Risk Assessment of Russian Use of Tactical Nuclear Weapons

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Oksana Vickers

New Realities for Nukes

Has Russia's war in Ukraine increased the specter of nuclear use by the aggressors? The phantom of nuclear warfare, which was once seemingly relegated to the annals of Cold War history, has reemerged as a major concern on the global stage. Putin's nuclear saber rattling, suspension of arms control treaties, deployment of tactical nuclear weapons (TNW) to Belarus, and escalatory rhetoric has left the ominous possibility of Russian use of tactical nuclear weapons in Ukraine.[1] This paper will delve into the potential use scenarios, provide an overview of Russian nuclear doctrine and assess their current nuclear forces, review the preexisting (albeit sparse) literature on tactical nuclear weapons from the Cold War, and employ forecasting methods to form an in-depth analysis of the risk of Russia's use of tactical nuclear weapons.

To begin, the following four variables are important to keep in mind when considering Russia's potential use of tactical nuclear weapons. In considering the use of nuclear weapons, state leadership must weigh several risks and benefits. The first variable leadership must consider is political costs resulting from nuclear use, both domestic and international. The second is the tactical battlefield effects achieved from nuclear weapons use. The third is strategic outcomes, in terms of achieving a strategic aim in a particular dispute as well as the effect on a states' credible nuclear deterrent. The fourth variable of consideration is the possibility of regime collapse. I will assess the conventional wisdom on these four variables regarding Russia's potential use of

[1] "H.Res. 562 — 118th Congress: Responding to the threat posed by the Russian Federation's deployment of tactical nuclear weapons, and for other purposes." www.GovTrack.us. June 23, 2023. October 11, 2023 https://www.govtrack.us/congress/bills/118/hres562

nuclear weapons in an attempt to explain why current assessments of Russia's likelihood of nuclear weapons use are low.

Russian nuclear doctrine currently states four scenarios under which use of nuclear weapons is permissible: 1) upon receipt of reliable data about the imminent threat of incoming ballistic missiles launched against Russia or its allies; 2) use of nuclear weapons or other weapons of mass destruction or Russia or its allies; 3) imminent attacks against Russian nuclear command, control, and communications (C3) infrastructure; 4) aggression against Russia with conventional weapons that "threaten the very existence" of the Russian state. Unlike the United States and China, Russia does not have a "no first use" provision in its nuclear doctrine. The Kremlin could also resort to nuclear weapons use first in a conflict to mitigate escalation and signal resolve, something coined 'escalate-to-de escalate.'[2] Much of Russia's nuclear doctrine is intentionally ambiguous, so that Russia's adversaries cannot gauge the risk of escalation.

This paper presents an unorthodox position as a counter to prevailing dogma on the use of tactical nuclear weapons.[3] I suggest that it is missguided to believe that Russia would only use tactical nuclear weapons in a demonstration strike (yielding no casualties, likely with a single device detonation) or on a single military target that inflicts limited casualties. Classical use doctrine from the Cold War makes two grave mistakes at this point in history: one, it assumes that international sanctions and global opinion matter much more to Russian strategic considerations than they actually do.[4] Two, it suggests that Russian leadership, having made the decision to employ TNW, will voluntarily make a decision that furthers the international opprobrium and isolation that Russia already faces, while simultaneously achieving no tangible

[2] Loomis, Ryan Wendell. "Rattling the Nuclear Saber: Rethinking Escalate-to-Deescalate Strikes." Ph.D., University of Pittsburgh, 2022. https://www.proquest.com/docview/2812073467/abstract/B0F9D774A43249A1PQ/1.
[3] Ryan, Kevin."Why Do We Think Putin Won't Use 'The Bomb'?." *The Hill,* April 10, 2023.
[4] Pape, R. A. (1996). "Why Economic Sanctions Do Not Work." *International Security,* 22(2), 90-136.

military benefit from the decision. This is contrary to the indications of Russia's perception of its own interests. It is my view that if Russian leadership opt to use TNW, it will necessarily be to achieve decisive effects on the battlefield. The best case scenario for the Kremlin is a weakened Ukraine, a frightened and frozen NATO, and a decisive result on the battlefield that deters Ukraine's accession to NATO and precludes additional supply of Western weaponry to Ukraine. This possibility becomes increasingly likely as conventional Russian forces stall, Ukraine's counter offensives succeed in disrupting critical infrastructure and logistics support in Crimea and in mainland Russia, and Russia feels cornered with no good option to achieve its aims in Ukraine.

Additionally, in observing that hardly any analysis exists positing that the Russians would use TNW to achieve decisive victory, there is a need to consider this possibility. Prior to the start of the war in Ukraine, many experts in the West would have argued that Russia's conventional military victory was easily assured and would be swift; this has not been the case.[5] Two years into Russia's continued and devastating campaign of military aggression, the conversation about the potential for TNW use to achieve Moscow's aims needs to be more seriously considered.[6] Finally, a genocidal actor equipped with TNW has thus far only existed in theoretical debates.[7] Given how Russia's campaign has unfolded, reconsidering whether it is now a reality changes the TNW conversation at a fundamental level. Though I still assess that the odds of Russia using

[5] Mykhaylo Zabrodskyi et al., 'Preliminary Lessons in Conventional Warfighting from Russia's Invasion of Ukraine: February–July 2022', RUSI, November 2022.
[6] Vicente, Adérito, Polina Sinovets, and Julien Théron. "Introduction: How Has Russia's War on Ukraine Changed the Global Nuclear Order?" In *Russia's War on Ukraine: The Implications for the Global Nuclear Order*, edited by Adérito Vicente, Polina Sinovets, and Julien Theron, 1–16. Contributions to Political Science. Cham: Springer Nature Switzerland, 2023. https://doi.org/10.1007/978-3-031-32221-1_1.
[7] Qaisar, Muhammad Naveed, and Amjad Abbas Khan. "Growing Reliance on Tactical Nuclear Weapons: A Case Study of US, Russia and Pakistan." *Strategic Studies* 39, no. 4 (February 6, 2020): 41–54. https://doi.org/10.53532/ss.039.04.0094.

tactical nuclear weapons remain low, this paper will argue that Russia may be quite willing to use tactical nuclear weapons to achieve decisive victory in Ukraine.

The Role of Nuclear Weapons

The US Department of Defense defines tactical nuclear weapons (TNW) as "the use of nuclear weapons by land, sea, or air forces against opposing forces, supporting installations or facilities, in support of operations that contribute to the accomplishment of a military mission of limited scope." Russian doctrine is less clear about the role of TNWs in regional nuclear deterrence (RND) and broader strategy.[8] However, this paper will assume that TNWs are any nuclear capable systems that do not fall under strategic nuclear arms treaties with limited detonation capacity, used to meet military objectives against opposing forces. Tactical nuclear weapons typically have a relatively low yield, ranging from 0.1 kiloton (KT) to yields higher than those dropped on Hiroshima and Nagasaki, between 10-15 KT. There are a variety of methods for TNW delivery and they are often distinct from strategic nuclear weapons delivery systems.

The threat of tactical nuclear weapons and their use in Ukraine presents a great challenge to the collective West and the rest of the international community. Russian nuclear use doctrine is intentionally vague, and conditions warranting use is widely debated among Russian elite as well. On one hand, the feature of "escalate to de-escalate" in Russian doctrine is believed to integrate a nuclear dimension, specifically with respect to tactical (low-yield) nuclear weapons. Despite the deliberate ambiguity, I assess that there are three discrete roles that nuclear weapons play in the Russia-Ukraine war. The first is psychological, observed through Russian officials'

[8] Warren, Spenser A. "Security, Prestige, and Power: Understanding the Determinants of Russian Strategic Nuclear Modernization Under Vladimir Putin." Ph.D., Indiana University, 2023. https://www.proquest.com/docview/2828598325/abstract/B8DB6F65B15644A7PQ/1.

nuclear saber rattling against Ukraine and the collective West, which most military subject matter experts contend implies a tactical low-yield nuclear weapon. The second role is the ever present escalation potential following a possible future use of a tactical nuclear weapon, which would draw in NATO allies or even NATO itself.

Adjacent to this is the implicit threat of an escalatory path to full-scale nuclear war between Russia and NATO, should Russia deploy a tactical nuclear weapon and appear to heighten the overall threat to the European continent. The panic resulting from this threat leads to pressure on Western governments to put an end to the conflict, preferably on Moscow's terms. The third role involves Russian forces' capture, control, and mismanagement of nuclear power plants in Ukraine, including Chornobyl and Zaporizhzhia. This paper will focus on these first two roles, as the third is not central to discussions of tactical nuclear weapons, and is beyond the scope of this paper.

The Evolution of a New Nuclear Calculus

The intent of this project is to create a reasonable risk assessment of Putin's odds of ordering a tactical nuclear strike on Ukrainian military forces out of frustration with his military's conventional failures on the battlefield. Assessing the possibility of this scenario requires evaluating certain faulty assumptions about nuclear use, defining of key terms, and exploring the potential threat scenarios under which use of TNWs (non-strategic nuclear weapons, or tactical nukes) is likely. This possibility of Russian use of tactical nuclear weapons in Ukraine is certainly concerning for a variety of reasons, but also raises questions about the possibilities of a Western response—ranging from NATO conventional attacks on Russian forces to direct military involvement by Ukraine's allies.

The potential use of tactical nuclear weapons by Russia in Ukraine is not merely an exercise relegated to academic theorizing, but a critical issue with far-reaching implications for international security. Since February 24th 2022, Russia's war in Ukraine has been a laboratory of many of the major theories of warfare and statecraft, most of which stem from the Cold War tradition.[9] The "theory" of nuclear deterrence is being assessed day-to-day, both in its capabilities and limits. The potential use of nuclear weapons for the first time in 77 years poses an existential threat not only to the security and sovereignty of Ukraine, but also to regional stability in Eastern Europe and the Baltics.[10] Further, such an event would fundamentally shatter international norms of nuclear non-use, set back diplomatic efforts for arms control decades, and would establish a dangerous precedent for the future of the international order. The gravity of this issue compels rigorous examination because until Russia's invasion in February 2022, hardly any literature existed on the use of tactical nuclear weapons, despite sizable arsenals among the nuclear club nations. Even with increased attention to the issue due to Russia's heightened signaling and some incisive analysis from the most attentive Russia-watchers, there seems to be no consensus on the likelihood of such a scenario, what response options are even on the table for the collective West, or what it would mean for broader international security.

The lack of anything beginning to even approach consensus among experts leaves the broader international community in challenging waters, limiting the possibility for useful international responses in the case of Russian use of TNWs in Ukraine. In some nuclear security circles, some substantial doubt has been expressed that the West has any viable means by which to respond without further exacerbating chances of nuclear exchanges between superpowers.

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[9] Vicente, Adérito, Polina Sinovets, and Julien Theron, eds. *Russia's War on Ukraine: The Implications for the Global Nuclear Order*. Contributions to Political Science. Cham: Springer Nature Switzerland, 2023. https://doi.org/10.1007/978-3-031-32221-1.

[10] Shlapak, David, and Michael Johnson. *Reinforcing Deterrence on NATO's Eastern Flank: Wargaming the Defense of the Baltics*. RAND Corporation, 2016. https://doi.org/10.7249/RR1253.

This is not a risk they are willing to take, as the White House will not risk New York for Kyiv. As the likelihood of use of TNWs by Russia grows, other nuclear powers with expansionist aims are watching closely to see both how and even **if** the West responds with anything more substantive than increased military presence in NATO's Eastern European theater, additional logistical support, and public condemnations of Russia's behavior.

Doctrinal Debates

The debate surrounding the role of tactical nuclear weapons in Russia resembles the discussions that Western academics had during the 1960s about their role in NATO force posture.[11] Russian leadership has tried to determine whether tactical nuclear weapons can be used to compensate for conventional failures.[12] Importantly, however, discussions of Russian nuclear doctrine and the role of tactical nuclear weapons in it occur in an information vacuum. To date, there is very little useful data, both qualitative and quantitative, on the Russian tactical nuclear weapons arsenal and Russian operational planning beyond updates to Russian nuclear doctrine.

The initial focus on tactical nuclear weapons in the post-Soviet Russian story began with its complaints about NATO's expansion in the 1990s. It appears that the initial interest began in April 1999 during a meeting on the future development of nuclear weapons with the Russian Security Council.[13] Over the last two and a half decades since, Russian statements on tactical nuclear weapons have not garnered much attention, even from the most plugged in nuclear analysts.

To contextualize the yield of TNWs, a ton is equivalent to the explosive force of one ton of TNT. A December 2001 article reported that a relatively small 10 KT detonation in

[11] Trachtenberg, Marc, "Strategic Thought in America, 1952–1966," in *History and Strategy* (Princeton, N.J.: Princeton University Press, 1991), 3–46.
[12] Acton, James. "Entanglement: Russian and Chinese Perspectives on Non-Nuclear Weapons and Nuclear Risks." Arms Control Today 47, no. 10 (12, 2017): 42.
[13] Oleg Grinevskyi, *Perelom. Ot Brezhneva k Gorbachevu* [The break from Brezhnev to Gorbachev] (Moscow: Olma-Press, 2004), 69–75.

Washington, D.C. would destroy everything within a 275 yard radius of the detonation site.[14] There would be intense shock and heat, mass fires, and few survivors in reinforced concrete buildings within a half mile radius of the blast. At two-thirds of a mile outside of the detonation area, there would be severe shock from the blast and wood homes would be significantly damaged. The radioactive fallout would vary according to wind direction and other weather variables, but the plume of dispersion would be 18 miles long and 2 miles wide, affecting a population of approximately 150,000 people (figures would be much higher today as this was in 2001). People outdoors would receive dangerous doses of radiation but those staying indoors would lessen their risk. Regardless of the yield of the weapon used, even a low-yield atomic blast would generate destructive effects, far beyond what conventional explosives could achieve.

Traditional Russian military thought contrasts warfare by attrition and annihilation.[15] Fighting wars of annihilation was the preferred method by Lenin, Stalin, etc., and has a strong rooting in Russian military history. Wars of annihilation bring about a swift and decisive strike, destroying the enemy deep within his territory. These kinds of wars are narrow and resource intensive, however. Wars of attrition can be achieved by multiple ways, and have more flexibility in their means. Wars of attrition are necessarily wars of limited aims. They must also address the enemy's political and economic capacity. Wars of annihilation are widely seen as not feasible for the current Russian state.

Gerasimov Doctrine, aka New Generation Warfare lays out how to achieve tactical overmatch against an adversary to attain limited goals. Gerasimov's 2013 article covers three points about the current trend of warfare:

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[14] Gavin, Francis J. "The Myth of Flexible Response: United States Strategy in Europe during the 1960s." *The International History Review* 23, no. 4 (2001): 847–75. http://www.jstor.org/stable/40108839.
[15] Budjeryn, Mariana. "Distressing a System in Distress: Global Nuclear Order and Russia's War against Ukraine." *Bulletin of the Atomic Scientists* 78, no. 6 (2022): 339–46. https://doi.org/10.1080/00963402.2022.2132742.

1. Importance of information in today's conflicts
    1. This reduces options for an enemy in war
    2. Infowar is rooted in RU mil tradition, ie reflexive control
2. High precision weaponry is taking on a mass character
    1. RU views NATO as having relative advantage in conventional weapons[16]
    2. US and NATO have advantages in precision weapons used in the initial period of war to destroy adversary critical capability
3. A discussion of how RU can overcome its disadvantages
    1. Russia must not copy foreign experience and chase after leading countries but outstrip them to occupy the leading positions ourselves
    2. Relative to NATO's perceived vulnerabilities

Information operations, precision munitions, and asymmetry of action are the three core tenets of Russian new generation warfare and undergirds their potential use of TNW. Russian nuclear weapons provide them with an asymmetry of action, particularly during the early phases of the 2015 War in Donbas. Russia possesses more TNW than the other European powers or the US, making its deterrence and strike capability more credible. It is perhaps one of their few advantages over NATO.[17]

Contemporary Russian military theorists have seen the need to leverage information operations and Russian relative advantages to affect their opponents' psychology and to prevent interference with Russian affairs. According to the literature, military theorists and Gerasimov alike highlight this need doctrinally and in speeches.[18] American military theorist Charles K.

[16] Ven Bruusgaard, Kristin. "Russian Nuclear Strategy and Conventional Inferiority." *Journal of Strategic Studies* 44, no. 1 (January 2, 2021): 3–35. https://doi.org/10.1080/01402390.2020.1818070.
[17] Hans M. Kristensen, Matt Korda & Eliana Reynolds (2023) Russian nuclear weapons, 2023, Bulletin of the Atomic Scientists, 79:3, 174-199, DOI: 10.1080/00963402.2023.2202542
[18] Michael Kofman, Anya Fink, and Jeffrey Edmonds, Russian Strategy for Escalation Management: Evolution of Key Concepts, CNA, 2020, https://www.cna.org/centers/cna/sppp/rsp/escalation-management.

Bartles argues that from General Gerasimov's point of view, belligerents need to use a 4-to-1 ratio for military means.[19] Nuclear weapons were leveraged in this manner in 2014 in Zelenopillya, Ukraine. Russia is presumed to have approximately four times the number of TNW as the United States, though estimates vary.[20] The Bulletin of Atomic Scientists' estimates as of early 2023 placed Russia's stockpiles at approximately Russia 4,489 nuclear warheads assigned for use by long-range strategic launchers and shorter-range tactical nuclear forces, with 1,819 of those being non-strategic (or sub-strategic, meaning they fall below the treaty requirements for New START).[21]

We can expect to see Russia's military to potentially use nuclear weapons to achieve both their tactical and strategic aims in Ukraine. If Russia has the option to achieve its limited aims, and with that dissuade NATO escalation and further assistance with the use of TNW, it is my assessment that they will do so. This would set a dangerous precedent for the world of nuclear security and broader geopolitics.

Background and Nuclear Signaling

Early on in the war, several Russian leaders, including President Putin, alluded to potential use of nuclear weapons as a veiled threat to deter western support to Ukraine and to limit NATO's involvement in the conflict.[22] The illegitimate referenda to incorporate the annexed

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[19] Lester W. Grau and Charles K. Bartles, The Russian Way of War, FMSO, 2016, https://www.armyupress.army.mil/Portals/7/Hot%20Spots/Documents/Russia/2017-07-The-Russian-Way-of-War-Grau-Bartles.pdf.

[20] US Defense Intelligence Agency. 2021. Statement for the Record: Worldwide Threat Assessment, April 26. https://www.dia.mil/Articles/Speeches-and-Testimonies/Article/2590462/statement-for-the-record-worldwide-threat-assessment.
US Department of Defense. 2018. "Nuclear Posture Review." https://media.defense.gov/2018/Feb/02/2001872886/-1/-1/1/2018-NUCLEAR-POSTURE-REVIEW-FINAL-REPORT/PDF.
US Department of Defense. 2022. "Nuclear Posture Review." https://s3.amazonaws.com/uploads.fas.org/2022/10/27113658/2022-Nuclear-Posture-Review.pdf

[21] Op Cit, Kristinsen, Korda and Reynolds, 2023.

[22] Al Jazeera, '"No other option": Excerpts of Putin's speech declaring war', 24 Feb. 2022, https://www.aljazeera.com/news/2022/2/24/putins-speech-declaring-war-on-ukraine-translated-excerpt;

territories of Luhansk, Donetsk, Kherson, and Zaporizhzhia provide additional pretext for potential use of tactical nuclear weapons because Russian doctrine is quite clear about nuclear use in the event of an attack on Russian territory.[23] Comments alluding to this condition have been repeated by multiple Russian officials over the course of the war.[24] Over the course of the conflict, Putin has largely removed the domestic political, logistical and operational barriers to using nuclear weapons in Ukraine, and has created justifications, both factitious and real, to garner domestic support.[25] It suggests that there could be a time and place when TNW becomes more than just a rhetorical device.

The framing of the war in Ukraine as an existential fight for Russia's survival against the West—which, doctrinally, warrants nuclear use—is even more concerning. Putin has also reshuffled his military leadership, especially following regime security concerns after Prigozhin's mutiny.[26] There are now three generals that are responsible for the deployment of tactical nuclear weapons in Ukraine. The rationale for use would be to save Russian soldiers' lives, shorten the already lengthy war, destroy Ukrainian forces and effectively break their resolve, and deter further Western military support to Ukraine by shattering the nuclear taboo and raising fears over total nuclear war.

At present, developments on the ground in Ukraine suggest that Russian military commanders have exhausted their capacity to respond to Ukrainian counteroffensive operations

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Al Jazeera, 'Russia–Ukraine war: Lavrov warns on risk of nuclear conflict', 26 Apr. 2022, https://www.aljazeera.com/news/2022/4/26/russia-ukraine-war-lavrov-warns-of-risk-of-nuclear-conflict.

[23] "Voennaya doktrina Rossijskoj Federatsii", *Nezavisimaya Gazeta,* 24 April 2000.

[24] Vladimir Putin, "Address by the President of the Russian Federation", The Kremlin, Moscow, September 21, 2022.; "Медведев предупредил Киев о 'судном дне' в случае атаки на Крымский мост", Radio Sputnik, July 17, 2022.

[25] *Ibid.;* Laura Smith-Spark, Alla Eshchenko, Emma Burrows, "Russia was ready to put nuclear forces on alert over Crimea, Putin says", CNN, March 16, 2022.

[26] Radio Free Europe/Radio Liberty, "Gerasimov Appointed Top Commander In Reshuffle Of Leaders Overseeing Russian Forces In Ukraine," January 11th, 2023. https://www.rferl.org/a/russia-gerasimov-commander-ukraine-forces-surovkin/32219254.html

and territorial gains. Stalling Russian forces combined with their dependence on outdated military equipment confirms that Russian material is dwindling. Putin's horrific bombing campaigns have not broken Ukraine, despite unceasing efforts. It is becoming increasingly worrisome, however, that Putin's failures to achieve his aims in Ukraine is making the use of tactical nuclear weapons more likely. Further, Putin has laid the groundwork over the last year and a half to prepare for tactical nuclear weapon use, including modifying Russian nuclear policy, making threats, moving warheads to Belarussian territory, and other maneuvers vis-a-vis nuclear capabilities.

Modeled Scenario

There are several features that one might look out for when considering potential Russian TNW employment in Ukraine. This section will cover them and explain their significance in detail. The elements of a potential TNW use scenario include the following: strategic surprise, mass employment, continual employment, minimize fallout, and TNW employment from Russian soil whenever possible. I will elaborate on each of these features and explain why they are part of Russia's TNW potential use scenario.

Surprise

Russia's initial use of tactical nuclear weapons would be most effective when used without warning.[27] The Russians are aware that they are constantly being monitored by foreign intelligence, and rely heavily on the information warfare component of their capabilities. If considering a TNW use scenario, they would likely do their best to account for this when preparing for their first strike. This would likely mean that only a small number of weapons would be forward deployed to minimize the visibility and trace. It is probable that Russia's

[27] Kyle Beardsley and Victor Asal, "Winning with the Bomb," *The Journal of Conflict Resolution*, APRIL 2009, Vol. 53, No. 2, A Strategic Approach to Nuclear Proliferation (APRIL 2009), pp. 278-301

maintenance, safety and security unit of the 12th main directorate of the Russian Ministry of Defense (GUMO) could be observed relocating to be in closer proximity to the location intended for TNW use. To maintain the element of strategic surprise, however, the Russians could minimize these signals prior to their initial use of TNW. Russian discussion of non-strategic nuclear weapons and the little literature available from the Cold War suggest that military groups attached to the 12th main directorate would be well equipped to hide and maintain strategic surprise leading up to a TNW use scenario.[28]

For a Russian TNW use scenario, potentially dozens of nuclear weapons would be taken out of central storage. Any such movement of live nuclear warheads would be a significant logistical operation, since all Russian nuclear weapons are kept in 'central storage' (Object-S) sites such as Belgorod-22 just over 16 km from Ukraine's border, or at base sites such as the 448th Missile Brigade near Kursk. This would entail the activation and movement of the maintenance, safety and security unit of the 12th Main Directorate of the Russian Ministry of Defence (Главное Управление Министерства Обороны, or GUMO).

Mass employment

Current estimates show that multiple TNWs would need to be used to achieve decisive battlefield results, likely around 12 or more. The Russians are more likely to use a larger number of TNWs in their initial strikes to achieve the tactical effects they desire on the ground. Their first use of TNW may include numerous 1-10kt detonations that are tied to a larger maneuver designed to break Ukrainian resolve and momentum.

Continual Employment

[28] Brian Alexander and Alistair Millar, *Tactical Nuclear Weapons: Emerging Threats in an Evolving Security Environment,* pp. 45-65, Brassey's Inc, 2003.

Once nuclear weapons have been used, there is little incentive to stop using them. Subsequent use of TNW would likely be tied to concentrated areas of Ukrainian resistance. TNW would become the tactical 'easy button' for the often stymied Russian forces. Strikes on key airfields or other military infrastructure and lines of communication may also make sense at this stage to impede the Ukrainians from responding with their carefully husbanded airpower or moving reserves. We can generally expect to see a full week or more of consistent nuclear employment every day. The number of TNW used will vary with the efficacy of the Russian targeting processes, accuracy of their delivery systems and rate of weapon proper function, but I anticipate around a dozen to several dozen to be in the cards. This is based off of a decades old wargaming exercise of how TNW would be used in a ground invasion of the Baltic States.[29]

One caveat here is that Ukrainian forces hardly operate in large enough concentrations for there to be an obvious tactical target for TNWs. There are no obvious military targets for Russian nuclear weapons in Ukraine, especially since the Ukrainians learned the hard way about the consequences of maintaining high concentrations of forces in one location during the 2014 war in Donbas. Ukraine does not operate with a large-enough concentration of forces to justify a 10–100 kiloton blast. Additionally, tactical nuclear weapons are much less decisive in their effects than generally thought. Conventional artillery strikes such as the one at Zelenopillya in July 2014 demonstrate similar levels of effectiveness in combat without breaching the nuclear taboo, risking global opprobrium, unleashing dangerous radioactive fallout, or demoralizing Russia's own soldiers.[30]

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[29] Shlapak, David A. and Michael Johnson, Reinforcing Deterrence on NATO's Eastern Flank: Wargaming the Defense of the Baltics. Santa Monica, CA: RAND Corporation, 2016. https://www.rand.org/pubs/research_reports/RR1253.html.

[30] Paul, T.V. "Nuclear Taboo and War Initiation in Regional Conflicts." *Journal of Conflict Resolution* 39, no. 4 (December 1995): 696–717.

It is difficult to say whether Russia would actually face the opprobrium we would expect, and my analysis concludes that it would be very difficult to respond quickly to Russian use of TNW once it begins.[31] Conventional options on the table, even if the West were to want to respond decisively, would be difficult to scale. It could take at least 6 months to build up a conventional military response to Russian forces in Ukraine following nuclear use, and I find this to be exceedingly unlikely. The point of nuclear use would be to coerce the Ukrainians to give up, force the West to agree to the Kremlin's terms, and prevent future support to Ukraine because of the risk of strategic escalation.

Minimize Fallout

Nuclear fallout can be minimized by altering fuze settings that explode the weapon to avoid fireballs from coming into contact with the ground (airburst). The Russians do have incentive to employ TNW in this manner because of the need to maneuver through the strike areas soon after they occur to be decisive. Assuming a low state of CBRN training and readiness in general of Russian forces, it cannot be assumed that they are prepared to maneuver through highly contaminated areas. It would therefore be wise to keep residual contamination to a minimum. This does beg the question of how it could be decisive yet also maneuverable post detonation. The only potential targets for surface bursts and cratering effects (with their associated high residual fallout) are the major Ukrainian airfields, logistical hubs and national command and control (C2) facilities on the West Bank of the Dnipro River beyond the potential advance of Russian ground maneuver.[32]

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[31] National Aviation University, Kyiv, Ukraine, O.L. Turovsky, E.V. Havrylko, O.M. Pankratov, L.A. Ustinova, B.D. Khalmuradov, V.L. Bohaienko, "Assessment of the consequences of the use of tactical nuclear weapons on the population and infrastructure in the regions of a nuclear explosion." *Nuclear Physics and Atomic Energy* 24, no. 3 (September 20, 2023): 267–82. https://doi.org/10.15407/jnpae2023.03.267.

[32] Butfoy, Andrew. "The Nuclear-Conventional Nexus in Western Military Planning for European Contingencies." Ph.D., The Australian National University, 1988. https://www.proquest.com/docview/2606927607/abstract/8E8DE048ED3F4F0BPQ/1.

TNW Will Be Employed from Russian Soil Whenever Possible

Some of the Russian shorter range systems will have to be employed from inside Ukraine's borders, though this is not entirely necessary.[33] Many Russian nuclear-capable systems can engage targets in Ukraine from Russian soil. This presents a significant escalation difficulty for NATO leaders who have publicly voiced support for a conventional NATO response to Russian forces in Ukraine in the event of TNW use.

Short of continued hostilities with Russia, NATOs options for response are extremely limited and unlikely to be availing. The most likely outcome of Russian TNW use is a negotiated peace deal with terms favoring the Kremlin. It is difficult to say, however, what this would look like at this juncture in the conflict. It would present a messy minimalist victory, but it would suffice for Putin's aims. Winning ugly is still winning.

Implications for Such Use

In the scenario of Russian use of TNW, Russia will surely face some form of backlash from the international community, international diplomatic pressure and economic censure and isolation.[34] However, it is naive to think that the Russians cannot weather the effects of this. There would likely be a vein of admiration in the developing world for Russia successfully calling the West's bluff.[35] Domestically, Putin would likely appear as a strongman who successfully stood up to NATO and the US and did what was necessary to achieve victory in Ukraine. Additionally, the Russian economy is younger than most millennials and they have decades of being excluded from international trade under their belt without considerable issue.

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[33] Gunnar, Arbman, and Charles Thornton. "Russia's Tactical Nuclear Weapons. Part II: Technical Issues and Policy Recommendations." Stockholm: Swedish Defence Research Agency, 2005. https://www.foi.se/rest-api/report/FOI-R--1588--SE.

[34] Lan, Ngo Di. "After the Fact: How States Respond to Faits Accomplis." Ph.D., Brandeis University, 2023. https://www.proquest.com/docview/2818611654/abstract/58A6C9ABF2F64C14PQ/1.

[35] Harrington de Santana, Anne. "Nuclear Weapons as a Currency of Power: Deconstructing the Fetishism of Force." Ph.D., The University of Chicago, 2010. https://www.proquest.com/docview/755050542/abstract/664D66DA15F486BPQ/1.

Because of this, it may be short sighted to suggest that thirty years of economic inclusion is going to trump three hundred years of imperial rule and cultivated self-sufficiency that occurred under several varied institutional structures at various technological stages.[36] If any nation can weather being a global pariah, it is Russia. This almost certainly plays a role in Russia's strategic calculus in its operational decisions in Ukraine.

Russia will not struggle to bounce back from this, though the West may try to make it difficult. The Russian military has been badly damaged as a result of this war and will take years to recover. It is unlikely that Putin will opt for another risky expansionist move in his lifetime as Russia will seek to absorb their newly acquired and worse for wear territory from a diminished and reliably anti-Russian Ukraine. Vladimir Putin will also have significant domestic support rebuilding to do following the conclusion of the war. Prigozhin's mutiny made that drastically clear.

Further, the Chinese government will likely respond in a cautiously disapproving manner to censure the Russians diplomatically, but will also privately celebrate as the immediate US reaction will be to reduce Pacific panic and send forces to support our newly concerned NATO partners. The CCP will be mindful that following Russia's use of TNW, Taiwan will be frantic to acquire its own nuclear weapons, but the CCP will likely conclude that Taiwan by itself cannot achieve nuclear capacity before China's military is fully modernized and operationally ready to take the island by force if necessary.[37] Russia's energy and wheat customers across the globe will all react with public-facing shock initially, but will quietly return back to business as usual within the year. This paints a grim picture of the West's ability to deter this threat scenario, especially as

[36] Hutchinson, George A. "Sovereignty, Legitimacy, and the Bomb: A Framework for Explaining North Korea's Nuclear Decisions and Strategies." Ph.D., George Mason University, 2023. https://www.proquest.com/docview/2814733100/abstract/B453932E9E824B69PQ/1.

[37] Vicente, Adérito, Polina Sinovets, and Julien Theron, eds. *Russia's War on Ukraine: The Implications for the Global Nuclear Order*. Contributions to Political Science. Cham: Springer Nature Switzerland, 2023. https://doi.org/10.1007/978-3-031-32221-1.

Ukraine continues to deliver major blows to Russian forces and make significant progress on the battlefield. We ultimately do not possess a theory of deterrence that integrates the potential use of TNW to achieve limited aims, and this presents one of the gravest risks to global stability in the 21st century.