms of attack—there can be many degrees of a cyberattack, and a territorial incursion can be minor or transitory. How many "little green men" had to arrive at Sevastopol airport in 2014 before it was an invasion? The facts of nuclear physics create an automatic threshold for a response; the absence of equivalent natural trigger points in other forms of warfare makes it harder to deter when facing these challenges.

2. There are a small and known number of nuclear actors. Only nine countries have nuclear weapons: Russia, China, France, the United Kingdom, the United States, Israel, Pakistan, India, and North Korea. All of these actors are understood far more than threat actors in other settings. Terrorists' capabilities, for example, are often unknown before they attack, and those who peddle malign influence operations specialize in disguising their intentions. When the character of a threat actor is unclear, that actor becomes harder to deter.

3. All nuclear actors are similar: they are all states, and generally rational. The resources needed to sustain a nuclear weapons program have meant that, so far, only nations have managed it, and all of them require a degree of rationality to make it work (even North Korea). Not so for other threats, where the actors tend to be much more diverse and the requirement for rationality is less prohibitive. From suicide bombers to lawfare, the range and diversity of non-nuclear challenges dwarf the relative conformity of the nuclear world, complicating deterrence immensely.

4. There is no attribution problem with nuclear. It is fairly easy to determine where a nuclear weapon came from—even a so-called suitcase bomb. The source of many other threats can be disguised, either deliberately through a false-flag operation, or because of the nature of the activity itself. The source of money used to corrupt a political system, for example, can be very hard to trace. If the instigators of an attack believe they cannot be identified, then a punishment will not deter them.

5. With nuclear, intention is clear. While an accidental nuclear launch is a theoretical possibility, it would not be credible for a nuclear state to assert that it set off its weapons "by accident." Any nuclear use can be regarded as deliberate, and so met with an appropriate response. Since all nuclear weapon states accept this, they take great steps to eliminate scope for error within their strategic programs. But in other realms, intention can be very uncertain indeed. A new capability in space, for example, could be a technological advance for civilians, or a threat, or both. Where intention cannot be determined, establishing deterrence is hard.

6. Nuclear is the ultimate form of warfare. A conflict that escalates to the use of nuclear weapons cannot escalate beyond it. Hence, nuclear conflict is a uniquely closed system of deterrence, which simplifies the calculus. All other forms of attack may well garner a response elsewhere: the Russian use of chemical weapons on British soil in 2018, for example, was met with diplomatic and financial sanctions. Compared with the options to retaliate against a nuclear strike, the range of possible responses to non-nuclear attacks will always be larger, and so more complicated.

7. Nuclear attacks are existential threats. This means there is no option other than to deter them, which in turn means the deterrence strategy has to be credible and effective. Other hostile activities may be more tolerable, so they might not provoke a response, and this possibility makes it harder to establish a credible deterrent against them. This is especially true of incremental, cognitive, hybrid, and minor attacks.

8. Participants in a nuclear conflict share relatively even stakes. Again, this simplifies deterrence: because all contestants to a nuclear exchange would suffer catastrophic loss, their approaches will share some similarities. By contrast, asymmetries in other areas unsettle the normal deterrence model. Russia's attacks on the democratic sphere, for example, are harder to deter because Russia itself is not a proper democracy, so simple reciprocity will not be effective.

9. Nuclear attacks occur in certain, known timeframes. Technology and ballistic trajectories mean that a nuclear attack and the response to it would take tens of minutes. This contrasts with the incremental creation of artificial islands in the South China Sea at one extreme, and super-swift actions in cyberspace at the other. Where threats are too fast for our normal decision-making systems to process, or too slow for us to regard the rate of change as significant, we are less likely to respond in a deliberate way.

10. The success of nuclear deterrence is self-reinforcing. Nuclear deterrence has worked until now, creating the reasonable expectation that it will remain effective: the so-called nuclear taboo is self-reinforcing. The reverse is true in other areas, especially where attacks have been successful in the past—it is much harder to deter the next information attack, for example, because several previous ones worked so well, diminishing the future credibility of deterrence in the information environment. Because actors look to the past when deciding how to influence the future, both good and bad deterrence models create positive feedback—feedback that pulls the successful nuclear model further away from less viable deterrence strategies.

Taken together, these ten reasons mean the perfect record of deterrence against nuclear use is exceptional. It is one of a kind—no other form of deterrence can be expected to come close. (Even

biological weapons, which have never been used to inflict mass destruction in the modern era, have been used in targeted operations against high-profile individuals.)

But that does not make non-nuclear deterrence impossible. It just makes it complicated.

It means, for example, that to deter hybrid attacks, we need to improve our resilience against them. This is deterrence by denial, making it harder for adversaries to achieve their goals, and so dissuading them from gambling on a strike.

Also, it means we need to seek out common goals with potential adversaries, identify "win-wins," and emphasise our values. Raw, interest-based calculations may not be enough.

And most of all, it means that, below the nuclear threshold, we should expect to carry out our deterrence threats from time to time. Non-nuclear deterrence can never be reliable, and sometimes it will fail. When that happens, we must respond. The surest way to doom deterrence in the future is to default on deterrence punishments we have promised in the past.

Even though warding off hybrid threats differs from nuclear deterrence, the paradox of deterrence still holds. As long as we are sure we are countering them in the right way, the readier we are to respond to hybrid attacks, the fewer of them we will have to face.

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The views expressed are those of the author and do not reflect the official position of the United States Military Academy, Department of the Army, or Department of Defense.

https://mwi.usma.edu/future-deterrence-keeping-nuclear-weapons-holstered-easy-part/

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Bulletin of the Atomic Scientists (Chicago, Illinois)

America Should Welcome a Discussion about NATO's Nuclear Strategy

By Jon B. Wolfsthal

June 29, 2020

In a recent article in Der Spiegel, a leading German newsmagazine, Michele Flournoy and Jim Townsend argued against a German political figure's suggestion that American nuclear weapons should be removed from Germany, contending such a move would weaken NATO and Germany. No one should lightly take issue with Flournoy or Townsend on nuclear policy or European security. Both are thoughtful experts and former officials with decades of experience and proven track records of enhancing American and allied security.

So my response to the article, "Striking at the Heart of the Trans-Atlantic Bargain," begins with important areas of agreement:

- NATO members should not unilaterally reinterpret or adjust alliance obligations, and discussions about such policy changes are better had in private among member states. Being in an effective and enduring alliance means that all countries must be part of a decision-making process and sometimes make compromises in the interests of collective security.
- Russian actions continue to challenge the NATO alliance, and all allies must contribute to the defense of the alliance with the goal of deterring Russian destabilization efforts and preserving stability.
- It is critical that America's commitment to Europe be enhanced and that European and North American allies have a robust multi-spectrum approach to defend against and deter efforts by Russia to splinter or threaten the alliance.

The otherwise valuable Spiegel piece has one major omission, however: It lacks explicit consideration about the real security and opportunity costs of maintaining the nuclear status quo in Europe, both overall and as it directly relates to the areas of agreement listed above. There is little confidence in any NATO capital that forward-deployed NATO nuclear capabilities can be depended upon in a military conflict with Russia. It is for this reason that NATO continually cites the strategic nuclear capabilities of member states as the ultimate guarantee of NATO's nuclear deterrent. Given the military realities, there is real reason for NATO members in general and the United States in particular to be open to a NATO discussion about the future of nuclear sharing and the possibility of withdrawing US nuclear assets from Europe.

Nuclear risks. The continued deployment of US nuclear weapons in Europe poses security risks. Over the past few years, protesters and even elements of state security have compromised the security of bases where US nuclear weapons are reportedly stationed in multiple NATO countries. While risks to forward deployed nuclear weapons can be mitigated, they cannot be eliminated unless the weapons themselves are eliminated. And perhaps when NATO faced what the alliance was convinced was massive conventional inferiority, these security risks outweighed by the benefits forward-based nuclear weapons provided. This is not the case today; the alliance has options for countering Russian aggression—including nuclear options—that do not require forward-based nuclear weapons, and the nature of the threat to NATO is much different now. That's to say, there is no overriding military requirement for US nuclear weapons in Europe—they are political symbols. They are important symbols, but not irreplaceable, and the risks of maintaining forward-deployed assets and nuclear sharing need to be considered in terms of their physical security and their role in providing or reducing stability in the region, and in regard to the signal those nuclear weapons send about our own confidence in NATO's conventional capabilities.

Opportunity costs. Nuclear-sharing arrangements in NATO are not easy to maintain, and they are not cheap. If, for example, NATO determined that its nuclear deterrence and reassurance commitments could be met through other means, there would be less pressure on NATO members to purchase as many F-35 next-generation nuclear-capable aircraft. While technologically advanced and highly capable, these planes are expensive and may not be priority items for countries or an alliance facing challenges like cyberattacks, disinformation campaigns, and little green men. The savings from smaller F-35 purchases could go a long way toward enhancing other more glaring shortcomings in the NATO defense portfolio. I would not pretend to advise the Der Spiegel authors where freed-up money should be placed first. But it is clear that deterrence and reassurance can be credibly and perhaps more cheaply obtained through other investments.

The rigid commitment to nuclear sharing and forward deployment, and the equally rigid aversion to discussing alternatives, has been in place for over 20 years. These make it all but impossible for the alliance to have a serious discussion about risks, costs, and alternatives to the current nuclear

arrangements. Such cost/benefit analysis will be all the more important in the coming years. NATO states were facing real budget pressures even before the global economic downturn associated with the COVID-19 pandemic, and those pressures can be expected to get worse both in individual countries and for the alliance as a whole. Every Euro spent on F-35s is one not spent on other pressing military and security requirements. Stating that we have to maintain the status quo without a comparative analysis of other options is not the best approach to setting alliance priorities.

Alliance risks. NATO countries worry about America's commitment to their security. This was true when the alliance was at its strongest, and it is even truer today because of the Russian effort to divide the West and after several years of abuse and denigration of the alliance by President Trump.

Now, the accelerating bilateral nuclear arms race between Moscow and Washington—for which both Washington and Moscow bear responsibility—increases concern within the alliance about nuclear risks. Having backed the US in withdrawing from the Intermediate-range Nuclear Forces Treaty (INF), largely to maintain alliance unity, the European allies feel powerless to address the growing nuclear dangers they face together. The looming expiration of New START (given President Trump's clear intent not to extend the deal) only enhances that concern.

While the United States rightly points a finger at Russia for its violation of INF and for other provocations (see: Ukraine), that does not mean it is reasonable to ignore the real concerns among allies over US nuclear policy. It is not just one European politician or party or country that worries about the growing nuclear risks, and despite the underlying goal of deterring conflict, the United States must face reality: US nuclear and defense policy are part of an action-reaction dynamic with Russia that increasingly risks conflict and even war.

In many NATO countries, important political constituencies for both nuclear restraint and disarmament exist. If America does not acknowledge European perceptions of its role in the new nuclear arms race—from the abandonment of the Anti-Ballistic Missile Treaty, to the rejection of nuclear restraint, and on to an openly hostile posture toward mass public efforts to re-energize the nuclear disarmament process—it will make internal NATO divisions more, rather than less likely and possibly make it easier for Russia or other adversaries to create friction.

Nuclear policy risks. By maintaining the current NATO nuclear policy and enhancing nuclear sharing, the United States continues to signal that the alliance needs to rely on nuclear weapons for more than nuclear deterrence. NATO and the United States maintain a policy option of using nuclear weapons in response to purely conventional attacks (or other admittedly extreme non-nuclear scenarios). This locks America out of adopting policies that could enhance nuclear stability and open the door to both nuclear arsenal reductions and major cost savings associated with adopting and fully implementing a policy of using nuclear weapons only in response to nuclear attack or even of no first nuclear use.

There is a strong case to be made that the United States and NATO can effectively deter Russian conventional aggression and efforts to destabilize Europe without forward-deployed nuclear weapons. Removing such weapons from Europe would not require NATO to eliminate either nuclear first use or response options. The key to enhancing conventional and nuclear deterrence is credibility. Improving the credibility of America's commitment to Europe and NATO's commitment to deter and defend itself may actually be more achievable without the political and economic burdens included in nuclear force modernization in Europe. It is less than fully evident that Russia considers America's forward-deployed nuclear assets to be a credible threat, especially in the face of their considerable and growing air defense and area denial capabilities.

It seems at least worth discussing as an alliance whether it would be effective to put Russia on the political defensive for maintaining large and threatening stocks of non-strategic nuclear weapons in and around Europe while NATO captures the politically-united high ground by doing away with nuclear weapons that have no credible military role. Such an effort could include an alliance decision to end the practice of forward deployment and challenge Russia to return its stocks of non-strategic nuclear weapons to storage under effective verification.

Of course, an end to forward deployment is only possible if the alliance is confident it can deter Russia through other means. But given the considerable strategic nuclear assets in the United States, the United Kingdom, and France and the NATO-wide conventional superiority over Russia, deterrence can remain effective, even if the forward-based nuclear bombs are removed from Europe. And even in those areas where NATO has to improve its capabilities, including in areas where it may be at a short-term conventional inferiority to Russia, investments would best be made in non-nuclear capabilities.

A proposal to step back from nuclear competition in Europe could also be part of new and long overdue strategic stability and arms control discussions with Russia. These talks might include other issues that undermine stability in Europe, among them intermediate-range missiles, increasingly capable conventional precise munitions, and missile defenses. Of course, steps would need to be taken to reassure the more insecure of the NATO allies. But the money saved via reduced nuclear deployments and dual-capable aircraft purchases could be directly applied both to current shortfalls in the European Deterrence Initiative and to enhancements in intelligence, surveillance, and reconnaissance and other force enhancers.

In the end, any determination on forward-based nuclear weapons in Europe must be a NATO-wide decision—come to through open discussions that determine NATO policy in the years ahead. Foreclosing a nuclear discussion within NATO will not make European worries about forward-based nukes go away. NATO members, including particularly Germany, have been trying to have this discussion in the post-Cold War context since at least 1999.

There has to be an alternative to lowest-common-denominator decision making when it comes to nuclear dangers. The United States and European NATO members should have a full discussion of deterrence policy as allies, as partners—sensitive to but not beholden to any domestic political agenda in the United States or in European countries. And in the end, the shared goal of peace and stability must be the magnetic north for the outcome. Many options for reaching that goal are available; none should be closed off.

https://thebulletin.org/2020/06/america-should-welcome-a-discussion-about-natos-nuclear-strategy/

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ABOUT THE USAF CSDS

The USAF Counterproliferation Center (CPC) was established in 1998 at the direction of the Chief of Staff of the Air Force. Located at Maxwell AFB, this Center capitalizes on the resident expertise of Air University — while extending its reach far beyond — and influences a wide audience of leaders and policy makers. A memorandum of agreement between the Air Staff's Director for Nuclear and Counterproliferation (then AF/XON) and Air War College commandant established the initial personnel and responsibilities of the Center. This included integrating counterproliferation awareness into the curriculum and ongoing research at the Air University; establishing an information repository to promote research on counterproliferation and nonproliferation issues; and directing research on the various topics associated with counterproliferation and nonproliferation.

In 2008, the Secretary of Defense's Task Force on Nuclear Weapons Management recommended "Air Force personnel connected to the nuclear mission be required to take a professional military education (PME) course on national, defense, and Air Force concepts for deterrence and defense." This led to the addition of three teaching positions to the CPC in 2011 to enhance nuclear PME efforts. At the same time, the Air Force Nuclear Weapons Center, in coordination with the AF/A10 and Air Force Global Strike Command, established a series of courses at Kirtland AFB to provide professional continuing education (PCE) through the careers of those Air Force personnel working in or supporting the nuclear enterprise. This mission was transferred to the CPC in 2012, broadening its mandate to providing education and research on not just countering WMD but also nuclear operations issues. In April 2016, the nuclear PCE courses were transferred from the Air War College to the U.S. Air Force Institute for Technology.

In February 2014, the Center's name was changed to the Center for Unconventional Weapons Studies (CUWS) to reflect its broad coverage of unconventional weapons issues, both offensive and defensive, across the six joint operating concepts (deterrence operations, cooperative security, major combat operations, irregular warfare, stability operations, and homeland security). The term "unconventional weapons," currently defined as nuclear, biological, and chemical weapons, also includes the improvised use of chemical, biological, and radiological hazards. In May 2018, the name changed again to the Center for Strategic Deterrence Studies (CSDS) in recognition of senior Air Force interest in focusing on this vital national security topic.

The Center's military insignia displays the symbols of nuclear, biological, and chemical hazards. The arrows above the hazards represent the four aspects of counterproliferation — counterforce, active defense, passive defense, and consequence management. The Latin inscription "Armis Bella Venenis Geri" stands for "weapons of war involving poisons."