

The Nuclear Triad and Interoperable Weapons

Abstract

The purpose of this essay is to examine the current threats to The United States, evaluate the status of emerging nuclear powers, and establish the most efficient use of funds when considering the future of our nuclear arsenal. The nuclear triad has allowed the US to maintain weapon parity with Russia for the last 60 years; however, the technological modernization of several developing countries requires us to reevaluate nuclear priorities. The question stands; are all three components of the nuclear triad necessary? I will provide evidence that geopolitical drivers indicate that the triad is the best option the US has to stay technically relevant and tactically prepared. That said, the nuclear arsenal could be improved to save money through weapon modifications and interoperability. I will evaluate the Pentagon's 3+2 Plan, and offer modifications to decrease spending and increase interoperability. This essay will also consider the ramifications of the Nuclear Non-Proliferation Treaty, and how to update the arsenal without accidentally antagonizing the United States' nuclear competitors. Finally, this essay will consider the relevance of Anti Ballistic Missile systems, and why America must secure its status as the primacy in space missions and research.

Background

The nuclear triad consists of three vehicles used by the United States to deliver nuclear warheads. Strategic bombers are long-range aircraft that deliver weapons by

airdrop from a B-2 Spirit, or similar aircraft, with an unrefueled range of 6,900 miles.¹ Intercontinental Ballistic Missiles (ICBMs) have a range of greater than 3,400 miles, and deliver warheads from ground bases dispersed globally.² Submarine Launched Ballistic Missiles (SLBMs) have a range of over 4,200 miles, and are delivered underwater by Ballistic Missile Submarines (SSBNs).³

Nuclear weapon value is primarily determined by deliverability. Submarines are virtually undetectable and can be moved readily to hit targets anywhere on the globe. Traveling at speeds in excess of 15,500 mph, ICBMs are unstoppable once launched.¹ The B-52 has a max speed of 650 mph, a max range of 7,650 nautical miles, but little ability to shield itself from radar.⁴ The B-2 Spirit does a much better job avoiding detection, but is still not on par with an SSBN. While the early advantage of air dropped weapons was target maneuverability, ICBMs and SLBMs are now accurate within 390 feet of their target, and can be reprogrammed mid-flight.⁵ ICBMs and SLBMs have the advantage of being under the radar. Strategic bombers are a somewhat redundant component of the nuclear triad, however, they engage the US in a distinct method of warfare.

The less obvious advantage of strategic bombers is their ability to deter nuclear aggression. Once engaged in a nuclear war, bombers would be the last platform utilized

¹ "B-2 Spirit Factsheet",

<http://www.af.mil/AboutUs/FactSheets/Display/tabid/224/Article/104482/b-2-spirit.aspx>

² "The 10 Longest Range Intercontinental Ballistic Missiles", www.army-technology.com/features/feature-the-10-longest-range-intercontinental-ballistic-missiles-icbm/ (2013)

³ "Trident II D-5 Fleet Ballistic Missile", fas.org/nuke/guide/usa/slbm/d-5.htm

⁴ "Presidential Remarks on The US Strategic Weapons Program", www.reagan.utexas.edu/archives/speeches/1981/100281c.htm

⁵ "LGM 30G Minuteman III Factsheet", <http://archive.is/HYdz>

to deliver a warhead. However, their mere existence might be enough to prevent the war from ever beginning. If the US parks an SSBN off the coast of an aggressor, they will never know. Invading their airspace with detectable bombers sends a much stronger message. Additionally, bombers can be called back before they launch their weapons, unlike ICBMs and SLBMs. This provides the US with the flexibility to show aggressors that they intend to use nuclear force without actually having to follow through. Updated B-52 bombers are currently slated to remain in maintenance/production until the 2040s. B-2 bombers are planned to receive a full overhaul worth \$2.2B to keep them operational until 2058.⁶ SLBMs, such as the Trident II Missile, require minimal maintenance, and will last for decades. The US chooses to fund strategic bombers in excess, when they provide a less capable service than SLBMs and ICBMs. Strategic bombers are certainly indispensable to the nuclear triad, just not at their present cost. Additionally, the incompetence of competing nuclear countries' aircraft further drives down the value of strategic bombers.

Prior to determining what can be cut from the triad, it is crucial to analyze The United States' threats and their nuclear capabilities. On 10SEP2015, President Putin stated that Russia is in the process of developing "a guaranteed nuclear deterrent" that will "take corresponding countermeasures to ensure (Russia's) security".⁷ Some of the projected plans include developing an aerospace defense system with highly precise, long-range nuclear weapons. This appears to be in direct competition with The United

⁶ Osborne, Kris. "B-2 Bomber Set to Receive Massive Upgrade", <http://www.dodbuzz.com/2014/06/25/b-2-bomber-set-to-receive-massive-upgrade/> (2014)

⁷ "Russia Developing New Nuclear Weapons to Counter US, NATO", <http://nypost.com/2014/09/10/russia-developing-new-nuclear-weapons-to-counter-us-nato/> (2014)

States' strategic bombers; however, Russia's plans to add 50 Tu-160 bombers to their air force have been delayed several years.⁸ Russia not only "lacks qualified personnel to front this effort", but more importantly, they have nowhere near the funds necessary for such an undertaking. Regardless, the current status of Russia's nuclear programs should not be used as a reason to lower defenses or abandon the production of strategic bombers. While they are not an imminent threat now, tensions have been steadily rising, and the US should be prepared for whatever the future may hold.

Introduction

Based on the costs and capabilities listed above, the strategic bomber is the weak link in the nuclear triad. While it cannot deliver a nuclear weapon as silently as an SSBN, it provides the US with nuclear deterrence by occupying airspace abroad and projecting US power to foreign enemies. This service is equally important in protecting US interests. Therefore, the nuclear triad must remain intact, yet can be modified significantly to cut costs. ICBMs and SLBMs should be refitted to support the same weapon type, an idea known as weapon interoperability. Significant costs can be cut from strategic bombers if the B-52 refitting is canceled in lieu of increased reliance on the B-2 during the phasing out process. Canceling the B-52 refit also renders the new ALCM irrelevant, further driving down costs of the redundant and outdated platform. Using less varieties of weapon types and cutting the ineffectual ones will allow the US to focus efforts and funds on maintaining its primacy in scientific research, and in the renewed space race.

⁸ Gady, Franz-Stefan. "Russia's Next Generation Bomber Delayed", <http://thediplomat.com/2015/07/russias-next-generation-strategic-bomber-delayed/>

Non-Russian Nuclear Competitors

Russia may have been the only nuclear contest during the cold war, but emerging nuclear powers present an entirely new threat to global security. India has indicated intentions of building up their own nuclear triad.⁹ China has developed their nuclear military, including one refurbished nuclear powered aircraft carrier. Iran may or may not be producing highly enriched uranium. None of these nations can rival the United States' current nuclear triad, but the point is that they are working towards it, and one day they might. I will now take a brief look at what emerging nuclear competitors have and how that affects US defense.

India

India began testing nuclear weapons in 1974, with the “peaceful explosion” of Pokhran I.¹⁰ In 1998, India declared itself a weapon state.¹¹ In 2003, India finalized its nuclear command structure, and formalized its nuclear doctrine. At present day, India is actively pursuing a nuclear triad in lieu of its dyad with the support of the United States.¹² India currently has bombers and medium to short range ballistic missiles to protect itself from Pakistan and China, but plans to build SSBNs for operational use by its Navy. US support for India's nuclear buildup is primarily to support its ally's survivability after a first strike from Pakistan, but also to wield control over Pakistan and China. Having a

⁹ Ray, Ayesha. “Political Masters and Sentinels: Commanding the Allegiance of the Soldier in India” (2008)

¹⁰ “First Nuclear Test at Pokhran in 1974”. <http://fas.org/nuke/guide/india/nuke/first-pix.htm>

¹¹ Harsh V. Pant. “India's Nuclear Doctrine and Command Structure: Implications for India and the World” Pages 1-18.

¹² Ibid

prepared ally in their region provides the US with more leverage in a part of the globe it cannot easily reach. The US also required that India's formalized nuclear doctrine met US standards of safety.¹³ India has declared a no first strike policy at the urging of the US. As an established democracy, the "nuclear button" will never rest in a non-civilian hand, and always with the elected president of their Nuclear Command Authority.¹⁴ This allows India to maintain a non-militarized international image providing confidence to NNPT signers that they will use nuclear power as a deterrent only. India has consistently reiterated its "commitment to a credible minimum deterrent" without ever quantifying what that means.¹⁵ The vague wording should cause concern, as this provides India with loopholes in their commitment to minimal nuclear weapon build up. Despite all the precautions the US has taken via treaties and doctrines to directly influence India's nuclear arsenal, the US has not required a definitive answer on how much is enough, but rather allowed India to build un-checked. Influence in the Indian Subcontinent is obviously attractive to the US, but consideration must be taken of the rapidly changing political climate over which the US has little control. Additionally, India has requested information on the US Patriot Missiles, as it intends to develop a ballistic missile defense arrangement, and the US is supportive of this effort. India's aversion to signing the CTBT should also be a red flag to US policy makers.¹⁶ Within 40 years, India has rapidly modernized its nuclear program. In ten more, who knows where they will stand on the

¹³ Ibid

¹⁴ Singh, Jasjit. "Nuclear Command and Control", <http://www.idsa-india.org/an-may-1.01.htm>

¹⁵ Harsh V. Pant. "India's Nuclear Doctrine and Command Structure: Implications for India and the World" Pages 1-18.

¹⁶ Kimball, Daryl. "The Status of the Comprehensive Test ban Treaty", <https://www.armscontrol.org/factsheets/ctbtsig>

world stage. The US should remain cognizant of the turbulent status of Middle Eastern politics, and use more caution when deciding what countries it provides with weapons and information.

China

China exploded its first nuclear device in 1964 and has completed 45 tests in the last 30 years.¹⁷ China has signed but not ratified the CTBT, and recently accessed to the NNPT.¹⁸ Technically, China maintains a triad; one submarine, old and limited strategic bombers, and a relatively successful land-based, long-range bomber system. Though not impressive, China has indicated intentions of modernizing its missile force with the help of Russian technologies. China has also made clear the desire to develop its command and accuracy to penetrate enemy forces, and attack space-based assets. China remains deliberately non-transparent, but there is reason to believe scientists are researching new delivery techniques, and improved submarine technology. The ambiguity of their operations is inherently concerning to the US. China's nuclear posture in the 1960s was one of minimum deterrence, but there has been a clear shift in priorities as China has steadily proved itself a major economic and political power. Unlike India, China has MIRV technology, and enough fissile material to develop over 1000 new bombs.¹⁹ Their technical expertise and non-reliance on the US makes them much more concerning as a nuclear competitor. Even more cause for concern, China has directly expressed their belief that the US has a huge advantage in destructive capability due to technological superiority. China also expressed the belief that the defensive anti-ballistic missile

¹⁷ Roberts Brad, Manning Robert, Montaperto Ronald. "China: The Forgotten Nuclear Power Essay" Pages 53-60

¹⁸ Ibid

¹⁹ Ibid

systems the US began building up in the early 2000s are in direct response to their nuclear arsenal. These feelings of vulnerability are reminiscent of the Cold War preventative/preemptive strike plans.²⁰ This mindset is highly dangerous, and promotes irrational behavior, as demonstrated by the Cuban Missile Crisis. The refusal to become transparent in their objectives causes Chinese-American communication to suffer. This situation can be illustrated through the Prisoner's Dilemma in that both China and the US are anticipating each other's actions, and due to the lack of communication, there is an illusion of threat where there may in fact be none.²¹ Due to all of this ambiguity, China is perhaps the United States' most concerning nuclear competitor.

Iran

The most recent and volatile emerging nuclear power is Iran. Iran has been a non-nuclear weapon state, and signer of the NNPT since 1970.²² In 2006, Iran began enriching uranium for peaceful uses such as power. An investigation by the IAEA has provided evidence that Iran has been enriching uranium far beyond the necessary 3-5% for power production, and instead intends to develop a nuclear weapon program. These activities are in direct violation of the NNPT, and have caused great distress to the nuclear community. Negotiations between the weapons states, US, UK, Russia, France, China, and Germany, have attempted to resolve the nuclear issue, and stop Iran's enrichment activities. The P5+1 Treaty is intended to be a comprehensive plan of action to determine the scope of Iranian nuclear activity, and prevent them from acquiring a

²⁰ Freedman, Lawrence. *The Evolution of Nuclear Strategy*. New York: St. Martin's, 1981. Print.

²¹ Ibid, Pages 165-178

²² "Iran Overview" <http://www.nti.org/country-profiles/iran/>

nuclear weapon.²³ These developments are all very new, so it is unclear what the future of Iranian nuclear weapons will be. Iran's direct violation of the NNPT implies that the integrity of any treaties they sign should be called into question. If they violated one before, what is to stop them from continuing uranium enrichment programs now? The volatile nature of this issue should cause concern to the US. If the NNPT was successful, and each weapon state was actively working to downsize their arsenal while preventing other states from acquiring nuclear weapons, then maybe the US could consider downsizing to a dyad. After investigating the emerging nuclear powers of India, China, and Iran, it is clear that the NNPT is not as effective as it hoped to be.

Modifications and Weapon Interoperability

Based on the overwhelming evidence of worldwide nuclear activity, now is not the time for The United States to lower defenses. Each component of the nuclear triad serves its purpose, and while it is not possible to downsize to a dyad, it is very possible to increase efficiency through weapon interoperability.

In 2013, the Pentagon presented Congress with The 3+2 plan at Obama's urging that the US could reduce the number of strategic nuclear weapons it deploys "by up to one-third."²⁴ This plan, illustrated in figure 1 below, suggests that the United States rebuild its nuclear stockpile, and move from 7 types of warheads to 5. The US currently uses 2 varieties of ICBM warheads, 2 varieties of SLBM warheads, and 3 bombs fitted for long-range bombers and jets. The suggested change is to refit W-76's, 78's, 87's, and

²³ "The Historic Deal", <https://www.whitehouse.gov/issues/foreign-policy/iran-deal>

²⁴ Morley, Jefferson. "Obama Calls for Deeper Nuclear Cuts", https://www.armscontrol.org/act/2013_0708/Obama-Calls-for-Deeper-Nuclear-Cuts

88's to three interoperable warheads fitted for use by SLBMs and ICBMs. Additionally, the Pentagon plans to completely eliminate the B-83.²⁵ This revamp of nuclear weapons would be costly at the projected \$62B, but the Pentagon suggests there would be long-term savings, as the refitted weapons would cost less to maintain than the weapons they replace.²⁶ They would also have to train fewer personnel on maintenance and operation procedures if there were 5 varieties of warheads rather than 7. Aside from money, interoperable warheads give the US the advantage of being able to use more than one warhead in each delivery system. Redundancy in weapon systems provides options when one missile type is unsuccessful. The final advantage is that the US can focus efforts on perfecting these 5 warhead types rather than struggling to maintain 7. There is an overall increase in efficiency.

²⁵ Tom Z. Collina. "Arms Control Today",
https://www.armscontrol.org/act/2013_09/Pentagon-Defends-3%202-Plan-for-Warheads

²⁶ Ibid

Figure 1: The '3+2' Plan

Over the next 25 years, the National Nuclear Security Administration (NNSA), a semi-autonomous part of the Department of Energy, plans to rebuild the U.S. nuclear arsenal and reduce the number of warhead types from seven today to five. The W78 intercontinental ballistic missile (ICBM) warhead and W88 submarine-launched ballistic missile (SLBM) warhead would be replaced by the first interoperable warhead, IW-1, which could be used on ICBMs and SLBMs. The NNSA has proposed two other interoperable warheads and a rebuilt air-launched cruise missile (ALCM) warhead, but the Nuclear Weapons Council, a joint body of the departments of Energy and Defense, has not approved them.

TODAY	3+2 PLAN	ESTIMATED PRODUCTION/ RETIREMENT START DATE	ESTIMATED COST, 2014-2038 (\$ BILLIONS)	
Delivery Systems	Warheads/ Bombs			
ICBMs	W87	Replace with IW-2	2030	14
	W78	Replace with IW-1	2025	14
SLBMs	W88	Replace with IW-3	2040	12
	W76	Retire once B61-12 is produced	2020	10
Bombers	B61-3/4/7/10 Bomb	Replace with B61-12	2025	12
	W80-1 ALCM	Retire once B61-12 is produced	2030	--
	B83 Bomb			
TOTAL COST			62	

Source: National Nuclear Security Administration, Department of Defense

Figure 1: 3+2 Plan

The 3+2 Plan is a step in the right direction. Weapon interoperability is the future of nuclear warfare as it simplifies weapon interfaces, and lowers production costs. This process can be improved to further lower weapon costs and improve efficiency by cutting nonessential upgrades. The projected replacement air launch cruise missile (ALCM) is a \$12B investment with little worth to the mission of strategic deterrence. The Long-Range Standoff Weapon (LRSO) is intended to replace the ALCM used in the B-52 Stratofortress. The B-52's alone are outdated, loud, and highly detectable. They are due for a complete overhaul estimated at \$4B for new engines, and unclear costs for body

reconstruction and other necessary improvements to keep them usable.²⁷ The Air Force has acknowledged that the platform is outdated, and has looked into replacing it with the F117.²⁸ Bennett Crosswell, head of Pratt's military engines unit, stated that the B-52 engine causes unnecessary costs in terms of fuel economy, and that there are much more attractive options than revamping the 8 inefficient TF33-P-3/103 turbofan engines each B-52 requires for operation.²⁹ The easiest defense budget cut would be to stop funding the upkeep of this outdated platform. Eliminating the US Air Force B-52s would render the new ALCM obsolete, cutting yet another \$12B of defense budget. In the spirit of weapon interoperability, the Air Force should consider moving entirely to B-2's, as they are modern, and capable aircraft. They were not built to send signals like the B-52, but it is possible to fly a B-2 low and slow, broadening its stealth-based mission set to send a message to enemies on the ground. The only warhead variant the B-2 requires is the B61-12, thus reducing the 3+2 Plan to a 3+1 Plan.

Adjustments to the Navy's portion of the triad are less significant than those of the Air Force, however, interoperability between ICBMs and SLBMs would minimize costs further. The submarine fleet has 18 active Ohio Class submarines, with plans in progress to replace them. Each SSBN is armed with roughly 24 Trident II missiles (UG-133) with W-76 or W-88 warheads, up to 12 of which are MIRV capable (multiple

²⁷ Rogoway, Tyler. "Once Again, The USAF is Looking to Re-engine its B-52 Fleet", <http://foxtrotalpha.jalopnik.com/once-again-the-usaf-is-looking-to-re-engine-its-b-52-fl-1685747978>

²⁸ Mehta, Aaron. "USAF Looking at B-52 Engine Options", <http://www.defensenews.com/story/defense/2015/02/12/b52-engine-private-public-partnership/23185827/>

²⁹ Ibid

independent reentry vehicles).³⁰ As the US develops the Ohio Class replacements, it would behoove the Navy and the country to refit one warhead type to become interoperable- the W-88, while maintaining the W-76. The W-88 can be converted to the W-78 warhead type used in ICBMs. The submarines would maintain system redundancy by keeping the two warhead varieties on hand, but by converting some of the W-88's into W-78's, ICBMs and SLBMs would decrease maintenance and training costs. This is more of an adjustment to ICBMs than SLBMs. When SSBNs are deployed, they are disconnected from the world. If there is weapon failure when they are called upon to launch, that is a significantly bigger issue than weapon failure on land. SLBMs need to maintain weapon redundancy because having the primary warhead fail with no backup leaves them defenseless and useless to the mission. ICBMs are less of a first strike option, and more of a visual reminder to enemies that the US possesses the means to launch anywhere at any time. ICBMs can handle the risk of a dud warhead, as they most likely will not be called upon to launch, while SLBMs will. By making the W-88/W-78 interoperable, the US would then move from 3 warhead varieties in SLBMs and ICBMs to 2, effectively downsizing the 3+1 Plan to the 2+1 Plan.

The unpopular legislation proposed by Congressman Markey to downsize the future submarine fleet to 8 SSBNs should be considered.³¹ The detriments of such a substantial decrease in deployable submarines would be decreased global coverage. As stated by Rear Admiral Tofalo, Commander of Naval Submarine Forces, "We have to

³⁰ Freedburg, Sydney. "No Margin for Error as Navy Builds New Nukes", <http://breakingdefense.com/2015/05/no-margin-for-error-as-navy-builds-new-nukes-tofalo/>

³¹ Senator Markey. "Smarter Approach to Nuclear Expenditures Bill", http://www.markey.senate.gov/imo/media/doc/2014_SANE_Act.pdf

cover two oceans at once and all of the targets that go with each of these oceans. Our SSBN force size is driven basically by three things: geography, survivability, and target coverage. Note that I did not say the words, ‘number of warheads.’”³² He goes on to assert that global coverage is more important than warhead number because nuclear deterrence is about presenting a threat, not the “number of times you can make the rubble bounce”.³³ These points are severely undermined by the primary capability that sets submarines apart for the rest of the triad- they are undetectable. If the submarine force’s mission were that of strategic bombers (to provide power projection), RADM Tofalo would be correct that the fleet could not afford to downsize. A core value of the submarine community is that they are a silent force. Other countries will be aware that the US lacks complete global coverage, but they still will not have any way to know where US SSBNs are at any given point. The submarine fleet loses none of its impact by downsizing because they remain a constant, and mysterious threat to their enemies. It is for this reason that RADM Tofalo’s refusal to downsize is shortsighted, and that it would be economically beneficial to downsize the replacements to the Ohio Class submarines from 18 to 10.

Ramifications of the Nuclear Non-Proliferation Treaty

The counterargument to refitting US weapons for interoperability across all platforms is that it can be viewed as pressure for other countries to follow suit. As example setters, US developments to nuclear arms could cause a small arms race as other countries aim to stay relevant. Nuclear arsenal updates have the potential to be

³² Freedburg, Sydney. “No Margin for Error as Navy Builds New Nukes”, <http://breakingdefense.com/2015/05/no-margin-for-error-as-navy-builds-new-nukes-tofalo/>

³³ Ibid

misconstrued as antagonistic behavior targeted at Russia/China, and could add to the pressure China feels regarding preemptive war. Additionally, as signers of the Nuclear Non-Proliferation Treaty, it is the US' promise to eliminate as many nuclear warheads as possible, not refit them for improved operability.³⁴ Developing, refitting, and improving weapons of mass destruction falls into a grey area under the NNPT. What the US agrees to, as a follower of the NNPT, is non-proliferation, disarmament, and the right to peaceful use of nuclear technology.³⁵ Recent Russian nuclear activity suggests that Russia is no longer adhering to treaty guidelines. The success of Iranian uranium enrichment programs also suggests that an NNPT signer has aided in the proliferation of nuclear weapons by informing Iran of how to create them/providing them with necessary materials to do so. Now is not the time to be a strict treaty follower.

In September of 2015, President Vladimir Putin said “We have warned many times that we would have to take corresponding countermeasures to ensure our security,” and that he would personally take charge of the government commission overseeing military industries.³⁶ President Putin stated that Russia's weapons modernization program, projected for 2016-2025, focuses on building new offensive weapons to provide a “guaranteed nuclear deterrent.”³⁷ Russia also indicated plans to build up strategic and long-range bombers to develop a high-precision aerospace defense system comparable to

³⁴ “Treaty on the Non-Proliferation of Nuclear Weapons”,
<http://www.un.org/disarmament/WMD/Nuclear/NPT.shtml>

³⁵ Ibid

³⁶ “Russia Developing New Nuclear Weapons to Counter US, NATO”,
<http://nypost.com/2014/09/10/russia-developing-new-nuclear-weapons-to-counter-us-nato/>

³⁷ Ibid

that of the US.³⁸ More importantly, there were indications from seismographs worldwide that Russia set off numerous nuclear tests in the 1990s.³⁹ There is some controversy as to whether these seismic occurrences were nuclear explosions or earthquakes near the Russian Arctic nuclear test site at Novaya Zemlya. Government officials were quoted implying that one event in particular "certainly had characteristics that at least would lead some to believe that there had been an explosion that caused the event."⁴⁰ As signers of the Complete Test Ban Treaty (CTBT), Russia would be in direct violation if they were not only testing warheads, but also testing in the Arctic. The Limited Test Ban Treaty (LTBT) of 1963, signed in Moscow, prohibits nuclear weapons tests "or any other nuclear explosion" in the atmosphere, in outer space, and under water.⁴¹ In October of 2012, "tests involving command systems of land and sea-launched long-range nuclear missiles and strategic bombers were conducted under the personal leadership of Vladimir Putin."⁴² Indications that Russia is testing nukes at all, let alone in places they should not, puts them in direct violation of two international treaties.

The overwhelming evidence of unusual seismic activity near the Arctic is significant enough for the US to assume that Russia is actively testing nuclear weapons. In this case, the integrity of all nuclear treaties followed by the US and Russia is to be questioned, and the US should feel empowered to refit warheads without fear of violating the NNPT. The recent US test of the Trident II missile over Los Angeles, California, has

³⁸ Ibid

³⁹ Sykes, Lynn. "Small Earthquake Near Russian Test Site Leads to US Charges of Cheating on CTBT", <http://fas.org/faspir/pir1197.htm>

⁴⁰ Ibid

⁴¹ "Limited Test Ban Treaty", <http://www.state.gov/t/isn/4797.htm>

⁴² Gutterman, Steve. "Putin Flexes Muscle in big test of Russia's Nuclear Arsenal", <http://www.reuters.com/article/2012/10/20/us-russia-nuclear-putin-idUSBRE89JOEJ20121020#ozpDK3MORbqsuJTT.97>

been described by Russian leadership as “open provocation.”⁴³ The Russian Deputy Defense Minister openly shamed Americans for actions contrary to Washington’s stated desire of complete nuclear disarmament, and sent a harsh reminder that Russia is currently “building up its military capacity, and modernizing its nuclear arsenal.”⁴⁴ It is a matter of utmost importance internationally that the US maintains at a minimum nuclear parity with Russia to deter aggression not only for national security, but also the border-states directly influenced by Russia. After the annexing of Crimea in 2014, the conflict expanded to parts of eastern Ukraine, where more than 6,000 people have now been killed after nearly a year of fighting.⁴⁵ These tensions on Russian borders confirm that now is not the time for the US to ramp down production and maintenance of its primary war-fighting device, the nuclear triad.

Counterforces and the Future of Nuclear Warfare

The Cold War is long over, but the ambiguity associated with nuclear warfare is as intense as ever. China’s distress regarding US defense capabilities, while misguided, exists for good reason. Nuclear weapons have no value if they will be shot down before reaching their target. The US was on the forefront of MIRV technology, and had highly capable Anti-Ballistic Missile (ABM) defenses until the Stanley R. Mickelsen Safeguard Complex in North Dakota was shut down in 1976.^{46 47} The Anti-Ballistic Missile Treaty

⁴³ “Russian Considers US Nuclear Bomb Test “Open Provocation”,
<http://sputniknews.com/military/20150713/1024563619.html>

⁴⁴ Ibid

⁴⁵ Birnbaum, Michael. “A Year After Crimean Annexation”,
https://www.washingtonpost.com/world/europe/a-year-after-crimean-annexation-threat-of-conflict-remains/2015/03/18/12e252e6-cd6e-11e4-8730-4f473416e759_story.html

⁴⁶ Garwin, Richard L., and Hans A. Bethe. "Anti-ballistic Missile Systems." *Survival* 10.8 (1968): 259-68. Web.

limitations prevented the US and then USSR from acquiring a large cache of ABMs. The US, and USSR were allowed 200 ABM warheads, while maintaining an arsenal of over 1600 nuclear weapons. This rendered ABMs obsolete, as it codified mutual assured destruction (MAD), discouraging either side from firing first as it would be suicide. The US' decision to pull out of the ABM Treaty in 2002, and place ABMs in Alaska is therefore a bold one.⁴⁸ US intent was never to have enough ABMs to counter a Russian attack, but rather to defend the nation if a rogue state such as North Korea launched a single warhead. Regardless, the site re-opening was interpreted as aggression targeted at Russia.⁴⁹ Such a strong reaction to improved US defense capabilities signifies how powerful ABM technology can be. Utilizing maneuverable reentry vehicles (MARV), US defense missiles have the capacity to provide a complete shield of protection over the nation. The limiting factor being cost, the US should reallocate the funds dedicated to old aircraft maintenance to fund a strong ABM defense system. Revisiting ABM warfare and what it has to offer the US in terms of protecting ICBM launch sites will prove to be a useful deterrent. Figure 2, from Johnson's essay on the new nuclear triad, provides further support that academics specializing in nuclear strategy have recognized ABMs as an essential component of future nuclear warfare. I propose that nuclear security will come to require a strong defense component of which ABMs will be critical.

⁴⁷ Perry, Mark. "US Army Safeguard Command", <http://www.srmisc.org/>

⁴⁸"ABM Treaty", <http://www.nti.org/treaties-and-regimes/treaty-limitation-anti-ballistic-missile-systems-abm-treaty/>

⁴⁹ Gordon, Michael. "Russians Firmly Reject US Plan to Reopen ABM Treaty", <http://partners.nytimes.com/library/world/global/102199us-russia-abm.html>

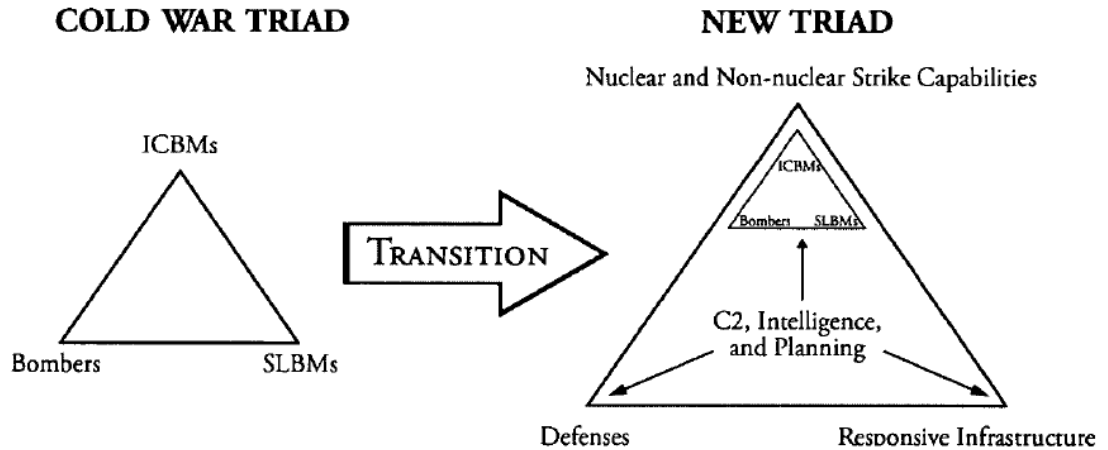


Figure 2: The New Triad⁵⁰

The New Frontier- Space

China's intentions to develop their aerospace industries guarantees that nuclear warfare may one day be moved to space.⁵¹ Trident II Missile technology is already utilizing star positions to fine-tune the accuracy of the inertial guidance system after launch through the missile's GPS system.⁵² Though there are no documented plans from China or Russia regarding the future of militarized warfare, they have both expressed interest in utilizing the new frontier to further their country's international influence. As signers of the Limited Test Ban Treaty (LTBT), the US and Russia have an obligation to keep nuclear weapons out of space. Russia's failure to adhere to the NNPT and CTBT proves that treaties are not always held to the same respect that the US expects them to be. It is time for the US to also begin thinking about the future of space security, and

⁵⁰ Johnson-Freese, Nichols. "Space, Security, and the New Nuclear Triad" (2007)

⁵¹ Roberts Brad, Manning Robert, Montaperto Ronald. "China: The Forgotten Nuclear Power Essay" Pages 53-60

⁵² Ali, Jamshaid, and Jiacheng Fang. "Realization of an Autonomous Integrated Suite of Strapdown Astro-inertial Navigation Systems." N.p., Jan. 2009.

appropriately funding the research required. The recommendation I made to significantly cut the defense budget for nuclear warhead upgrades is intended to open the eyes of US military strategists to focus on emerging technologies. The Cold War is over, but the US remains consumed by nuclear warfare because it cannot be matched in terms of magnitude of destruction. The future of warfare may not be about massive destruction on Earth, but rather access to assets in space, or the long-term goal of moving humanity beyond Earth. By limiting what the US spends on nuclear warhead maintenance, the US can broaden its scope to remain technologically relevant for the space race, and warfare beyond nuclear weapons.

Conclusions

Policy must evolve with the changing technological landscape of the world. Non-proliferation only makes the world a safer place if everyone does it. The US should focus efforts on maintaining a working relationship with Russia, although that may be impossible while Putin is in charge. The US should also encourage non-proliferation, and limit support of emerging powers such as India. These issues will only become more complicated as developing countries move towards the peaceful use of nuclear energy as a dominant power source, giving them direct access to Plutonium-239 and other fissile materials capable of reaching bomb-grade enrichment.

The US can simplify and cut costs of its nuclear weapon arsenal by adjusting the Pentagon's 3+2 Plan to the 2+1 I developed. Funding for the new ALCM and improvements to the B-52s should be entirely cut, and reallocated to refitting weapon systems for B-2s, SLBMs, and ICBMs. Additionally, the replacement class for the Ohio submarines should be limited to 10, rather than the current fleet of 18. Significant budget

cuts such as these will allow the US to fund research in emerging areas of interest, such as promoting a US presence in space.

The developing role of space in modern warfare will require US nuclear strategy to evolve with the new technologies. Nothing is set in stone, and as Russia and China further their space programs, they will naturally progress beyond the US in satellite/missile technology unless the US government funds NASA appropriately. The capabilities of nuclear weapons are understood at this point, while the repercussions of weaponizing space is not. The US should therefore reallocate defense spending to emerging technologies that will ensure the US can maintain dominance in space.

As technologies improve and treaties mean less, it is important for the US to stay prominent technologically so that it can respond to nuclear competitors' aggression. The current geopolitical status of the world requires the US to improve warheads, focus on interoperability, and eliminate unnecessary defense spending so US money can instead be put toward preventative measures like ABM sites, the maintenance of SLBMs/ICBMS, and the eventual progression of warfare to space.