

The Escalatory Attraction of Limited Nuclear Employment For Great Power Competitors of the United States

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Abstract:

The United States has entered into a dangerously new era in which, for the first time in our nation's history, we now face two nuclear-armed great power competitors. Over the past three decades, while the United States has been focused on a variety of other national security challenges, Russia and China have observed the "US way of war" and made immense strides to position themselves to successfully counter that. While having achieved some level of success in closing the gap across a wide spectrum of military capabilities and operational realities, those two nuclear-armed peers have concluded not only that limited nuclear employment might be required in any conflict with the United States, but that this is a domain of conflict and level of escalation affording unique advantage for them since it is an area in which the US has neither the perceived will nor the perceived capabilities to compete. This paper discusses that "escalatory attraction" of limited nuclear employment for our great power competitors.

Scene Setting:

After the fall of the Warsaw Pact in 1989 and the Soviet Union in 1992, Russia emerged to face a rival that seemed to present an overwhelming challenge. Not only did the United States unambiguously demonstrate the dominance of its "Second Offset" military strategy in the two Gulf Wars,¹ but it also confirmed Russia's perception of an abiding antagonism through several rounds of NATO expansion and especially the Allied bombing of historical Russian client, Serbia.² Thus, despite a bright start to the post-Cold War era in the years 1992-95, with a welcome focus on cooperative diplomacy and the promised historic reductions of both strategic and non-strategic nuclear weapons (NSNW), by 2000 Russia had assumed a trajectory of both increased reliance on nuclear weapons for its security and inveterate opposition to the world order now largely directed by the United States.³

The PRC, too, faced the dominance of the United States on the world stage through at least two defining crises, the Tiananmen Square massacre in 1989 and the 1996 Taiwan Strait crisis. Having observed the demonstrable conventional military overmatch of the United States, the PRC embarked on a multi-pronged military response, which included, among a very wide variety of non-nuclear upgrades to its defense posture, two specific nuclear upgrade programs: increasing the survivability of its strategic nuclear forces (largely through mobility, both land- and sea-based), until such time as rough strategic nuclear parity, the next step, might be a reasonable goal; and developing robust theater force capabilities, thus enabling theater nuclear strikes, if and when required.⁴

Strategically, both Russia and China have made it their goal to resist the status quo "lightly multi-polar" world order, which is dominated by the United States and its allies, and seek to replace it with a more "heavily multi-polar" world order more favorable to their own competing interests.⁵ In order to achieve this overarching goal, as separate poles in this multi-polar geopolitical

environment both require a “sphere of interest” in which they hold sway over both allies and neutrals, together with some degree of worldwide reach through allies and basing. And while their economic interests may be showing some signs of divergence,⁶ for the past two decades it has been in their separate but congruent interests to correlate their efforts, including efforts in the military domain.⁷ Operationally, both Russia and China require the need to construct near-abroad “spheres of influence” in which either is militarily uncontested. This requirement, though, is still only aspirational, and it will remain so until they are able to demonstrate the overall military capability to “seal off” those respective spheres of influence from the dominant form of warfare that the United States and her allies have perfected, the overwhelming aerospace blitzkrieg resulting in the rapid destruction of enemy defenses, situational awareness, and ability to command and control forces. To be sure, both Russia and China have embarked upon strategies to attempt to cope with and even gain ascendancy over that aerospace blitzkrieg,⁸ but both have surely concluded that such success is far from a forgone conclusion, therefore requiring contingency capabilities and planning.

Necessary But As-Yet-Insufficient Symmetric Responses:

Nevertheless, given the relatively deep, abiding reluctance and stated aversion of nations to opt for nuclear employment,⁹ the preferred approach to this military goal would be symmetric, and we see just that. In space, the domain that governs so much of the defensive complex of great powers (situational awareness and command and control of forces), Russia has regenerated much of its once comparatively strong infrastructure and capacity. During the 1990s, for example, Russia lost much of its space-based capacity to even assure sufficient early warning of ballistic missile attack. However, through prioritized investment over the past two decades, Russia has reestablished, and in many cases expanded and modernized, its space-based ISR and early warning capabilities.¹⁰ And in the case of China, that nation has gone from operating only a handful of satellites in the early 1990s to almost 500 less than thirty years later, most of which perform some sort of military support function for the PLA. Space is an increasingly contested domain, and to be sure there are areas of urgent need,¹¹ but the United States remains ahead and will remain so for years to come with the proper investment.

In the areas of air and counter-air, while Russia remains ahead of China in integrated air and missile defenses, China is ahead of Russia in fielding fifth generation aircraft. While there is no commonly agreed upon definition of “fifth generation” for fighters, consensus elements include: stealth, enhanced situational awareness, electronic warfare, advanced engine performance, and networking.¹² The Russian aerospace industry struggles to even begin production of its Su-57 fifth generation fighter (notwithstanding the introduction of pseudo-fifth gen “Checkmate” at this year’s Moscow Air Show).¹³ Meanwhile, though China has produced¹³ some 150 J-20s and will soon enter into production of its H-20, it is debatable just how “fifth generation” those multi-role fighter and heavy bomber are.¹⁴ Against large numbers of truly fifth generation F-22s and F-35s, backed by fourth-plus generation F-15EXs and Block III F-18E/Fs, Russian and Chinese air defenders will likely experience high early attrition rates, Pacific distances notwithstanding.¹⁵ And the US will keep this advantage well into the future as it is already flight testing its latest sixth generation fighter aircraft.

In the area of air defenses, Russia and China certainly take these capabilities very seriously and would rely on them for effectiveness in blunting the type of allied air campaign that was demonstrated in both Iraq and Kosovo. And while the Integrated Air Defense System (IADS)

environment of both the Russian west and the Chinese eastern coast are formidable, the operational radars that are tasked with detecting, identifying, tracking, and targeting US fifth generation aircraft simply are not up to the task ... they are subject to suppression and/or destruction at ranges well beyond their ability to detect. The numbers of fifth generation allied aircraft and their concomitant long-range ordnance preclude any reversal of this situation for at least a decade. While this author expected our analysis to indicate that nuclearizing the S-300/400/500 family of interceptors might change this equation – and that cannot be ruled out given a sufficient but improbably robust electronic warfare environment – on the contrary, our research suggests that this possibility remains remote for the foreseeable future.¹⁶

In fact, across the entire range of non-nuclear military capabilities, the United States has repeatedly and enduringly demonstrated the will and ability to establish and maintain superiority through Congressional commitment (adequate funding), innovation (unparalleled research and development), and operational dominance (tactics, techniques, and procedures). Despite the “peace dividend” of the 1990s and the necessary counter-terrorism focus of the first two decades of the 21st century, the United States has managed to stay competitive across the entire range of non-nuclear conflict. Moreover, in both the materiel and non-materiel components of conventional military competition (and here we include both space and cyberspace), the United States likely will maintain a relatively durable military advantage, even in the case of an “away game” within the aspirational spheres of influence of our peer competitors. More importantly, it seems clear that our great power competitors have come to this same conclusion, even while attempting over decadal timeframes to rectify that situation.

The Competitive Attraction of Limited Nuclear Employment:

It is a virtual truism of competition that challengers will invariably focus on areas of competition in which an otherwise dominant party may be weak. This is particularly true when a challenger can be reasonably assured of two critical elements: a) that with sufficient and affordable effort the area in question can become a strength for the challenger, and b) the dominant party shows no inclination to focus on that area of competition. For example, if two perennial rival football teams are reasonably symmetrically matched, but one is inferior across almost all elements of the game, while the other has very little capability in one particular area, the weaker team is incentivized to strengthen that specific element of the game and exploit the stronger team’s weakness. The weaker team is not released from the imperative of competing across all elements of the game, but will seek victory by especially focusing on that area of relative strength. What’s more, the weaker team is all the more incentivized if, during the off-season, the stronger team sees the weaker team’s attempts to exploit this specific area of weakness, but refuses to do anything about it.

Over the past three decades, if there is one area in which the United States has made it abundantly clear that we refuse to compete, it is in the area of NSNW. This refusal to compete is evidenced by: the vast array of alarmist op eds and disarmament articles opposing even the modest introduction of a small number of W76-2s to the US SSBN force; the extremely rapid and nearly complete divestment of NSNW forces in the 1990s, unabated even after it became clear that the such divestment was starkly unilateral in the face of Russian slow-rolling and re-armament; and vigorous Congressional resistance to funding relevant recapitalization activities, such as the Robust Nuclear Earth Penetrator (RNEP) in the early 2000s. If, on the other hand, that competitive refusal had been

formalized and made multilaterally binding through arms control efforts, this area of military competition, which had been critical for decades throughout the Cold War, could have been taken off the table. To be sure, there still would be an incentive to “cheat” the arms control regime and achieve “breakout,” gaining a sudden significant competitive advantage (as the Russians attempted in the case of the INF Treaty, before the United States wisely withdrew), but that merely underscores the competitive requirement for both treaty verifiability and enforcement.

Instead, throughout the quarter-century NSNW modernization and buildup by our potential adversaries, near-peers who sought to become peers, the United States has deliberately refused to compete in this area. While the United States rapidly and largely irreversibly dismantled its entire NSNW arsenal via thorough implementation of the Presidential Nuclear Initiatives of 1991 and 1992, Russia, after a promising start to that process, abandoned the effort by the end of the 1990s. Its unilateral abandonment, indeed reversal, of this informal arms control process was not unknown by the United States. Nor was it unknown that the PRC had focused (at least in part) on NSNW development and deployment for the past decade and a half by that time (see redacted DIA analysis of 1984),¹⁷ culminating with *inter alia* the completion of the design of both low-yield tactical and enhanced radiation warheads, the deployment of a large variety of dual-capable theater missile systems,¹⁸ and the development of a doctrine of “dual deterrence / dual operations.”¹⁹ Additionally, while the United States continues to this day to observe a true “zero yield” interpretation of the Comprehensive Nuclear Test Ban Treaty (CTBT), our competitors have been presumably testing at extremely low yield for many years (in the case of Russia, probably a couple decades!).²⁰ While it is unknown what benefits our competitors are reaping through this activity, not only are there specific areas in which the United States could benefit from similar testing, but more importantly the US absence in this field of military scientific inquiry merely underscores our modern aversion to competition within the general area of nuclear weapons development.

These competitive developments, which were emerging by the early 2000s, accelerated after the invasions of Georgia and Ukraine in 2008 and 2014, respectively. The clear outlines of a coercive new “theory of victory,” which locates limited theater nuclear employment at its core, are now in full view.²¹ Rather than respond competitively, the United States responded repeatedly (until very recently) with unambiguous messages that we refuse to compete in this area: full asymmetric Presidential Nuclear Initiative (PNI) compliance, Congressional prohibition on low-yield weapons development (Precision Low-Yield Nuclear Weapon ban, PLYWD), cancellation of RNEP, prohibition on even conceptual design efforts unless specifically Congressionally authorized, retirement and disassembly of the W84 cruise missile warhead, the planned (though later extended) retirement of the B83 gravity bomb, asymmetric adherence to a “zero yield” testing policy, and myriad correlating political statements dramatically emphasizing US desire to “reduce the role of nuclear weapons” even as our great power competitors engaged in precisely the opposite.

The Pursuit of Competitive Limited Nuclear Employment Capabilities:

Russia:

Russia continues to expand its reliance on nuclear weapons, and will likely have a fully modernized operational force of some 8000 nuclear warheads by the end of this decade, roughly half strategic and half non-strategic.²² Currently, Russia has completed about 88% of its strategic force

modernization, which presumably includes the warheads associated with the systems in question, and it is almost 80% complete with the modernization of its non-strategic nuclear forces.²³ In its strategic modernization, Russia has displayed a distinct preference for building significant upload capacity into its force structure. Whereas the United States, for example, has de-MIRVed the Minuteman III's, taking the entire fleet to single-RV ICBMs (from a maximum of 3-RVs, previously), Russia's newest strategic ICBM systems, the Yars and the Sarmat have reported maximum RV capacities of six and twenty RVs, respectively. And while the Yars ICBMs that are treaty inspected under the NST regime often have a single declared RV, there is no limit to the number of RV's that await immediate upload, particularly in light of the fact that the two Russian nuclear production plants have a combined capacity of at least ten times the capacity that the two US pit production plants will have by the end of 2030 (if the program stays on track).²⁴ At the expiration of New START in 2026, or anytime sooner in the event of a break-out, Russia could almost overnight triple the number of operationally deliverable strategic nuclear warheads. Because of much less reversible logistics constraints and the lack of warhead production capability, it would take the United States years to even double the number of operationally deliverable strategic nuclear warheads.²⁵

Though the net balance in strategic nuclear forces significantly favors Russia, the true focus for Russian Federation nuclear modernization has been what in the Cold War were dubbed "Long Range Theater Nuclear Forces" (LRNTF). In a separate paper this author with others described the operational and strategic rationale for focusing on these types of systems, but the bottom line is this: ***Russia requires recourse to theater range, ultra-low yield, nuclear systems in order to blunt the US/NATO air war that it perceives as the inevitable opening gambit of any conflict with the West.***²⁶ The possibility cannot be discounted that the Russian Federation may find a way of blunting that formidable conflict initiation through the use of aggressive electronic warfare, an advanced long-range radar architecture, and highly integrated nuclear-armed IADS. Nevertheless, ***we believe that purely "defensive" operations, even nuclear-armed operations, against that Allied aerospace blitzkrieg" will rapidly be demonstrated as cataclysmically insufficient, and almost immediate recourse will be to deep interdiction against Allied airbases across the NATO landscape to dramatically reduce the sortie rate of 5th generation aircraft.***²⁷ The Russian Federation realized this as early as 1999 [Ref decree] and has since then focused a large fraction of its defense spending to LRNTF, successfully developing and fielding a variety of such platforms to include: the SSC-08 Ground-Launched Cruise Missile (GLCM), the Kinzhal Air-Launched Hypersonic Missile (ALHM), the Kalibr Land-Attack Cruise Missile (LACM), the Oniks Anti-Ship Cruise Missile (ASCM), etc.²⁸ Not only are these systems fielded, but Russia has built the operational plans, formulated the doctrine, and conducted the exercises to successfully execute strikes with these systems in actual combat.²⁹

China:

The advent of the DF-41 heavy mobile ICBM, the JL-3 intercontinental-range SLBM, and the H-20 heavy stealth bomber, has not only ensured the survivability of China's strategic nuclear forces, but it has also positioned China to "sprint" to rough strategic nuclear parity with the United States over the course of the coming decade. However, what is perhaps more disconcerting is that concurrently the PRC has achieved theater nuclear superiority centered on a paced build-up of advanced theater missiles of various ranges, most of which began developmental life with an explicit nuclear mission (the DF-21 and DF-26, as examples). The extent of dual-allocated theater

systems is, quite frankly, unknown. Unfortunately, where there is opacity in the nuclear posture of China, Western analysts have been quick to down-play the threat. For example, though the introduction of every previous known “stealthy” bomber in other P-5 nations has been accompanied by suitable air-delivered, direct-attack, gravity bombs, Western analysts remain surprisingly unconvinced that China possesses a modernized nuclear gravity bomb.³⁰ This lack of transparency into China’s theater nuclear forces has been largely met with Western skepticism in the existence of a robust theater force. Such forces likely include at least cruise and ballistic missiles delivered by the H-6K and H-6N theater bombers (augmented by in-flight re-fueling) and medium-to-intermediate range ballistic missiles like the DF-15, DF-16, DF-17, DF-21, and DF-26.³¹ But what’s more, PRC theater nuclear forces may also include a dual role for the J-20 (analogous to the F-35), a dual-capability for the imported S-400s, a sub-launched cruise missile, and even a nuclear role for its newest 155mm artillery. In fact, with the large array of possible and probably dual-capable theater systems, the open question is not whether China is racing to achieve rough nuclear parity with the US, but whether China is racing to achieve the more ambitious objective of rough nuclear parity with Russia (in terms of capabilities).

Now, though it has been argued that the PRC now is postured well to defeat the United States in a conflict close to their own shores (i.e., within the first island chain),³² as outlined above this is far from a foregone conclusion. It is at least probable, for example, that the so-called 5th generation J-20 aircraft will be quite rapidly swept from the sky by the truly 5th generation F-22s, enabling US 5th generation strike aircraft to systematically suppress or destroy PRC IADS and blind or confuse the PRC Command, Control, Communications, and Intelligence (C3I) complex. While it’s debatable whether US forces will be able to generate the required sortie rates over the much longer “Pacific-relevant” distances, it is at least a very real possibility that PRC planners must surely have considered. The situation, then, for China may be very similar as that for Russia, placing upon it the onus of escalating across the nuclear threshold ... that, or face defeat, which may well be existentially untenable for CCP political leadership. ***Given the geography of the theater of operations, though, China would likely resort to discriminate low-yield (it remains to be seen just how low) nuclear strikes on important theater targets in order to forestall defeat.***

The combined outcome, therefore, of these great power dynamics of the past quarter century is that the United States finds itself now in a strategic environment in which it faces two nuclear-armed peer competitors that have both positioned themselves favorably with respect to the net nuclear balance. ***Russia has, of course, retained its parity with the United States in the area of strategic nuclear weapons, retaining also a more rapid and sizable upload capacity. But it has also finished the bulk of a non-strategic nuclear weapons modernization program, in which it has developed and fielded several thousand such warheads across an enormous variety of weapon systems with the required policy and doctrinal underpinnings for credible employment. And recently China’s own “breathtaking nuclear breakout”³³ has come to light as several previously unknown missile fields have been identified,³⁴ indicative of near-term strategic parity, together with a likely surge in theater nuclear weapon development, production, and deployment.***³⁵ As just one other indicator of this theater nuclear expansion, it is unlikely that the massive expansion at Pingtong, China’s nuclear weapons production site (roughly analogous to pit production plus Pantex in the US) can be attributed entirely to the expansion of the number of strategically deliverable warheads, notwithstanding the rapid expansion in that latter category (see Figure 1).



Figure 1: Pingtong Nuclear Weapons Assembly Plant: 2002, 2013, 2021 (Google Earth)

Strategic and Operational Consequences:

In the event that one of our rivals crosses the nuclear threshold into discriminate, very low yield, theater nuclear strikes, the consequences for the United States and our Allies would be grim indeed. Such “light” employment would be designed to encourage US capitulation and avoid galvanizing our resolve, almost assuredly striking purely military targets with extremely low (if any) collateral damage and essentially zero fallout. Such theater targets are numerous for Russia and China to choose from, since our forces enjoy extensive overseas basing options and our Allies will presumably be “in the fight” as well, opening up their own target sets. Especially attractive targets would be fifth-generation supporting airstrips, air and missile defense radars, logistics hubs, and C2 nodes. These types of targets could have seriously degrading operational impacts on the allied war effort, particularly the immediate effort to establish air dominance in the region of conflict. As another example, all rail and road links into Ukraine, needed for allied reinforcement of Ukrainian armor and mechanized brigades, might be immediately destroyed by a relatively small number of ultra- and very-low yield nuclear strikes while avoiding significant civilian casualties. And as an example of the avoidance of collateral damage, the Aegis Ashore installation in Romania is separated from civilian population sufficiently for Russia to strike it with an ultra-low or very-low yield Kinzhal and kill essentially zero civilians unless a chance motorist happens to be passing by the base. Strikes like these are designed to pressure the United States and its allies by messaging to democratic populations and their leadership that the stakes of this conflict are high enough for the rival to “go nuclear,” without substantial likelihood of strengthening resolve, due to the purely military nature of the casualties. The implied (or explicit) message will be: there are hundreds more strikes like these coming, with the real threat of escalation to more painful societal nuclear strikes ... are you absolutely certain that the stakes are high enough for you to continue? And that message to capitulate will function asymmetrically across the alliance structure, whether European or Pacific, with the additional intended effect of straining decisional fracture lines.

If these “light” theater strikes fail to collapse the will to continue to fight in the United States and allied nations, graduated escalatory responses are also envisioned. For example, one of Russia’s known operational plans is the Strategic Operations for the Destruction of Critically Important Targets (SODCIT),³⁶ and incorporates a mix of conventional and nuclear strikes, combined with cyber and space operations, in order to deliver significant damage to US infrastructure, such as military bases, power grids, transportation, POL distribution, communications, etc. In this context a useful example to highlight would be that a very-low yield nuclear cruise missile strike on the weapon storage area at Whiteman AFB, serving the B-2 bomber fleet, would essentially take that

target out without even killing many airmen conducting flight operations three quarters of a mile away. Alternatively, “heavier” theater strikes might be executed ... these might be higher yield (perhaps in the single-digit kilotons), against more “valuable” targets (early warning radars in theater, for example), or more widely distributed (such as coincident ultra- and very-low yield nuclear strikes across a large number of in-theater airbases).

In all of these cases, about which our potential adversaries have thought long and hard, the intention is to undermine the will to fight, through a number of avenues: the public shock at the actual employment of nuclear weapons; the horror of the thought of additional, more painful strikes to come; and the re-evaluation of the “value” of the objective. In this phase, as in every phase of the conflict, the adversary would be vigorously conducting an information operation against us, supporting all voices that call for an immediate cessation of hostilities, advise strenuously against entering into nuclear escalation, question the “real value” of the political objective, or even call for the alternative of prolonged economic and political sanctions (a “new cold war”) post-conflict. The pressure to seek accommodation of some sort, any sort, would be very high, particularly since the United States and our allies have very limited “proportional” responses, most of which are not “in kind,” and thus do not carry the same weight of escalatory psychological effect. And proportional responses that do exist almost invariably demand strikes into the homeland of our peer competitor, thus giving a “shadow of legitimacy” to potential limited nuclear strikes on the US homeland.

We have conducted a number of wargames that bear on this issue, and the results have been almost universally discouraging to American players. The introduction of theater nuclear employment into a “traditional” wargame is often where the wargame culminates, but we have designed and executed a number of wargames to explore limited nuclear escalation deeper across the nuclear threshold. In these wargames, adversary crossing of the nuclear threshold has been deemed by players as quite credible, given the paucity of reciprocal US deterrent capabilities and the minimized collateral damage afforded by such adversarial employment. US players have found response options to be uncomfortably insufficient or even non-credible, largely because of a paucity of sufficient prompt, assured, proportional NSNW capability. And with the threat of seemingly limitless additional strikes held in reserve by the adversary across an exceptionally broad and deep array of escalatory targets, the prospect for future “moves” becomes bleak indeed. This “revelation” is a necessary first step for US leaders to begin to take steps to rectify the strategically unstable situation, but it is not sufficient without the follow-up will and commitment to adjust US posture.

Recommendations for the United States:

While it may be distasteful to Americans to compete in the area of NSNWs, necessarily bringing with them as they do the sobering thought of credible nuclear employment, the alternative of leaving that field of competition entirely to our adversaries positions us very poorly in the event of future conflict. On the other hand, building a capability to credibly respond at that specific level of escalatory intensity will deter the very violence that is most feared. The need to bolster such deterrence is underscored by the additional weighty consideration that either of our rivals might opportunistically take advantage of a limited nuclear conflict between us and the other, in order to attempt a *fait accompli* of its own, also weaponizing the threat of limited nuclear employment.

It should be clear from the preceding that the US strategic nuclear modernization program must be executed without further delay, otherwise the instability that we see in the area of potential adversarial NSNW employment would be exacerbated by the erosion of the “apocalypse insurance” afforded by US strategic forces deterring less-limited nuclear escalation. But the modernization of the Triad should also be seen as the floor of nuclear posture adjustment, not the ceiling. The 2018 NPR rightly concluded that not only would W76-2 be required as a force posture adjustment, but that the nation ought also to pursue a sea-launched, nuclear-armed, cruise missile (SLCM-N). The W76-2 most assuredly gives a survivable, penetrable, and prompt response option, but it does suffer from two limitations: very small numbers in the fleet and a yield in the higher range of “low yield,” as opposed to ultra- or very-low yield. The SLCM-N would alleviate the constraints imposed by those two limitations, by allowing for adaptability and scalability in both numbers and yield options. For this reason, given the SLCM-N’s strong credibility and sovereign basing, the US should re-commit to the acquisition of this NSNW option.

Additional capabilities may also be required, whether these provide an enduring deterrent answer to peer competitor military strategies³⁷ or the United States eventually accumulates sufficient leverage to successfully pursue NSNW arms control with Russia and China, called for by the past several Presidential Administrations.³⁸ Given the criticality of the perceived value of their NSNW forces, great power competitors will be very loath to divesting themselves of those capabilities, virtually requiring the US to offer up its own NSNW forces, which at present are too inadequate for sufficient arms control leverage. Additional US countervailing capabilities might include symmetric and asymmetric options. An example of a symmetric countervailing capability would be nuclear-armed, mobile, ground-launched, continental-range hypersonic missiles, such as might be achieved with a range extension to the most recently tested joint USA-USN common hypersonic body. The nuclear warhead might even be of the “clip-in” type that were briefly pursued by the US in the 1980s³⁹ and of variable yields from tens of tons to kilotons. These warheads might additionally be designed so as to not exacerbate either the plutonium pit production challenges or the tritium stockpile. Asymmetric countervailing capabilities would almost certainly have to be kinetic, since non-kinetically induced effects, while operationally significant, generally do not carry the same psychologically escalatory effects, which is one of the deterrent goals. Several options exist, including some that are space-based, but they all face significant political hurdles and possibly even greater technological ones.

In either countervailing case, symmetric or asymmetric (but kinetic), the primary goal is to bolster deterrence. Great power competitors would perceive absolutely no advantage to escalating across the nuclear threshold, and therefore the escalatory attraction of limited nuclear employment would evaporate. Without recourse to some means of escalating “past” the US and our allies, our prospective adversaries would then also be deterred from even beginning down the path to conflict. Of course, should that deterrence fail, the United States would be well positioned to contain the conflict to non-nuclear modes and levels of escalation, since there would be no strategic or operational advantages for our adversaries to gain through NSNW employment, in theater or otherwise. And finally, by gaining countervailing capabilities the US also gains arms control leverage. Fielding such capabilities, as we did in the 1980s with the Pershing II IRBM and the Gryphon GLCM, would hopefully open the door to a multi-lateral arms control treaty that captures all nuclear warheads, rather than just so-called “strategic” warheads or delivery vehicles.

And in any case, the modernization of the NNSA infrastructure should be accelerated wherever possible. In light of both China's massive expansion of its nuclear forces over the past few years and the foregoing discussion regarding Russian and Chinese limited nuclear employment plans, there is every reason to expect that the negative net assessment in the area of nuclear weapons will only become more pronounced in the 2020s, if left unchecked. But counterbalancing the nuclear strength of our peer competitors will require robust plutonium pit and tritium production *inter alia*. We should continue with the very rational plan to produce pits at two locations, with the concomitant hedge capacity at the Savannah River Plutonium Pit Facility. And rather than diluting and disposing of the 34 metric tons of plutonium, which cost enormous sums in funding and manpower to produce, currently located at the Savannah River Site, the United States ought to consider the construction of a plutonium oxide fueled dedicated tritium production reactor on that site. Such a tritium production plant would eliminate any concerns that the US or its allies might have regarding tritium availability for many decades to come.

In the end, the United States needs to demonstrate its commitment to foreclosing all of the advantages that a nuclear-armed peer might gain in employing non-strategic nuclear weapons in a very limited and selective manner. Until this is done, there will be a natural competitive attraction toward limited nuclear employment that we should expect our peer competitors to continue to assiduously attempt to exploit.

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