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Nuclear Weapons Modernization And Nuclear Proliferation Triggers

Concern about proliferation of nuclear weapons most often focuses on the spread of nuclear weapons to new countries, but vertical proliferation – when existing nuclear-armed states modernize, add to, or increase their nuclear arsenals – should not be ignored for its impact on nuclear stability and nuclear risks. Triggers for nuclear proliferation vary depending on the country, region, and international security climate. The triggers may include direct nuclear or general military threats, modernization programs, fielding of new or significantly enhanced weapons, offensive military operations, adjustment of strategy and doctrine, and political rhetoric. Any one of these, or a combination of them, may cause a non-nuclear country to decide to pursue nuclear weapons or convince a nuclear-armed state it needs to enhance or increase its nuclear arsenal.

Countries tend to react more to proliferation triggers during periods of deteriorating and tense international relations. The world is in such a period now where direct nuclear and general military threats are increasing and many countries are responding in kind. The US demonstration of overwhelming offensive conventional military capabilities in two Gulf Wars, as well as the decision to withdraw from the Anti-Ballistic Missile Treaty (ABM) to field a global ballistic missile defenses, triggered or significantly increased nuclear and general military modernization programs and strategies in Russia and China. Similarly, Russia's

invasion of Ukraine and its nuclear modernization triggered a significant adjustment and strengthening of NATO's posture and its strategy that includes a reaffirmation and invigoration of the role and importance of nuclear weapons in US and NATO strategy. And China's widespread military modernization - including a significant enhancement of its nuclear forces - has triggered adjustments to the US military posture, including the role and requirement for nuclear forces in the region.

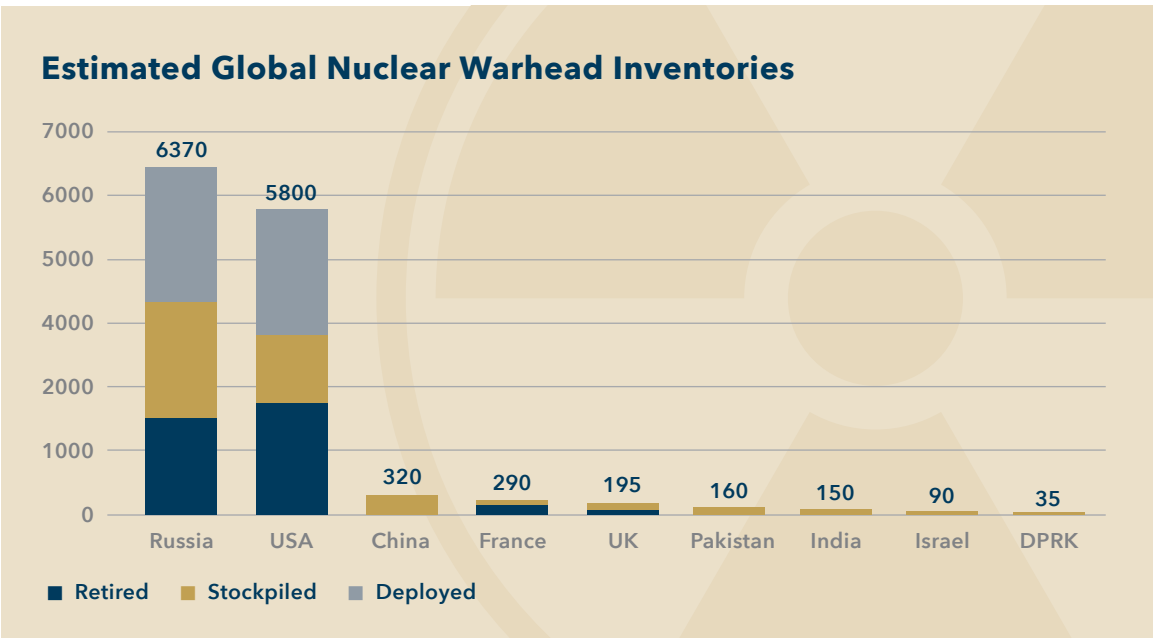
These current adjustments and modernization programs seek to strengthen deterrence in response to adversarial military developments that in turn responded to earlier enhancements. Domestic institutional interests and competition also play an important role, but they tend to feed off the same external threat. This cycle of action and reaction is dangerous if it is not managed carefully as part of a broader grand strategy that seeks to steer relations in a positive direction that reduces tension and competition. Too much deterrence is dangerous and counterproductive - even destabilizing - because large military powers are unlikely to back down but instead develop countermeasures to safeguard their national security interests. That, in turn, drives arguments for "strengthening deterrence" even further, potentially triggering vertical proliferation and even an arms race.

Arms control treaties have played a key role in the past to halt the action-reaction cycle of weapons proliferation and thereby reduce the dangers of escalation. Several important agreements have been abandoned recently as the nuclear and military competition has grown and the appetite for arms control amid divisive rhetoric has weakened.

STATUS OF WORLD NUCLEAR FORCES

Although horizontal nuclear proliferation has been less than what was feared in the 1960s, it has nonetheless been significant. Nine countries (China, France, India, Israel, North Korea, Pakistan, Russia, and the United Kingdom) developed nuclear weapons after the first were fielded and used by the United States in 1945. Many other countries (including Iran, Iraq, Libya, Taiwan, South Korea, and Sweden) began nuclear weap-

Figure 1: Estimated Global Nuclear Warhead Inventories, 2020



Source: Kristensen and Korda 2020a

ons research development programs but abandoned them for various reasons. One country (South Africa) eliminated its nuclear weapons, and three countries (Belarus, Kazakhstan, and Ukraine) surrendered nuclear weapons left on their territories after the breakup of the Soviet Union and returned the weapons to Russia.

Today nine countries maintain nuclear weapons arsenals and combined possess an estimated 13,410 nuclear warheads (Kristensen and Korda 2020a). The vast majority of those weapons are owned by Russia and the United States, who each possess around 6,000 nuclear warheads (see Figure 1). These two arsenals are abnormally large; no other nuclear-armed state believes it needs more than a few hundred nuclear weapons to deter major conventional or nuclear attack.

After three decades of declining warhead inventories, reductions have been slowing for the past several years. The total inventory is still declining mainly due to dismantlement of a backlog of US and Russian retired nuclear warheads. But active arsenals are not decreasing anymore, and several countries are even increasing their arsenals: China, India, North Korea, and Pakistan. The United States is also accusing Russia of increasing its active arsenal after decades of reductions. France and Israel appear to have relatively stable arsenals, while the United States and Britain are reducing their total warhead inventories.

All the nuclear-armed states are modernizing their arsenals and adjusting their nuclear capabilities. Nuclear modernization cycles do not necessarily overlap between countries but depend on when they fielded their weapon systems and how long they last. Moreover, different countries don't necessarily maintain their nuclear forces in the same way; some prefer fielding entirely new weapons while others focus on maintaining and upgrading existing types. The public claims that "we're behind" other countries' nuclear modernizations can sometimes, therefore, be misleading.

When relations deteriorate and military competition intensifies, as is happening now, nuclear modernization programs may take on added importance and purpose and be used to signal resolve and add enhanced military capabilities - even new or greater numbers of weapons - to "strengthen deterrence." The main outlines of the current US modernization program were drawn shortly before the current crises, but the Trump administration significantly increased funding, added new weapons, and embraced a more competitive and adversarial strategy coined "Great Power Competition" (US White House 2017, 27; US DoD 2018a, 6-7). Russia also adjusted its national strategy in response to NATO expansion and China has initiated a massive military modernization and strategy upgrade in response to what it sees as threats to its national security and in an effort to increase China's status in the world. Once political and military objectives have been articulated as the national security framework, all military services and agencies start to interpret and implement it into requirements and justifications for modernization programs, military operations, strategy and doctrine, and political rhetoric.

TECHNICAL EFFECTS OF NUCLEAR MODERNIZATION

Modernization of nuclear forces, strategies, and the policies that guide their potential use have always had a significant effect on the proliferation of nuclear weapons. That is a core dynamic of deterrence and nuclear arms competition. Once countries acquire nuclear weapons, they also acquire a never-ending requirement to demonstrate and improve the credibility of their capabilities to their potential nuclear adversaries. Nuclear-armed states react directly - and sometimes strongly - to a potential adversary's modernization of its nuclear posture that introduces enhanced new weapons, significantly improves military capabilities of existing forces, and modifies strategies and policies in ways that are seen as being more offensive or effective. The reaction may take the form of nuclear modernization programs, more and/or new nuclear weapons, changes to operations and exercises, articulation of national strategy and declaratory policy, and public rhetoric, or a combination of those.

Non-nuclear states also monitor nuclear modernizations to be assured they're protected against aggression by a "nuclear umbrella" or to consider

whether their region is getting so dangerous that they have to develop nuclear weapons to protect themselves. If allowed to proliferate, that dynamic can have serious and long-lasting consequences for national and international security. Within just two decades after the US bombed Japan with nuclear weapons, one nuclear-armed state with a few nuclear bombs had proliferated into five nuclear-armed states with more than 38,000 nuclear weapons in an out-of-control global nuclear arms race. By the mid-1980s, there were more than 70,000 nuclear weapons. Defense officials and military strategists insisted that nuclear weapons were intended to safeguard security, but instead, they became the most dramatic public symbol of danger.

Sea-Based Nuclear Weapons

Sea-based nuclear weapons are widely considered a source of stability if they are deployed on strategic submarines that cannot be destroyed in a surprise attack. As such, no aggressor would be able to conduct a surprise nuclear first strike without facing a devastating retaliatory attack. That is the core of nuclear deterrence and, by extension, strategic stability.

But sea-based nuclear weapons can also be a source of instability if they are so capable that they can be used in a first strike to destroy a sizeable portion of a country's nuclear forces and other strategic assets. The development of sea-based nuclear weapons in the mid-1950s enabled nuclear-armed states to continuously deploy nuclear weapons close to the territories of potential adversaries without being detected and to threaten destruction of important facilities with very short notice from stealthy submarines. During the Cold War, for example, the patrols by Russian nuclear-powered ballistic missile submarines (SSBNs) off the eastern and western coasts of the United States was not seen a stabilizing development, but a grave threat of quick strikes on the US homeland. Likewise, the launch of highly accurate Trident II submarine-launched ballistic missiles (SLBMs) from US forward-operating SSBNs is seen by Russia and China as a significant threat to their retaliatory capabilities. A Trident II launched on a compressed trajectory could reach its target in less than 15 minutes, significantly faster than the 30 minutes required for a land-based intercontinental ballistic missile (ICBM) to reach its target. According to the US Central Intelligence Agency, China began its development of road-mobile solid-fuel ICBMs in the mid-1980s when it "became concerned about the survivability of its silos when the US deployed the Trident II-D5 because you could hit those silos" (Walpole 2002).

Over the years, the number of countries operating or developing nuclear-armed submarines has proliferated from one to nine. Four of these have been added since the end of the Cold War. Today's naval arsenals constitute approximately 30% of global stockpiles, up from 24% at end of the Cold War (see Table 1) .

During the Cold War, many sea-based weapons were tactical nuclear weapons intended to sink

Table 1: Estimated Naval Nuclear Weapons, 1990 and 2019

COUNTRY	1990	2019
United States	7,524	1,920
Soviet/Russia	6,410	1,540[a]
France	440	250
Britain	125	200
China	12[b]	48[b]
India	0	12
Pakistan	0	0[c]
Israel	0	(5-10)[d]
North Korea	0	0
Total	14,511	3,980

Sources: Estimates based on Nuclear Notebooks, SIPRI Yearbooks, and author's estimates. [a] Russia's 1,540 naval nuclear weapons include 720 strategic and 820 tactical. [b] Two more SSBN's are fitting out. [c] Pakistan is developing the Babur-3 cruise missle for its submarines. [d] Israel might have a small inventory of submarine-launched cruise missles.

other ships and submarines or attack targets on land (Kristensen 2016). Russia is the only country that continues to operate large numbers of non-strategic naval nuclear weapons. An important recent Russian addition is the Kalibr land-attack sea-launched cruise missile that is being incorporated into most new major surface ships and attack submarines. The Russian government claims the missile is nuclear-capable (Putin 2015); the US Intelligence Community calls it "nuclear possible" (US National Air and Space Intelligence Center 2021). With a range of up to 2,000 kilometers, the Kalibr can threaten targets all over Europe and, if launched from an attack submarine off the US coasts, deep into the territory of the continental United States. The Kalibr is probably replacing the SS-N-21 nuclear sea-launched land-attack cruise missile first deployed in the 1980s. The Russian navy is also acquiring a nuclear-powered long-range underwater drone designed to detonate a large nuclear warhead inside a harbor to make a coastal area uninhabitable, a mission that would clearly violate international law (Kristensen and Korda 2020a).

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The United States has replaced all its non-strategic naval nuclear weapons with conventional weapons. Until 2010, the US Navy possessed a nuclear sea-launched cruise missile - the Tomahawk Land-Attack Missile (TLAM-N). It was retired because it was redundant after it had been stored on land for nearly two decades and the regional nuclear mission could be covered by dual-capable aircraft and air-launched cruise missiles.

But Russia's modernization of its non-strategic nuclear weapons, an inventory the US military says is "likely to grow significantly over the next decade" (Richard 2020), has recently triggered plans in the United States to reinstate a nuclear-armed sea-launched cruise missile. The Trump administration's NPR said the weapon is necessary to "provide a needed non-strategic regional presence, an assured response capability. It also will provide an arms control compliant response to Russia's non-compliance with the Intermediate-range Nuclear Forces Treaty," a treaty the United States has since abandoned, "its non-strategic nuclear arsenal, and its other destabilizing behaviors." The nuclear cruise missle is also intended to provide "a valuable hedge against future nuclear 'break out' scenarios" (US DoD 2018a, XII).

Specifically, the Pentagon is concerned that Russia believes "its expanding anti-access/area denial (A2AD) networks will be able to neutralize the airborne nuclear deterrent forces of the United States and NATO" and that it's possible China could adopt a similar doctrine in the future. So, the "SLCM-N will bolster allied confidence in U.S. security guarantees," the Pentagon claims, and it will be fielding this new non-strategic nuclear weapon in the "hopes of persuading other states to eliminate these and related weapon systems" (US DoD 2019, 2).

This plan is a clear and recent example of the nuclear action-reaction dynamic that characterized the Cold War. The same line of argument could, of course, be used to argue that the United States also needs to acquire other non-strategic nuclear weapons that Russia has, such as nuclear torpedoes and short-range ballistic missiles. There is obviously no way to know if fielding a new nuclear sea-launched cruise missile will in fact result in the benefits claimed by the NPR and defense officials. Instead, Russia might see it as an additional US tactical nuclear threat against its territory that it has to defend against, for example by deploying attack submarines off the US coast. The deployment of the earlier TLAM-N did not persuade the Soviet Union to back down but caused it to field its own long-range nuclear land attack sea-launched cruise missile. Likewise, China would almost certainly view deployment of a new SLCM-N in the Pacific as an additional tactical nuclear threat intended to provide strike options against its nuclear forces below the strategic level.

This might cause China to field its own nuclear cruise missile in response, which in turn would increase the nuclear threat against US bases and allies in the region. These uncertainties and potential countermeasures illustrate the proliferation dynamic that nuclear modernizations can fuel.

Moreover, fielding of a new SLCM-N will likely reignite the political tension that used to follow US nuclear-armed warships wherever they sailed during the Cold War. Rather than reassurance and good will, port visits by nuclear-armed ships and submarines stirred up political controversary and bad press that complicated relations with allies and fueled local opposition to US military operations in the region in general (Kristensen 2006). Any claims about military needs will have to take these political issues into consideration as well.

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Today's naval nuclear weapons are a lot more capable than they were during the Cold War. The Trident II SLBMs on US SSBNs are not simply reserve weapons but serve a daily front-line deterrent and warfighting role. And recent modernizations have increased the capability further. The life-extended W76-1/Mk4A warhead produced for the navy's Trident submarines includes a new fuse that increases the weapons target kill capability (Postol, Kristensen, and McKinzie 2017). And the future W93 warhead proposed by the navy will be even more capable and "improve the SSBN force's ability to hold all targets in current plans at risk" and "allow for more efficient targeting by expanding the footprint of targets the warhead can hit" (US DoD 2020b).

Potential adversaries will almost certainly view such modernizations as attempts to increase the US's ability to win a nuclear war and trigger countermeasures to strengthen deterrence against the United States. Such countermeasures would, in turn, be viewed by US officials as increased threats that require the United States to strengthen its deterrent.

Non-Strategic Nuclear Weapons

Development and deployments of non-strategic nuclear weapons are potential powerful proliferation triggers that can have a significant effect on how nuclear-armed states and non-nuclear countries view security and threats. Non-strategic nuclear weapons are developed explicitly and overtly to provide nuclear options below the level of strategic nuclear weapons use, in "battlefield" and "warfighting" scenarios, including in the earliest phases of a conflict that escalates from conventional to nuclear. Non-strategic nuclear weapons are therefore often seen as indicators of increased nuclear risks and risk-taking.

Nuclear-armed states often interpret non-strategic nuclear weapons as a sign of growing nuclear adventurism. A country that has non-strategic nuclear weapons – certainly one that begins to field more types of them – is viewed with concern because it could indicate that the country is increasing the role of nuclear weapons and may even be lowering the threshold for when they could be used.

This dynamic is currently playing out in the relationship between Russia and the United States. Non-strategic nuclear weapons are nothing new in Russia's military posture or strategy, and Russia has maintained significant numbers of non-strategic nuclear weapons for decades; it probably possesses fewer of them today than a decade ago (Kristensen 2012, 2019; Kristensen and Korda 2020b). But the Trump administration accused Russia of increasing the numbers and planning to use nuclear weapons first if it were about to lose a conventional war. According to the 2018 NPR:

> ***Moscow apparently believes that the United States is unwilling to respond to Russian employment of tactical nuclear weapons with***

strategic nuclear weapons…It mistakenly assesses that the threat of nuclear escalation or actual first use of nuclear weapons would serve to 'de-escalate' a conflict on terms favorable to Russia," whose non-strategic nuclear weapons are intended to take advantage of "an exploitable 'gap' in U.S. regional deterrence capabilities (US DoD, 2018).

The perception that Russia has become more willing to use nuclear weapons early in a conflict took hold after it invaded Ukraine in 2014. Even prior to that, Russian officials had made several explicit nuclear threats against NATO countries involved in the US missile defense program in Europe, including against Denmark (Vanin 2015) and Poland (de Quetteville and Pierce 2008). And Russian officials – including President Vladimir Putin himself – allegedly said nuclear forces might have been alerted if NATO used military force to push Russia out of Crimea, and potentially do the same in a clash over the Baltic states (Johnston 2015).

At the time, US nuclear strategy already included the "ability to project power by communicating to potential nuclear-armed adversaries that they cannot escalate their way out of failed conventional aggression" (US DoD 2014, 13). But contributors to the NPR persuaded the Pentagon that Russia had moved beyond nuclear escalation in retaliation to "using an entirely different definition of 'escalating to deescalate,' employing the threat of selective and limited use of nuclear weapons to forestall opposition to *potential* aggression" (Miller 2015; emphasis added). STRATCOM commander General John Hyten, now the Vice-Chairman of the Joint Chiefs of Staff, said: "I don't think the Russian doctrine is escalate to deescalate. To me, the Russian doctrine is to escalate to win. So the purpose of their escalation is to win the conflict because they believe we won't respond." Even though Hyten said he was "very comfortable today with the flexibility of our response options," his signal to the authors preparing the Trump administration's NPR at the time was that "given the Russian escalate to win, if you like, or escalate to deescalate doctrine, the United States needs to have more options" (Hyten 2017).

When the NPR was finished less than a year later, it included two "nuclear supplements" to the existing modernization program: immediate development and deployment of a new low-yield warhead on the navy's Trident submarines and pursuit of a nuclear sea-launched cruise missile. Although Hyten had just said he was "very comfortable" with existing US response options, the nuclear supplements were necessary, so the authors of the NPR argued, to "enhance the flexibility and responsiveness of U.S. nuclear forces" in order to "enhance deterrence by denying potential adversaries any mistaken confidence that limited nuclear employment can provide a useful advantage over the United States and its allies. Russia's belief that limited nuclear first use, potentially including low-yield weapons, can provide such an advantage is based, in part, on Moscow's perception that its greater number and variety of non-strategic nuclear systems provide a coercive advantage in crises and at lower levels of conflict" (US DoD 2018a, 53-54).

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Whereas Russia's strategy of escalating to use tactical nuclear weapons to win a conflict was described by the NPR as dangerous and lowering the threshold for nuclear use, US pursuit of new nuclear weapons to "enhance the flexibility and range of its tailored deterrence options" by threatening escalation to deescalate a conflict was said to stabilize and raise the threshold for nuclear use (US DoD 2018, 54). The low-yield Trident warhead went to sea in late-2019, nearly one year after the NPR had advocated it (Arkin and Kristensen 2019). The Pentagon is pursuing the nuclear cruise missile to "improve U.S. capabilities for

deterring limited nuclear use and assuring our allies that we will meet our extended deterrence commitments" (US DoD 2020a, 7). In a recent interview, the director of the US Navy's Strategic Systems Program, Vice Admiral Johnny Wolfe, provided a clear-cut example of the vertical proliferation dynamic:

> ***It goes along with the deterrent mindset game. Today we know, for instance, that Russia has many what they call tactical nuclear weapons. We all see it in the open press, this thought that we've heard many, many times, which is their idea that they could escalate-to-deescalate. In other words, they would use a tactical nuclear weapon in a regional threat scenario to back us down. Again, it's a nuclear weapon, but they believe that by using those tactical nuclear weapons, 'cause we don't have anything that is in kind, that that would be a scenario that they could actually win and they would consider using it.***
>
> ***If you have a sea-launched cruise missile, which again starts to match where they're at, it changes their thought-equation, OK. Because, as they play scenarios, their thought of escalate-to-deescalate, they can't do that. Because if they escalate, and we've got something in-kind, you 'gotta ask yourself, do they really want to do that?***
>
> ***So, a SLCM really calls…and I've heard a lot of things in this job like we're lowering the threshold for which we would consider using nuclear weapons. I don't believe that's true. I believe we're actually raising the threshold. You're putting it back right where it needs to be so that nobody believes that by using any type of nuclear weapon the outcome could be favorable for them. Again, the essence of deterrence (Wolfe 2021; emphasis added).***

Russia has had more types and numbers of tactical nuclear weapons than the United States for decades without anyone in the US military arguing that the United States needed to get a new tactical nuclear weapon to have something "in-kind." And there is no public evidence that a Russian decision to escalate depends on whether the United States has a new non-strategic SLCM-N or a low-yield Trident warhead. The United States already has several hundred "tactical" nuclear bombs - many deployed in Europe - that it could use in response. They are being modernized with the B61-12 guided nuclear bomb on the F-35A stealth fighter. And any Russian nuclear-use decision would have to consider the risk and consequences of the nuclear response it would trigger. Whether the new Biden administration agrees the SLCM-N is needed given the existing capabilities of the arsenal and the cost of producing the new missile and its warhead remains to be seen.

Another region where non-strategic nuclear weapon dynamics are causing concerns is in South Asia where Pakistan has fielded a nuclear-capable short-range ballistic missile with a range of only 70 kilometers (43.5 miles). The dual-capable weapon system, known as NASR (Hatf-9), is described as a "shoot and scoot" weapon that "carries nuclear warheads of appropriate yield with high accuracy" and was developed as a "quick response system" to "add deterrence value" to Pakistan's strategic weapons development program "at shorter ranges" in order "to deter evolving threats," specifically in response to India's conventional "Cold Start" strategy (Inter Services Public Relations 2011; Inter Services Public Relations 2017). Both US and Indian officials have expressed concern about what the weapon means for Pakistani nuclear-use scenarios and command and control in a crisis.

China considers all of its nuclear weapons to be strategic. But it does operate nuclear-capable weapons that do not have intercontinental range that are therefore considered by the United States to be non-strategic. This includes the DF-21A/E medium-range ballistic missiles and the new DF-26 intermediate-range ballistic missile. A fact sheet published by the US Defense Department at the time of the 2018 NPR explicitly stated "China is also expanding and modernizing its *non-strategic nuclear weapons*, including the CSS-5 Mod 6 and DF-26, intended to threaten its neighbors and challenge the US's ability to conduct regional operations" (US DoD 2018b). According to the NPR, US military planners are working on "increasing the range of graduated nuclear response options available to the president" to "strengthen the credibility of our deterrence strategy and improve our capability to respond effectively to Chinese limited nuclear use if deterrence were to fail" (US

DoD 2018a). So, while China may not officially possess tactical nuclear weapons, the US military is planning as though it does. But since China has operated medium-range and intermediate-range nuclear missiles for many decades, it is unclear why US planners are now "increasing the range of graduated nuclear response options."

Another dynamic of non-strategic nuclear weapons is that most delivery platforms are dual-capable – that is, they can be used to deliver both nuclear and conventional warheads. A modernization or deployment might be partly or entirely conventional but be misinterpreted by an adversary as a nuclear development or signal. The Russian Kalibr land-attack sea-launched cruise missile is a current example of this dilemma. Since the weapon is dual-capable, governments and news media reports overwhelmingly attribute nuclear capability to any ship that is equipped with the missile. But it is not clear that all platforms necessarily will be assigned a nuclear role. Likewise, although many tactical fighter-bombers are considered nuclear-capable, that does not mean all units are assigned nuclear weapons.

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In a crisis, certainly in the phase where significant conventional combat operations have started, a deployment or activation of a dual-capable weapon could result in misunderstandings about intentions and result in overreaction. This is especially the case if the weapon being readied is a fast-flying ballistic missile or even a hypersonic weapon. Or, if a nuclear-armed state secretly begins preparations to arm dual-capable missiles without the adversary knowing about it, a conventional attack against that unit could be misinterpreted as a preemptive attack against its nuclear forces and trigger further escalation.

Non-Nuclear Capabilities

As mentioned above, it's not just nuclear programs and operations that affect proliferation. Non-nuclear capabilities - and increasingly so - have had a significant effect on proliferation. That effect is growing.

The conventional capabilities demonstrated in the two Gulf Wars had profound effects on Russian and Chinese perceptions about the vulnerability of and need for their nuclear forces. It significantly deepened Russian reliance on nuclear weapons at a time when the Russian economic crisis was depleting the country's conventional forces. This was not just a matter of national prestige but also of pure military necessity: Russia would simply not have the capability to defend against a conventional attack from NATO, a potential risk Russian planners saw in NATO's eastward expansion and its attack against Serbia in 1998. Moreover, US withdrawal from the ABM Treaty, in 2002, the ambitious missile defense program that followed, continued enhancement of long-range conventional precision strike capabilities, and talk about pre-emptive strikes and "left of launch" strategies, all converged into a perception of bad intent and strategic vulnerability that further fueled Russia's nuclear modernization.

China, for its part, realized that it was more or less defenseless. Its newfound wealth made it possible for its leaders to set forth ambitious goals about modernization and China's rise on the world stage. In addition to its general military modernizations and push into the South China Sea and Western Pacific, its nuclear modernization has been directly influenced by a perception of a US threat and how to counter it. That includes solid-fuel ICBMs, SSBNs, nuclear and conventional ballistic and cruise missiles, and in the near future also a nuclear bomber force. It has decided to equip some of its ICBMs with multiple warheads in response to US missile defense capabilities and increase the number of missile silos possibly with ICBMs on alert in response to offensive US nuclear and conventional precision strike capabilities. While China sees this as a prudent step to safeguard its nuclear deterrent

and national security, the United States sees it as signs of a growing Chinese threat.

Conventional strike capabilities now form an integral part of US strategic nuclear plans and are routinely exercised alongside nuclear forces in what used to be more or less exclusively nuclear operations. Some targets that used to covered by nuclear weapons are now held at risk with conventional weapons. The 2010 Quadrennial Defense Review and Ballistic Missile Defense Review both explicitly described how advanced conventional forces would allow for a reduction in the regional role that nuclear weapons play in US military strategy. Offensive cyber capabilities are now part of the strategic portfolio as well, all serving to create a broad suite of strategic capabilities to deter, de-escalate, and, if necessary, defeat Russian and Chinese forces - including their nuclear forces.

Russia and China are mimicking these efforts. After having relied overwhelmingly on nuclear forces, Russia is now fielding a broad range of long-range conventional precision strike capabilities on land, at sea, and in the air. And it is rushing ahead with programs to field air-launched ballistic missiles and hypersonic missiles. All of China's short-range and most of its medium- and intermediate-range missiles are conventional, as are all of its ground- and air-launched land-attack cruise missiles. Like the United States, both countries clearly see benefits in building up conventional strategic capabilities that give them military options below the nuclear threshold.

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Ironically, while increased conventional capabilities may allow a nuclear-armed state to reduce reliance on nuclear weapons in regional scenarios, it may in fact fuel its adversaries' need to modernize their nuclear forces to better account for these capabilities. This may materialize as increased requirements for keeping nuclear forces on high alert, deployment of hypersonic weapons to hold nuclear forces at risk or defend against them, and greater capability to defend nuclear forces against conventional attacks. Smaller nuclear powers and potential proliferators will almost certainly react to the continued enhancement of long-range conventional precision capabilities by increasing their reliance on nuclear weapons.

POLITICAL EFFECTS OF NUCLEAR MODERNIZATION

In addition to technical modernizations and operations, the rhetoric that military and civilian officials of nuclear-armed states use to justify and describe the need for and role of nuclear weapons is another powerful proliferation trigger. Not only does it help drive domestic defense spending and modernization programs, but it can also affect other countries' perceptions of the intentions of a nuclear-armed state and trigger countermeasures. As such, it can affect both military and political developments.

Some US officials and nuclear weapons advocates in recent years have begun to use the slogan that the United States is using its nuclear weapons every day. The slogan emerged in the 2008 Schlesinger report following the so-called Minot incident in 2007: "Though our consistent goal has been to avoid actual weapons use, **the nuclear deterrent is "used" every day** by assuring friends and allies, dissuading opponents from seeking peer capabilities to the United States, deterring attacks on the United States and its allies from potential adversaries, and providing the potential to defeat adversaries if deterrence fails" (US DoD 2008 emphasis added).

The statement was intended at the time to be a "call to arms" for the nuclear community and reverse what was found to be declining proficiency in the nuclear forces. But it was quickly hijacked by

nuclear advocates to counter a widespread post-Cold War perception that nuclear weapons were losing their value and instead build support for the continued value and modernization of nuclear forces. The implication that nuclear weapons are "used" every day is entirely inappropriate because "use" has a particular meaning in nuclear terminology, which includes the detonation of nuclear weapons over Japan in 1945 and the much-debated questions of "first use" or "no-first-use" of nuclear weapons. The nonchalant claim that nuclear forces are "used every day" undermines repeated US official statements and policies that seek to ensure adversaries and allies that non-use of nuclear weapons is a central objective of US nuclear weapons policy. "The number one priority of the DoD," Defense Secretary Mattis stated in 2017, "is that we maintain a safe, secure and effective nuclear deterrent so we make certain those weapons are never used" (Mattis 2017).

Modernization of nuclear forces can also have a significant effect on the perception that non-nuclear states have of the long-term outlook for international security and the intention of the nuclear-armed states to limit and reduce nuclear dangers.

The 2018 NPR itself states: "For any President, **the use** of nuclear weapons is contemplated only in the most extreme circumstances to protect our vital interests and those of our allies…Our goal is to convince adversaries they have nothing to gain and everything to lose from **the use** of nuclear weapons" (US DoD 2018a, II; emphasis added). Moreover, US declaratory policy explicitly states: "The United States **will not use** or **threaten to use** nuclear weapons against non-nuclear weapons states that are party to the NPT and in compliance with their nuclear non-proliferation obligations" (US DoD 2018a, 21; emphasis added).

The principles of non-use and to only use nuclear weapons in extreme circumstances are closely linked to the issue of first-use and, by extension, to no-first-use because retaining the option to use nuclear weapons first - certainly expanding it - appears to contradict these principles. The perceived erosion of these principles is deepened by the decision in the 2018 NPR to "expand the range of credible U.S. options for responding to… non-nuclear strategic attack…" (US DoD 2018, 55). Since these expanded response options would be first use, this doctrinal development may fuel international perceptions that the United States is lowering the threshold scenarios for use of nuclear weapons.

Modernization of nuclear forces can also have a significant effect on the perception that non-nuclear states have of the long-term outlook for international security and the intention of the nuclear-armed states to limit and reduce nuclear dangers. The pledge by non-nuclear weapon states under the NPT, which has achieved near-universal support, to not develop nuclear weapons rests in no small measure on the promise made by the nuclear weapon states to "pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control."

Although the nuclear weapon states correctly argue that they have reduced nuclear forces significantly compared with the Cold War, this achievement is getting long in the tooth as reductions have slowed significantly, some nuclear weapon states are increasing their nuclear arsenals, many are adding new nuclear weapons to their inventories or enhancing their capabilities, all are modernizing their nuclear forces for the long haul, and all are reaffirming the importance and role of nuclear weapons in their national strategies.

The modernization of nuclear weapons for the long haul and reaffirmation of their importance and role coincide with the abandonment or weakening of several arms control agreements, including the Intermediate-Range Nuclear Forces

(INF) Treaty and the US withdrawal from the Iran agreement (JCPOA) and the Open Skies Treaty.

If, fifty years after the NPT entered into force, the nuclear-armed states significantly modernize their nuclear forces - even add new ones - for the purpose of possessing them further into the future than the NPT has lasted so far, reaffirm the continued importance of nuclear weapons, and increase offensive nuclear operations and military competition, non-nuclear weapon states would be justified in questioning whether the nuclear-armed states are in compliance with their obligations under NPT's Article VI.

Part of the nuclear weapon states' efforts to deflect criticism of their Article VI achievements is the argument that deep nuclear reductions - certainly disarmament - are unlikely to happen in the current security environment. The Trump administration has argued that "disarmament is – as the text of the NPT's Article VI makes clear – an endeavor in which all states have a responsibility" (Ford 2018). The subtle message is that the non-nuclear weapons states can't just demand that the nuclear weapon states eliminate nuclear weapons but must first help create the international security conditions that would make this possible. The US State Department has argued that those conditions must include: robust and reliable nonproliferation assurances, successful containment of other WMD, stability after "zero," and making "zero" desirable (Ford 2018).

In other words, nuclear disarmament comes last in the process after all other security challenges have been resolved - assuming "zero" is even desirable - even though it is overwhelmingly the nuclear weapon states that are the main actors and drivers of the conditions they say make implementation of Article VI impossible under current conditions. Moreover, many of the non-nuclear weapon states that over the years have pushed for more progress on nuclear reductions rely themselves on protection from a so-called nuclear umbrella - extended deterrence - provided by some of the nuclear weapon states. Without this umbrella, so the argument goes, some of those countries might otherwise decide to develop their own nuclear weapons. In this entanglement, nuclear weapons are seen to prevent horizontal proliferation - a key objective of the NPT but also a roadblock to the disarmament process.

It is in this political context that significant nuclear modernizations - certainly increasing arsenals or adding new nuclear weapons or increasing military capabilities - can have a corrosive effect on the NPT and increase proliferation of nuclear weapons. Some of the frustration with the nuclear weapon states' behavior and their apparent violation of NPT's Article VI has led to the negotiation and adoption of the Treaty on the Prohibition of Nuclear Weapons (TPNW). The treaty went into force on January 22, 2021 (ICAN 2020). The nuclear weapon states and their allies have rejected the TPNW, even sought to coerce countries not to sign it, arguing that it lacks verification measures, undermines international security, and could weaken the NPT. Clearly, nearly half of the states party to the NPT do not agree. This number is likely to increase.

The good news is that the NPT countries that have also joined the TPNW have not decided to withdraw from the NPT.

The good news is that the NPT countries that have also joined the TPNW have not decided to withdraw from the NPT. As such, instead of being a threat to the NPT, as claimed by the nuclear weapon states and their allies, the TPNW might actually have helped protect the non proliferation regime by enabling countries to express their frustration about the lack of Article VI progress without withdrawing from the NPT in protest. The TPNW is now a reality and here to stay, and its members are likely to continue to pressure the nuclear weapon states and the countries that rely on the nuclear umbrella to live up their obligations under NPT's Article VI. Instead of demonizing the TPNW countries, the nuclear weapons states and their allies should instead work constructively with them to strengthen all arms control initiatives. ■

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