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Feature Report

“Nuclear Arms Control without a Treaty: Risk Options After New Start”. By Vince Manzo.
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https://www.cna.org/CNA_files/PDF/IRM-2019-U-019494.pdf

The United States must prepare to compete with Russia without a treaty that verifiably constrains intercontinental-range nuclear weapons. This coming challenge stems from three changes in US-Russian relations. First, the United States has officially transitioned from strategic partnership to strategic competition as the basis for its Russia policy. By acknowledging Russia's revisionist intentions, the 2018 National Defense Strategy codified an assessment that took root in the United States and many other North Atlantic Treaty Organization (NATO) states after Russia's invasion of Ukraine and has garnered more support every year. This assessment is accompanied by growing appreciation that Russia's political-military strategy poses a full-spectrum foreign and defense policy challenge for the United States. "Russia is challenging US and NATO interests below the threshold of armed conflict, while simultaneously fielding high-end forces to make the barrier to entry for war extremely costly and dangerous for the United States," explains a former US senior defense official. In a major departure from the 1990s, 2000s, and part of the current decade, the United States is now developing a political-military strategy to counter Russia. Second, in another change from the past 25 years, Russia is in the final stages of its nuclear modernization program. It fields a modern force of intercontinental-range, commonly described as "strategic," nuclear forces, and is capable of increasing its deployed arsenal. The United States is also modernizing its nuclear forces, albeit on a different schedule. Both countries are expanding their strategic-military postures to include non-nuclear systems capable of achieving strategic effects. Strategic-military interactions between the United States and Russia in the next two decades will be markedly different than the previous two, with multiple acquisition, development, and deployment pathways available to both. Third, the nuclear arms control treaty framework the United States and Russia have built and sustained over decades is on the precipice. The New Strategic Arms Reduction Treaty (START) will expire next decade. It will reach its 10-year duration in February 2021, though the United States and Russia have the option of extending it for up to 5 years. As of early 2019, the prospects for New START extension are uncertain. Regardless of when New START expires, there is a strong possibility that a follow-on treaty will not be forthcoming. Recognizing these changing conditions, the report explores risks, uncertainties, and US policy options for a world in which there is significant competition between Washington and Moscow, but no bilateral strategic nuclear arms control treaty.

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NUCLEAR WEAPONS

Air Force Magazine (Arlington, Va.)

B-21 to Fly in December 2021; More B-52s to Come Out of Boneyard

By John A. Tirpak

July 24, 2019

The new B-21 Raider stealth bomber is making good progress and should fly in December 2021, USAF Vice Chief of Staff Gen. Stephen “Seve” Wilson said July 24.

Wilson, speaking at an AFA Mitchell Institute event in Washington, D.C., said the service continues to analyze its capacity for long-range strike. The Air Force still believes it is short, and is reviewing alternative force mixes.

Speaking on deterrence and the need to modernize the nuclear command, control, and communications network, Wilson said he was at Northrop Grumman’s facilities in Melbourne, Fla. in the last few weeks, “looking at the B-21,” and said the company is “moving out on that pretty fast.” Wilson said he has an application on his phone “counting down the days ... and don’t hold me to it, but it’s something like 863 days to first flight.”

That would put the first flight of the B-21 in December 2021. The Air Force has said from the beginning that the first B-21 would be a “useable asset” but has also said it doesn’t expect an initial operating capability with the B-21 before the “mid 2020s.”

Northrop Grumman CEO “Kathy Warden and her team are focused on software integration and making sure ... we’ll have the software ready for the plane when it’s delivered,” Wilson said.

The Air Force is “focused on the development of the new bomber as well as modernizing the B-52,” with new engines and radar, “and we’re exploring the force structure between the B-1 the B-2 and the B-52,” Wilson noted. “The general consensus is, we don’t have enough long range strike capacity, and that came out in ‘The Air Force We Need,’ ” study the service published last September.

“We continue to look at what that force will be for the future across the bomber force, what mix it will be.” He maintained the service needs “at least 100” B-21s.”

Air Force Magazine asked Wilson why the service has not advanced the planned number of B-21s, given the acknowledged shortfall in bomber capacity. The Air Force said in “The Force We Need” that it requires another seven bomber squadrons. Increasing the planned buy would also have the effect of reducing the unit cost, by amortizing development over a larger number of units.

“That’s exactly what we’re looking at,” Wilson replied, as well as “what the right balance” will be as B-21s come online. The service has yet to decide if it will extend the B-1 and B-2 bombers—slated to retire in the early 2030s—to increase the bomber fleet or simply go for an all B-21 and B-52 fleet. “But we can’t have four bombers” Wilson said.

Asked if the Air Force will have the new bomber plan by September, or in time for the fiscal 2021 budget, Wilson said only “it may take some time” before the Air Force reaches a final decision. He acknowledged that Air Force Global Strike Command boss Gen. Timothy Ray has openly questioned whether the B-1 and B-2 should be retired as the Air Force has planned.

Wilson also said that while the Air Force “isn’t going to get any new B-52s,” AFGSC might still take “one or two more out of the boneyard.” He noted that Ray has “already brought one B-52 out of the boneyard.”

<http://www.airforcemag.com/Features/Pages/2019/July%202019/B-21-to-Fly-in-December-2021-More-B-52s-to-Come-Out-of-Boneyard.aspx>

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Defense News (Washington, D.C.)

Boeing Drops from Next-Generation ICBM Competition

By Valerie Insinna

July 25, 2019

WASHINGTON — Boeing has announced its withdrawal from the Ground Based Strategic Deterrent competition, potentially leaving Northrop Grumman as the only contender vying to replace the Air Force’s Minuteman III intercontinental ballistic missiles.

“After numerous attempts to resolve concerns within the procurement process, Boeing has informed the Air Force that it will not bid Ground Based Strategic Deterrent (GBSD) Engineering and Manufacturing Development (EMD) under the current acquisition approach,” reads a Boeing statement. “We’ve evaluated these issues extensively, and determined that the current acquisition approach does not provide a level playing field for fair competition.”

An Air Force spokeswoman declined to comment on the news, as the competition is currently in source selection.

Inside Defense broke the news of Boeing’s departure from the competition.

Boeing’s decision comes a week after the Air Force released its final request for proposals on July 16. A contract for the engineering, manufacturing and development phase is expected to be awarded by the end of 2020.

Lockheed Martin had previously competed for the contract, but was ousted in August 2017, when the service awarded technology maturation and risk reduction contracts to Boeing and Northrop.

It’s unclear how Boeing’s departure will affect the ultimate price of the GBSD program.

In April, Gen. Timothy Ray, head of Air Force Global Strike Command, said he was counting on competition between Northrop and Boeing to help offset a near-term bump in cost expected as the Air Force makes investments in current infrastructure that will be reused for the GBSD system. Ultimately, that competition would help drive “billions” of dollars in savings over the lifespan of the weapon, he said.

“Between the acquisition and the deal that we have from a competitive environment, from our ability to drive sustainment, the value proposition that I’m looking at is a two-thirds reduction in the number of times we have to go and open the site. There’s a two-thirds reduction in the number of times we have to go and put convoys on the road.”

It would be unusual for the Air Force to move forward with this program with only one competitor, Byron Callan, an analyst with Capital Alpha Partners, noted in an email.

“One option would be for the Air Force to re-write the RFP to address some of Boeing’s concerns, which could delay the program,” he wrote. “The RFP had been seen by some analysts as favoring

Northrop Grumman because the initial portion was cost-plus, but Boeing's concerns suggest it's worried about a strategic bid by Northrop Grumman."

During an earnings call on Wednesday, Boeing CEO Dennis Muilenburg referred to the GBSD program a single time — to say that the company would leverage its development work on GBSD for future programs such as NASA Commercial Crew effort and next-generation space launch.

<https://www.defensenews.com/space/2019/07/25/boeing-drops-from-next-generation-icbm-competition/>

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Homeland Preparedness News (Washington, D.C.)

Air Force Releases Request for Proposals for Missile System Program

By Douglas Clark

July 18, 2019

The U.S. Air Force has issued a request for proposals for five production lot options to produce and deploy its Ground Based Strategic Deterrent (GBSD) intercontinental ballistic missile weapon system.

The effort stems from the branch's Engineering and Manufacturing Development (EMD) phase. The contractors for GBSD's current Technology Maturation and Risk Reduction phase, Boeing and Northrop Grumman, will compete for the EMD contract and the Air Force Nuclear Weapons Center expects to award the contract in the fourth quarter of fiscal year 2020.

"There is no margin to do another service life extension program on Minuteman III, because not only would it be more expensive than developing GBSD, but you would not have the resiliency in the capability because you would not have the modern equipment, you would not have the actual capabilities from a functional range point of view (or) warhead capability," Ellen Lord, undersecretary of defense for acquisition and sustainment, said. "So we need to, by 2028, start replacing (ICBMs)."

The new GBSD system has garnered the support of senior Air Force leadership.

"If you look at the threat that we face, Russia just completed their modernization of their triad this year...because they know they cannot defeat us—and certainly can't defeat NATO—conventionally," Gen. David L. Goldfein, Air Force chief of staff said at a congressional committee hearing in April. "So, our modernization and recap of the triad is just in time because in the missile leg, key parts of that program expire right about the time that we bring on the new Ground Based Strategic Deterrent to replace it."

<https://homelandprepnews.com/stories/34850-air-force-releases-request-for-proposals-for-missile-system-program/>

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Seapower (Arlington, Va.)

Defense Secretary Nominee Supports Modernization of Nuclear Deterrent

By Richard R. Burgess

July 16, 2019

WASHINGTON — President Trump’s nominee for secretary of defense said he supports modernization of the nation’s strategic nuclear deterrent.

“Clearly, modernization of the [strategic nuclear] triad is top priority,” Mark T. Esper said June 16 during his confirmation hearing before the Senate Armed Services Committee, listing his top modernization priorities.

Nuclear deterrence “has kept the peace with regard to deterring nuclear war for 70 years now,” Esper said during his testimony. “The important part is to ensure that we have a modern, effective, credible, safe and reliable deterrent.”

Each leg of the triad [bombers, intercontinental ballistic missiles and submarine-launched ballistic missiles] “provides certain capabilities to complement one another,” he added. “Continuing to modernize that triad is important our safety and security.”

Esper said that each leg is in a different status.

“We need to certainly modernize the GBSD [Ground-Based Strategic Deterrent],” he said. “Obviously, we have plans to recapitalize

the Ohio-class [ballistic-missile] submarines, and there is a program underway to [recapitalize] our long-range stealth bombers.”

Esper said that two parts of deterrence are “having a capability and the will to use it.”

He stressed that the strategic deterrent force needed to be cyber-protected.

There was no daylight between the priorities between Esper and the nominee for the chairman of the Joint Chiefs of Staff, Army Gen. Mark Milley.

Milley, testifying June 11 in his confirmation hearing before the same committee, listed the nation’s strategic nuclear deterrent as his top modernization priority, the others being space capabilities, artificial intelligence and hypersonic weapons.

He supports modernization of all three legs of the U.S. strategic deterrent triad.

“The triad has worked,” Milley said. “There are many reasons why there hasn’t been a great power war since 1945. Clearly one of them is nuclear deterrence and part of that is the capability of the triad. Each leg of the triad gives you different capability.”

“I think we need to develop the domain of space as a warfighting domain,” Esper said. “We need to improve our capabilities and policies with regard to cyberspace. And then of course there is a wide range of conventional capabilities we need to improve.” Space is no longer “a place from which we support combat operations,” he said. “It is now a warfighting domain. Not because we made it that way, but because the Russians and Chinese are making it that way. To make sure we are sufficiently robust in the space warfighting domain is to have unity of command and unity of effort.”

<https://seapowermagazine.org/defense-secretary-nominee-supports-modernization-of-nuclear-deterrent/>

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US COUNTER-WMD

Sandia Labs (Albuquerque, N.M.)

What Do Dragonflies Teach Us about Missile Defense?

Author Not Attributed

July 24, 2019

Be grateful you're not on a dragonfly's diet. You might be a fruit fly or maybe a mosquito, but it really wouldn't matter the moment you look back and see four powerful wings pounding through the air after you. You fly for your life, weaving evasively, but the dragonfly somehow tracks you with seemingly instant reflexes. For a moment, you think you've gotten away, just as it closes in swiftly from below for the kill.

Then, as the dinosaur-era predator claws into you with its spiny legs and drags you into its jaws midair, you might wonder to yourself, "How did it catch me with such a tiny brain and no depth perception?"

Sandia National Laboratories is homing in on the answer with research showing how dragonfly brains might be wired to be extremely efficient at calculating complex trajectories.

In recent computer simulations, faux dragonflies in a simplified virtual environment successfully caught their prey using computer algorithms designed to mimic the way a dragonfly processes visual information while hunting. The positive test results show the programming is fundamentally a sound model.

The Sandia research is examining whether dragonfly-inspired computing could improve missile defense systems, which have the similar task of intercepting an object in flight, by making on-board computers smaller without sacrificing speed or accuracy. Dragonflies catch 95% of their prey, crowning them one of the top predators in the world.

Computational neuroscientist Frances Chance, who developed the algorithms, is presenting her research this week at the International Conference on Neuromorphic Systems in Knoxville, Tennessee. Earlier this month, she presented at the Annual Meeting of the Organization for Computational Neurosciences in Barcelona, Spain.

Research replicates dragonfly's highly efficient brain

Chance specializes in replicating biological neural networks — brains, basically — which require less energy and are better at learning and adapting than computers. Her studies focus on neurons, which are cells that send information through the nervous system.

"I try to predict how neurons are wired in the brain and understand what kinds of computations those neurons are doing, based on what we know about the behavior of the animal or what we know about the neural responses," she said.

For example, a dragonfly's reaction time to a maneuvering prey is a mere 50 milliseconds. A human blink takes about 300 milliseconds. Fifty milliseconds is only enough time for information to cross about three neurons. In other words, to keep up with a dragonfly, an artificial neural network needs to be done processing information after only three steps — though, because brains fire lots of signals at once, each step may involve many calculations running at the same time.

Faster, lighter computing for missile defense

Missile defense systems rely on established intercept techniques that are, relatively speaking, computation-heavy. But rethinking those strategies using highly efficient dragonflies as a model could potentially:

Shrink the size, weight and power needs of onboard computers. This would allow interceptors to be smaller and lighter, and therefore more maneuverable.

Reveal new ways to intercept maneuvering targets such as hypersonic weapons, which follow less-predictable trajectories than ballistic missiles.

Reveal new ways to home in on a target with less sophisticated sensors than are currently used.

Dragonflies and missiles move at vastly different speeds, so it's unknown how well this research will ultimately translate to missile defense. But developing a computational model of a dragonfly brain also could have long-term benefits for machine learning and artificial intelligence.

AI is used throughout wide-ranging industries, from self-driving transportation to prescription drug development. These fields stand to gain from highly efficient methods for constructing fast solutions to complex problems. Ongoing research at Sandia is refining Chance's algorithms and determining where they're most applicable.

Her research is funded by Sandia's Laboratory Directed Research and Development program.

Sandia National Laboratories is a multimission laboratory operated by National Technology and Engineering Solutions of Sandia LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration. Sandia Labs has major research and development responsibilities in nuclear deterrence, global security, defense, energy technologies and economic competitiveness, with main facilities in Albuquerque, New Mexico, and Livermore, California.

https://share-ng.sandia.gov/news/resources/news_releases/dragonfly_defense/

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National Defense (Arlington, Va.)

CBRN Conference News: Defense Officials See Increased Threat from Chinese, Russian Chem-Bio Weapons

By Yasmin Tadjeh

July 23, 2019

WILMINGTON, Del. — Much attention has been focused on Russia and China's modernization of their nuclear and conventional forces. But there is growing concern at the Pentagon about those nations' chemical and biological weapons, U.S. officials said July 23.

There is now an increased focus on threats posed by near-peer adversaries, noted Andrew Kilianski, chief intelligence officer at the joint program executive office for chemical, biological, radiological and nuclear defense.

"They're in that emerging space ... in terms of things we haven't seen before or things that we don't have a lot of information on," he said during remarks at the National Defense Industrial Association's annual CBRN Conference and Exhibition in Wilmington, Delaware. The question now is, "how do we build capability against a threat space which ... we don't know much about?" he added.

James Madsen, lead clinical consultant and clinical laboratory director at the chemical casualty care division at the U.S. Army Medical Research Institute of Chemical Defense, pointed to Russia as the greatest chemical threat. Last year, Moscow was widely blamed for the poisoning of former Russian double agent Sergei Skripal and his daughter Yulia with the nerve agent Novichok in the United Kingdom.

But China is the leader in toxin-based weapons, Madsen said.

“China knows more about marine toxins in particular than any other country in the world,” he said.

Madsen said there are many deadly and frightening chem-bio threats that are not on many people’s radar. One, which he would not name, can infect a person and have a long latency period. “When you have symptoms ... it's too late and you deteriorate over a period of months to weeks and you die,” he said.

North Korea, Iran and non-state actors also pose a threat, officials noted.

“Over the past few years, we've gotten numerous examples of the emerging and reemerging threats space out there, ... from non-state and state adversaries,” Kilianski said.

It’s no longer rare for nations to use these types of lethal agents, he said.

“What we've seen over the past few years is the norms around chemical and biological weapon use have been eroded almost completely,” Kilianski said. “The norms surrounding these and the treaties surrounding these have really taken a hit.”

Retired Army Brig. Gen. William King, who now works as an executive advisor with Booz Allen Hamilton focusing on countering weapons of mass destruction, said the Defense Department has to prepare now.

It’s only a matter of when — not if — a chemical or biological attack will occur, he said. “It's already happened and [is] happening, and the inhibition to use some of these threats is no longer there.”

King pointed to high-profile events such as the use of nerve agents against populations in Syria and the assassination of North Korean leader Kim Jong Un’s brother, Kim Jong Nam, in Malaysia with the nerve agent VX in 2017.

Despite these growing threats, the joint PEO for chemical, biological, radiological and nuclear defense has a “flatlined” budget, said Doug Bryce, who heads the office.

“We've been at steady state,” he said. “Our buying power has gone down [due to inflation]. ... It's the same amount of money year after year.”

President Donald Trump’s fiscal year 2020 budget request included \$1.4 billion that would be “aligned against the highest CBRN-defense priorities for the department, joint service and combatant commands to improve near-term joint force readiness and modernize the force over the long term.”

<https://www.nationaldefensemagazine.org/articles/2019/7/23/defense-officials-see-increased-threat-from-chinese-russian-chembio-weapon>

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US ARMS CONTROL

Breaking Defense (Washington, D.C.)

Army Readies Long-Range Missile Tests – Post INF

By Paul McLeary

July 19, 2019

WASHINGTON: The Army has moved flight testing of its new long-range missile from this summer until after the drop-dead date for US withdrawal from the INF treaty with Russia. That will mean the Pentagon will kick off testing of longer-range weapons banned by the Cold War-era pact.

Tests of the Precision Strike Missile, now slated for the November-December time frame, will fall well after the Aug. 2 deadline Russia has to return to compliance with the treaty. Any tests after that date can hit ranges beyond the previously-allowed 499 km for ground-launched ballistic and cruise missiles.

Current plans call for the Army's PrSM to exercise only up to 499 km, but the weapon's potential range is really "only limited by the INF Treaty," as chief of Army Futures Command, Gen. Mike Murray, has said.

Since 2017, Lockheed Martin and Raytheon have worked on competing PrSM prototypes with a view to replace the existing Army Tactical Missile System (ATACMS), while vastly increasing that weapon's range from about 300 km to hundreds or thousands of kilometers more. After the coming shoot-off, the Army will pick a winner in 2021, and field a workable system in 2023, a considerable acceleration from the original date of 2027. While the missiles will be new, the launchers already exist in the form of the M270 tracked vehicle and HIMARS truck, which will be able to hold two and four missiles respectively, doubling the load allowed by the bulkier, older ATACMS.

With less than two weeks before the US walks away from the INF treaty, it's certain the coming tests will be closely watched to see how far the Army pushes its latest prototypes. Speaking at the Center for Strategic and International Studies on Thursday, Col. John Rafferty, director of the Army's Long Range Precision Fires program, downplayed the INF implications, saying the revamped schedule came about due to "a couple of technical issues," but that he expects everything to be up and running come the fall.

While he's pushing to meet the compressed schedule to get the system fielded in 2023, Rafferty remains concerned about the complex research and development: "You can pull some things to the left, but it's hard to pull [science and technology] to the left because that takes time to accomplish."

Of particular concern is that the Army is looking to develop PrSM to reach out and smack ships at sea, but it can't just plug-and-play the Navy's "sea-skimming" missile seekers, since those track targets on the horizon. By contrast, the Army's ground-launched seeker will come from over the top, and "right now there really isn't anything that does that. It doesn't mean there isn't a capability that could be learned," Rafferty said, adding he has seen some technologies "that are close" to what he needs.

Post INF?

While the Senate and the House still have to meet in conference later this year to hash out a 2020 budget that will include funding for research and development of intermediate-range weapons systems for a post-INF world, it's unclear how much money will be pushed toward the issue.

Developing a new generation of ground-launched, intermediate-range missiles has found near universal support at the Pentagon, with presumptive Defense Secretary Mark Esper, and Chairman of the Joint Chiefs nominee Gen. Mark Milley, supporting the work in their nomination hearings earlier this month. Indo-Pacom chief Adm. Philip Davidson, and current Joint Chiefs chairman Gen. Joe Dunford have also supported the work.

If Russia fails to return to compliance with the treaty by Aug. 2, the US “should pursue development of ground-based, conventional, intermediate-range missile systems,” Esper told the Senate in written responses to questions. “Failing to do so could cause allies and others to question our resolve in ensuring Russia cannot achieve a military advantage through its INF violation.”

While Russia is front and center in these discussions, much of the support for more work on the issue actually reflects challenges posed by China across the vast expanses of the Pacific, where Beijing has already fielded some 1,600 intermediate-range ballistic missiles, as it has never been bound by the strictures of the bilateral INF pact.

“If you look at a map of Europe, 500km means something, but if you look at a map of Asia, 500km is a rounding error, said Eric Sayers, an adjunct Senior Fellow at the Center for a New American Security. “Asia continues to pay for the strategic stability of yesteryear in Europe.”

Sayers called Congress “the center of gravity on this issue right now,” since their policy and budget conference debates over the immediate future of developing intermediate-range conventional weapons will dictate how far the Pentagon can go.

<https://breakingdefense.com/2019/07/army-readies-long-range-missile-tests-post-inf/>

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The Economist (London, U.K.)

The Nuclear Deal Fuelling Tensions between Iran and America

Author Not Attributed

July 22, 2019

PRESIDENT BARACK OBAMA called it “the strongest non-proliferation agreement ever negotiated”. President Donald Trump derided it as “one of the worst deals ever”. Now the Joint Comprehensive Plan of Action (JCPOA)—the unwieldy name given to the multinational nuclear deal signed between Iran and six world powers in 2015—is on life support. Mr Trump dealt it a near-fatal blow last year by withdrawing America from the accord. And Iran inflicted more wounds in July by breaching some of the agreed limits, on the size of its stockpile of low-enriched uranium and on the concentration of fissile material. As tensions rise in the Gulf, America and Iran seem to be on a collision course. So what, exactly, is the JCPOA?

In 2002 the world learned of a large, secret Iranian uranium-enrichment site buried deep underground. Iran claimed it was intended to make low-enriched uranium for nuclear-power stations. The rest of the world suspected it was part of a clandestine nuclear-weapons programme, intended to give Iran the ability to produce the highly enriched stuff that goes into bombs. In 2003, shortly after President George W. Bush declared his “global war on terror” and America invaded Iraq, Iran announced that it would suspend all enrichment-related activities, as part of diplomacy with Europe. But as regional tensions rose over the next decade, its nuclear programme mushroomed. Western powers, fearing the development of an Iranian nuclear weapon and the Middle Eastern arms race that might follow, piled on increasingly draconian sanctions to force Iran

to back down. Rumours swirled that Israel might launch air strikes, as it had on an Iraqi reactor in 1981 and a Syrian site in 2007.

In July 2015 Iran reached a bargain with the permanent five members of the UN Security Council (America, Britain, France, Russia and China) as well as with Germany and the European Union. It mothballed thousands of centrifuges (machines that enrich uranium). It agreed to enrich uranium only to low levels not suitable for a bomb and to accumulate no more than 300kg. It poured concrete into the core of its heavy-water reactor at Arak, which might otherwise have yielded plutonium for a bomb. And it agreed to the most stringent inspections regime anywhere in the world. In return, some of the sanctions were lifted, providing relief for Iran's battered economy.

The deal's proponents argued that the restrictions left Iran more than a year away from being able to produce a bomb's worth of fuel, as opposed to a few months. "Military action would only set back Iran's programme by a few years at best, which is a fraction of the limitations imposed by this deal," pointed out Mr Obama. And even if Iran cheated, went the theory, it could only move slowly to avoid being found out. Less impressed, hawks in America, Israel and the Gulf states scoffed that Mr Obama had given away too much. Iran, they complained, would be permitted to continue some enrichment and to expand its programme as restrictions fall away (the first expire after a decade). In the meantime, it would receive billions of dollars that could be funnelled to allied militant groups in the region.

In May 2018 Mr Trump pulled America out of the JCPOA and soon re-imposed sanctions on Iran. European countries promised to protect trade as best they could, but most companies preferred to sacrifice deals with Iran rather than risk losing business in the American market. Iran kept its side of the nuclear bargain for a year. But in April 2019 Mr Trump ended waivers that had allowed some countries to continue buying Iranian oil. That was the final straw. In May Iran gave notice that it would begin walking away from the deal, provision by provision, unless the Europeans could shield Iran's economy.

Since then, hostilities between America and Iran have increased. Ships have been attacked in or near the Strait of Hormuz, through which a fifth of global oil exports pass. In June, Iran shot down an American drone; American bombers were ten minutes away from their targets in Iran when Mr Trump called a retaliatory strike off. In July, America claimed to have downed an Iranian drone. Meanwhile, the International Atomic Energy Agency verified that Iran broke the 300kg limit on July 1st, followed by the 3.67% purity threshold on July 8th.

Unless America and Iran can find a way to talk again, Iran will creep back towards the ability to make a nuclear bomb; and Mr Trump will face growing pressure from his hawks to bomb Iran. What could stop either of these nightmares from becoming a reality? Probably a deal that looks much like the JCPOA.

<https://www.economist.com/the-economist-explains/2019/07/22/the-nuclear-deal-fuelling-tensions-between-iran-and-america>

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Breaking Defense (Washington, D.C.)

US Missile Warning Sats Fair Game If No New START?

By Theresa Hitchens

July 17, 2019

WASHINGTON: After nearly 50 years, the mutual US-Russian ban on interfering with early warning and reconnaissance satellites — fondly known as National Technical Means — will disappear if the Trump Administration abandons (as is likely) the bilateral New START treaty.

Besides capping nuclear force levels, the New START treaty — like every other bilateral nuclear arms control treaty dating back to the early 1970s — includes a prohibition on interference with “national technical means of verification” known as NTMs.

New START expires in February 2021, and the Trump Administration is leaning against extending it for five years in favor of pursuing a highly unlikely trilateral deal that would include China. The administration also intends in August to withdraw from the only other extant nuclear arms treaty that includes this provision, the 1987 Intermediate-Range Nuclear Forces (INF) Treaty, over violations by Russia.

“With the end of New START, there is no longer going to be any prohibition on interference with NTMs ... for the first time in 50 years,” Gleason, a former Air Force officer now at the Aerospace Corporation’s Center for Space Policy and Strategy, told a conference cosponsored by Aerospace and the George Washington University’s Space Policy Institute on Monday.

This could lead to a “changed strategic context for the national security space community,” he said, in which satellites linked to the nuclear kill chain are legitimized as targets for interference, which in turn would increase the likelihood of “misunderstanding, misperception and miscalculation” and erodes strategic stability as well as stability in space.

While neither New START nor the past nuclear arms control treaties (or their negotiating records) clearly define NTMs, Washington and Moscow have tacitly included in that definition pretty much all satellites — although most specifically for the US, the Air Force’s aging Defense Support Program (DSP) satellites that detect missile launches as well as the follow-on Space-Based Infrared System (SBIRS) satellites, the Department of Energy nuclear detection (NUDET) payloads on Global Positioning System (GPS) satellites, and other reconnaissance satellites, such as the Orion/Mentor signals intelligence satellites, operated by the National Reconnaissance Office (NRO).

“Since neither Russia nor the US wanted to specify which satellites were engaged in verifying compliance with arms control treaties, both extended the ban on non-interference to the entire national space constellation of the other,” Gleason explained. “In addition,” he said, “the term interference has never been defined but is generally assumed to include jamming, dazzling and other types of interference.”

At least two other international treaties signed by the US have provisions relating to non-interference with satellites: the 1967 Outer Space Treaty (OST) and the International Telecommunication Union (ITU) Constitution and Convention. The OST does not provide a hard ban on interference with satellites, although it is implied (via Article 9). The ITU treaty, under the Radio Regulations governing use of radio frequency by satellites, does contain a prohibition on “harmful interference” with satellite operations, and goes further to set up a dispute resolution mechanism for dealing with cases of interference deliberate or not. However, neither treaty directly mentions NTMs.

But despite these treaties, the US is already seeing an increase in interference with its satellites by Russia, especially with GPS satellites, according to a number of recent studies including the Defense Intelligence Agency's (DIA) January 2019 "Challenges to Security in Space."

A study on the counterspace capabilities of Russia, China, the US and several other countries by the independent Secure World Foundation (SWF) further noted that the Finland and Norway have accused Russia of jamming GPS signals during a November 2018 NATO exercise in the region. The SWF report said: In November 2018, there were media reports of widespread jamming of civil GPS signals in Norway and Finland at the same time as a major North Atlantic Treaty Organization (NATO) exercise. The jamming reportedly affected military systems as well as civilian airliners, cars, trucks, ships, and smartphones. In March 2019 the Norwegian government claimed they had proof that the disruption was caused by Russian interference and demanded an explanation. (Russia, of course, denied that it had anything to do with the problem.)

So, one might ask what real world affect might the demise of the NTM noninterference agreement have? The difference is that up to now, Russia (and China) have avoided jamming or spoofing missile warning satellites and those directly linked to nuclear operations.

Gleason argues that a key concern for the national security space community is that the US may face destabilizing Russian interference with NTMs "while demand for strategic intelligence on Russian strategic nuclear forces from space-based NTMs goes up significantly" because, in the absence of New START, there will no longer be requirements for Russia to share data about its nuclear activities, allow on-site inspections by US officials of nuclear weapons and materials production facilities, and refrain from concealing nuclear testing activities and facilities. Thus, he said, "US confidence in its understanding of Russian nuclear forces may erode over time."

Indeed, a March 2019 study by the Center for Naval Analyses (CNA), "Nuclear Arms Control Without A Treaty: Risks and Options after New START," made similar findings:

"Without New START's cooperative transparency practices, the US intelligence community would likely devote more resources to monitoring Russian strategic nuclear forces but have less insight and less confidence in its analytical judgements. The United States would face an opportunity cost of diverting scarce national technical means (NTM), such as satellites, and technical analysts from other missions. Russian defense officials would also navigate increased uncertainty and lose the ability to confirm that the United States has not reversed its New START reductions. Neither country would have the same degree of confidence in its ability to assess the other's precise warhead levels. Worst-case scenario planning is also more likely as a result. Over the longer term, both countries are likely to face greater uncertainty about each other's strategic nuclear forces and operations."

This situation would put more demands on the "national security space workforce and intelligence analysts," Gleason said.

Further, some historians argue that the then-Soviet Union, despite the success of Sputnik and President Dwight Eisenhower's political machinations, did not actually accept that spy satellite overflights of their territory were legitimate until the 1972 negotiations of the NTM clause in the SALT I nuclear arms control treaty and the concomitant Anti-Ballistic Missile Treaty. So the question is whether Russia might, in a post New START world, reanimate its old stance.

More worrying, however, is the specter of Russian and Chinese interference with nuclear command and control satellites and/or early warning satellites in a crisis being interpreted by US leadership — or vice versa — as a harbinger of nuclear attack.

According to a 2017 study by James Miller and Richard Fontaine of the Center for a New American Security, the increasing integration of counterspace technologies (as well as cyber offenses) into US

and Russian arsenals is creating “new escalatory risks and threatening to erode strategic stability between the two nations. Because of the extensive dependence on information technology within both nations’ militaries, and likely perceptions of lower risk for the use of “non-kinetic” nonlethal attacks, there are growing incentives on both sides for early use of cyber capabilities in particular and, potentially in coming years, counter-space ones as well. These and other technologies also are impacting the stability of the strategic nuclear balance.”

Some nuclear experts argue that Russia would have no incentive to target US early warning or other nuclear-related satellites because Moscow understands that would cross the line and likely to a US nuclear response. That may be true, at least for the generation of Russian leaders that have grown up with the legacy of bilateral nuclear arms control treaties.

However, China has never really acknowledged the prohibition on interference with NTM as something that applies to Beijing’s activities; moreover, according to the DIA, “PLA writings suggest that reconnaissance, communications, navigation, and early warning satellites could be among the targets of attacks designed to “blind and deafen the enemy.”

<https://breakingdefense.com/2019/07/us-missile-warning-sats-fair-game-if-no-new-start/>

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COMMENTARY

Defense One (Washington, D.C.)

Should Cyber Arms Be Treated Like Bioweapons?

By David Fidler

July 24, 2019

A recent paper suggests that the two are more closely related under international law than previously thought. But the analogy, while useful, is not exact.

In an important contribution, Jeffrey T. Biller and Michael N. Schmitt argue that cyber capabilities are not “weapons” or “means of warfare,” but can be “methods of warfare” under international humanitarian law (IHL). These conclusions challenge the prevailing notion, contained in the Tallinn Manual 2.0 on the International Law Applicable to Cyber Operations, that cyber capabilities can be weapons and means of warfare. Biller’s and Schmitt’s claim is that, unlike other military technologies, cyber capabilities do not cause direct harm to people or property. “Having a damage mechanism with the ability to directly inflict the damaging or injurious terminal effect on a target is,” they write, “the litmus test for qualification as a means of warfare.” When computer code is deployed, “the harmful effects are ... indirect; they are not terminal vis-à-vis the code.” Harmful effects directly arise from the operation of the target system infected with the code, rather than from the code itself. “Therefore,” they conclude, “computer code and associated systems cannot qualify as means of warfare.”

For much of article, I nodded in agreement as the argument unfolded. With one exception, which produced a quizzical tilt of the head.

Biller and Schmitt observe that biological weapons are “beyond question” a means of warfare because the biological agent’s “damage mechanism is...terminal” as the agent “directly inflicts the harm.” However, they appear to conflate biological agents with toxins in stating that “[t]ypical

biological toxins include bacteria, rickettsia, fungi, and viruses.” Not all biological agents are toxins or generate morbidity or mortality through toxins.

Some agents, such as anthrax, produce toxins that directly damage cells and organs. Other pathogens considered biological weapons trigger a cascade of adverse physiological reactions in the host that contribute to, or cause, illness or death. In addition, fears about biological weapons include how inadequate health systems can exacerbate pathogenic damage. Put another way, many harmful effects of biological agents directly arise from the operation of biological and social systems the pathogen affects, rather than from the pathogen itself.

The smallpox virus is one of the most feared biological weapon agents. How the virus causes disease and death is complicated and does not simply involve the virus killing cells. Responses of the immune system factor significantly in the morbidity and mortality associated with smallpox. The virus interferes with the normal functioning of the immune system, which over-reacts in ways that seriously harm the body. A review of smallpox in *Clinical Infectious Diseases* stated that “many features of severe illness...were the result of host inflammatory responses. In severe cases, the release of cytokines, chemokines, and other mediators into the bloodstream caused vascular dysfunction, coagulopathy, and multiorgan failure, resembling septic shock.” Smallpox also generates concern because most countries do not have adequate health capabilities to address re-emergence of the smallpox virus.

Whether biological agents are “means of warfare” or only “methods of warfare” based on direct or indirect effects has not been a major policy or legal question. Smallpox and other pathogens that cause adverse biological and societal cascades are considered “repugnant to the conscience of mankind” because of the totality of their direct and indirect effects. The indirect effects of pathogenic infection are proximate to the direct action of the pathogen on the host and sufficiently severe in the human body and the body politic to take into account.

This treatment of biological agents perhaps suggests that deciding whether cyber capabilities constitute a means of warfare should involve consideration of the nature and scale of indirect effects and not just the direct effects of code on target computer systems. The indirect effects of malware can be proximate to the direct impact of the code and, potentially, severe enough within the target system and beyond to warrant inclusion in the determination of a means of warfare.

However, reasoning from biological analogy is not persuasive. International law bans the development and use of biological agents for non-peaceful purposes. Indeed, biological agents are one of the few areas in which states have banned specific technologies as means of war. Many of these bans reflect heightened concerns about the direct and indirect effects these technologies can inflict on people and societies. So far, cyber capabilities and operations have not generated fears about such grave, gruesome, and repugnant threats to human life, health, and social order.

As a method of warfare, cyber operations that constitute attacks would, Biller and Schmitt note, “still have to comply with all [IHL] prohibitions and limitations that apply to attacks.” Thus, the likely indirect effects of cyber capabilities would not escape scrutiny. Further, the nature and complexity of military cyber operations, military-civilian interdependence in cyberspace, and civilian dependence on cyber technologies counsel early and comprehensive technical, policy, and legal consideration of the potential direct and indirect effects of such operations, regardless how cyber capabilities slot into legal definitions of means or methods of warfare. Whether such prudential handling of cyber capabilities keeps indirect effects tolerable as military cyber operations expand remains to be seen.

<https://www.defenseone.com/ideas/2019/07/cyber-capabilities-are-not-weapons-war-closer-look-analogy-biological-weapons/158653/?oref=d-river>

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Defense News (Washington, D.C.)

America's Defense Export Strategy Is Key to Deterrence in the Indo-Pacific Region

By Tate Nurkin

July 19, 2019

In late March, two Chinese fighter jets crossed the maritime border separating China from Taiwan, lingering in Taiwan's airspace for about 12 minutes. It was the first time China had flown aircraft across the border since 2011. The event — and China's live-fire military exercise near the strait in May — joins a growing list of boundaries crossed — figuratively and literally — in the Taiwan Strait and as part of an intensifying and expanding U.S.-China geostrategic competition.

The stakes of this competition are high, increasingly focused on the future predominance of democratic norms, efficacy of the rules-based order, and persistence of a free and open Indo-Pacific region. The U.S. Department of Defense's recently released "Indo-Pacific Strategy Report" frames the challenge to the U.S. and the region starkly, labeling China as a revisionist power seeking to "reorder the region to its advantage by leveraging military modernization, influence operations, and predatory economics to coerce other nations."

Deterring expansion and intensification of these behaviors requires an integrated whole-of-government effort that should prominently feature a U.S. defense export strategy that balances multiple imperatives: demonstrating commitment and providing capabilities to allies and partners, confronting China directly when necessary, and building new and enhanced partnerships all while managing increasingly pronounced escalatory risks.

At the root of China's Taiwan Strait encroachment in March was the Trump administration's approval of the sale of 66 F-16Vs to Taiwan.

The deal will not fundamentally alter the strategic military balance between Taiwan and China. Neither will the Administration's approval in June of the export of an additional \$2 billion worth of defensive equipment. The F-16V constitutes a significant upgrade of Taiwan's tactical air capabilities and offers a clear commitment to Taiwan, though it will not solve the central challenge associated with the defense of Taiwan: absent intervention from the United States, Taiwan would likely be overwhelmed by the quantity of missiles and aircraft and increasing sophistication of Chinese military assets.

However, fully redressing the military imbalance between China and Taiwan was never the objective of these deals. They are largely symbolic, designed to deter China by signaling heightened U.S. commitment to Taiwan rather than through providing a specific balance-shifting capability. The deals also represent provocative means of pushing back on China's efforts to define and bound the competition and, as a result, bound U.S. action and strategic flexibility.

As welcome as this pushback is, a U.S. Indo-Pacific defense export strategy cannot rest solely on provocation or on a narrow focus on "the revisionist power of China." Deterrence need not always be confrontational, especially in the charged and complicated competitive environment of the Indo-Pacific. Subtle but directed should also be part of the strategic mix.

A focus on the export and development of primarily defensive intelligence, surveillance and reconnaissance capabilities constitutes a potential "sweet spot" for advancing U.S. interests and deepening partnership- and capability-building efforts while reducing risks of escalatory responses.

And demand for U.S. ISR assets across the region is more than notional in a region marked by difficult-to-detect gray zone challenges.

Australia announced in November 2018 its intent to acquire MQ-9 Reaper drones through a sole-sourced procurement. India, Japan and New Zealand have also all expressed interest in acquiring the platform, among other ISR assets, as part of efforts to enhance situational awareness of an expanding range of fast-moving threats frequently unfolding over great distances or in crowded and contested urban or maritime environments.

A U.S. defense export strategy stressing ISR assets has an additional benefit for allies and partners. Geopolitical dynamics in the Indo-Pacific do not lend themselves to clean, Cold War–like lineups of economically and ideologically separated blocs. Many U.S. allies and current and prospective partners have deep economic and political links to China, raising fears among some that they could be caught in the middle of a competition that compromises their interests and forces unwanted choices.

As Singapore Prime Minister Lee Hsien Loong noted during June’s Shangri-La Dialogue, “unfortunately when the lines start to get drawn ... that makes it difficult for the small countries.” U.S. partnership- and capacity-building efforts focused on ISR capabilities offer opportunities for constructive engagement that does not have to aggravate this sense of vulnerability. The foreign military sale in May of 34 ScanEagle drones to support maritime security activities in Malaysia, Indonesia, the Philippines and Vietnam offers a useful and replicable model.

Deterring China in the Indo-Pacific is a complicated, but achievable task. It begins by signaling commitment and resolve to U.S. allies and partners (as well as China) through many measures, including defense exports. The nature of these exports should align with the broader objective of deterring China without unnecessarily risking escalation or alienation of partners. An enhanced — but not exclusive — focus on building allied and partner situational awareness seems both operationally relevant and strategically correct.

Tate Nurkin is the founder of the OTH Intelligence Group and a nonresident senior fellow with the Atlantic Council.

<https://www.defensenews.com/opinion/commentary/2019/07/19/americas-defense-export-strategy-is-key-to-deterrence-in-the-indo-pacific-region/>

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Breaking Defense (Washington, D.C.)

Don’t Delay GBSD ICBMs; It’s Too Risky

By Mark Gunzinger

July 2, 2019

The Air Force will soon request industry proposals to develop and build the Ground Based Strategic Deterrent (GBSD), the nation’s next Intercontinental Ballistic Missile. The GBSD program will replace Minuteman III missiles first deployed in the 1970s and upgrade their aging launch facilities.

Russia’s and China’s aggressive nuclear weapons modernization programs prompted the Obama administration to make the long-overdue decision to procure state-of-the-art GBSDs. They should begin to join the inventory in the late 2020s and operate into the 2070s. Some persistent critics of modernizing the U.S. nuclear triad have called to delay or even terminate the GBSD in favor of another extension of the Minuteman III’s service life. Arguments for doing so do not make strategic,

technical, or economic sense. In effect, a GBSD program slip or cancellation would be tantamount to a decision to unilaterally giving up one leg of our nation's triad.

The nation's ICBM force of 400 operationally deployed Minuteman IIIs and 45 launch centers dispersed over five states provides a unique set of capabilities to deter adversaries from credibly threatening or confidently planning a nuclear strike. Without it, an adversary would only need to attack three bomber bases and two submarine bases to eliminate most of the remaining U.S. nuclear force, thus increasing its incentive to consider a disarming first strike in a crisis.

A variety of factors mandate fielding the replacement. First, the Pentagon is rightfully concerned about the effectiveness of an ICBM designed half a century ago. Missile defenses are now more difficult to penetrate, cyber threats are increasing, and electronic warfare and directed energy weapons pose new challenges to the Minuteman III's survivability. The need for additional targeting flexibility will also increase as nuclear proliferation continues. The 2018 Nuclear Posture Review put it starkly: "The Minuteman III service life cannot be extended further... In addition, Minuteman III will have increasing difficulty penetrating future adversary defenses."

Second, the solid rocket fuel in the Minuteman III's lower stages will degrade by the 2030 timeframe, thus requiring them to be scrubbed and refueled. Based on previous life extension programs, some of these stages may not fit together after this process and would need to be replaced. This is a significant concern, since no one makes these any more. The Minuteman III's third stage, which is constructed of composite materials, cannot be washed out and would also need to be replaced. Moreover, a GBSD program delay would require the Air Force to replace critical components in the Minuteman III's guidance system that will reach the end of their service lives. These and other efforts to maintain the Minuteman III beyond its scheduled replacement date would cost billions. More importantly, they would not meet DoD's future requirements.

The timeline of Leonardo DRS's 50 years of innovation is peppered with notable technologies and capabilities that have given militaries around the world a warfighting edge. Here's a look.

Third, delaying the GBSD does not make economic sense. New ICBMs will begin to enter service before the Minuteman III becomes unserviceable. A GBSD delay would require spending billions of dollars on band-aid fixes to maintain the Minuteman III, despite analysis provided to Congress that it would actually cost less to buy and sustain the GBSD over time.

Finally, life extension programs would not resolve the impending Minuteman III inventory shortfall. There are now approximately 500 Minuteman III missiles. To ensure the aging weapon system works, the Air Force conducts four to five test launches per year. Should the GBSD be delayed, a combination of test launches and attrition driven by parts obsolescence will deplete the Minuteman III inventory to the point that it will not sustain a force of 400 operationally deployed missiles.

In summary, keeping the Minuteman III in the force beyond its planned replacement date would not provide the capabilities needed for 21st century deterrence, could cost more than the GBSD, and would be tantamount to unilaterally giving up one leg of the triad by neglect. The lack of a credible ICBM force could also reduce the willingness of Russia and China to engage in future arms control negotiations. Keeping the GBSD program on schedule would avoid these risks and ensure the ICBM leg of the U.S. triad remains viable for the next six decades.

Mark Gunzinger, former deputy assistant secretary of Defense for forces transformation and resources, is the new director for government programs and wargaming at the Mitchell Institute for Aerospace Studies.

<https://breakingdefense.com/2019/07/dont-delay-gbsd-icbms-its-too-risky/>

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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."

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