UNITED STATES AIR FORCE CENTER FOR UNCONVENTIONAL WEAPONS STUDIES

OUTREACH JOURNAL

Issue No. 1296
5 January 2018

Featured Item

"*Mixed-Oxide Fuel Fabrication Plant and Plutonium Disposition: Management and Policy Issues*". Written by Mark Holt and Mary Beth D. Nikitin, published by the Congressional Research Service; December 14, 2017

https://fas.org/sgp/crs/nuke/R43125.pdf

The Mixed Oxide Fuel Fabrication Facility (MFFF) in South Carolina has been a key component of the current U.S. strategy for disposing of surplus weapons plutonium from the Cold War. Disposition of surplus plutonium is required by a 1998 agreement, amended in 2010, between the United States and the Russian Federation. Each country agreed to convert 34 metric tons of surplus weapons-grade plutonium to a form that could not be returned to nuclear weapons, to begin in 2018. Russia suspended its participation in the agreement in October 2016 due to what it called "hostile actions" by the United States. However, both countries appear to be continuing their plans for surplus plutonium disposition.

The U.S. disposition strategy called for the surplus plutonium, in oxide form, to be blended with uranium oxide to make mixed oxide (MOX) fuel for U.S. commercial nuclear reactors. The plutonium in MOX fuel would be mostly destroyed in the reactors by fission (splitting into other isotopes). At the same time, isotopes of plutonium undesirable for weapons would be created, along with highly radioactive fission products. As a result, after several years in a reactor, spent MOX fuel would have less total plutonium than when it was freshly loaded, and the remaining plutonium would be degraded for weapons purposes. Moreover, the fission products would make the material difficult to handle, in case of future attempts to use the plutonium.

Because of sharply rising cost estimates for the MOX project, the Obama Administration proposed to terminate the project in its FY2017 budget request. The Trump Administration in its FY2018 request also proposed replacing the MFF with the dilute and dispose option. Starting with the FY2015 budget request, the Administration proposed placing MFFF in "cold standby" and studying other plutonium disposition options. However, Congress authorized and appropriated $345 million for FY2015 to continue construction at a reduced level and required the Department of Energy (DOE) to procure an independent cost and schedule estimate for MFFF and alternative disposition approaches. Pending the results of those analyses, DOE requested $340 million for FY2016 to continue construction at about the FY2015 level. DOE's FY2017 budget proposed to instead pursue a dilute and dispose (D&D) program.

The federal plutonium disposition program is run by the National Nuclear Security Administration (NNSA), a semiautonomous agency of DOE. NNSA estimated in 2002 that MFFF would cost about $1 billion to design and build. DOE said in its budget justification for FY2014 that the MFFF contractor had estimated the project's total construction cost would rise to $7.78 billion, and that construction would not be completed until November 2019. DOE's FY2015 budget justification said the life-cycle cost estimate for the MOX program had risen to $30 billion.

Differing sharply from the U.S. MOX strategy, Russia is planning to use its BN-600 and BN-800 fast breeder reactors for plutonium disposition. According to the World Nuclear Association, the BN-800 started producing electricity in 2015, and the reactor is "capable of burning 1.7 metric tons of plutonium per year from dismantled weapons." The DOE FY2015 through FY2018 budget requests included no funds for support of the Russian plutonium disposition program.

The debate over U.S. plutonium disposition strategy raises several issues for Congress. The Administration asserts that the rising cost estimates for MFFF are unsustainable in the current budget environment and proposes a different disposal method. The effects of alternative disposal options on DOE's Savannah River Site in South Carolina, where MFFF is located, will also be an important element of the debate.

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US NUCLEAR WEAPONS

The Diplomat (Tokyo, Japan)

US Shipbuilder Scores $468 Million Contract for New Ballistic Missile Sub

By Franz-Stefan Gady

January 3, 2018

Huntington Ingalls Industries was awarded a contract for Columbia-class integrated product and process development.

U.S. defense contractor General Dynamics Electric Boat has awarded Newport News Shipbuilding division, a subsidiary of Huntington Ingalls Industries (HII), a contract worth up to $468 million for integrated product and process development for the U.S. Navy's new Columbia-class of nuclear-powered ballistic missile submarines (SSBN), according to a December 19 statement by HII.

General Dynamics Electric Boat has been awarded a $5.1 billion contract to undertake detailed design work for the new Columbia-class in September 2017. The contract entails a complete design of the new class of SSBNs and also includes engineering analysis, component development, detail planning and technical services. Newport News Shipbuilding will be the new subcontractor for the new class of ballistic missile subs.

Each shipyard will design and build separate components of the new boats.

"This contract leverages the productive partnership we've built with Electric Boat in the construction of Virginia-class submarines," said Dave Bolcar, vice president of submarine programs at Newport News Shipbuilding. "We are excited and ready to do our part to support EB and deliver these submarines to the Navy in an efficient and cost-effective manner."

In addition, "the contract also includes component and technology development, missile tube module and reactor compartment bulkhead prototyping and manufacturing efforts, and United Kingdom Strategic Weapon Support System kit manufacturing for the Columbia class ballistic missile submarines." As I reported previously, the British Royal Navy's future Dreadnought-class will share a common missile compartment with the Columbia-class.

The first-of-class SSBN is expected to cost $14.5 billion, including $5.7 billion in detailed design and nonrecurring engineering costs and $8.8 billion in construction costs. The remaining 11 subs are estimated to cost around $8 billion in 2017 dollars. The Columbia-class boomers are being designed to replace the 14 Ohio-class submarines currently in service with the U.S. Navy. Ohio-class SSBNs are armed with up to 24 Trident II D-5 submarine-launched ballistic missiles fitted with multiple independently targetable reentry vehicles.

I previously elaborated on the new Columbia-class' technical specifications:

> According to the United States Naval Institute, the new sub will displace 20,810 tons when submerged — the largest submarine the U.S. Navy has ever constructed — measure 561 feet (171 meters) in lengths, and have a beam of 43 feet (13 meters). This will make the new class only marginally larger than the Ohio-class with 18,750 tons submerged, 560 feet (170 meters) in lengths, and a beam of 42 feet (13 meters). With a complement of 155, the crew size will also be roughly the same on both ships.

Construction of the Columbia class is expected to begin in fiscal year 2021, with the first delivery to the Navy in 2028. The new class of SSBNs will begin replacing the Ohio-class in 2031. The new subs will be designed for a 42-year service life all the way through 2085.

https://thediplomat.com/2018/01/us-shipbuilder-scores-468-million-contract-for-new-ballistic-missile-sub/

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National Defense (Arlington, VA)

Analysts Outline Options to Cut Nuclear Forces

By Jon Harper

January 3, 2018

The Congressional Budget Office estimates that current plans to modernize, operate and sustain U.S. nuclear forces would cost a whopping $1.2 trillion over the next three decades. Analysts have laid out a number of ways to reduce the price tag.

The Pentagon has ambitious plans to revamp its aging strategic arsenal including buying new classes of ballistic missile submarines, intercontinental ballistic missile systems and stealth bombers.

"Over the next 30 years just about every piece of the nuclear forces will be going through either refurbishment, life extension, or being replaced with a new system," Michael Bennett, an analyst in the national security division of the Congressional Budget Office, said at a conference hosted by the Carnegie Endowment for International Peace.

Modernization plans would cost $399 billion over that timeframe, CBO estimated in a recent report, "Approaches for Managing the Costs of U.S. Nuclear Forces, 2017 to 2046."

It projected that the total annual cost of nuclear forces including operation and sustainment would increase from $29 billion in 2017 to about $50 billion through the early 2030s. By then it would eat up about 8 percent of the defense budget, compared to about 5.5 percent today.

The office was tasked with analyzing approaches to manage those costs by adjusting modernization plans. The strategies fell into three broad categories: delay some modernization programs; reduce force structure; or slash the size of the force and the number of warheads.

Among the options considered was delaying efforts to develop new ICBMs, stealth bombers and interoperable warheads. That would save a total of $17 billion over the 30-year period, the report said.

It estimated that bigger savings could be obtained by: forgoing nuclear cruise missiles, $28 billion; fielding only 10 ballistic missile submarines and 300 ICBMs, $30 billion; eliminating the bomber leg of the nuclear triad, $71 billion; eliminating the ICBM leg of the triad, $120 billion; fielding a triad with only 1,000 warheads, $66 billion; fielding a 1,000-warhead force without bombers, $107 billion; or fielding a 1,000-warhead force without ICBMs, $139 billion.

Each of these paths would at least somewhat reduce the United States' ability to wage limited or large-scale nuclear war, the report noted.

"This is by far the most authoritative treatment of the subject, and whether you think the United States is poised to spend too much or too little on nuclear weapons in the future, we all need to reckon with the estimates and the analysis that CBO has produced," said Kingston Reif, director of disarmament and threat reduction policy at the Arms Control Association.

The report shows that the United States is facing "a ticking nuclear budget time bomb," he said. Spending on strategic forces is projected to eat up about 15 percent of the Pentagon's acquisition

budget by the early 2030s, leaving less money for important conventional weapon modernization programs, he noted.

"Unless the Defense and Energy Departments find a pot of gold at the end of the rainbow … the government's current nuclear weapons spending plans will pose a crushing affordability problem," he said.

The United States has more nuclear weapons than it needs for its security and can safely pursue more cost-effective options to sustain the arsenal while still retaining a credible deterrent, he said.

Mackenzie Eaglen, a defense budget analyst at the American Enterprise Institute, said decisions in recent decades to delay nuclear modernization have left the current administration with little choice but to pursue a wide-ranging effort to upgrade the force. Additionally, the more drastic options presented by the CBO report, such as eliminating a leg of the triad, would have little political support in Washington, she said.

President Barack Obama's defense plans included maintaining a nuclear triad, despite his call for the eventual elimination of all nuclear weapons. President Donald Trump has repeatedly said the United States needs to bolster its arsenal.

"If the last administration didn't drop from a triad to a dyad … I think the moment of that debate has fundamentally passed," Eaglen said.

The Trump administration has been conducting a nuclear posture review, which could affect decisions about modernization. But Eaglen doesn't expect any major deviations from the current plans.

"I don't see this president's budget differing much from the last president's budget, and therefore … I don't think we're going to see significant changes," she said.

http://www.nationaldefensemagazine.org/articles/2018/1/3/analysts-outline-options-to-cut-nuclear-forces

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Air Force Magazine (Arlington, VA)

Replacing Minuteman

By Wilson Brissett

February 2018

The Air Force is finally moving forward with a program to develop a next generation ICBM.

The Air Force's effort to field a next generation intercontinental ballistic missile (ICBM) system has renewed energy, as the service announced in August the award of two contracts for technology maturation and risk reduction (TMRR) work.

The contracts, to Boeing and Northrop Grumman, pave the way for replacing the Minuteman III with what is being called the Ground-Based Strategic Deterrent (GBSD). One of the two will be chosen in 2020 to build the system, and the service's Nuclear Weapons Center at Kirtland AFB, N.M., is working hard to keep the program on time and within budget.

It's a tough challenge, since the next ICBM needs to last until 2075 and must be able to adapt to decades' worth of evolving threats. Success will require a smart acquisition strategy and intelligent system design.

The Minuteman III replacement program hasn't always enjoyed this kind of momentum. Within the bow wave of modernization programs the Air Force is funding—a large slate of new fighters, bombers, space systems, and surveillance platforms—recapitalizing nuclear ICBM and bomber weapon systems has repeatedly been delayed or deferred.

The new ICBM system will be very expensive. Replacing Minuteman alone could cost as much as $85 billion for research and development, procurement, and military construction. With budget shortfalls pressing the Department of Defense from every direction, upgrading the nation's nuclear weapons is "the one place where we can save money the most clearly," said Rep. Adam Smith (D-Wash.), the ranking member of the House Armed Services Committee, in July.

In a post-Cold War world, policymakers have also questioned the need to maintain a triad of air-, sea- and ground-launched nuclear weapons. To some it seems like overkill. "A more focused strategy" could create a credible deterrent while reducing the nuclear arsenal, said Smith. "Personally, I think we need to look at whether or not the triad still makes sense. Do we need the ICBMs?"

The Pentagon and Air Force leadership answer yes emphatically. In March, Vice Chairman of the Joint Chiefs of Staff, Gen. Paul J. Selva, told Congress that "there is no higher priority for the joint force" than the effort to "modernize all three legs of the triad."

All of those systems have been stretched "well beyond their designed service life," US Strategic Command boss Gen. John E. Hyten said at the same hearing, noting that the average age of a US nuclear warhead is 26 years. After a decade of uncertainty, and despite the continuing questions, the GBSD and B-21 Raider next generation programs now appear to be on their strongest footing yet.

Congress must act to modernize this capability "with urgency," Selva warned, because "nuclear weapons pose the only existential threat to the United States."

Hyten agreed. "When I look at each element" of the triad, "we cannot slow them down," he told the audience at an AFA Mitchell Institute for Aerospace Studies event in June, insisting, "We actually need to accelerate them, not decelerate them."

In the 1960s, he pointed out, USAF built the Minuteman I in five years, and at a cost of $17 billion in today's dollars. At AFA's Air, Space & Cyber Conference in September, Hyten said there's no reason why the service couldn't achieve similar results with GBSD. The key, he said, would be developing "simple requirements" that don't change over the life of the program and making sure the program director is "given the authority and responsibility to execute that program" without excessive bureaucratic oversight. Finally, GBSD will require a stable annual budget to keep the program on track, Hyten said. Given that the federal government has run on 31 continuing resolutions over nine of the last 10 years, the lack of a stable, predictable budget may be the most difficult aspect of the program.

KEEP IT SIMPLE, STUPID

Building a new ICBM system is a highly complex and technical endeavor, and the Air Force rarely misses an opportunity to remind the public that it's more than rocket science. Besides the missiles themselves, there are launch facilities, command and control networks, nuclear warheads, and thousands of miles of copper wiring to keep the weapons connected over the vast distances of Wyoming, Montana, and North Dakota. Replacing or refreshing all of these components presents the mother of all systems engineering challenges.

Air Force GBSD program manager Col. Heath Collins insists on keeping simplicity as the No. 1 goal for his team. "We're a program that is not looking to push the technology bounds," he told Air Force

Magazine. “There’s no technology miracles that have to happen for GBSD. It really is an integration program.”

From guidance systems to propulsion and software, “today’s technology, integrated and implemented in GBSD, can meet our requirements,” Collins said.

Collins believes that acquisition efforts run into schedule and cost problems primarily when managers depend too heavily on “technical miracles …that need to happen for the program to be successful.” He learned this lesson working in space acquisition. Before taking the GBSD lead in February of 2016, Collins was a troubleshooter on programs like the Space Based Infrared System (SBIRS), which saw cost overruns of nearly 300 percent and arrived almost nine years late. To avoid a similar fate for GBSD, Collins said, “Our foundation is a low-risk, mature technology program.”

Another key to keeping costs low over the lifespan of the program is for the service to “own the tech baseline,” he said. With recent satellite programs, as with the Minuteman service life extension programs (SLEP) in the 1990s, “a lot of authority and control was given” to the prime contractor, Collins said.

When the government yields data rights and the technology baseline to contractors, it becomes much more difficult to maintain competition “throughout the life cycle of the program,” according to Collins.

The GBSD must not only have “a very firm requirements baseline, that we’ve spent a lot of time to mature,” stated Collins, but he and his team have worked hard to develop “a very detailed own-the-tech baseline strategy and data rights strategy … to make sure we … get the best value for the government.”

No matter how simple and firm the system requirements for GBSD remain, the Air Force’s expectation that the weapon will need to be operational for nearly five decades means the new ICBM must be able to evolve to meet unknown future threats. The service’s fundamental approach to this problem is to build a modular system that can accommodate maximum change with minimum cost and effort.

Modularity starts with digital modeling design. For all its reliability, Minuteman III is not particularly agile, and that truth is reflected at the design level, which required “thousands of pages of blueprints,” Collins said. Both Boeing and Northrop Grumman are using computer-based 3D modeling to explore potential designs well in advance of prototyping. This process makes early design changes more efficient and less costly.

At the heart of modularity, however, is the creation of an open-systems architecture. Implementing “open standards and open designs” means that program officials can “make modifications or changes as you go forward on the program,” Collins said. Again, the contrast with Minuteman is instructive.

Minuteman III is “a very tightly coupled, integrated system,” Collins said, which means that “if you wanted to change something in the guidance system, you would actually have to change pieces and parts on the missile” and then make changes to the “hardware and software on the ground too.” Some of these upgrades could become very labor-intensive (and therefore expensive) as well, because of the need to open launch facility doors or partially remove the missile from its silo in order to make the changes.

GBSD will have “very set, modular components that are built around a standard,” Collins said, so that a guidance system upgrade will be as easy as switching “a component we can change in and out very quickly.” The same could be true of a new re-entry vehicle or updated cyber capability or

almost any part of the system. Modularity means "we can much more effectively and cost-efficiently make changes … based on evolving threats, based on evolving capability needs, based on evolving technology," Collins explained.

GETTING AHEAD OF THE COST CURVE

Over the coming year, the Air Force will have initial opportunities to control GBSD costs. Cost has been a controversial subject already with this program, in part because the US has not built a new ICBM system since Peacekeeper was developed in the early 1980s. In 2016, the Air Force estimated the program would cost $62.3 billion for GBSD missiles—400 for deployment and the rest to make up a test-launch stockpile. But the DOD's Cost-Assessment and Program Evaluation (CAPE) office later said GBSD would cost closer to $85 billion.

CAPE said the more than $20 billion difference was "driven by the selection of data sources." The Air Force estimate relies on the Minuteman and Peacekeeper programs, whereas CAPE incorporated more recent evidence from the Navy's Trident II and the Missile Defense Agency's Ground Based Interceptor programs. With either method, CAPE concluded, "it was unusually difficult to estimate the cost of a new ICBM program because there was no recent data to draw upon." As a result, any attempt to anticipate the cost of GBSD brings "considerable uncertainty and risk" along with it.

Collins said that more clarity on the cost of the program is not far away. Within nine months from the TMRR awards, the program office will hold "cost capability technical interchange meetings" with Boeing and Northrop Grumman. The purpose of these meetings is to identify cost-capability trade-offs in order to highlight key efficiencies for the GBSD system.

The Air Force team will be working with the contractors to find "the big cost drivers in the program from a requirements perspective," and to outline "potential savings that could be had," Collins noted. For example, a five percent reduction in some requirements might translate to "really huge cost savings." These tradeoffs could include "range or ability to penetrate any of those major requirements," Collins said.

The data from that review should be available by May of 2018. Collins' task will then be to work with Air Force Global Strike Command, in coordination with US Strategic Command, to work out adjustments to the program that will preserve core capability while shaving cost where possible. Beyond these core capabilities, which are approved by the Joint Requirements Oversight Council, there is room to find "the knees in the curve where you start paying too much for the incremental increase in capability," he said.

One decision that's already been made is to reuse the existing Minuteman launch facilities for the new missiles. An Air Force analysis of alternatives determined that "to generate and build 450 new silos was very cost prohibitive," Collins said. His team is analyzing the concrete in the existing silos and has concluded so far that "those are still solid launch facilities." Collins said this decision doesn't bring with it any technical limitations. "They were big enough for whatever GBSD needed to be and to refurbish them was much more cost-effective."

The contractors are pleased with the Air Force's handling of the program thus far. The service "drove through evaluations and [TMRR] awards ahead of schedule," Frank McCall, head of strategic deterrence at Boeing, told Air Force Magazine. He also said he expects clarity and consistency as the service drills down to the next level of detail at the systems requirements review.

As to whether the impressive speed and affordability of Minuteman can be repeated on GBSD, McCall said, "our current acquisition plan doesn't have that same kind of time line." He allowed that "it could be accelerated perhaps from where it is, but that's a decision that we as a nation need to make." Crossing that Rubicon would mean, at least, committing to "continuity of purpose"—having

the sustained national will to modernize the strategic deterrent, so it can continue to credibly hold diverse and evolving threats at risk.

Presumably, continuity of purpose includes having lawmakers consistently pass federal budgets and for them to include sufficient funding for GBSD and related defense programs. The Minuteman replacement can succeed under a shadow of inconsistent and uncertain budgets, but it will take longer to deliver that way, and will ultimately cost the nation more for the same capability.

“We hear General Hyten,” when he talks about going faster and doing it more cheaply, Collins said. “We absolutely want to deliver GBSD as quickly and efficiently and affordably as we can, and our industry partners agree.

Perhaps the most important question, then, is what Congress thinks, and what it is willing to do.

http://www.airforcemag.com/MagazineArchive/Pages/2018/February%202018/Replacing-Minuteman.aspx

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US COUNTER-WMD

Los Angeles Times (Los Angeles, CA)

Trump Administration Moves to Boost Homeland Missile Defense System despite Multiple Flaws

By David Willman

December 24, 2017

Citing North Korea's growing nuclear and ballistic missile threat, the Trump administration is moving to vastly expand the problem-plagued homeland missile defense system despite warnings that the planned upgrades may not succeed.

Immediate plans call for building two $1-billion radar installations and adding 20 rocket interceptors to the 44 already deployed in underground silos at Ft. Greely in Alaska and at Vandenberg Air Force Base in California.

The Pentagon also is taking steps to launch new satellites to help each interceptor's "kill vehicle" find, crash into and destroy incoming ballistic missiles high above the atmosphere.

The expected cost is about $10.2 billion over five years, on top of more than $40 billion already spent for the system. On Thursday, Congress passed a short-term government funding bill that includes $200 million to start preparing construction of additional missile silos in Alaska.

But government reports and interviews with technical experts suggest the planned upgrades, including a redesigned kill vehicle, are unlikely to protect the United States from a limited-scale ballistic missile attack, the system's stated mission.

One concern is the administration's rush to expand the system.

The first new radar is scheduled to be made operational in 2020 before any flight testing is conducted. And the first set of redesigned kill vehicles will be installed in late 2021 — following just one flight test of a prototype. All the new interceptors and kill vehicles are supposed to be in place by the end of 2023.

"There's no way to prove out the design — let alone its reliability — without more flight tests," said L. David Montague, a former aerospace executive who co-chaired a National Academy of Sciences panel of 16 experts that recommended ways to improve U.S. missile defenses in 2012. "It's stupid."

On Oct. 11, President Trump told Fox News that the interceptors "can knock out a missile in the air 97% of the time." The interceptors have only a 50% success rate in controlled flight tests, according to Pentagon reports.

The stakes are high because North Korea has developed an arsenal of nuclear weapons and last month tested an intercontinental ballistic missile that American officials said appeared capable of reaching the entire United States.

Some experts fear that U.S. overconfidence in the missile defense system could lead to miscalculations in the standoff with Pyongyang.

"The response to North Korea is, 'Let's spend billions of dollars more on missile defense,' " said Laura Grego, a physicist who led a 2016 study of the anti-missile system for the nonpartisan Union of Concerned Scientists. "But we ought to be very careful that we're not fooling ourselves."

The Missile Defense Agency, the Pentagon division responsible for protecting the nation from a limited ballistic missile attack, did not respond to questions for this article.

Pentagon officials have assured Congress that they have confidence in the system — but that it needs improvements. In April 2016, Vice Adm. James D. Syring, then head of the missile agency, told a Senate subcommittee that he wanted to "replace the less reliable kill vehicles."

More details about the system's upgrades, and their expected costs, are expected early next year when the administration completes its Ballistic Missile Defense Review, a document aimed at setting policy and priorities.

Even more ambitious missile defense projects may be on the way.

On Dec. 12, Trump signed a defense authorization bill that requires the missile agency to develop plans to ultimately deploy 104 interceptors — perhaps by building new missile silos in the Midwest or on the East Coast. The agency also is preparing options to deploy space-based laser weapons for missile defense.

The interceptors form the core of the existing Ground-based Midcourse Defense system, or GMD. It is designed to track and destroy a limited number of incoming missiles from North Korea, Iran or another non-superpower adversary, not the kind of cataclysmic nuclear exchange envisioned in the Cold War.

The first few interceptors were made operational in 2004, but the GMD system has been beset with multiple shortcomings.

Since flight testing started, interceptors — often launched from Vandenberg AFB in Santa Barbara County — have failed to destroy target missiles in 9 of 18 attempts. Since 2004, the system has failed in 6 of 10 of the flight tests.

Pentagon officials, including two former directors of the Missile Defense Agency, have attributed the problems to shortcuts taken during the development and deployment of GMD.

Military planners estimate that four or five interceptors would be needed for each incoming missile to ensure its destruction. A dozen nuclear-tipped missiles thus could overwhelm the current U.S. arsenal.

The system's inadequacies have been described by the Pentagon's operational test office, the U.S. Government Accountability Office, the National Academy of Sciences panel and in interviews with other defense specialists.

For instance, 34 of the 44 existing interceptors use circuit boards that flight testing suggested are vulnerable to electrical shorting. The boards are crucial for powering the rocket thrusters that help steer the 5-foot-long kill vehicles toward their targets.

A Missile Defense Agency spokesman, Christopher Johnson, told The Times in an email last February that "improved manufacturing processes" would upgrade circuit boards in new interceptors, but "no corrective actions" would be taken for the original 34.

Moreover, U.S. officials have no reliable way to know if an interceptor has hit and destroyed an incoming warhead and not a decoy or large rocket debris. The so-called kill assessment is vital to ensure that interceptors are not squandered during an attack.

"You don't want to keep shooting at something that's already dead because you need your ammunition for things that aren't dead yet," said Philip E. Coyle III, a missile defense expert who headed Pentagon weapons testing and evaluation from 1994 to 2001.

Each of the new missile defense projects faces significant technical obstacles.

Every new interceptor will have a redesigned kill vehicle at its tip. If they are launched, the kill vehicle is supposed to separate from the three-stage rocket and, aided by an onboard sensor and rocket thrusters, slam into the target at a speed of 4 miles per second. Because of weightlessness in space, that's much faster than a speeding bullet on Earth.

Although missile agency officials say the new kill vehicle will perform more reliably than earlier versions, some outside experts are skeptical.

The Government Accountability Office, or GAO, which investigates federal programs for Congress, reported on May 30 that a heat-seeking sensor designed for the kill vehicle "may not have sufficient performance to defeat some intercontinental ballistic missile threats."

The 117-page report said several Defense Department units, including Strategic Command, "have raised concerns" about the sensor's ability to detect and track enemy missiles.

The missile agency plans only one flight test of the redesigned kill vehicle before the first set of new interceptors are deployed, however. That commits the Pentagon "to buying a product prior to demonstrating the system is operationally useful," according to the GAO.

The new radars also have come under scrutiny. They are supposed to be able to distinguish an enemy warhead from decoys or rocket debris. The National Academy panel and other experts cited the existing system's inability to do so as a major concern.

The missile agency aims to solve or mitigate the problem by installing new radars — each costing about $1 billion — at Clear Air Force Station in central Alaska, and at a site not yet announced in Hawaii.

Both radars will operate in the "S-band" radio frequency, a mode used by the Navy to track short- and intermediate-range ballistic missiles.

In interviews, several outside experts questioned whether the S-band can adequately identify long-range missiles and said the Pentagon should instead use more powerful "X-band" radars.

David K. Barton, a radar engineer who served on the National Academy panel, said X-band's shorter wave length enables it to provide better magnified detail, or resolution, of potential targets.

"Inherently, the resolution at X-band is three times as good as that at S-band," said Barton, who has advised U.S. intelligence agencies. "The higher the resolution, the better your results."

Cristina Chaplain, lead author of the GAO report, said her staff learned that the missile agency chose S-band over X-band in an effort to reduce costs.

The GAO report also noted the missile agency intends to deploy the new radar in Alaska before it is used in a single flight test. The Pentagon thus will "risk that there may be unknown and unmitigated capability gaps in the fielded system," the report said.

The new satellites pose another challenge. Over the decades, the Pentagon has repeatedly sought a space-based system to distinguish warheads from decoys.

Most recently, the Obama administration spent $231 million to develop what was called the Precision Tracking Space System. It was never deployed.

The Trump administration is backing a rebranded approach, called the Persistent Space-Based Sensor Architecture. It ultimately could send numerous new satellites into space.

The number of deployed satellites has not been determined. Outside experts estimate at least 24 would be needed — at an additional cost of tens of billions of dollars — to provide continuous monitoring and guidance for the kill vehicles of a potential missile attack from North Korea.

Montague, who co-chaired the National Academy panel, said the latest satellite initiative faces the same obstacles that its predecessors failed to solve.

"It's very difficult for me to see how such a scheme would work," Montague said.

http://beta.latimes.com/politics/la-na-pol-missile-defense-flaws-20171222-story.html

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US ARMS CONTROL

The Hill (Washington, DC)

Russia Accuses US of Violating Arms Control Treaty

By Julia Manchester

December 28, 2017

Russia is accusing the U.S. of violating an arms control treaty by selling Japan two U.S. missile defense systems.

Moscow claims the sale violates the Intermediate-Range Nuclear Forces (INF) Treaty, which was reached between the two countries 30 years ago.

"Actions like these are in direct contradiction to the priority of building military and political trust between Russia and Japan, and, unfortunately, will impact in a negative way on the whole atmosphere in bilateral relations, including negotiations over the peace treaty problem," Russian Foreign Ministry spokeswoman Maria Zakharova said Thursday.

"In practice, it will mean one more breach of the Intermediate-Range Nuclear Forces Treaty by the Americans with, in fact, Japan's assistance," she added.

Zakharova's comments come after Japan announced it would buy two U.S.-constructed Aegis Ashore missile defense systems as the country grapples with the growing threat from North Korea's nuclear weapons program.

The U.S. has accused Russia of violating the INF treaty in the past, which Moscow has repeatedly denied.

Tensions between the U.S. and Russia have grown in recent days.

Zakharova accused the State Department on Thursday of directly interfering in Russia's upcoming presidential elections after the U.S. condemned the Kremlin banning Alexei Navalny, an opponent of Russian President Vladimir Putin, from running.

"This State Department statement, which I'm sure will be repeated, is a direct interference in our electoral process and internal affairs," Zakharova said.

The U.S. intelligence community has concluded that Russia interfered in the 2016 presidential election.

http://thehill.com/policy/international/366688-russia-accuses-us-of-violating-arms-control-treaty

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ASIA/PACIFIC

Popular Mechanics (New York, NY)

Asia's Quiet Missile Race

By Kyle Mizokami

January 2, 2018

The arms race you haven't heard about.

The major powers in North Asia are locked in a new arms race, one designed to give them the ability to strike their neighbors quickly and with little advance notice. China, Taiwan, Japan, North Korea, and South Korea are all busy developing or purchasing cruise and ballistic missiles with ranges of a hundreds if not thousands of miles. Although most missiles are conventionally armed, some can and do carry nuclear weapons.

What's driving this arms race? The same thing that drives all arms races: rivalries and tensions between powers. There's North Korea's permanent standoff with South Korea, Japan, and the United States, but also Japan's rivalry with China in the East China Sea, and Taiwan versus China. These are all flashpoints that could conceivably erupt into military action and even worse, have no clear political solution on the horizon.

China

China has been developing ballistic for decades, and more recently cruise missiles. In the 1980s and 1990s, ballistic missiles were a way for Beijing to project long-range firepower without developing and producing expensive weapons such as bombers and aircraft carriers. Instead, Beijing built hundreds of short-range missiles such as the DF-11 and DF-15 capable of striking the only target that really mattered: Taiwan.

Today, China's more aggressive foreign policy dictates the need for longer range missiles. China's territorial dispute with Japan in the East China Sea, with a number of its neighbors in the South China Sea, and budding rivalry with the United States, requires missiles capable of striking targets as far away as the island of Guam. The DF-21 medium range ballistic missile can target the Vietnamese capital of Ho Chi Minh City, the Philippine capital of Manila, all of Taiwan, all of North and South Korea, and all of Japan. The even longer range DF-26 intermediate range ballistic missile, also known as "The Guam Express," can strike targets as far away as the American air and naval bases on the island of Guam.

In addition to conventional, chemical, or even nuclear warheads, the DF-21 and DF-26 both have "carrier killer" variants. Known as anti-ship ballistic missiles, or ASBMs, the missiles are based on the Chinese mainland and designed to strike moving ships at sea. ASBMs are difficult for existing sea-based air defenses to intercept due to their high ballistic flight profile and extremely fast reentry speed. The DF-21 and DF-26 are meant to create a "no-go zone" around Asia where U.S. Navy carrier strike groups cannot operate.

China is also broadening its capabilities with the DF-10A cruise missile. The DF-10A is launched from land or sea, has a 932 mile range, and can attack targets on both land and sea. As a cruise missile, the DF-10A flies low and subsonic, ideally flying below enemy air defense radars.

Taiwan

The Republic of China (colloquially Taiwan), always wary of the threat of invasion from the much larger People's Republic of China, has long maintained an interest in the ability to strike the mainland. War is not in China's interest, but Taiwan wants the ability to deter China by holding targets on the mainland at risk. If Taiwan had the ability to strike airfields, ports, refineries, electrical power stations, communications networks, and command centers supporting the invasion, it could cause Chinese leaders to doubt their ability to pull an invasion off, this deterring the invasion itself.

Taiwan currently fields the Hsuing Feng ("Brave Wind") IIE land attack cruise missile. The current version can carry a 400-pound warhead up to 372 miles. The Taiwan Strait is roughly 80 to 140 miles wide, meaning Taiwan can strike targets up to 290 miles from the China's coastline. According to reports, Taipei is preparing to field an extended range version. Taiwan also has a small number of Wan Chien ("Ten Thousand Swords") air launched cruise missiles. Taiwan's likely goal is a missile with a range of 1,100 miles —enough range to threaten Beijing itself.

North Korea

North Korea's missile program stems from a desire by Kim Il Sung, grandfather of the current leader Kim Jong Un, to strike U.S. bases in Japan in the event of war on the Korean peninsula. Over time, this has evolved into a strategy that involves deterring the United States by holding targets in Japan, South Korea, and even the United States at risk with conventional, biological, chemical, and now nuclear warheads.

North Korea has a bewildering number of missiles, though not all are operational. For use against regional targets, it has the Hwasong-6 short range ballistic missile, a derivative of the infamous Scud, which can strike all of South Korea and parts of Russia and China. The No Dong missile, an improvement on the Scud, can strike all of Japan and even farther into Russia and China.

Ever industrious in the world of missile development, North Korea is developing new generation of missiles designed to replace the older ones. The Musudan intermediate range ballistic missile, a likely replacement for the No Dong, is under development but facing severe problems. Of eight test launches in 2016, all eight failed. With no launches in 2017, the project may have been abandoned. In the meantime, the Hwasong-12 intermediate range ballistic missile has similar characteristics

and can reach as far as Guam. The Hwasong-12 was tested six times in 2017, the first three launches ending in failure, and the second three a success of one measure or another.

Finally, North Korea is developing the Pukkuksong 1 and 2 medium range ballistic missiles. The two missiles are very similar, each with an estimated range of 745 miles. Pukkuksong 1 is designed to be launched from submarines and will carry a nuclear warhead. Pukkuksong 2, on the other hand, is launched from vehicle with tank tracks, enabling it to travel offroad, and could be armed with nuclear, conventional, chemical, or biological warheads.

South Korea

In response to the North Korean missile threat, South Korea has developed two contingency plans to deal with the problem. The first, Korean Massive Punishment and Retaliation, is designed to launch missile attacks against the North in case of a provocation such as the 2010 sinking of the Navy corvette Cheonan, which killed 46 sailors, or the 2010 artillery bombardment of Yeongpyeong Island, which killed four South Koreans. It is also designed to scale upward to include all-out attacks if the North invades. The second contingency plan, Kill Chain, involves targeting the North Korean leadership if it is on the verge of launching a nuclear missile, in order to prevent launch orders from being issued.

South Korea currently has three missile systems. The first, the German-made Taurus air-launched cruise missile, is carried by Republic of Korea F-15K fighter bombers. Taurus is a low-flying, subsonic, precision-guided cruise missile with the ability to penetrate hardened concrete bunkers. The second is also a cruise missile, the locally developed Hyunmoo-3 land attack cruise missile. Two versions of the Hyunmoo-3 are operational, the -3A with a range of 310 miles and the -3B, with a range of 620 miles. A third version, the -3C, is under development with a goal range of 930 miles, a baffling number since North Korea is the country's only realistic enemy and the farthest distance between the two countries is 664 miles.

South Korea also has a short-range ballistic missile, the Hyunmoo 2B, a truck-mounted, two stage, solid fuel missile with a range of 497 miles. In the event of imminent war with North Korea, Hyunmoo 2Bs would leap into the skies, their destinations any and all places the Kim Jong Un regime might take shelter in from American and South Korean air power. Seoul is reportedly developing a submarine-launched version of the Hyunmoo 2B but currently does not have a submarine to launch it from.

Japan

An avowedly pacifist country, Japan has for years avoided offensive weapons such as cruise missiles. Recently however the Japanese government has made clear its desire to purchase two cruise missiles: the Norwegian/U.S. Joint Strike Missile (JSM) and the American Joint Air-to-Surface Standoff Missile-Extended Range (JASSM-ER). Both missiles will give Tokyo the ability to strike North Korean missiles on the launch pad and ready to fire if no other option exists. The missiles are justified as "offensive-defensive" missiles capable of carrying out pre-emptive strikes.

The Joint Strike Missile is a development of the Kongsberg/Raytheon Naval Strike Missile. JSM is designed to fit internally in the weapons bay of the F-35 Joint Strike Fighter, of which Japan has 42 on order, and can also be launched from Japanese ships. It is also, unlike the Naval Strike Missile, capable of striking targets on land. JASSM-ER will be fitted to Japan's F-15J Eagle fighters and has a range of 575 miles.

http://www.popularmechanics.com/military/weapons/a14518920/asias-quiet-missile-race/

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VOA (Washington, DC)

North Korea Leader Warns US of Reality of its Nuclear Program

Author Not Attributed

January 1, 2018

North Korean leader Kim Jong Un says the United States must realize that the North's nuclear program is a reality.

In his annual New Year's address Monday, Kim warned that he has a nuclear button on his desk. "The entire area of the U.S. mainland is within our nuclear strike range," Kim said. "The United States can never start a war against me and our country."

The North Korean leader said his country "can cope with any kind of nuclear threats from the U.S. and has a strong nuclear deterrence that is able to prevent the U.S. from playing with fire."

"The U.S.," he said, "must realize this is not blackmail, but reality."

Kim vowed to not attack unless his country's peace was threatened.

He also took a conciliatory tone with South Korea, suggesting that he was "open to dialogue."

Kim said he would consider sending a team to the Winter Olympics, to be held in February in his southern neighbor.

Kim's annual New Year's address is widely considered to be an indication of his direction and priorities for the upcoming year.

Last year, Kim and U.S. President Donald Trump engaged in a series of escalating verbal exchanges, with Trump warning that North Korea would face "fire and fury" if it threatened the United States.

Pyongyang responded by saying it was considering test firing an intercontinental ballistic missile into waters near the U.S. Pacific territory of Guam. Soon after, the North launched two long-range missiles over Japan and in September conducted its sixth nuclear test.

The war of words continued in Trump's address to the United Nations in September, when the president referred to Kim as a "Rocket Man" on a suicide mission.

Kim responded in a statement that described Trump as a "dotard," which means senile, and that described his behavior as "mentally deranged."

In November, the North announced it had reached its goal of developing operational ICBM capability after it launched a long-range Hwasong-15 missile that could potentially reach the U.S. mainland.

Kim also suggested in his New Year's speech that the North and the South should meet to discuss the possibility of the North sending athletes to the Pyeongchang Winter Olympics.

South Korean presidential office spokesperson Park Soo-hyun said Monday the Blue House welcomes Kim's "willingness" to send North Korean athletes to the Olympics and "the suggestion that the two governments hold a meeting to discuss the issue."

Sung Yoon Lee, an associate professor in Korean studies at Tufts, told VOA the current South Korean administration is "all for dialog and inter-Korean cooperation."

Sung said South Korea welcomes what he called the North's "peace overture" that would place the South in "a better position to even try to persuade the United States to endorse South Korea's keen interest in re-opening the Kaesong Industrial Complex that was shut down almost two years ago."

South Korea suspended all activities at the industrial zone it operated jointly with North Korea to punish the Kim Jung Un government for conducting nuclear and missile tests.

The possibility of re-opening the complex, however, is fraught with complications, Sung said. "Kaesong has been a funnel, a cash cow for the North Korean regime, with South Korea sending upwards of $100 million, sometimes $120 million a year to the North Korean regime for workers' wages, which, of course, must have been diverted to North Korea's weapons development program," putting it in direct violation of the United Nations security resolution.

When Kaesong closed, South Korean companies left behind over $600 million in equipment and raw materials.

https://www.voanews.com/a/kim-jong-un-nuclear-threat/4187244.html

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EUROPE/RUSSIA

Homeland Preparedness News (Washington, DC)

European Anti-Terrorism Package Prioritizes CBRN Preparedness, Expert Says

By Kim Riley

January 2, 2018

Experiencing an escalating threat level of chemical, biological, radiological and nuclear (CBRN) attacks across its region, the European Commission's related preparedness plan is extremely important, a London-based expert recently told Homeland Preparedness News.

"I consider this to be highly significant as for the first time, the European Commission is proposing that medical preparedness for CBRN attacks is a high priority" for the European Union, said Steven Neville Chatfield, an independent consultant in biopharmaceuticals and a director for the Centre for Emergency Preparedness and Response in the United Kingdom's Health Protection Agency.

The European Commission's (EC) Action Plan to enhance preparedness against CBRN security risks is part of its anti-terrorism package released in October 2017, a strategy aimed at better protecting the more than 511 million citizens across the 28 member states of the European Union (EU).

Considering the current state of affairs, the terror-threat level in Europe requires immediate attention.

In fact, according to the EC's plan, the EU faces a range of violent terrorist threats and attacks from networked groups and lone actors.

"Both terrorist groups and radicalized individuals have sought to carry out mass-casualty attacks in the EU with the aim of maximizing both the number of victims and the psychological and economic impact on society," the plan states.

"I would describe the threat level in Europe as being high and evolving," said Chatfield, who holds a PhD in microbiology and has published more than 100 papers in the biotechnology field. His previous roles include executive positions at Medeva plc, Microscience Ltd., and Emergent BioSolutions.

"There are several reports and studies that provide good reason to believe that threats from deliberate release of CBRN materials is credible," he said, adding that future threats are likely to come from the use of chemical and biological weapons.

"Chemical weapons have already been used in Syria and Iraq and there are indications that organizations such as ISIS are experimenting with biological weapons," Chatfield wrote in an email sent from London.

Comparatively, he thinks the threat levels are similar in Europe and the United States.

"Although it could be said that recent events in displacing ISIS from its strongholds in Iraq and Syria, leading to the return of a large number of European citizens that fought with ISIS, could increase the threat level in Europe," Chatfield explained.

Action plan elements

There are several critically important elements of the EC's action plan against CBRN security risks.

The EC's proposal notes that attacks involving, for instance, "a radioactive dispersal device or an anthrax attack using unmanned aerial systems," could be extremely high, and directly says that member states have an obligation to provide medical countermeasures.

"The Directive on Combating Terrorism includes for the first time provisions on all strands of CBRN terrorism," according to the document. "It imposes obligations on Member States when it comes to the response to a terrorist attack, including an obligation to provide medical assistance to all victims. The initiatives proposed in this Communication will help Member States to meet their obligations to assist victims when it comes to an attack conducted with the CBRN materials."

Notably, Chatfield said the plan makes equally relevant recognitions, including:

– There are credible indications suggesting terrorist groups might have the intention of acquiring CBRN materials or weapons and they're developing the knowledge and capacity to use them;

– Member states should increase preparedness for cross-border threats to health via joint purchases of medical countermeasures; and

– Member states and the EC should develop a shared vision at the EU level on how to improve vaccine coverage in the EU and then take actions to strengthen vaccine supplies and stock management, and should increase the effectiveness of vaccine research and development.

"My opinion," Chatfield wrote, "is that this is a recognition that stockpiles of specialist countermeasures — such as vaccines and antibody therapies — need to be established at EU level (as the U.S. has done through the establishment of the strategic national stockpile) in order to provide a full and effective response in the event of a CBRN attack."

Unlike conventional medicines, some countermeasures — such as those for anthrax and botulinum, two of the biggest threats — may not be immediately available to member states in the aftermath of an attack, he added.

"They may take several months to manufacture and supply when in reality they would only be effective if used within days after the attack for which the ideal solution is the establishment of stockpiles at the EU level," he said.

Additionally, the section of the Action Plan on developing CBRN Security Cooperation would call for several EU-U.S. workshops to be held and to "invite strategic partners to dedicated sessions of the CBRN Security Advisory Group where appropriate."

There also are Action Points calling for the "elaboration of national preparedness strategies for bioterrorism issues;" for member states to "appoint national CBRN Security Coordinators" as primary points of contact; and for member states to cooperate with the industry.

Existing tools

The EC's action plan — which Chatfield said is not a legislative proposal but rather a document that sets out the commission's strategy and intentions — would be implemented in cooperation with the 28 member states.

"Previously this policy area was considered to be the responsibility of national governments," explained Chatfield, who said the commission's CBRN action plan could change after reviews are concluded by the Council of the EU and the European Parliament, which comprise the EU's legislature.

However, a 2017 EU directive on terrorism is in place that provides guidance on how the member states may assist and support victims of terrorism, said Chatfield.

"Importantly, this directive also obliges member states to provide medical assistance (i.e. CBRN countermeasures) to all victims of terrorism," he said. "In essence, this will underpin the legislative base for the action plan."

Additionally, the EC's 2014-approved procurement mechanism established a voluntary and centralized process for member states to jointly and collaboratively "engage in … the advance purchase of medical countermeasures for serious cross-border threats to health," according to language contained in the Joint Procurement Agreement (JPA).

Specifically, the JPA is designed to strengthen the member states' purchasing power and ensure equitable access to medical countermeasures like vaccines and antiviral medications that would be used in the event of a pandemic and "to protect their citizens against CBRN incidents," said Chatfield.

"This is another tool that can be used in the implementation of the action plan," he added.

As of Fall 2017, the JPA had been signed by 24 EU countries.

https://homelandprepnews.com/countermeasures/26013-european-anti-terrorism-package-prioritizes-cbrn-preparedness-experts-say/

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Business Insider (New York, NY)

Russian Scientists in the '90s May Have Given North Korea Designs for its Newest Missiles

By Daniel Brown

January 2, 2018

Russian scientists in the 1990s may have provided North Korea the designs for its newest missiles, The Washington Post reported last week, citing "newly uncovered documents."

After the collapse of the Soviet Union, scientists who helped build Soviet missiles and nuclear weapons were in need of money and without other prospects, The Post reported. When a joint venture with US investors to turn submarine-launched missiles into space boosters failed, Russian scientists at the Makeyev Rocket Design Bureau sought other avenues.

In 1992, about 60 scientists and their family members were arrested at a Moscow airport trying to fly to Pyongyang to work as consultants, according to The Post. But US, Russian, and South Korean officials think some eventually reached the North.

Now, more than two decades later, Pyongyang is successfully launching missiles that appear eerily similar to the old Soviet missile designs, The Post reported.

The Hwasong-10, test-fired in June 2016, seems to have the same engine and design as the Soviet R-27 Zyb, as does the Pukguksong-1, tested in August 2016, the report says.

The North has begun to develop and successfully test the missiles in the past year because it was "recently able to acquire machine tools that were state-of-the-art in the 1990s," David Wright, a nuclear-weapons expert at the Union of Concerned Scientists, told The Post.

"Once you have the plans and are able to get your hands on the materials and the right kinds of tools, you have a real leg up," he added.

In addition to getting some parts on the black market through China, "North Korea can at this point build a lot of its machine tools," Wright told Business Insider.

The North, once the industrial hub of the Koreas, has slowly obtained the knowledge and materials since acquiring the Russian designs — and now it's paying off, Wright said.

Wright says this is why economic sanctions the UN imposed on North Korea late last month won't hurt Pyongyang's missile program.

"I think tougher sanctions will make them cut back on some things, like gas available for cars and heating," Wright said, but "they will not solve the missile problem."

How it could have been prevented

North Korea's missile buildup may have been prevented if the US had granted American investors a waiver of the Strategic Arms Limitation Treaty, Kyle Gillman, a former executive of the US-Russia venture, told The Post.

The treaty, known as SALT, limited how many nuclear weapons the US and Russia could stockpile. The US's decision not to grant the waiver allowed the Russian scientists at the Makeyev Rocket Design Bureau to then partner with North Korea, the Post report says.

"We just needed to be creative, and try and win the peace," Gillman told The Post. "But our government and military and intelligence agencies were shortsighted."

Wright agreed that North Korea's buildup could have been avoided.

He told Business Insider that at the time, the US felt it had "a lot of stuff going on, and it kind of slipped through cracks."

"You didn't have the right people thinking about this at the right time," Wright said, adding that Russia was also partly to blame for letting the technology out.

http://www.businessinsider.com/russian-scientists-north-korea-newest-missile-designs-2018-1

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MIDDLE EAST

Xinhua (Beijing, China)

News Analysis: Hawkish U.S. Stance to Complicate Prospect of Iran Nuclear Deal: Experts

By Zhu Dongyang and Matthew Rusling

January 3, 2018

WASHINGTON, Jan. 2 (Xinhua) -- The hawkish rhetoric of U.S. President Donald Trump and the White House on Iranian protests will further complicate the prospect of an Iran nuclear deal, U.S. experts said Tuesday.

At least eight people were killed, dozens injured and scores arrested as protests against the Iranian government's economic policies continued in major cities across the nation over the past days.

CONTINUOUS U.S. RHETORIC

Trump raised eyebrows around the world as he continued to lash out at Tehran over the last couple of days on the social media platform Twitter, accusing the Iranian government of squandering its national wealth in support of "foreign terrorism."

He also blasted the "terrible deal made with them by the (Barack) Obama Administration," referring to the hard-won nuclear deal signed by Tehran and other parties.

White House spokesperson Sarah Huckabee Sanders at Tuesday's press briefing referred to Hillary Clinton, then secretary of state under the Obama administration, saying that Clinton "said that the Obama administration was too restrained of the 2009 protests and said that won't happen again."

"We agree with her because President Trump is not going to sit by silently like President Obama did," Sanders added.

Anti-government protests occurred in major Iranian cities after the June 12 presidential election in 2009, causing riots and unrest until early 2010.

When asked whether the Iranian protests will renew Trump's desire to re-impose sanctions on Iran, Sanders only said the United States will "certainly keep our options open in terms of sanctions."

"In terms of signing a waiver later in January, the President hasn't made a final decision on that, and he's going to keep all of his options on the table in that regard," she added.

ECONOMIC MOTIVES

According to Dan Mahaffee, senior vice president and director of policy at the non-profit Center for the Study of the Presidency and Congress, Iranian protests are fueled largely by economic discontent on issues such as unemployment, the value of Iranian currency, and disappointment with the government's approach to the economic situation.

Darrell West, a senior fellow at the Washington-based think tank the Brookings Institute, said that protests in Iran have grown due to public concerns about corruption and lack of economic prospects.

"The country remains mired in weak economic performance, even though many international sanctions have been lifted," West added.

In the eyes of David Pollock, a senior fellow at the Washington Institute for Near East Policy, the scale of the protests, sweeping many provincial cities and towns and involving working-class Iranians, was still smaller than that in 2009.

COMPLEX FUTURE FOR NUCLEAR DEAL

Nevertheless, Trump's efforts to link the protests with the nuclear deal bodes ill, experts said.

"Separate from the economic situation for the average Iranian, much of President Trump's rhetoric has been focused on his skepticism towards the international nuclear deal with Iran and the continued Iranian support for the Syrian government," Mahaffee said.

As Pollock saw it, Trump's rhetoric reflects his strong view of Iran's government as an enemy and a source of Islamic extremism, threatening the U.S. interests in the region and beyond.

"Sanctions against Iran for terrorism and human rights abuses are still separate from the nuclear deal, and I think Congress and the White House will try to maintain that distinction," he added.

Brookings' West also noted that Trump has been very critical of Iran and feels Obama did not negotiate an effective agreement with the Iranians.

"He has threatened to rip up the agreement and continue to maintain U.S. sanctions on Iran. That would destabilize the Middle East and make it more difficult for foreign leaders to trust U.S. agreements," West said.

"If one leader rips up an agreement approved by the last one, it would be hard to maintain continuity in foreign policy," he added.

FUTURE INVOLVEMENT BY U.S. IN IRAN

However, experts predicted that the Trump administration's rhetoric against Iran would more likely be symbolic.

"The U.S. will probably limit its involvement mainly to moral support for the protestors, and mostly symbolic sanctions against particular regime criminals. We will work to bring other countries on board with this, in the UN (United Nations) and elsewhere," Pollock said.

"There may also be some efforts to offer the protestors technical help in getting around regime censorship and cyberattacks," he added.

"Given the history of past U.S. involvement in Iranian domestic politics, the best thing for the United States would be to ... do little to intervene or directly support these protests," Mahaffee said.

West had a similar opinion, saying that "Washington has to be careful how it handles the current protests."

"If it gets involved, Iranian leaders will cite that as evidence of foreign intervention and use that to strengthen their own popularity. They will claim the U.S. is behind the protests and the discontent is not a genuinely grass roots movement," he said.

Earlier this week, Secretary of Iran's Supreme National Security Council Ali Shamkhani said certain countries are waging a "proxy war" against the Islamic republic via social media and the Internet.

The United States, Britain and Saudi Arabia are behind the recent riots in Iran, he said.

http://www.xinhuanet.com/english/2018-01/03/c_136869563.htm

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INDIA/PAKISTAN

The Hindu (Chennai, India)

India, Pakistan Exchange List of Nuclear Installations

Author Not Attributed

January 1, 2018

This is the twenty seventh consecutive exchange of such a list between the two countries.

India and Pakistan on Monday exchanged, through diplomatic channels simultaneously at New Delhi and Islamabad, the list of nuclear installations and facilities under a three-decade old bilateral pact.

According to an External Affairs Ministry release, the two sides exchanged the list under the Agreement on the Prohibition of Attack against Nuclear Installations between India and Pakistan.

The agreement, which was signed on December 31, 1988, and entered into force on January 27, 1991, provides that the two countries inform each other of nuclear installations and facilities to be covered under the pact on the first of January of every calendar year.

This is the twenty seventh consecutive exchange of such a list between the two countries, the first one having taken place on January 1, 1992.

http://www.thehindu.com/news/national/india-pakistan-exchange-list-of-nuclear-installations/article22343648.ece

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COMMENTARY

The Hill (Washington, DC)

Missile Defense Must Prioritize Homeland Defense

By James Durso

January 2, 2018

The Trump administration and the Congress responded to North Korea's ballistic missile tests by increasing the original missile defense budget for fiscal year 2018 by an additional $368 million. This action is welcome, but much of America's planned missile defense spending is allocated to costly interceptor systems located overseas, which are designed to intercept missiles at the beginning or end of their flight.

There has been recent growth in missile defense sites overseas. Romania is a new host to a missile interceptor site, and Poland will host a site in 2018. Aside from a significant financial commitment from the U.S., a lot of diplomatic effort is required to negotiate the deployment of missile defense systems, and the supporting troops and contractors, to foreign soil.

The systems deployed overseas are designed to intercept missiles either prior to or after the midcourse phase of their flight. Destruction of a missile early in its flight should be a good thing, but destruction of a missile carrying a nuclear warhead at a low altitude greatly increases the chance that the population and infrastructure of the defender or a friendly neighbor will be damaged by missile debris or radioactive material from the warhead. In addition, the local commander must

have the ability and authority to correctly identify and destroy a target less than a minute after launch.

A missile defense system deployed to a foreign country will also have to contend with the reasonable demand by the host nation for a say in a launch decision, which may not be practicable in a fast-moving situation, and is known as "dual key." The host nation wants a vote because, by hosting the launch site, they will also be going to war against the country that launched the missile at the U.S.

Other solutions, like parking a ship equipped with the Aegis Combat System off the coast of North Korea, then hoping the Kim regime obliges us by launching a missile that can be chased down by the interceptor missiles, will put even more stress on our Navy, which has too few ships and too many missions. And stationing a ship off the North Korean coast may provoke the launch the U.S. is trying to avoid.

Defending against nuclear-armed ballistic missiles by using Ground-based Midcourse Defense (GMD) to destroy them in the middle of their flight is less risky to our population and property as the debris will likely land in the ocean. And hitting an incoming missile at a longer distance allows time to correctly assess the flight path and for a second volley, known as "shoot-look-shoot," if the first interceptor misses its mark.

So, a mid-course intercept option puts decisions about America's defense solely in American hands, saving joint efforts with our allies for those efforts that are best approached collaboratively. We should take the opportunity to co-invest in critical missile defense R&D with our allies, but our hardware dollars are best invested in missile defense assets on American soil.

As 2018 begins, America's inventory of interceptor missiles in American GMD sites totals 44. Due to a planned test this year, there will soon only be 43. The law mandates that there be no fewer than 43 interceptor missiles on the ground, so if disaster strikes, we may not have enough GMD interceptors when one might make the difference between success and a disaster that may change America forever, and not for the better.

Administration policymakers should work with the Congress to boost funding for GMD which is the best option for homeland defense, is in consonance with the goal of enhancing missile defense as outlined by the "National Security Strategy of the United States of America," and strengthens our alliances by focusing joint attention the best win-win solutions.

http://thehill.com/opinion/national-security/367007-missile-defense-must-prioritize-homeland-defense

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Real Clear Defense (Chicago, IL)

The Strategy behind Russia's Alleged INF Treaty Breach

By Adam Cabot

January 3, 2018

On Christmas Day I played a game of chess with my 12 year-old nephew. At one stage I sacrificed my bishop so that he would move his queen into a position where it would be taken. Upon doing this, I explained to him that it is important to understand why an opponent is doing something in order to deal with it effectively. If he had known why I had moved my bishop into a vulnerable position, he surely wouldn't have moved his queen in response. It is likely that my nephew, who is

quite a good chess player, didn't give my actions much thought and merely assumed I was making a mistake.

Like moves on a chess board, allegations regarding Russia's breach of the Intermediate-Range Nuclear Forces (INF) Treaty parallels Russia's strategic maneuvering.

Signed by the Soviet Union and the U.S. in 1987, the INF Treaty came into effect in 1988. Put simply, it bans any land-based missile, nuclear and conventional, with a range between 500 and 5,500km. In recent years the U.S. has accused Russia of violating the INF Treaty with the deployment of a land-based cruise missile. In November 2017 a U.S. National Security Council official declared that the missile violating the treaty is the Novator 9M729 cruise missile. The U.S. has limited the information released regarding the alleged breach, so not much is known about the 9M729 cruise missile, possibly due to the protection of intelligence sources and methods. If the 9M729 cruise missile has a range between 500 and 5,500km, it is crucial to understand why Russia would openly deploy such a system, much like my decision to move my bishop.

First, it is important to note that Russia shares land borders with 14 nations. The scale of its land mass is vast, stretching across two continents and 11 time zones. To Russia's immediate Western flank is NATO stretching along its border. Surrounding Russia but not necessarily bordering it are nations with missiles within the INF range who are not subject to the INF Treaty. Israel, Iran, Pakistan, India, China and North Korea all have missiles capable of striking within Russia's borders, and all but Iran have nuclear capability. Without missiles within the INF range, Russia is severely limiting its tactical defensive capability.

China borders Russia, has the world's second-largest economy and the world's largest army. It has an increasingly modernized military capability and can freely deploy land-based missiles within the INF range. Russia's only viable defense against this behemoth would be its strategic arsenal which, if used, would significantly increase escalation to possible countervalue target level, i.e., Moscow and Beijing. To assist in offsetting China's tactical advantage, one can understand how the deployment of an INF range cruise missile would benefit Russia. There are countless scenarios, but one, in particular, would be the ability to hold Chinese ground forces at bay as they pour across the border or at least deter them from attacking in the first place.

Second, is the deployment of Ballistic Missile Defences (BMD) to Russia's Western and Eastern flanks. In 2016 the Aegis Ashore Ballistic Missile Defence system was deployed to Romania, with Poland to follow in 2018, and in 2017 the THAAD Ballistic Missile Defence system was deployed to South Korea. These systems include the use of powerful radars designed to provide missile defense against targets within the Short to Intermediate range. The Russians claim that these U.S. BMD systems are in fact a breach of the INF Treaty as they can be converted to launch missiles within the INF range. The deployment by Russia of missiles within the INF range could be used in a tactical scenario to counter these systems and their radars. While one may claim that Russian aircraft and air-launched cruise missiles can accomplish this task, the aircraft would potentially face great difficulty in breaching air defenses. While the From the Russian perspective, they are being sandwiched between BMD defenses to their West and East and increased INF range missile proliferation to their South.

Third, is the potential use of INF range missiles as a component of a Hybrid Warfare strategy. There have been many definitions of "Hybrid Warfare" and different names for it including "New Generation War." One such definition is that it encompasses the use of a broad range of subversive instruments, many being non-military, to further national interests. These instruments may include economic pressure, propaganda, cyber-attacks, political influence and nuclear coercion to name a few. Russia has utilized a Hybrid Warfare strategy inclusive of varied instruments in the invasion of Georgia in 2008, the annexation of Crimea in 2014 and the ongoing conflict in Ukraine.

The deployment of INF range missiles with the capability of being fitted with nuclear warheads, whether confirmed by Russia or not, could be utilized to "divide and weaken NATO" which the RAND Corporation argues is an objective of Russia's Hybrid Warfare strategy. These Non-Strategic Nuclear Weapons with the ability to target Europe but lacking the range to hit the United States could in theory divide and weaken NATO by making the U.S. think twice before intervening in a potential conflict for fear of nuclear escalation. This strategy is reminiscent of the French decision in the 1950s to obtain a nuclear arsenal due to uncertainty about U.S. nuclear guarantees. Russia may calculate that it can invade the Baltic States under the umbrella of a nuclear INF range force without the U.S. intervening. This would be the end of NATO and could potentially further embolden Russia and other powers to use force or coercion as the concept of U.S. extended nuclear deterrence would, therefore, no longer exist.

This is not a farfetched Russian strategy. The U.S. under President Obama stepped back from armed intervention to the point of failing to enforce a clear red line against Syria using chemical weapons. It also decided not to take military action when Russia blatantly invaded and seized Crimea from Ukraine in contravention of the Budapest Memorandum of 1994, signed by the U.S. and Russia as a security assurance in exchange for Ukraine giving up its nuclear weapons left over from the Soviet Union. President Trump with his "America First" isolationist rhetoric, criticism of NATO and suggestion that South Korea and Japan should obtain nuclear weapons also suggests a future withdrawal from global leadership. This may act to not only cast doubt in allied countries that the U.S. will come to their aid if attacked but also embolden Russia to push the envelope further.

The potential benefit of Non-Strategic Nuclear Weapons over strategic arsenals, such as the nuclear triad deployed by the U.S. and Russia, is the perception that their use would not escalate into a strategic level conflict. Although ICBMs could strike a regional target within the INF range, this use of the strategic arsenal could be seen as an escalation and potentially result in a global exchange. Although this level of thinking is dangerous, as any use of nuclear weapons would potentially be difficult to limit within the region, it must be taken into account that a perception may be present in the mind of an adversary that limited use is possible with the deployment of a modernized non-strategic nuclear arsenal.

I eventually beat my 12 year-old nephew in our Christmas Day chess game but the time will come when he will analyze my piece movements and successfully counter me. If we limit our focus on the alleged breach of the INF treaty without understanding or taking into account why Russia may breach it, we will fail to implement an effective strategy to counter any further actions. A potential consequence of this is that when and if Russia decides to withdraw from the treaty, it will already have an advanced INF range force ready to employ immediately. In our changing geopolitical environment where alliances may appear more fragile than they were previously, this could lead to miscalculation and subsequent disaster.

https://www.realcleardefense.com/articles/2018/01/03/the_strategy_behind_russias_alleged_inf_treaty_breach_112848.html

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The Cipher Brief (Washington, DC)

Trump's Trigger Finger: Nuke Review Ditches Obama Pledges

By Walter Pincus

January 2, 2018

The Trump administration may open the New Year with a bang – a nuclear bang – with the impending release of its Nuclear Posture Review.

One of President Donald Trump's first executive orders, signed a week after he took office, included directing Secretary of Defense James Mattis to "initiate a new Nuclear Posture Review to ensure that the United States nuclear deterrent is modern, robust, flexible, resilient, ready and appropriately tailored to deter 21st-century threats and reassure our allies."

To some Trump national security supporters, those words could be interpreted as calling for developing new, low-yield weapons, a return to testing, and preparing to put strategic bombers back on 24-hour alert.

Two Obama administration pledges will be reversed or ignored: not to use nuclear weapons against non-nuclear states; and the long-range goal of eventually doing away with nuclear weapons altogether.

People have not forgotten that Trump has had his verbal ups-and-downs discussing nuclear weapons, starting with campaign references to, "My uncle [who] used to tell me about nuclear before nuclear was nuclear." He was referring to John Trump, an MIT professor of engineering who specialized in X-ray machines and radar.

Then there was the December 2016 debate moment, when Trump was asked twice to explain his "priority among the Triad" and rambled on, not recognizing the Triad referred to the three U.S. nuclear delivery systems, and finally saying, "I think — I think, for me, nuclear is just the power, the devastation is very important to me."

But matters became more serious when in August, now-President Trump threatened North Koreans and their leader Kim Jong-un by saying, "They will be met with fire and fury, and frankly power the likes of which this world has never seen before." To show he was thinking nuclear weapons, Trump tweeted the next morning at 7:56 am, "My first order as President was to renovate and modernize our nuclear arsenal. It is now far stronger and more powerful than ever before…."

That was typical, Trumpian off-the-cuff rhetoric. Frightening as the words seemed, it took a subsequent Senate hearing to reassure people that there are both civilian experts and military officials standing between Trump and an actual nuclear weapons launch.

However, Trump can seriously influence future U.S. nuclear weapons policy based on what happens to recommendations contained in the upcoming Nuclear Posture Review. Then only Congress could influence the outcome.

First off, remember the U.S. is already in the midst of the Obama administration's major renovation of its nuclear delivery systems, upgrading the tactical B-61 nuclear bomb and the long-range, nuclear-tipped cruise missile, along with slowly modernizing the complex that builds and sustains nuclear weapons.

A new class of 12 Columbia strategic submarines, each carrying 16 missiles is starting to be built with the first scheduled to be procured in 2021 and the last in 2035. Each is expected to have a 42-year life, meaning the final sub could be operating in 2077. The total acquisition cost is estimated at more than $100.2 billion – not including the costs of the missiles it will carry.

The Air Force is designing a next-generation bomber, the B-21 Raider, to replace the ancient B-52s and B-1s beginning in the 2030s and 2040s. The plan is purchase some 100 at a price between $511 million to $550 million apiece.

Development of the next generation land-based ICBM has begun under a plan that will see delivery of 666 missiles beginning in 2028 at a lifetime cost of some $100 billion.

The Obama fiscal 2017 plan for the above nuclear forces, if carried out over the next 30 years, was estimated to cost $1.2 trillion, according to an October 2017 Congressional Budget Office report. That includes $400 million for modernization and $800 billion to maintain and operate the systems.

Ironically, this new construction under Obama was the cost of gaining Republican support for the New START treaty with Russia that was signed April 8, 2010, and went into effect on February 5, 2011. It set new warhead deployment limits that go into effect next month: 1,550 warheads each, down from 2,200.

Currently, according to figures exchanged under the START Treaty, the U.S. has some 1,393 warheads deployed on 660 land- and submarine-based intercontinental ballistic missiles and strategic bombers. In addition, there are an additional 4,000 warheads active and inactive warheads stockpiled and another 2,800 retired and awaiting dismantlement.

Treaty signatory Russia is the only country close, with 1,561 deployed on 501 ICBMs and strategic bombers. North Korea, these days considered the greatest threat to the U.S., at best has 20 bombs or warheads.

The Trump administration's Dec. 18, National Security Strategy gave no hint at what may be in the Nuclear Posture Review. It did favorably mention "the extension of the U.S. nuclear deterrent to more than 30 allies and partners helps to assure their security, and reduces their need to possess their own nuclear capabilities."

That seems to be in contrast to past Trump statements that threatened removal of the U.S. "nuclear umbrella" from allies such as Japan and South Korea if Tokyo and Seoul did not pay more for America's protection. Both countries have since have had senior officials talk of producing their own nuclear weapons in the face of North Korea's successes toward developing them.

In another statement that showed distance from some other past Trump statements, the new National Security Strategy stated, "To avoid miscalculation, the United States will conduct discussions with other states to build predictable relationships and reduce nuclear risks. We will consider new arms control arrangements if they contribute to strategic stability and if they are verifiable."

Needless to say, Trump's own statement when releasing this strategy paper never once mentioned nuclear weapons.

There are, however, plenty of voices around him calling for a more active U.S. nuclear weapons program.

In March, the non-partisan Defense Science Board said the Department of Energy "must re-establish the knowledge base in nuclear matters and the art of deterrence among both civilian and military leadership, which has largely atrophied. In short, 'nuclear' still matters, nuclear is in a class of its own, and nuclear cannot be wished away." It also said the Pentagon needed the ability to fight through a nuclear battlefield and "provide, if needed, additional nuclear options."

A nuclear review by Dr. Keith B. Payne's National Institute for Public Policy last April, chaired by former Livermore National Laboratory Director Dr. John S. Foster, Jr., recommended that "the 2017 NPR [Nuclear Posture Review] should explicitly reestablish deterrence and assurance—coupled

with preparations for damage limitation in the event of deterrence failure—as the priority goals for U.S. nuclear policy."

In May, the Heritage Foundation restated its long-standing recommendation for resuming nuclear weapons tests stating, "The assessment of the reliability of life-extended weapons could be less uncertain. The United States could validate computer codes that it currently uses to assess what is happening in the nuclear stockpile and increase the margins of certainty that nuclear warheads will perform as expected."

In November, a former Obama administration official made the argument for low-yield weapons in an article on the War on the Rocks website. "There is no evidence that the mere possession of these weapons during the Cold War made the United States more likely to use them," argued John R. Harvey, a former Principal Deputy Assistant Secretary of Defense for Nuclear, Chemical and Biological Defense Programs during the Obama administration. "Rather, these weapons were never used because nuclear deterrence worked."

It may well be that such arguments may appeal to Trump and thus find a place in the upcoming Nuclear Posture Review.

Given already existing concerns about Trump's finger being anywhere near the nuclear button, we could be seeing in the next month the start of a public discussion on nuclear weapons followed by a much-needed debate in Congress on the same subject.

https://www.thecipherbrief.com/column/fine-print/trumps-trigger-finger-nuke-review-ditches-obama-pledges

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War on the Rocks (Washington, DC)

Deterrence in the Last Sanctuary

By Zack Cooper and Thomas G. Roberts

January 2, 2018

There's never been a war in the space domain, but some believe it won't be that way forever. At the Reagan National Defense Forum in December, Air Force Gen. John Hyten, commander of U.S. Strategic Command, remarked that "any domain that humans move into will be subject to conflict." Secretary of the Air Force Heather Wilson warned, "We must expect that war, of any kind, will extend into space in any future conflict."

In the 60 years since the launch of the first human-made satellite, the space domain has evolved from a relatively benign environment with two primary actors to a much more complicated landscape — one with over 80 players operating more than 1000 satellites in orbit. This new space environment comes with uniquely modern threats against space systems. As Wilson explained, "The U.S. built a glass house before the invention of stones… The shifting of space [from] being a benign environment to being a warfighting environment requires different capabilities."

What types of capabilities does the United States need for the modern space age? And how can the United States and its allies continue to maximize their use of space while minimizing the risk of attacks against space systems? An important first step is understanding how the space environment has changed over the past 60 years and how escalation and deterrence dynamics — including attribution, reversibility, resilience, thresholds, and asymmetries — may have shifted along with it.

In the first space age, from 1957 to the fall of the Soviet Union, attribution was simpler than it is today. Before 1990, the United States and the Soviet Union were responsible for over 90 percent of all space launches, so any actions that interfered with space systems could be reasonably viewed as attacks by the opposing superpower. Attribution was assumed. Since the end of the Cold War—what some are calling the second space age—space has been more accessible to other countries. Last year, the United States and Russia were responsible only 32 percent of all space launches. As American strategists develop more tailored deterrence strategies, they will have to ensure that the United States can attribute aggressor actions in order to respond effectively and credibly. Due to its investments in space surveillance and situational awareness capabilities, the United States has a substantial edge in attribution capabilities, which could provide it with a major advantage over less capable adversaries. Yet, U.S. leaders will have to demonstrate their ability to attribute attacks, or else an adversary could believe that it could avoid retaliation by relying on attribution ambiguity.

During the Cold War, both the United States' and the Soviet Union's space programs were strongly tied to their nuclear forces. Before 1990, over 70 percent of satellites were military satellites, with many primarily dedicated to supporting nuclear attack warning and response and continuity of nuclear command and control on the ground. Any action that disabled a satellite, even temporarily, was treated as a potential prelude to a nuclear attack. Today, however, recent experiences with "gray zone" coercion suggest that reversible actions could blur escalation thresholds. This is particularly dangerous because simulated attacks in space indicate that reversible actions may be perceived differently by attackers and defenders. This phenomenon has already occurred in the cyber domain, where distributed denial of services attacks have been viewed as minor disruptions by their perpetrators, but major attacks by defenders. In space, a reversible dazzling of a satellite could prove even more complicated, as an attacker might not know the extent or duration of an attack's success. Different views about reversibility in the second space age are therefore likely to increase the risk of inadvertent escalation.

Until recently, resilience in space was largely an afterthought. It was assumed that a conflict in space would likely lead to or precede a major nuclear exchange. Therefore, the focus was on cost-effective architectures that maximized satellite capabilities, often at the cost of resilience. Recently, however, some have hoped that new architectures could enhance resilience and prevent critical military operations from being significantly impeded in an attack. Although resilience can be expensive, American investments in smaller satellites and more distributed space architectures could minimize adversary incentives to carry out first strikes in space.

In the late 20th century, minor escalations against space systems were treated as major events, since they typically threatened the superpowers' nuclear architectures. Today, the proliferation of counter-space capabilities and the wide array of possible types of attacks means that most attacks against U.S. space systems are unlikely to warrant a nuclear response. It is critical that policymakers understand the likely break points in any conflict involving space systems. Strategists should explore whether the characteristics of different types of attacks against space systems create different thresholds, paying particular attention to attribution, reversibility, the defender's awareness of an attack, the attacker's ability to assess an attack's effectiveness, and the risks of collateral damage (e.g., orbital debris). Competitors may attempt to use non-kinetic weapons and reversible actions to stay below the threshold that would trigger a strong U.S. response. The 2017 National Security Strategy warns:

> Any harmful interference with or an attack upon critical components of our space architecture that directly affects this vital U.S. interest will be met with a deliberate response at a time, place, manner, and domain of our choosing.

In order to fulfill this promise, the United States will want to ensure that it has capabilities to respond both above and below various thresholds to ensure a full-spectrum of deterrence options for the full range of potential actors.

In the first space age, the two superpowers had largely symmetric capabilities and interests in outer space (with a few notable exceptions). In the second space age, however, the space domain includes many disparate players with vastly different asymmetric capabilities and interests. The United States is more reliant on space than any other country in the world, but it also retains greater space capabilities than any of its competitors. Although the 2011 National Security Space Strategy states, "Space capabilities provide the United States and our allies unprecedented advantages in national decision-making, military operations, and homeland security," this also means that that the United States has more to lose.

From the dawn of the first space age, Americans understood the many benefits that could come from the peaceful uses of space and the great harm that could result from hostile uses of space. In 1962, President John F. Kennedy addressed the dilemma of how to reap the benefits of space without conflict, stating

> only if the United States occupies a position of pre-eminence can we help decide whether this new ocean will be a sea of peace or a new terrifying theater of war… space can be explored and mastered without feeding the fires of war, without repeating the mistakes that man has made in extending his writ around this globe of ours.

For 60 years, space has been the exception: the one domain that has remained free from the scars of war. By better understanding the dynamics of the second space age, we may be able to keep it that way.

https://warontherocks.com/2018/01/deterrence-last-sanctuary/

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ABOUT THE USAF CUWS

The USAF Counterproliferation Center 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 Director for Nuclear and Counterproliferation (then AF/XON), now AF/A5XP) and the Air War College Commandant established the initial manpower 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.

The Secretary of Defense's Task Force on Nuclear Weapons Management released a report in 2008 that 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." As a result, 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 continuing education through the careers of those Air Force personnel working in or supporting the nuclear enterprise. This mission was transferred to the Counterproliferation Center in 2012, broadening its mandate to providing education and research to not just countering WMD but also nuclear deterrence.

In February 2014, the Center's name was changed to the Center for Unconventional Weapons Studies 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.

The CUWS 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.