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14. ABSTRACT

The unipolar moment is over. Thanks to the rise of revisionist nuclear states, America must return to analyzing nuclear signaling, nuclear coercion, and even nuclear warfare. Otherwise, a single hostile power may dominate Eurasia threatening American geopolitical interests. Competitor expansion of low-yield battlefield nuclear weapons (LYBNW) exacerbates this menace. Combined with stagnant or declining US LYBNW, American security and extended deterrence are under intensifying risk of failing under coercive pressure. **Due to the rising disparity in nuclear weapons between the US and competitors, the acquisition of sea and shore-based LYBNW, such as the Sea Launch Cruise Missile-Nuclear (SLCM-N), presents valuable tools that provide policymakers additional options to signal resolve, improve deterrence, and provide unique warfighting potential.**

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Introduction

The unipolar moment is over. Thanks to the rise of revisionist nuclear states, America must return to analyzing nuclear signaling, nuclear coercion, and even nuclear warfare. Otherwise, a single hostile power may dominate Eurasia threatening American geopolitical interests.[1] Competitor expansion of low-yield battlefield nuclear weapons (LYBNW) exacerbates this menace. Combined with stagnant or declining US LYBNW, American security and extended deterrence are under intensifying risk of failing under coercive pressure. **Due to the rising disparity in nuclear weapons between the US and competitors, the acquisition of sea and shore-based LYBNW, such as the Sea Launch Cruise Missile-Nuclear (SLCM-N), presents valuable tools that provide policymakers additional options to signal resolve, improve deterrence, and provide unique warfighting potential.**

Background

How did America arrive at this state? Post-Cold War administrations sought to reduce nuclear capabilities in what they saw as a world devoid of existential state threats. President George H. W. Bush unilaterally reduced tactical nuclear weapons by 90 percent and took nuclear bombers off day to day alert.[2] This came alongside NATO's New Strategic Concept that replaced Flexible Response wherein the role of nuclear weapons in warfighting and deterrence found itself reduced to "weapons of last resort.[3]" In 2010, President Obama decided to remove the

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[1] Ronald Reagan, "National Security Decision Directive 238," pg. 2; Zhengyu Wu, "Classical Geopolitics, Realism and the Balance of Power Theory," *Journal of Strategic Studies* 41, no. 6 (2018), https://www.tandfonline.com/doi/full/10.1080/01402390.2017.1379398: 797-798, 812.

[2] Thomas Yancy Headen, "Further Tactical Nuclear Weapons reductions in Europe: The Next Challenge for Arms Control," (master's thesis, U.S. Army Command and General Staff College), 2.

[3] Thomas Yancy Headen, 15.

nuclear submarine-launched cruise missile from the US arsenal.[4] The 2010 Nuclear Posture Review (NPR) also stated the US would not use nuclear weapons against Nuclear Non-Proliferation Treaty states.[5] This reduction came alongside a lack of investment in nuclear weapon production. Even in 2008, nuclear weapons and their production infrastructure were atrophied and beyond service life.[6] Due to these reductions, the whole of the LYBNW consists of 400 tactical nuclear weapons carried by F-15 dual-capable aircraft (DCA) and a single Ohio class Fleet Ballistic Missile Submarine (SSBN).[7] Even with these shortfalls compared to Russian and growing Chinese capabilities, the objective remains to reduce the US reliance on its nuclear arsenal, even for nuclear deterrence.[8] This would include the last NPR in 2022 calling for the

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[4] John R. Harvey and Robert Soofer, "Strengthening deterrence with SLCM-N," *Atlantic Council*, 5 November 2022, https://www.atlanticcouncil.org/in-depth-research-reports/issue-brief/strengthening-deterrence-with-slcm-n/; Jim Garamone, "Nuke Sea-Launched Cruise Missile Would Bolster Deterrence," *DOD News*, 4 Aug 2020, https://www.defense.gov/News/News-Stories/Article/Article/2299140/nuke-sea-launched-cruise-missile-would-bolster-deterrence-officials-say/; Congressional Research Service, "Report to Congress on Sea-launched Nuclear Cruise Missile," *USNI News*, 25 April 2022, https://news.usni.org/2022/04/27/report-to-congress-on-sea-launched-nuclear-cruise-missile.

[5] U.S. Department of Defense, *The Nuclear Posture Review*, 2010, viii.

[6] U.S. Department of Defense, *The Nuclear Posture Review*, 2018, 38.

[7] Ibid. XI.

[8] U.S. Department of Defense, *The Nuclear Posture Review*, 2022, 11; Joseph Biden, *National Security Strategy*, 2022, 21.

cancellation of the SLCM-N.[9] Thus, limited capabilities remain in the DOD arsenal to deter with LYBNW, leaving current US nuclear deterrent capabilities as the "absolute minimum.[10]"

The SLCM-N is one nuclear asset capable of helping increase signaling, deterrence, and nuclear warfighting. The SLCM-N is a LYBNW based on the Tomahawk Land Attack Missile launchable from any Vertical Launch System (VLS) cell, whether on land, on a surface Naval vessel, or aboard a submarine. As an LYBNW, SLCM-N is a nuclear weapon with a payload below 15 kilotons that targets enemy surface forces. It seeks not to achieve decisive effects at the strategic level but instead to support objectives at the tactical and operational level of war in its employment and to deter adversaries from escalating to higher levels of nuclear use.[11] Yet, SLCM-N alone cannot fill the gap. The expansion of the W76-2 LYBNW and ensuring the ability to mate a nuclear warhead with the US Army Long-Range Hypersonic Weapon (LRHW) will also grant capabilities in penetrating underground facilities (UGF) and High-Altitude Electromagnetic Pulse (HEMP) capabilities. By investing in all these capabilities, the US can fill the current gap in US LYBNW capability.

Counterargument

Current policymakers in the executive branch argue there is no need for additional low-yield battlefield ship and shore-based nuclear weapons. They contend we ought to reduce nuclear capability as the threat does not require it. In lieu of a LYBNW response, the current

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[9] U.S. Department of Defense, *The Nuclear Posture Review*, 2022, 20-21.

[10] John Grady, "Joint Chiefs Vice Chair, STRATCOM CO Still In Favor of Navy Nuclear Cruise Missile," *USNI News*, 5 May 2022, https://news.usni.org/2022/05/05/joint-chiefs-vice-chair-stratcom-co-still-in-favor-of-navy-nuclear-cruise-missile.

[11] Louis J. Crist, "NATO and the Low-Yield Battlefield Nuclear Weapons," (*School of Advanced Military Studies*), vii.

administration reasons that having the SLCM-N would lead to an increased risk of total nuclear war.[12] As a "nuclear war cannot be won and must never be fought," the administration seeks to reduce nuclear weapons.[13] The administration remains convinced that the current nuclear deterrent is sufficient. Instead, the administration wants to employ non-nuclear means, such as cyber and EW, found in integrated deterrence to prevent adversary attacks.[14] This leads to the desire to cancel the last earth-penetrating nuclear weapon and the SLCM-N.[15]

Rebuttal

Nevertheless, the times have changed in the international security environment as competitors do not view nuclear weapons doctrinally as tools of last resort, nor are they reducing their dependency upon them. The revanchist Russian state continues to expand their nuclear

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[12] General John E. Hyten, "Testimony," Committee on Armed Services United States Senate, *Hearing to Receive Testimony on United States Strategic Command in review of the Defense Authorization request for Fiscal Year 2019 and the Future Years Defense Program*, 115 Cong., 2d sess., 2018.

[13] Peter Vincent Pry, "Nuclear Sea-Launched Cruise Missile: Badly Needed for Deterrence," *Gatestone Institute*, 22 June 2022, https://www.gatestoneinstitute.org/18629/nuclear-sea-launched-cruise-missile; U.S. White House, "Joint Statement of the Leaders of the Five Nuclear-Weapon States on Preventing Nuclear War and Avoiding Arms Races," 3 January 2022, https://www.whitehouse.gov/briefing-room/statements-releases/2022/01/03/p5-statement-on-preventing-nuclear-war-and-avoiding-arms-races/.

[14] Peter Juul, "The Trouble with 'Integrated Deterrence'," *The Liberal Patriot*, 30 March 2022, https://www.liberalpatriot.com/p/the-trouble-with-integrated-deterrence; John Grady, "Joint Chiefs Vice Chair, STRATCOM CO Still In Favor of Navy Nuclear Cruise Missile," *USNI News*, 5 May 2022, https://news.usni.org/2022/05/05/joint-chiefs-vice-chair-stratcom-co-still-in-favor-of-navy-nuclear-cruise-missile.

[15] U.S. Department of Defense, "Senior Defense Officials Hold a Background Briefing on the National Defense Strategy," 27 Oct 2022; Bryant Harris, "Republicans lay battle lines over Biden's plan to retire B83 megaton bomb," *Defense News*, 19 May 2022, https://www.defensenews.com/congress/budget/2022/05/19/republicans-lay-battle-lines-over-bidens-plan-to-retire-b83-megaton-bomb/.

capabilities and due to the degradation of their conventional capability in Ukraine are more likely to lean upon nuclear arms for security. The People's Republic of China (PRC) has also increased their nuclear capability and capacity at an unexpectedly high rate. Not only have the PRC increased their arsenal, but their doctrine has underwent significant changes that make nuclear use more likely. Even the 2022 National Security Strategy acknowledges, "Our competitors and potential adversaries are investing heavily in new nuclear weapons.[16]" The current threat environment requires additional US investment in LYBNW to prevent hostile actors from using LYBNW as an asymmetric advantage.[17] Due to the risk of growing nuclear arsenals amongst strategic competitors, the US must adapt additional tools to support deterrence and warfighting.

Russia presents a significant LYBNW threat that the United States is currently unprepared to handle. The Russians do not see nuclear, biological, and chemical weapons as a purely deterrent capability but instead as a warfighting mechanism.[18] The US assesses it is likely Russia trains to and would use LYBNW not to "escalate to deescalate," but to "escalate to win

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[16] Joseph Biden, *National Security Strategy*, 2022, 21.

[17] Peter Juul, "The Trouble with 'Integrated Deterrence'," *The Liberal Patriot*, 30 March 2022, https://www.liberalpatriot.com/p/the-trouble-with-integrated-deterrence; John Grady, "Joint Chiefs Vice Chair, STRATCOM CO Still In Favor of Navy Nuclear Cruise Missile," *USNI News*, 5 May 2022, https://news.usni.org/2022/05/05/joint-chiefs-vice-chair-stratcom-co-still-in-favor-of-navy-nuclear-cruise-missile; U.S. Department of Defense, "Senior Defense Officials Hold a Background Briefing on the National Defense Strategy," 27 Oct 2022; Fabian Hoffman and William Alberque "Non-Nuclear Weapons with Strategic Effect: New Tools of Warfare," *IISS*, 31 March 2022, https://www.iiss.org/blogs/research-paper/2022/03/non-nuclear-weapons-with-strategic-effect-new-tools-of-warfare.

[18] U.S. Department of Defense, *The Nuclear Posture Review*, 2018, XII; William B. Caldwell, "The Intermediate-Range Nuclear Forces (INF) Treaty: An Operational Error," (*School of Advanced Military Studies*), 16; U.S. Department of State, "Strengthening Deterrence and Reducing Nuclear Risks, Part II: The Sea-Launched Nuclear Cruise Missile-Nuclear (SLCM-N)," *Arms Control and International Security Papers* 1, 11 (July 2020).

on the battlefield" due to not only a qualitative advantage, but a ten to one quantitative advantage in LYBNW.[19] Russia depends on nuclear weapons for their defense and see them as an asymmetric advantage against a US with an older, less flexible, and degrading capability arsenal.[20] The Russians have maintained, expanded, and tested new capabilities to deliver tactical and theater level nuclear weapons.[21] Thus, the lack of American capability reduces the nuclear threshold by creating an incentive for Russian use due to the Russian asymmetric LYBNW nuclear advantage (see figure 1).

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[19] General John E. Hyten, "Testimony," Committee on Armed Services United States Senate, *Hearing to Receive Testimony on United States Strategic Command in review of the Defense Authorization request for Fiscal Year 2019 and the Future Years Defense Program*, 115 Cong., 2d sess., 2018, 22-23; U.S. Department of Defense, *The Nuclear Posture Review*, 2022, 5; Peter Brookes, "Russia's Small Nukes are a Big Problem for European Security," *The Heritage Foundation*, 17 Jun 2022, https://www.heritage.org/global-politics/commentary/russias-small-nukes-are-big-problem-european-security; Justin R. Nash, "Future Offensive Capabilities for Low-Yield Nuclear Deterrence," (*School of Advanced Military Studies*), 10-11; Zachary L. Morris, "Emerging U.S. Army Doctrine Dislocated with Nuclear-Armed Adversaries and Limited War," *Military Review*, January-February 2019, https://www.armyupress.army.mil/Portals/7/military-review/Archives/English/JF-19/Morris-Emerging-Army-Doctrine.pdf, 29-30.

[20] U.S. Department of Defense, *The Nuclear Posture Review*, 2018, I, XII; Michael D. Maginness, "Dynamic Deterrence: The Modernization of Nuclear Deterrence to Meet Dynamic Future Threats," (*School of Advanced Warfighting*), https://usmc.primo.exlibrisgroup.com/view/delivery/01USMCU_INST/1246436530005241, 8.

[21] Eric Schlosser, "What If Russia Uses Nuclear Weapons in Ukraine?" *The Atlantic*, 20 June 2022, https://www.theatlantic.com/ideas/archive/2022/06/russia-ukraine-nuclear-weapon-us-response/661315/; U.S. Department of Defense, *The Nuclear Posture Review*, 2018, 6.

Figure 1: Russian Non-Strategic Nuclear Modernization

The PRC also in a nuclear breakout creating the new challenge of a tri-partite great power nuclear deterrence problem.[23] Traditionally, the PRC sought to maintain minimal deterrence against American power.[24] In 2022, the PRC affirmed they had no desire to enter a nuclear arms race.[25] Yet, the PRC doubled its nuclear arsenal in the last year with a rate that "rivals the biggest

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[22] Department of Defense, "Nuclear Deterrence: America's Foundation and Backstop for National Defense," April 6, 2020, https://media.defense.gov/2020/Apr/07/2002276858/-1/-1/1/NUCLEAR-DETERRENCE-AMERICAS-FOUNDATION-AND-BACKSTOP-FOR-NATIONAL-DEFENSE.pdf.

[23] U.S. Department of Defense, *The Nuclear Posture Review*, 2022, 4; Joe Gould, "US Nuclear Forces Chief "Very Concerned" by Russia-China Cooperation," *DefenseNews*, 8 March 2022, https://www.defensenews.com/pentagon/2022/03/08/us-nuclear-forces-chief-very-concerned-by-russia-china-cooperation/.

[24] Gerald C. Brown, "Understanding the Risks and Realities of China's Nuclear Forces," *Arms Control Today*, June 2021, https://www.armscontrol.org/act/2021-06/features/understanding-risks-realities-chinas-nuclear-forces.
Department of Defense, "Nuclear Deterrence: America's Foundation and Backstop for National Defense," April 6, 2020, https://media.defense.gov/2020/Apr/07/2002276858/-1/-1/1/NUCLEAR-DETERRENCE-AMERICAS-FOUNDATION-AND-BACKSTOP-FOR-NATIONAL-DEFENSE.pdf.

expansion of any nation" that puts the PRC on course to achieve parity in deployed capability with the US by 2035.[26] This includes going from 0 to 360 ICBM silos, doubling mobile missile launchers, increasing more capable ballistic missile submarines, maintaining Enhanced Radiation Weapon (ERW) capability, and creating air-launched nuclear missiles on top of their minimum existing number of 150 tactical nuclear missiles (see Figure 2, Figure 3).[27] This is further complicated by a lack of transparency in the PRC's nuclear arsenal as well as issues with effective strategic dialogue, back channels, and crisis management between the US and the PRC.[28] Thanks to this expansion of nuclear capabilities, the PRC will present an ever greater challenge to deter with current capabilities.

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[25] U.S. Department of Defense, *The Nuclear Posture Review*, 2022, 2.

[26] Ibid. 4. John Grady, "Joint Chiefs Vice Chair, STRATCOM CO Still In Favor of Navy Nuclear Cruise Missile," *USNI News*, 5 May 2022, https://news.usni.org/2022/05/05/joint-chiefs-vice-chair-stratcom-co-still-in-favor-of-navy-nuclear-cruise-missile.

[27] John Grady, "Joint Chiefs Vice Chair, STRATCOM CO Still In Favor of Navy Nuclear Cruise Missile," *USNI News*, 5 May 2022, https://news.usni.org/2022/05/05/joint-chiefs-vice-chair-stratcom-co-still-in-favor-of-navy-nuclear-cruise-missile. U.S. Department of Defense, *Military and Security Developments Involving the People's Republic of China 2022*, 94, 99. Daniel G. Beck, "China's Low-Yield Battlefield Nuclear Weapons: A Threat Assessment," (*School of Advanced Military Studies*), 4-7. Jonathan Ray, "Red China's "Capitalist Bomb": Inside the Chinese Neutron Bomb Program," *China Strategic Perspectives* 8, (Jan 2015): 6. David C. Logan, "Making Sense of China's Missile Forces," in *Chairman Xi remakes the PLA Assessing Chinese Military Reforms*," ed. Phillip C. Saunders, Arthur S. Ding, Andrew Scobell, Andrew N.D. Yang, and Joel Wuthnow, (Washington D.C., National Defense University Press, 2019), 397-399.

[28] U.S. Department of Defense, *The Nuclear Posture Review*, 2022, 13, 17; U.S. Department of Defense, *Military and Security Developments Involving the People's Republic of China 2022*, IX, 95, 97, 98; Keir A. Lieber and Daryl G. Press, "The New Era of Counterforce: Technological Change and the Future of Nuclear Deterrence," *International Security* 41, 4 (April 2017): 17; U.S. Department of Defense, "Senior Defense Officials Hold a Background Briefing on the National Defense Strategy," 27 Oct 2022.

	No. of launchers	Year deployed	Range (km)	Warheads and est. yield (kt)	No. of Warheads
LAND-BASED BALLISTIC MISSILES					
DF-4	6	1980	5,500	1 x 3,300	6
DF-5A	10	1981	12,000	1 x 4,000–5,000	10
DF-5B	10	2015	13,000	5 x 200–300	50
DF-5 C	*?*	*(2020)*	*13,000*	*(multiple)*	*?*
DF-15	?	1990	600	?	?
DF-17	*(18)*	*(2021)*	*1,800+*	*1 x hypersonic glide vehicle*	*?*
DF-21A/E	40	2000, 2016	1,750-2,150	1 x 200–300	40
DF-26	100	2016	4,000	1 x 200–300	20
DF-31	6	2006	7,200	1 x 200–300	6
DF-31A	36	2007	11,200	1 x 200–300	36
DF-31AG	36	2018	11,200	1 x 200–300	36
DF-41	*(18)*	*(2021)*	*12,000*	*(3 x 200–300)*	*(54)*
SUB-BASED					
JL-2	4 subs, 48 launchers	2016	7,000+	1 x 200–300	48
	(2 subs, 24 launchers)	*(2021)*	*7,000+*	*1 x 200–300*	*(24)*
AIRCRAFT					
H-6 Bomber	20	1965/2009	3,100+	1 x bomb	20
TOTAL	**312 *(372)***				***272 (350)***

Figure 2: PRC Nuclear Capabilities[29]

[29] Gerald C. Brown, "Understanding the Risks and Realities of China's Nuclear Forces," *Arms Control Today*, June 2021, https://www.armscontrol.org/act/2021-06/features/understanding-risks-realities-chinas-nuclear-forces.

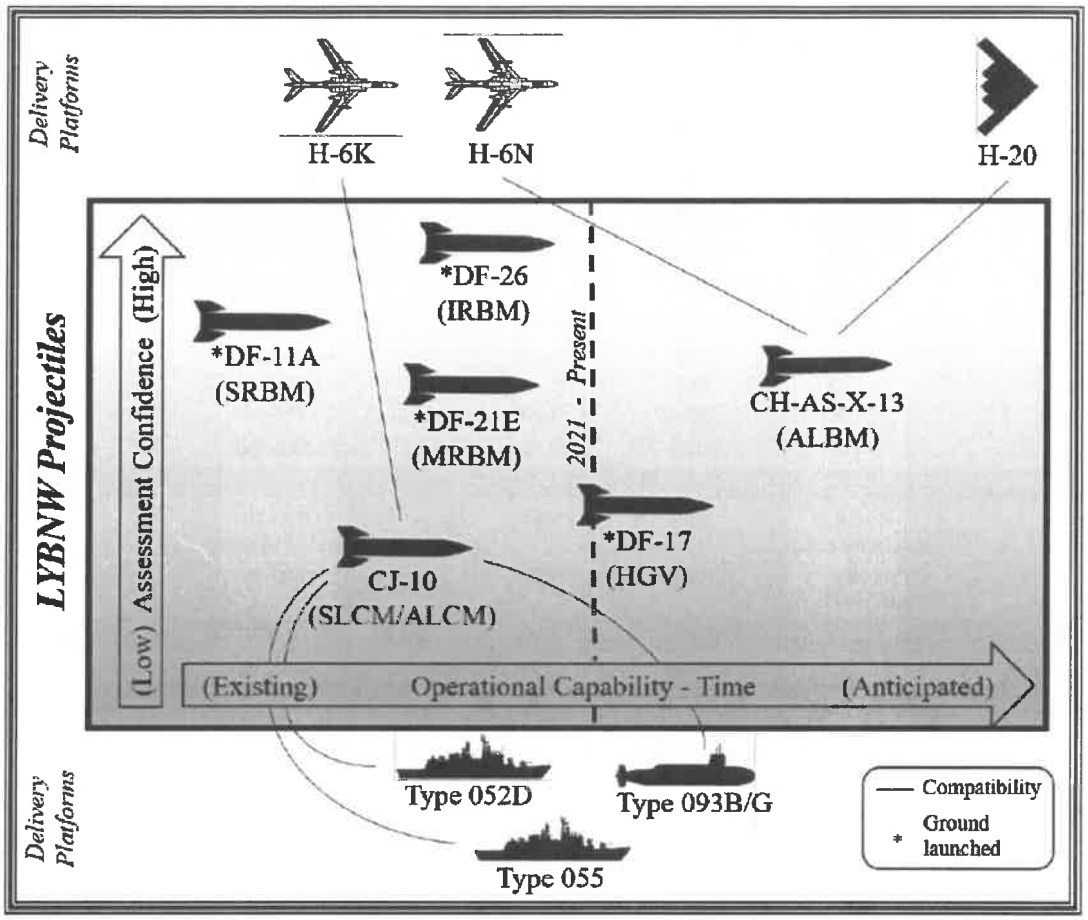

Figure 3: PRC LYBNW Delivery Mechanisms[30]

PRC doctrine has also become more aggressive. The PRC likely sees any war with the US as existential, leading to an increased likelihood of nuclear use by China.[31] The Chinese nuclear doctrine altered as the Rocket Force, handling both nuclear and conventional missiles,

[30] Daniel G. Beck, "China's Low-Yield Battlefield Nuclear Weapons: A Threat Assessment," (*School of Advanced Military Studies*), 27.

[31] Ibid. 12, 41. Zachary L. Morris, "Emerging U.S. Army Doctrine Dislocated with Nuclear-Armed Adversaries and Limited War," *Military Review*, January-February 2019, https://www.armyupress.army.mil/Portals/7/military-review/Archives/English/JF-19/Morris-Emerging-Army-Doctrine.pdf, 29. Gerald C. Brown, "Understanding the Risks and Realities of China's Nuclear Forces," *Arms Control Today*, June 2021, https://www.armscontrol.org/act/2021-06/features/understanding-risks-realities-chinas-nuclear-forces.

grows in prominence and funding.[32] The Rocket Force accepted an aggressive missile use policy where nuclear missiles have the preemptive strike doctrine of their conventional munitions.[33] PRC writings believe using precise small-yield nuclear weapons would allow for controlled nuclear weapons employment in war, ultimately lowering the cost of war.[34] Moreover, despite protestations against US ballistic missile defense (BDM) and statements they did not seek Anti-Satellite Weapons, China made significant investments in both, likely seeking to remove US nuclear early warning as well as to defeat US retaliatory nuclear strikes.[35] Furthermore, the Chinese stated they believe their "No-First Use" doctrine does not apply when dealing with Taiwan or "defensive" scenarios.[36] Chinese defense papers have also discussed using an

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[32] Phillip C. Saunders, Arthur S. Ding, Andrew Scobell, Andrew N.D. Yang, and Joel Wuthnow, ed., *Chairman Xi Remakes the PLA Assessing Chinese Military Reforms* (Washington D.C.: National Defense University Press, 2019), 5, 421-422.

[33] David C. Logan, "Making Sense of China's Missile Forces," in *Chairman Xi remakes the PLA Assessing Chinese Military Reforms*," ed. Phillip C. Saunders, Arthur S. Ding, Andrew Scobell, Andrew N.D. Yang, and Joel Wuthnow, (Washington D.C., National Defense University Press, 2019), 417-418; Ian Burns McCaslin and Andrew S. Erickson, "The Impact of Xi-Era reforms on the Chinese Navy," in *Chairman Xi remakes the PLA Assessing Chinese Military Reforms*," ed. Phillip C. Saunders, Arthur S. Ding, Andrew Scobell, Andrew N.D. Yang, and Joel Wuthnow, (Washington D.C., National Defense University Press, 2019), 144; U.S. Department of Defense, *Military and Security Developments Involving the People's Republic of China 2022*, 35-37.

[34] U.S. Department of Defense, *Military and Security Developments Involving the People's Republic of China 2022*, 99.

[35] Jonathan Ray, "Red China's "Capitalist Bomb": Inside the Chinese Neutron Bomb Program," *China Strategic Perspectives* 8, (Jan 2015): 33-34; U.S. Department of Defense, *The Nuclear Posture Review*, 2018, 11.

[36] John Grady, "Joint Chiefs Vice Chair, STRATCOM CO Still In Favor of Navy Nuclear Cruise Missile," *USNI News*, 5 May 2022, https://news.usni.org/2022/05/05/joint-chiefs-vice-chair-stratcom-co-still-in-favor-of-navy-nuclear-cruise-missile; Justin R. Nash, "Future Offensive Capabilities for Low-Yield Nuclear Deterrence." (*School of Advanced Military Studies*), 18-20; Lacy H. Bartee Jr., "Possible U.S. Navy Responses to People's Republic of China Military Action Against Taiwan," (master's thesis, U.S. Army Command and General Staff College), 4-5/

"escalate to deescalate" employment of nuclear weapons with nuclear preemption playing a central role in "Active Defense.[37]" The People's Liberation Army (PLA) now considers HEMP in the category of a paralyzing information warfare rather than falling into the realm of nuclear warfare.[38] These more aggressive stances in PRC doctrine increase the risk associated with their growing arsenal while simultaneously impelling action to deter the use of their new arsenal.

The combination of growing capability, capacity, and more aggressive doctrine raises the risks of nuclear employment by American adversaries due to their ever-increasing superiority in LYBNW (See Figure 4). Russian capability, particularly in LYBNW, presents a challenge the US nuclear arsenal is unprepared to counter. PRC nuclear expansion creates a new tri-partite nuclear balance that current nuclear posture, doctrine, and capability is not balanced to deter. Combined with PRC's new doctrine for the employment of nuclear arms this poses a requirement to expand US nuclear deterrent options to prevent the use of competitor nuclear weapons and to win if competitors turn themselves into adversaries. Therefore, the DOD needs to reevaluate the SLCM-N's ability to provide policymakers with additional options to signal resolve, improve deterrence, and provide unique warfighting potential.

Daniel G. Beck, "China's Low-Yield Battlefield Nuclear Weapons: A Threat Assessment," (*School of Advanced Military Studies*), 21-25.

[37] Christopher J. Mihal, "Understanding the People's Liberation Army Rocket Force Strategy, Armament, and Disposition," Military Review, July-August 2021, https://www.armyupress.army.mil/Portals/7/military-review/Archives/English/JA-21/Mihal-PLA-Rocket-Force-v1.pdf, 27-28; Daniel G. Beck, "China's Low-Yield Battlefield Nuclear Weapons: A Threat Assessment," (*School of Advanced Military Studies*), 15-16.

[38] Daniel G. Beck, "China's Low-Yield Battlefield Nuclear Weapons: A Threat Assessment," (*School of Advanced Military Studies*), 29-30.

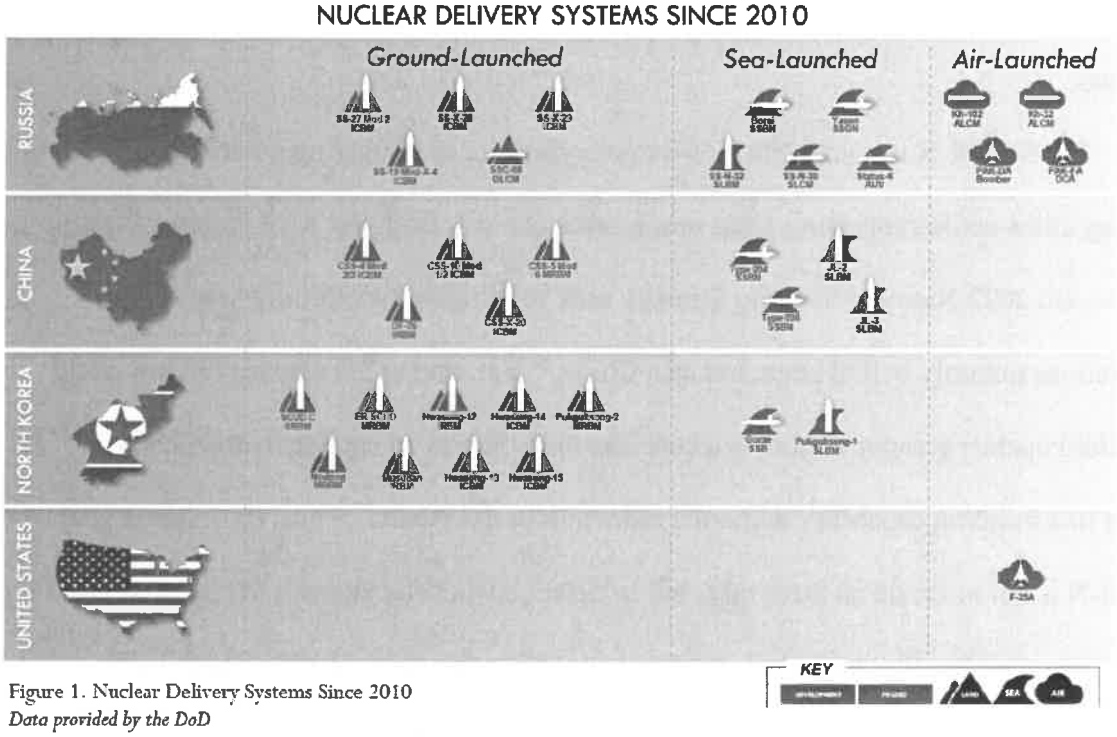

Figure 1. Nuclear Delivery Systems Since 2010
Data provided by the DoD

Figure 4: Increasing Disparity in Nuclear Delivery Systems since 2010[39]

Nuclear Signaling

To deal with the new operating environment, the acquisition of LYBNW provides policymakers further options to signal competitors. LYBNW acquisition historically drove successful arms control negotiations and can do so again while lessening the risks of nuclear proliferation. Merely having LYBNW in armed conflict also serves to support negotiation within an armed conflict. Perhaps more central, LYBNW provide policymakers with greater options to signal prior to an armed conflict to support deterrence. Of special interest to the Naval Department, LYBNW grant greater signaling and deterrence value particularly to naval forces. Due to these particular and unique strengths of LYBNW to support signaling, the US should

[39] U.S. Department of Defense, *The Nuclear Posture Review*, 2018, 8.

continue development of SLCM-N and other LYBNW to preserve a just peace and successfully end wars.

The SLCM-N is a valuable tool for policymakers in mitigating nuclear proliferation by assuring allies while supporting great power arms control. Both the 2018 Nuclear Posture Review and 2022 National Security Strategy seek to mitigate risk through arms control negotiations not only with Russia, but also China.[40] Yet, due to the disparity in low-yield battlefield nuclear weapons, there is a lack of a tailored way to engage in arms control.[41] The US cannot halt building capability without a reduction in the threat.[42] Thus, the explicit goal of the SLCM-N is not to create an arms race, but to deter conflict and signal a desire to engage in arms control negotiations.[43] A historical instance supporting this method is the Dual-Track Intermediate-Range Nuclear Forces (INF) methodology of the 1980s where the US pursued nuclear Ground Launched Cruise Missile (GLCM) and Pershing II Intermediate-Range Ballistic Missile (IRBM) to counter the new Soviet SS-20 IRBM and Backfire Bomber while

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[40] Ibid. 39. Joseph Biden, *National Security Strategy*, 2022, 25.

[41] U.S. Department of State, "Strengthening Deterrence and Reducing Nuclear Risks, Part II: The Sea-Launched Nuclear Cruise Missile-Nuclear (SLCM-N)," *Arms Control and International Security Papers* 1, 11 (July 2020).

[42] General John E. Hyten, "Testimony," Committee on Armed Services United States Senate, *Hearing to Receive Testimony on United States Strategic Command in review of the Defense Authorization request for Fiscal Year 2019 and the Future Years Defense Program*, 115 Cong., 2d sess., 2018, 21-22, 63.

[43] U.S. Department of State, "Strengthening Deterrence and Reducing Nuclear Risks, Part II: The Sea-Launched Nuclear Cruise Missile-Nuclear (SLCM-N)," *Arms Control and International Security Papers* 1, 11 (July 2020), 3, 7.

simultaneously engaging in arms control negotiations.[44] Thus, the SLCM-N gives the US a position from which to bargain in order to both create an equilibrium while also seeking arms control reductions to lower the risk of nuclear conflict.

The SLCM-N supports signaling and negotiations amid crises or even wars. Critical to crisis and war termination is the eventual compromise of both sides to accept terms for the re-establishment of peace. SLCM-N is essential to enable multiple options and gradualism in nuclear weapons employment while avoiding the full use of nuclear weapons. Without LYBNW, it becomes infeasible to hold the threat of violence in reserve during the conflict. The SLCM-N would, then, grant off-ramps if the conflict escalated to the nuclear level so that the US would be able to signal as it fights.[45] This is particularly critical as China and Russia would consider any war with the US an existential conflict.[46] A compelling historical example of using nuclear weapons in this methodology was Eisenhower's employment of threats to employ nuclear weapons to compel war termination by the Chinese and North Korean Communists in 1953.[47] Thus, the SLCM-N enables negotiation and signaling during war.

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[44] Russell R. Sherrett, "The Dual Track Decision and the intermediate-Range Nuclear Force Treaty The Role of the Cruise and Pershing II Missiles," (master's thesis, U.S. Army Command and General Staff College), 2-3, 5, 24, 77-78.

[45] Peter J. Schifferle, "The Ia Drang Campaign 1965: A Successful Operational Campaign or Mere Tactical Failure," (*School of Advanced Military Studies*), 26; Paul Tiberi, "Encircled Forces: The Neglected Phenomenon of Warfare," (master's thesis, U.S. Army Command and General Staff College), 9; Stephen J. Cimbala, "Nuclear-Crisis Management and Cyber War—A Dangerous Crossroads," *Naval War College Review* 75, No. 1 (2022), https://digital-commons.usnwc.edu/cgi/viewcontent.cgi?article=8246&context=nwc-review, 48-49.

[46] Daniel G. Beck, "China's Low-Yield Battlefield Nuclear Weapons: A Threat Assessment," (*School of Advanced Military Studies*), 46-47.

[47] Angelo M. Codevilla, "Make America Victorious Again," *Claremont Review of Books*, 18 Oct 2016, https://claremontreviewofbooks.com/digital/make-america-victorious-again/.

The SLCM-N also provides improved signaling options than current capabilities. Current signaling options for ballistic missile submarines are minimal due to the need to hide them for a secure second strike or risk exposing them through nuclear signaling. [48] To employ the low-yield W76-2 ballistic missile would require the US to expose and risk an SSBN, thus reducing the weapon's credibility. The nuclear aviation capabilities are similarly limited in signaling as they have limited time on station in a crisis. ICBMs in silos lack the psychological impact of a physical presence in the region and similarly lack credibility in anything below a general nuclear war.

In contrast, the SLCM-N enables naval surface ships, attack submarines, and Fleet Marine Force units to have the capability of signaling resolve with a nuclear device.[49] Naval assets provide particular flexibility in signaling since they are easier to deploy, both logistically and politically, than ground forces, do not require host nation assent, tend to be more credible to employ in kinetic and non-kinetic methods, and also enable the policymaker to relieve coercive pressure by withdrawing the naval forces.[50] Undersea forces also provide a valuable signaling option as the stealth can allow an adversary to back down without losing face as the US can

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[48] Michael D. Maginness, "Dynamic Deterrence: The Modernization of Nuclear Deterrence to Meet Dynamic Future Threats," (*School of Advanced Warfighting*), https://usmc.primo.exlibrisgroup.com/view/delivery/01USMCU_INST/1246436530005241, 14.

[49] John R. Harvey and Robert Soofer, "Strengthening deterrence with SLCM-N," *Atlantic Council*, November 2022, https://www.atlanticcouncil.org/wp-content/uploads/2022/11/Strengthening-Deterrence-with-SLCM-N.pdf, 6-7.

[50] Julian Corbett, *Some Principles of Maritime Strategy* (Newport, RI: United States Naval Institute, 1988), 66; James Cable, *Gunboat Diplomacy, 1919–1991,* 3rd ed. (Basingstoke, U.K.: Macmillan, 1994), 14, 20-22; Edward N. Luttwak, *The Political Uses of Sea Power* (Baltimore: Johns Hopkins Univ. Press, 1974), 7, 47.

privately signal to an adversary by moving a nuclear-armed submarine into the theater.[51] The addition of the SLCM-N thus gives the policymaker additional options that increase the range of coercive options to solve issues short of nuclear war.

Due to the specific nature of LYBNW, it supports policymakers by granting them alternate signaling options. Just as the Dual-Track Decision in the 1980s gave impetus to the INF Treaty, wise LYBNW acquisition could halt a growing nuclear arms race. LYBNW further support the successful termination of wars through providing policymakers greater escalation options. At the same time, LYBNW provide tools to signal competitors to deter actions that would lead to armed conflict. As LYBNW are of particular value when applied to maritime forces, the US should acquire SLCM-N and greater LYBNW capabilities.

Nuclear Deterrence with LYBNW

Acquiring LYBNW to include the SLCM-N improve extended deterrence. Wise use of nuclear arms historically preserves the peace while also defending US interests. The US requires appropriate capability, credibility, and communication to deter potential adversaries. LYBNW such as SLCM-N provide greater and different capability to deter the growing gap in LYBNW between the US and competitors. LYBNW also give a more credible threat than strategic nuclear weapons to both reassure allies and deter competitors. LYBNW further supports deterrence by granting more possibilities to policymakers to communicate intentions to competitors. By acquiring LYBNW like SLCM-N, the US will improve its ability to prevent hostile acts against its partners, allies, and, ultimately, the American homeland.

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[51] Chao, Brian C. and Hyun-Binn Cho. 2022. "Security in the Asia-Pacific and Signaling at Sea." International Relations of the Asia-Pacific 22 (3): 17-18.

LYBNW serve deterrence by convincing competitors decisionmakers that war is not a useful option, and thus preserving a just peace. The goal of deterrence with nuclear weapons is to ultimately "Convince adversaries they have nothing to gain and everything to lose from the use of nuclear weapons" while also halting non-nuclear aggression against the interests of the US and allies.[52] Historically, the possession of nuclear weapons in the world has served to prevent major great power conflict and mitigate medium power conflict thanks to extended deterrence.[53] As Figure 5 shows, the percentage of wartime fatalities significantly decreased even as the tools of destruction grew, largely due to the effective use of deterrence. If used appropriately to deter, US nuclear forces are a tool for peace. "As long as nuclear arsenals are survivable, that is, able to withstand an enemy's first strike and retaliate, nuclear weapons are a tremendous force for peace.[54]" Yet, the US can only do this so long as its LYBNW deterrence remains capable, credible, and effective in its communication to prevent adversaries from seeking to broach the nuclear threshold with LYBNW of their own.

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[52] Ibid. II.

[53] U.S. Department of Defense, *The Nuclear Posture Review*, 2018, V-VI.

[54] Keir A Lieber and Daryl G. Press, "The New Era of Counterforce: Technological Change and the Future of Nuclear Deterrence," *International Security* 41, 4 (April 2017): 13.

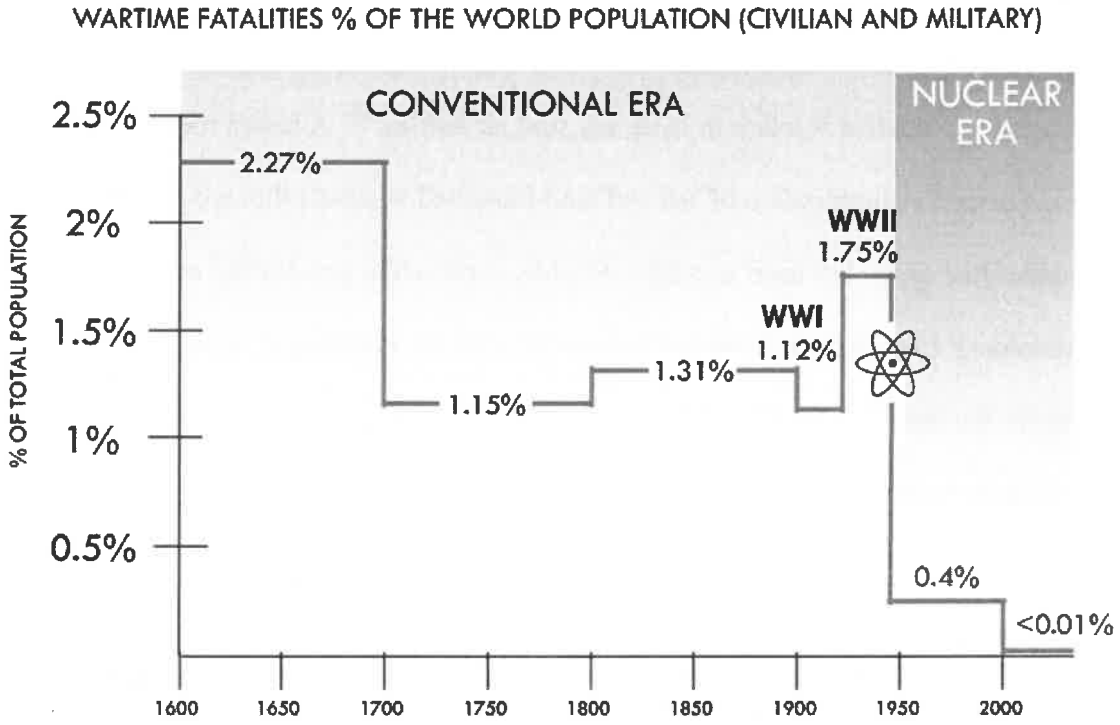

Figure 2. Wartime Fatalities Percentage of World Population
Data from the DoD Historical Office

Figure 5: Wartime Fatalities as a Percentage of the World Population[55]

The SLCM-N and other LYBNW are a step towards creating an affordable method to restore the capability of US deterrence. Superior American capability encourages adversaries to recognize that there are "no possible benefits from non-nuclear aggression or limited nuclear escalation.[56]" In order to have the capability to deter, the enemy must measure our strength and assume that they cannot use brute force alone to achieve their objectives.[57] Currently, the

[55] U.S. Department of Defense, *The Nuclear Posture Review*, 2018, 17.

[56] Ibid. VII.

[57] Thomas C. Schelling, *Arms and Influence*, (New Haven and London, Ct: Veritas Paperback, 2020) Pg. 1-3.

available Dual-Capable Aircraft (DCA) and Fleet Ballistic Missile Submarine (SSBN) with low-yield weapons are unlikely to effectively deliver ordnance to targets in the face of adversary Anti-Access/Area Denial (A2/AD) capabilities.[58] Due to this weakness, Russia "may exploit by waging nonstrategic nuclear warfare in land, sea, and air battles.[59]" A tested method to rebuild capability is through a combination of sea and land-launched weapons that are persistent, mobile, and survivable. Just as the US used accurate, reliable, survivable, penetrating nuclear capabilities like the Tomahawk Land Attack Missile-Nuclear (TLAM-N), Pershing II, and GLCM to get more "bang for the buck" in the Cold War, the SLCM-N would grant capability the enemy would be unlikely to defeat with their defenses or a preemptive strike.[60] The SLCM-N is

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[58] U.S. Department of State, "Strengthening Deterrence and Reducing Nuclear Risks, Part II: The Sea-Launched Nuclear Cruise Missile-Nuclear (SLCM-N)," *Arms Control and International Security Papers* 1, 11 (July 2020), 5; Marshall Hoyler, "2010 China's "Antiaccess" Ballistic Missiles and U.S. Active Defense," *Naval War College Review* 63, 4, 2022, https://digital-commons.usnwc.edu/cgi/viewcontent.cgi?article=1714&context=nwc-review, 84-85; William B. Caldwell, "The Intermediate-Range Nuclear Forces (INF) Treaty: An Operational Error," (*School of Advanced Military Studies*), 28; Justin R Nash, "Future Offensive Capabilities for Low-Yield Nuclear Deterrence." (*School of Advanced Military Studies*), 23; Peter Vincent Pry, "Nuclear Sea-Launched Cruise Missile: Badly Needed for Deterrence," *Gatestone Institute*, 22 June 2022, https://www.gatestoneinstitute.org/18629/nuclear-sea-launched-cruise-missile; U.S. Department of Defense, *The Nuclear Posture Review*, 2018, 7; John Grady, "Joint Chiefs Vice Chair, STRATCOM CO Still In Favor of Navy Nuclear Cruise Missile," *USNI News*, 5 May 2022, https://news.usni.org/2022/05/05/joint-chiefs-vice-chair-stratcom-co-still-in-favor-of-navy-nuclear-cruise-missile; Michael D. Maginness, "Dynamic Deterrence: The Modernization of Nuclear Deterrence to Meet Dynamic Future Threats," (*School of Advanced Warfighting*), https://usmc.primo.exlibrisgroup.com/view/delivery/01USMCU_INST/1246436530005241, 11.

[59] Peter Vincent Pry, "Nuclear Sea-Launched Cruise Missile: Badly Needed for Deterrence," *Gatestone Institute*, 22 June 2022, https://www.gatestoneinstitute.org/18629/nuclear-sea-launched-cruise-missile.

[60] Edward G. Ferguson, "Tactical Nuclear Weapons: Their Purpose and Placement," (*School of Advanced Air and Space Studies*), 12; Russell R Sherrett, "The Dual Track Decision and the intermediate-Range Nuclear Force Treaty The Role of the Cruise and Pershing II Missiles," (master's thesis, U.S. Army Command and General Staff College), 14; William B. Caldwell, "The Intermediate-Range Nuclear Forces (INF) Treaty: An Operational Error," (*School of Advanced Military Studies*), 42; John R. Harvey and Robert Soofer, "Strengthening deterrence

relatively affordable, costing 9 billion to field by 2028, as its design derives from existing technology and gains more capability for less cost than conventional Precision Guided Munitions (PGMs).[61] The Block V *Virginia*-class Guided Missile Submarines (SSGN), each with 40 VLS cells, is already designed.[62] Marine and Army mobile ground launchers capable of launching SLCM-N, already purchased, have greater survivability and cost far less than an F-15, F-35, B-2, or B-21 and their associated support.[63] Both sea and land platforms are cheaper, support improved capability, are already in theater, are more prompt in ordnance delivery, can remain in the region for the duration of a crisis, and their payload is difficult to intercept by an A2/AD umbrella.[64] Therefore, SLCM-N gives a "proportional, discriminate response based on

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with SLCM-N," *Atlantic Council*, November 2022, https://www.atlanticcouncil.org/wp-content/uploads/2022/11/Strengthening-Deterrence-with-SLCM-N.pdf, 6-7; U.S. Department of Defense, *The Nuclear Posture Review*, 2022, 9.

[61] John R. Harvey and Robert Soofer, "Strengthening deterrence with SLCM-N," *Atlantic Council*, November 2022, https://www.atlanticcouncil.org/wp-content/uploads/2022/11/Strengthening-Deterrence-with-SLCM-N.pdf, 3-4; Peter Vincent Pry, "Nuclear Sea-Launched Cruise Missile: Badly Needed for Deterrence," *Gatestone Institute*, 22 June 2022, https://www.gatestoneinstitute.org/18629/nuclear-sea-launched-cruise-missile; Robert H Vokac, "Smart Weapons—Can We Fold the Nuclear Umbrella," (*School of Advanced Military Studies*), 30-34.

[62] Douglas Barrie, Nick Childs, and Timothy Wright, "Sub-optimal deterrence, SLCM-N and the US Posture," *IISS*, 6 May 2022, https://www.iiss.org/blogs/military-balance/2022/05/sub-optimal-deterrence-slcm-n-and-the-us-posture.

[63] Justin R Nash, "Future Offensive Capabilities for Low-Yield Nuclear Deterrence." (*School of Advanced Military Studies*), 23-24; Robert H Vokac, "Smart Weapons—Can We Fold the Nuclear Umbrella," (*School of Advanced Military Studies*), 35.

[64] U.S. Department of Defense, *The Nuclear Posture Review*, 2018, XII; John R. Harvey and Robert Soofer, "Strengthening deterrence with SLCM-N," *Atlantic Council*, November 2022, https://www.atlanticcouncil.org/wp-content/uploads/2022/11/Strengthening-Deterrence-with-SLCM-N.pdf, 6-7; Robert C. Rubel, "A Theory of Naval Airpower" *Naval War College Review* 67, 3 (2014), *65-67*.

survivable, regionally present platforms, and with the necessary range, penetration capability, and effectiveness to hold critical adversary targets at risk.[65]"

LYBNW such as the SLCM-N enables the US Navy to restore the credibility of the US deterrent. With the increasing discrepancy between states' LYBNWs, US extended deterrence is degrading. Since the retirement of the TLAM-N in 2010, Japan and South Korea increasingly demand an additional US LYBNW deterrent.[66] A maritime-based system would provide "attraction" and soft power to reassure allies without requiring partner acquiescence for stationing.[67] In the late Cold War Europeans did not believe America had a credible deterrent due to the belief that America would not use ICBMs in response to IRBMs striking their cities. The US employed the dual-track program to reassure its European allies by coupling American LYBNW with NATO allies. Similarly, the SLCM-N would couple security of Pacific allies with the US nuclear deterrent.[68] Pershing and GLCM provided credibility as they coupled the Soviet homeland with European theater, were more discriminate and proportional, serving as symbols

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[65] U.S. Department of State, "Strengthening Deterrence and Reducing Nuclear Risks, Part II: The Sea-Launched Nuclear Cruise Missile-Nuclear (SLCM-N)," *Arms Control and International Security Papers* 1, 11 (July 2020), 5.

[66] General John E. Hyten, "Testimony," Committee on Armed Services United States Senate, *Hearing to Receive Testimony on United States Strategic Command in review of the Defense Authorization request for Fiscal Year 2019 and the Future Years Defense Program*, 115 Cong., 2d sess., 2018.

[67] Joseph S. Nye, *Soft Power: The Means to Success in World Politics* (New York: PublicAffairs, 2004), 5; Joseph S. Nye, *The Future of Power* (New York: PublicAffairs, 2011), 40.

[68] William B. Caldwell, "The Intermediate-Range Nuclear Forces (INF) Treaty: An Operational Error," (*School of Advanced Military Studies*), 12, 42; Russell R Sherrett, "The Dual Track Decision and the intermediate-Range Nuclear Force Treaty The Role of the Cruise and Pershing II Missiles," (master's thesis, U.S. Army Command and General Staff College), 90.

of the US willingness to use nuclear arms in Europe.[69] The SLCM-N could fulfill this role in the Pacific.[70] The smaller yield of the SLCM-N convinces adversaries of a greater US willingness to use the weapon due to lower collateral effects and reduced risk of escalation compared to strategic nuclear weapons. [71] US ground forces with the SLCM-N on allied soil would likely to use the SLCM-N in self-defense if attacked, thus enhancing the credibility of American deterrence.[72] Consequently, the SLCM-N increases the credibility of US extended deterrence.

The SLCM-N and LYBNW improve the ability to communicate American deterrence to allies and adversaries. The lack of significant LYBNW in the US inventory communicates an unwillingness of the US to respond in kind to adversary use of LYBNW.[73] It also creates in the mind of our adversaries the view that the US is unwilling to fight in the tactical nuclear zone or have effective responses. Acquiring the SLCM-N would rectify this communication gap,

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[69] William B. Caldwell, "The Intermediate-Range Nuclear Forces (INF) Treaty: An Operational Error," (*School of Advanced Military Studies*), 42.

[70] John R. Harvey and Robert Soofer, "Strengthening deterrence with SLCM-N," *Atlantic Council*, November 2022, https://www.atlanticcouncil.org/wp-content/uploads/2022/11/Strengthening-Deterrence-with-SLCM-N.pdf, 6-7.

[71] Michael D. Maginness, "Dynamic Deterrence: The Modernization of Nuclear Deterrence to Meet Dynamic Future Threats," (*School of Advanced Warfighting*), https://usmc.primo.exlibrisgroup.com/view/delivery/01USMCU_INST/1246436530005241, 9.

[72] George H. Quester, "If the Nuclear Taboo Gets Broken," *Naval War College Review* 58, 2 (2005), 75-76.

[73] Michael D. Maginness, "Dynamic Deterrence: The Modernization of Nuclear Deterrence to Meet Dynamic Future Threats," (*School of Advanced Warfighting*), https://usmc.primo.exlibrisgroup.com/view/delivery/01USMCU_INST/1246436530005241, 9-10; Robert J. Peters, "The Red Zone: Understanding an Escalatory Pathway that the Adversaries are Exploring—and We Are Not," *Wild Blue Yonder*, 9 May 2022, https://www.airuniversity.af.edu/Wild-Blue-Yonder/Article-Display/Article/3021286/the-red-zone-understanding-an-escalatory-pathway-that-the-adversaries-are-explo/.

demonstrating that the US retains flexible nuclear options to adversaries.[74] It would attest to the limits of a conflict to prevent horizontal escalation. The SLCM-N also serves to convey the American willingness to defend allies.[75] It is particularly valuable when combined with clear political messaging stating which actions by an adversary would lead to SLCM-N's emplacement and possible use to ensure clarity in strategic relationships. Even the act of acquiring and fielding SLCM-N conveys to adversaries America's strategic will to deter. Thus, the SLCM-N improves American ability to communicate its commitment to nuclear deterrence.

For these reasons, the US can improve extended deterrence through improved LYBNW capabilities. These assets historically provided effective deterrence against adversaries to preserve a just peace. LYBNW like SLCM-N grant unique capabilities that support deterrence. The lowered chance of uncontrollable escalation increases the credibility of extended deterrence with LYBNW. Furthermore, the acquisition, positioning and employment of LYBNW improves the ability of the US to communicate its will to opponents. Due to these reasons, the US ought to increase its development and acquisition of LYBNW, particularly SLCM-N, so that it can prevent competition from escalating into an undesired war.

Nuclear Warfighting

Acquiring LYBNW provide unique warfighting capabilities to win when deterrence fails. The US cannot only have a deterrence strategy, but it must also have a warfighting strategy to win and successfully terminate the war if and when deterrence fails. Today, however, "General

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[74] Thomas Yancy Headen, "Further Tactical Nuclear Weapons reductions in Europe: The Next Challenge for Arms Control," (master's thesis, U.S. Army Command and General Staff College), 9.

[75] Thomas C. Schelling, *Arms and Influence* (New Haven and London, Ct: Veritas Paperback, 2020). 146-149.

nuclear war has been so awful a prospect that Americans have preferred not to speculate beyond the concept of deterrence.[76]" In contrast, the Soviets/Russians and Chinese clearly assess how to win a nuclear war.[77] The SLCM-N provides a necessary capability to enable the United States to fight and win a nuclear conflict when deterrence fails. This is due to the ability to employ SLCM-N and other LYBNW within the Law of Armed Conflict in accordance with Just War Theory when compared with strategic nuclear arms. LYBNW are also the only assets capable of holding at risk key underground facilities (UGF) while not causing uncontrollable escalation or significant collateral damage. Finally, LYBNW and SLCM-N grant the US the ability to cause electromagnetic pulse (EMP) effects to disable key electronic, command, control, and communications systems to not only deter adversary use of EMP, but also to grant US forces an advantage in war. As these capabilities remain unique to LYBNW, the US ought to pursue the SLCM-N and other LYBNW options.

A consistent trend in US Nuclear Posture has been the requirement to employ nuclear weapons in line with LOAC.[78] While strategic nuclear weapons struggle with proportionality and discrimination due to their lack of accuracy and higher yields, the SLCM-N allows for a more proportional response to enemy aggression as it fills the gap between strategic nuclear weapons and conventional explosives.[79] It also enables increased discrimination due to its accuracy, lower

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[76] Capt. Wayne P Hughes Jr. and RADM Robert P. Girrier, *Fleet Tactics and Naval Operations, Third Edition* (Annapolis, MD, Naval Institute Press. 2018), 234.

[77] Richard O. Wightman Jr., "An Assessment of Potential Soviet Responses to Evolving Theater Nuclear Systems," (master's thesis, U.S. Army Command and General Staff College), 67.

[78] U.S. Department of Defense, *The Nuclear Posture Review*, 2018, VIII, 23; U.S. Department of Defense, *The Nuclear Posture Review*, 2022, 8.

[79] Thomas Moore, "Does the United States Need to Develop a New Nuclear Earth Penetrating Weapon?" (master's thesis, U.S. Army Command and General Staff College), 37-38.

yield, and radioactive effects. Moreover, if used in a maritime theater against targets on the open ocean, it would likely prevent any collateral damage while avoiding unnecessary human suffering. Additionally, if used to destroy an underground facility or as an EMP, the direct collateral impact outside the law of war would be limited to non-existent due to the underground facility trapping the heat, blast, and radiation.[80]

The SLCM-N and other LYBNW can penetrate well-defended underground facilities (UGFs). Experimentation in the Cold War demonstrated the survivability of well-protected positions from bombardment, including nuclear weapons.[81] North Korea, China, and Russia have all made significant investments in underground facilities that conventional weapons cannot penetrate.[82] Even the conventional 5,000 pound GBU-28 developed in the Gulf War and the

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[80] Michael D. Maginness, "Dynamic Deterrence: The Modernization of Nuclear Deterrence to Meet Dynamic Future Threats," (*School of Advanced Warfighting*), https://usmc.primo.exlibrisgroup.com/view/delivery/01USMCU_INST/1246436530005241, 10; Jeff Fanelli, "Command and Control on the Nuclear Battlefield in Multi-Domain Operations," (*School of Advanced Military Studies*), 20-21; Jack F. Smith, "Pentomic Doctrine: A Model for Future War," (*School of Advanced Military Studies*), 12; United Nations, "End Nuclear Tests Day," 29 August, https://www.un.org/en/observances/end-nuclear-tests-day/history#:~:text=The%20Soviet%20Union's%20last%20nuclear,Nuclear%2DTest%2DBan%20Treaty.

[81] Louis J. Crist, "NATO and the Low-Yield Battlefield Nuclear Weapons," (*School of Advanced Military Studies*), 35-36; Harold L. Chappell, "Fixed Permanent Fortifications at The Operational Level of War," (*School of Advanced Military Studies*), 25-26, 38.

[82] Justin R. Nash, "Future Offensive Capabilities for Low-Yield Nuclear Deterrence," (*School of Advanced Military Studies*), 20-21; U.S. Department of Defense, *The Nuclear Posture Review*, 2018, 33; Fabian Hoffman and William Alberque "Non-Nuclear Weapons with Strategic Effect: New Tools of Warfare," *IISS*, 31 March 2022, https://www.iiss.org/blogs/research-paper/2022/03/non-nuclear-weapons-with-strategic-effect-new-tools-of-warfare; Stephen J. Cimbala, "Nuclear-Crisis Management and Cyber War—A Dangerous Crossroads," *Naval War College Review* 75, No. 1 (2022), https://digital-commons.usnwc.edu/cgi/viewcontent.cgi?article=8246&context=nwc-review, 5; Milan Vego, "On Littoral Warfare," *Naval War College Review* 68, No. 2, (2015), Available at: https://digital-commons.usnwc.edu/nwc-review/vol68/iss2/4, 37-38.

current earth penetrating nuclear weapons are highly unlikely to succeed as the current nuclear weapons only penetrate to six meters.[83] In contrast, the SLCM-N when combined with the appropriate penetrator could cause more damage with a lower yield warhead due to increased accuracy and ability to penetrate.[84] Admittedly, a ballistic option with the Army LRHW would be preferable due to increased terminal velocity, but the SLCM-N still provides a better option than current capabilities. Thus, the SLCM-N is critical to hold adversary UGFs at risk in war and thus deter them from believing key capabilities are safe.

Due to the EMP properties of nuclear weapons, the LYBNW provides US forces with yet another capability that could prove critical to achieving a proportional response while in armed conflict. The Chinese have already examined the use of EMP-laden missiles to disable the defenses of a naval force prior to conventionally armed missiles striking the defenseless fleet. [85] The US could employ the SLCM-N with a Maritime Strike Tomahawk seeker for a similar purpose. It and other LYBNW are able to degrade adversary C2, Integrated Air Defense Systems (IADS), and airfields (See Figure 6).[86] With the SLCM-N, the US would be capable of responding to any adversary preemptive use of an EMP to ensure that the US can rapidly revisit

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[83] Thomas Moore, "Does the United States Need to Develop a New Nuclear Earth Penetrating Weapon?" (master's thesis, U.S. Army Command and General Staff College), 3-4, 14-15, 26.

[84] Ibid. 28.

[85] Carlo Kopp, "The Electromagnetic Bomb-a Weapon of Electrical Mass Destruction," (Monash University), https://apps.dtic.mil/sti/pdfs/ADA332511.pdf, 33-34. Nicholas R. Reisdorff, "Winning the Hundred Battles: China and Asymmetric Warfare," (master's thesis, U.S. Army Command and General Staff College), 51.

[86] Carlo Kopp, "The Electromagnetic Bomb-a Weapon of Electrical Mass Destruction," (Monash University), https://apps.dtic.mil/sti/pdfs/ADA332511.pdf, 2, 26, 33; Jeff Fanelli, "Command and Control on the Nuclear Battlefield in Multi-Domain Operations," (*School of Advanced Military Studies*), 20-24.

any denial effects the adversary achieves, thus ensuring a proportional response and greater deterrence.[87] Therefore, the SLCM-N would grant a unique ability to execute and respond to an EMP attack.

Burst type	Estimated duration of blackout to line of sight communications	Estimated duration of blackout to satelliete communications
Ground	Few seconds to a few minutes	Negligible
Low altitude	Few seconds to 1 minute	Negligible
High altitude	Few seconds to few minutes	Minutes to hours

Figure 6: Ionization radio blackout duration[88]

Thus, the unique warfighting potential of LYBNW grants critical abilities to win in conflict that other weapons lack. Appropriate targeting and fusing allows LYBNW to operate within the LOAC. LYBNW are also the only assets capable of defeating many key UGFs built by competitors. EMPs created by LYBNW provide additional measures to defeat adversary electronic capabilities to give US forces an advantage. Through the construction and wise employment of LYBNW, the US is able to gain advantages in combat against enemy forces.

Conclusion

Due to the rising impact of adversary nuclear capability and capacity, the US should invest in SLCM-N and other LYBNW to **provide policymakers additional options to signal resolve, improve deterrence, and provide unique warfighting potential.**

The threat demands that the US prepare to deter a new assortment of threats that have seen their LYBNW as an asymmetric advantage. Russia, particularly with the degradation of

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[87] Carlo Kopp, "The Electromagnetic Bomb-a Weapon of Electrical Mass Destruction," (Monash University), https://apps.dtic.mil/sti/pdfs/ADA332511.pdf, 35; Justin R Nash, "Future Offensive Capabilities for Low-Yield Nuclear Deterrence." (*School of Advanced Military Studies*), 24.

[88] Jeff Fanelli, "Command and Control on the Nuclear Battlefield in Multi-Domain Operations," (*School of Advanced Military Studies*), 25.

their conventional forces in Ukraine, looks to their LYBNW as a key tool for coercive and warfighting advantages. China similarly seeks to expand their nuclear arsenal to leverage their increasing number of delivery systems to impose their will upon US partners and allies. When tying the Chinese arsenal to their more aggressive doctrine for nuclear employment, it is key to have sufficient LYBNW to prevent them from seeking an advantage through nuclear employment. If the US is to continue deterring competitors from LYBNW use, it must remove the existing gap in deterrence due to disparities in LYBNW.

LYBNW grant policymakers in the US additional possibilities to signal to competitors. It may be that through the procurement of LYBNW such as SLCM-N, the US can drive our competitors into arms control negotiations to prevent an ongoing arms race that is detrimental to US interests. If arms control fails, then LYBNW grant further options to signal in the midst of war to prevent escalation and successfully terminate the conflict. Ideally, however, the US would employ LYBNW to prevent a conflict in the first place by signaling resolve with land and especially naval forces to convince an adversary the conflict is not worth the cost or is unattainable. Without LYBNW, the US would lack these potentialities and would have fewer options by which to deter competitors from becoming adversaries in armed conflict.

Indeed, by adequately investing in LYBNW like the SLCM-N the US is able to deter these enemies from using LYBNW to coercive advantage. Historically, the United States has effectively used nuclear arms from LYBNW to strategic weapons to protect its partners and allies while preventing open war between strategic competitors. Yet, that success depended upon a highly capable nuclear force, of which LYBNW were a key asset. Without LYBNW, the US risks a gap in capability between conventional and strategic nuclear arms. So too does the lack of LYBNW and SLCM-N reduce the US ability to provide credibility to our extended deterrence by

reassuring allies and frightening potential enemies. These weapons further support deterrence with additional pathways to communicate US intentions to adversaries. By the appropriate application of LYBNW such as the SLCM-N, the US would prevent escalation of competition to conflict but also prepare for war if deterrence waned.

In the event of war, the US would have a higher likelihood of winning with the exclusive potentialities provided by LYBNW and SLCM-N. LYBNW give greater firepower than conventional munitions while remaining within the LOAC. These nuclear weapons also threaten enemy UGF too well protected to destroy with conventional munitions. SLCM-N and other LYBNW give the US more capability to defeat enemy command and control with EMP effects. Therefore, LYBNW and SLCM-N strengthen the US ability to win wars.

Currently, the objectives demanded by policy are not achievable given the growing disparity between friendly and enemy forces.[89] Though the highest priority of the Department of Defense (DOD) is deterring and preventing nuclear attack, the means dedicated to it are limited, with only 6.4 percent of the DOD budget going to nuclear arms.[90] For a minor investment, the US would be able to ensure that this new Cold War does not go hot and consume the world in nuclear fire.[91] The best method by which to close this gap in the short term is investment in the SLCM-N based on existing technology and employable upon our current submarines. In the medium term, investment in other LYBNW will provide additional guarantees to the United States and its allies while maintaining the international order for the benefit of all, even for our competitors.

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[89] B.H. Liddell Hart, *Strategy* (New York: Praeger Publishers, 1975), 351.

[90] U.S. Department of Defense, *The Nuclear Posture Review*, 2018, XI.

[91] U.S. Department of Defense, *The Nuclear Posture Review*, 2018, XII.

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