Chapter 8:

Arms Control Among Rivals

John D. Maurer

After decades of small wars and counterinsurgency, the United States is refocusing on great power rivalry with China and Russia.[555] This rivalry has profound implications for all aspects of defense planning, especially arms control negotiations.[556]

555. While the phrase "great power competition" may soon be replaced, geopolitical rivalry between the United States, China, and Russia will remain an enduring feature of international politics. On great power rivalry, see: "Summary of the 2018 National Defense Strategy of the United States of America: Sharpening the American Military's Competitive Edge," Department of Defense, 19 January 2018, https://dod.defense.gov/Portals/1/Documents/pubs/2018-National-Defense-Strategy-Summary.pdf, and Elbridge A. Colby and A. Wess Mitchell, "The Age of Great-Power Competition: How the Trump Administration Refashioned American Strategy," *Foreign Affairs*, January/February 2020, https://www.foreignaffairs.com/articles/2019-12-10/age-great-power-competition. On the language of great power rivalry, see: Zack Cooper, "Bad idea: 'Great power competition' terminology," Defense360, 1 December 2020, https://defense360.csis.org/bad-idea-great-power-competition-terminology/, and Robert C. O'Brien, "*A Free and Open Indo-Pacific*," White House, 5 January 2021, https://www.whitehouse.gov/wp-content/uploads/2021/01/OBrien-Expanded-Statement.pdf.

556. Maggie Tennis and Strobe Talbott, "Jettisoning arms control endangers America's edge in great-power politics," Brookings, 26 July 2019, https://www.brookings.edu/blog/order-from-chaos/2019/07/26/jettisoning-arms-control-endangers-americas-edge-in-great-power-politics/; John D. Maurer, "Post-INF great power arms control," *Real Clear Defense*, 17 September 2019, https://www.realcleardefense.com/articles/2019/09/17/post_inf_great_power_arms_control_114747.html; Christopher Ashley Ford, "The Politics of Arms Control: Getting Beyond Post-Cold War Pathologies and Finding Security in a Competitive Environment," Remarks, International Institute of Strategic Studies,

Many analysts worry that renewed great power rivalry will mean the end of arms control as a tool of national security policy.[557] These analysts are correct that changes in the international security environment will require significant deviation from the autopilot policies that guided American arms control policy for the last thirty years. Arms control in a world of great power rivalry will instead be *competitive arms control*. Great powers will use negotiations to promote their military advantages, the better to prevail over their rivals. If the United States does not wish to be left behind in this new world of competitive negotiation, then it must begin preparing to integrate arms limitation into its long-term strategy *now*.

In facing great power rivals, arms control can contribute to American security in three ways. First, the United States should avoid limiting weapons technologies where it enjoys decisive advantages, like missile defenses. Over the longer term, as adversaries diversify their own capabilities and catch up, limitation may become more desirable, but in the short term the United States gains little by trading away areas of strength. Second, the United States should focus on ensuring *equal* limitation of forces in which it can compete effectively with adversaries, but cannot predominate, like strategic nuclear forces. Over the longer term equal agreements will enhance the United States' major and durable geopolitical advantages. Third, the United States should accept adversary advantages in categories of weapons in which the United States does not wish to compete, like theater nuclear weapons. In these categories, the United States has little to lose to conceding to adversary demands, especially if they

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London, 11 February 2020, https://www.state.gov/the-psychopolitics-of-arms-control/.

557. Eugene Rumer, "A Farewell to Arms… Control," Carnegie Endowment for International Peace, 17 April 2018, https://carnegieendowment.org/2018/04/17/farewell-to-arms-.-.-.-control-pub-76088; Greg Thielmann, "Are We Approaching the End of the Arms Control Era?" Remarks, Grinnell College, Grinnell, IA, 1 April 2019, https://www.armscontrol.org/blog/2019-04-01/we-approaching-end-arms-control-era; Linton F. Brooks, "The End of Arms Control?" *Daedalus* 149 (2), 2020, 84-100, https://doi.org/10.1162/DAED_a_01791; Ulrich Kühn, "Why Arms Control Is (Almost) Dead," Carnegie Endowment for International Peace Europe, 5 March 2020, https://carnegieeurope.eu/strategiceurope/81209.

are linked to adversary concessions in other more important areas.

To maximize advantages from the above three approaches over the longer term, American leaders will need to pursue three important tasks in the short term. The first is to compete vigorously with rivals in certain military-technical domains. Only a strong defense program will provide the leverage necessary to bring rivals to the negotiating table. The second is to integrate arms limitation negotiations into American strategy, along the lines described above. Finally, the United States must retain and expand its hard-won geopolitical advantages, especially its network of alliances and security partners throughout Eurasia. Arms control can support an effective long-term strategy, but it cannot substitute for it: even very successful negotiations will do little to promote American security if the fundamentals, such as alliance security, are allowed to crumble.

Past Competitive Arms Control

While arms control theory predicts that countries will use negotiations to advance their mutual interests in reducing the threat from inherently dangerous technologies, the historical record suggests that, in practice, arms control negotiations are often competitive.[558] Rival great powers move through a cycle of arms control negotiations: the contest for new weapons drives states to negotiate and, in turn, negotiations shape future rounds of rivalry. States manipulate this cycle to advance their own particular aims over time; they will deploy weapons aimed at shaping future negotiations in ways that benefit them, and they will negotiate agreements that shape future rounds to their advantage. For example, the great naval powers of the interwar period employed arms limitation negotiations to stall adversary naval construction, while pursuing transformative technologies like aircraft and submarines that each party hoped would

558. John D. Maurer, "The Purposes of Arms Control," *Texas National Security Review* 2, 1 (2018), 9-27, http://dx.doi.org/10.26153/tsw/870; Brendan Rittenhouse Green, *The Revolution that Failed: Nuclear Competition, Arms Control, and the Cold War* (New York: Cambridge University Press, 2020), 48-65.

prove decisive in future conflict.[559] Similarly, the United States used arms control negotiations with the Soviet Union during the Cold War to advance its "offset strategy," limiting the size of Soviet forces while allowing the United States to leap ahead in weapon accuracy and reliability.[560]

How do great powers use arms limitation negotiations for advantage? The most basic way is by deciding which weapons to limit, and which weapons to leave unrestrained. Great powers that enjoy a substantial advantage over their rivals in a certain type of weapon are unlikely to negotiate its limitation, and will instead prefer to exploit that advantage as much as possible. Similarly, great powers that are dramatically behind in an important weapons technology will generally prefer to rectify that major disadvantage, rather than ratify and extend their weakness into the future. Negotiations will instead focus primarily on technologies which both great powers are capable of producing and exploiting and whose ultimate benefit to either side is therefore ambiguous. Under those circumstances, great powers will seek to use negotiation to bolster their edge in that given technology.

Historically, we can see that great powers have engaged in negotiations selectively to promote their military-technical advantages. During the naval arms limitation negotiations of the 1920s and 1930s, for example, the United States and Great Britain preferred stricter limitations on asymmetric weapons technologies like submarines, which were potentially detrimental to their power-projection capabilities. Yet the Japanese, French, and Italians would not agree to limit this technology, which they believed could serve their interests in offsetting the battleship advantages of other countries.[561]

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559. Emily O. Goldman, *Sunken Treaties: Naval Arms Control Between the Wars* (University Park, PA: The Pennsylvania State University Press, 1994), 153-188.
560. John D. Maurer, "The Forgotten Side of Arms Control: Enhancing U.S. Competitive Advantage, Offsetting Enemy Strengths," *War on the Rocks*, 27 June 2018, https://warontherocks.com/2018/06/the-forgotten-side-of-arms-control-enhancing-u-s-competitive-advantage-offsetting-enemy-strengths/.
561. Joel Ira Holwitt, *"Execute Against Japan": The U.S. Decision to Conduct*

On the other hand, during the early Cold War the United States tried to freeze the strategic nuclear balance in a position of significant American numerical superiority. Unsurprisingly, Soviet leaders would not accept inferiority in such a crucial category of weapons, and continued their own buildup until they reached numerical parity with the United States in the late 1960s.[562]

Rivalrous great powers generally avoid arms control negotiations when they believe that unilateral measures will allow them to prevail over rivals, but when the future balance of capability is less certain they will use negotiations to promote their own strengths. The search for advantage through arms control often results in early rounds of negotiation in which each power demands obvious, unilateral advantages in number and quality of forces over its rival. Yet paradoxically negotiation can only promote one's relative advantage if the adversary consents to and honors the agreement. To win the adversary's assent while preserving one's own advantage, great powers employ two major strategies in their competitive arms control negotiations: *equality,* or *equivalence*. Under a strategy of "equality," a great power offers the adversary a seemingly fair, numerically equal agreement, with the tacit understanding that numerical equality of forces will enhance one's own fewer tangible advantages. Conversely, under a strategy of "equivalence," a great power demands agreements numerically weighted in its favor, which are justified as necessary to offset some larger advantage of its rival.

Whether a great power demands equality or equivalence in arms control negotiations depends on its specific combination of strengths and weaknesses beyond the military realm – economic, technological, and geopolitical. First, a state that is much weaker economically than its rival is more likely to offer negotiations premised on numerically equal forces, since it would be outpaced in an unlimited arms contest. On the other hand, an economically powerful state

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Unrestricted Submarine Warfare (College Station, TX: Texas A&M University Press, 2009), 29-42.

562. James Cameron, *The Double Game: The Demise of America's First Missile Defense System and the Rise of Strategic Arms Limitation* (New York: Oxford University Press, 2018), 49-106.

is likely to demand a higher "equivalent" level of forces reflecting its economic strength. Second, a state that has more sophisticated weapons technology than its adversary is also likely to offer negotiations based on numerical equality, since this will force future contests into the qualitative domain. Conversely, a state that recognizes its technological inferiority will likely demand numerically larger equivalent forces to offset its qualitative disadvantages. Third, a state that enjoys major geopolitical advantages – physical security, easy access to a strategic theater, or many helpful local partners – will also generally offer to negotiate on the basis of equality, trusting that its geopolitical strengths will allow it to prevail. Countries that are less geopolitically secure or surrounded by many hostile states will conversely demand larger equivalent forces that reflect their malign environment.

Because the economic, technological, and geopolitical factors driving great power arms control negotiations reflect *relative* advantages, it is common for different great powers to prefer different approaches, with one calling for equality while the other demands equivalence. Much of the drama of previous negotiations has been bound up in the struggle to determine which approach will prevail, with the outcome often determined by how large the relative advantages of each power are. Take, for example, the naval arms limitation negotiations of the 1920s and 1930s. During this period, Japan's relative economic weakness and geopolitically secure position in the Western Pacific led it to demand *equality* in number of major warships with the other major naval powers, Great Britain and the United States. Japan's far weaker economy meant that it would be swamped in a naval arms race, something that Japanese leaders hoped to avoid. At the same time, Japan's isolated position in the Western Pacific made it difficult for adversaries to attack, while also giving it prime position to expand its colonial holdings in East Asia. An agreement establishing numerical equality of naval forces thus suited Japan's economic and geopolitical situation.

Yet given their economic strengths and geopolitical disadvantages *vis a vis* Japan, Britain and the United States would not settle for equal naval forces. Because Japan was a "one ocean" power while Britain and the United States were each "two ocean" powers, Brit-

ish and American leaders argued that they needed *more* forces than Japan. Put another way, British and American leaders argued that their geopolitical situations were worse than that of Japan, and so required unequal forces to ensure equivalent security – an *equivalent* approach. Japanese leaders were unhappy with this arrangement, but faced with the threat of a naval arms race against the much larger economies of *both* Britain and the United States, they reluctantly agreed to an unequal but "equivalent" level of forces, even though this meant that the Japanese Navy might end up outgunned in a future fight if the British or Americans concentrated all of their forces on the Pacific.[563]

During the Cold War, however, the United States abandoned its demands for arms control equivalence and instead insisted that negotiations be conducted on the principle of *equality* between the superpowers.[564] American leaders calculated that their network of alliances and advanced industrial base would allow them to produce and deploy qualitatively superior weapons, and that Soviet-American numerical equality would therefore advance American strength.[565] The Soviets insisted that arms control agreements reflect the Soviet Union's much more difficult security situation, surrounded as they were by American-backed allies and hostile former clients like China.[566] Soviet leaders agreed that American alliances

563. Goldman, *Sunken Treaties*, 111-152; John H. Maurer, "Arms Control and the Washington Conference," in *The Washington Conference, 1921-22: Naval Rivalry, East Asian Stability and the Road to Pearl Harbor*, eds. Erik Goldstein and John Maurer (New York: Frank Cass, 1994), 267-293.
564. "National Security Decision Memorandum 74," 31 July 1970, *Foreign Relations of the United States, 1969-1976, Volume XXXII: SALT I, 1969-1972*, ed. Erin R. Mahan (Washington, DC: United States Government Printing Office, 2010), Document 100, https://history.state.gov/historicaldocuments/frus1969-76v32/d100.
565. "Conversation Among President Nixon, the Joint Chiefs of Staff, Secretary of Defense Laird, and Others," 10 August 1971, *FRUS 1969-76,* Vol. XXXII, Document 190, https://history.state.gov/historicaldocuments/frus1969-76v32/d190.
566. Memo, Sonnenfedlt to Kissinger, 20 May 1970, *FRUS 1969-76*, Vol. XXXII, Document 77, https://history.state.gov/historicaldocuments/frus1969-76v32/d77.

and technology gave the United States a sizeable advantage, and so preferred that arms control grant them superiority in the number and size of weapons, which they argued would be equivalent.[567]

Yet Soviet demands for larger forces to offset their technological and geopolitical weaknesses ran into trouble given the much smaller Soviet economy. Initially, Soviet leaders tried to split the difference: they conceded equality in strategic weapons in the mid-1970s, but still demanded numerical advantage in theater-range weapons targeting American allies.[568] Only as their economy was truly crumbling, and facing a new generation of American missiles, did Soviet leaders finally agree to American demands for equal strategic and theater forces in the 1987 INF and 1991 START I Treaties.[569] Under the INF Treaty, the Soviets agreed to dismantle their land-based intermediate-range weapons while permitting the United States to retain its growing arsenal of similar sea-based weapons.[570] Similarly, under the START I Treaty the Soviets agreed to smaller, numerically equal strategic arsenals, even as the United States deployed a new generation of qualitatively-superior and highly-accurate Peacekeeper and

567. Aleksandr' G. Savel'yev and Nikolay N. Detinov, *The Big Five: Arms Control Decision-Making in the Soviet Union*, ed. Gregory Varhall, trans. Dimitriy Trenin (Westport, CT: Praeger, 1995), 10-11; John Hines, Ellis Mishulovich, and John Shull, *Soviet Intentions 1965-1985, Volume I: An Analytical Comparison of U.S.-Soviet Assessments During the Cold War* (McLean, VA: BDM Federal, 1995), 4-8, http://nsarchive.gwu.edu/nukevault/ebb285/.

568. Steven Pifer *et al*, *The Treaty on Intermediate-Range Nuclear Forces: History and Lessons* (Washington, DC: Brookings Institution, 2012), https://www.brookings.edu/research/the-treaty-on-intermediate-range-nuclear-forces-history-and-lessons-learned/.

569. "Treaty Between the United States of America and the Soviet Union of Socialist Republics on the Elimination of Their Intermediate-Range and Shorter Missiles (INF Treaty," United States Department of State, accessed 16 September 2020, https://2009-2017.state.gov/t/avc/trty/102360.htm; "START I at a Glance," *Arms Control Association*, February 2019, https://www.armscontrol.org/factsheets/start1.

570. John D. Maurer, "The Dual-Track Approach: A Long-Term Strategy for a Post-INF Treaty World," *War on the Rocks*, 10 April 2019, https://warontherocks.com/2019/04/the-dual-track-approach-a-long-term-strategy-for-a-post-inf-treaty-world/.

Trident II missiles.[571]

Future Competitive Arms Control

As the old Russian-American bargains break down and new rivals emerge, the big question is how previous dynamics will map onto future arms control negotiations. First, we should expect little from negotiations where one side enjoys an obvious advantage. Second, we should expect countries that *do* engage in negotiation to wrestle with the question of equality and equivalence. As before, we should expect great powers to bargain hard at the negotiating table for whatever advantages they can wring from the adversary. Yet countries that are weaker economically or stronger technologically and geopolitically should be more willing to offer numerically "equal" negotiations that compensate for their economic weakness or allow their technological and geopolitical advantages freest reign. Conversely, countries that are economically stronger or technologically and geopolitically weaker will continue to demand numerically greater "equivalent" forces, reflecting their economic advantages and/or offsetting their qualitative weaknesses.

What does this all mean for the United States? Given its massive advantages, the United States should engage in arms limitation negotiations selectively, and avoid limiting areas of significant strength. When it *does* negotiate, the United States should still generally prefer numerically *equal* arms limitation. For decades the United States' economic and technological advantages have dwarfed those of rivals, allowing it to prevail qualitatively even in contests where the number of weapons was limited. As such, the United States should always be on the lookout for opportunities to head off arms racing and further extend these American advantages.

Yet even as rivals like China close the economic and technologi-

571. Maurer, "The Forgotten Side of Arms Control," https://warontherocks.com/2018/06/the-forgotten-side-of-arms-control-enhancing-u-s-competitive-advantage-offsetting-enemy-strengths/.

cal gap and some traditional American advantages wane, the United States can build on the advantages of its unique geopolitical position, including its relative geographic isolation from its rivals and its large network of alliances throughout Eurasia. America's strategic bastion in the Western Hemisphere means that its Eurasian rivals will always pose a greater threat to each other than the United States does, hindering their ability to coordinate effectively beyond diplomatic posturing.[572] At the same time, the United States' vast network of allies complicates adversaries' defense planning and provides the United States with strategic options that adversaries lack.[573] Where it cannot retain significant superiority in numbers, the United States should stand firm on numerical equality in arms control negotiations, confident that its durable advantages will allow it to prevail over its rivals. For this very reason, we should also expect Chinese and Russian leaders to resist "equal" arms control proposals, and instead insist on numerical advantage in weapons they perceive as offsetting American geopolitical strengths.

As the United States considers its future arms control options, it will also have to contend with the shift from the bipolar world of

572. Paul Stronski and Nicole Ng, "Cooperation and Competition: Russia and China in Central Asia, the Russian Far East, and the Arctic," *Carnegie Endowment for International Peace,* 28 February 2018, https://carnegieendowment.org/2018/02/28/cooperation-and-competition-russia-and-china-in-central-asia-russian-far-east-and-arctic-pub-75673; Tanvi Madan, "Between a Cold War Ally and an Indo-Pacific Partner: India's U.S.-Russia Balancing Act," *War on the Rocks,* 16 October 2018, https://warontherocks.com/2018/10/between-a-cold-war-ally-and-an-indo-pacific-partner-indias-u-s-russia-balancing-act/; Pavel K. Baev, "The limits of authoritarian compatibility: Xi's China and Putin's Russia," The Brookings Institution, June 2020, https://www.brookings.edu/research/the-limits-of-authoritarian-compatibility-xis-china-and-putins-russia/.

573. Mira Rapp-Hooper, "Saving America's Alliances: The United States Still Needs the System That Put It On Top," *Foreign Affairs*, March/April 2020, https://www.foreignaffairs.com/articles/united-states/2020-02-10/saving-americas-alliances; David A. Wemer, "Defense Secretary unveils a new strategy for bolstering allies and partnerships in an era of great-power competition," *New Atlanticist*, 20 October 2020, https://www.atlanticcouncil.org/blogs/new-atlanticist/defense-secretary-unveils-a-new-strategy-for-bolstering-allies-and-partnerships-in-an-era-of-great-power-competition/.

the Cold War to the multipolar world of the 21st century. Yet as the naval arms limitation negotiations of the interwar period demonstrate, the basic principles of competitive arms control can and do apply in a multipolar contest – countries will still negotiate only when it suites them, and then structure those negotiations towards equality or equivalence depending on their relative strengths. Of course, multilateral arms limitation negotiations will likely remain a long-term aspiration. The conventional wisdom is that multilateral negotiations are harder to conduct and conclude than bilateral ones, given the added difficulties of satisfying everyone's demands and the added points of failure in additional ratification processes.[574]

As it approaches multilateral arms control negotiations, the most important question for the United States is what role American allies and security partners will play. On the one hand, the United States could exclude allies from negotiations, and limit talks to only the United States and its rivals. This was the approach that the United States pursued during the Cold War, when most of the key arms limitation negotiations took place between the superpowers. This approach can yield tremendous benefits, since by demanding equality with its rivals the United States can effectively augment the strength of its allied partners, whose forces are not counted. On the other hand, this approach demands that the United States shoulder many of the burdens of rivalry and negotiation by itself, a potentially costly proposition. It also poses challenges for alliance cohesion, as allies and partners will have to trust that the United States is representing their best interests at the negotiating table. Canny adversaries may try to exploit this potential mistrust, much as the Soviets did during the Cold War.[575]

Alternatively, the United States could try to "seed" the negotiat-

574. Larry Crump and I. William Zartman, "Multilateral Negotiation and the Management of Complexity," *International Negotiation* 8, 1 (2003), 1-5, https://doi.org/10.1163/138234003769590640.

575. Memo, Lynn and Sonnenfeldt to Kissinger, 1 July 1970, *Foreign Relations of the United States, 1969-1976, Volume XXXII: SALT I, 1969-1972*, ed. Erin Mahan (Washington, DC: United States Government Printing Office, 2010), Document 86, https://history.state.gov/historicaldocuments/frus1969-76v32/d86.

ing table with its own security partners as well as rivals. Including friendly states in negotiations could allow the American "side" to generate greater leverage in talks. For example, the United States was able to impose its preferred 5:3 ratio on Japan during interwar naval talks in large part because the British came to support its stance, threatening Japan with an overwhelming naval coalition arrayed against it. On the other hand, including security partners in talks could allow rivals to demand more "equivalent" forces, such as a Russian demand to equal all of NATO's strategic nuclear capabilities, not just those of the United States. Coordinating allied negotiating strategy would also pose political and diplomatic challenges to ensure that rivals could not divide the United States and its partners against each other.

In the shorter term, however, continued bilateral arrangements between the great powers will still have an important role in multilateral rivalry. First, agreements that enable two powers to cooperate more effectively against common rivals will still have relevance, like the United States and India's growing détente on nuclear issues.[576] Second, agreements that enable two powers to compete with each other at lower costs will also remain relevant. For example, continued Russian-American bilateral strategic dialogue could be important in redirecting resources from both countries towards competing with China.[577] Third, agreements might shape *where* rivals clash geographically. For example, the United States and Russia could conclude agreements covering only Europe but not Asia.[578] Finally, agreements might have implications from *when* rivalry takes place,

576. Mohan Malik, "China Responds to the U.S.-India Nuclear Deal," *China Brief* 6, 7 (2006), https://jamestown.org/program/china-responds-to-the-u-s-india-nuclear-deal/; Amitai Etzioni, "The Darker Side of the U.S.-India Nuclear Deal," *The Diplomat*, 13 February 2015, https://thediplomat.com/2015/02/the-darker-side-of-the-u-s-india-nuclear-deal/.
577. John D. Maurer, "America's strategic interest in New START," *AEIdeas*, 5 November 2019, https://www.aei.org/foreign-and-defense-policy/americas-strategic-interest-in-new-start/.
578. "The Post-INF Treaty Crisis: Background and Next Steps," *Arms Control Association*, 7 August 2019, https://www.armscontrol.org/issue-briefs/2019-08/post-inf-treaty-crisis-background-next-steps.

allowing countries to accelerate or delay key phases of arms racing. For example, the United States might seek to delay racing with the Russians while their technological base declines or with the Chinese while their demographic and environmental challenges multiply.[579]

Scenarios for Future Great Power Arms Control

The return of great power rivalry means that arms control negotiations are unlikely to succeed in the short term, especially as the legacy Cold War agreements are outstripped by new circumstances and while the United States belatedly retools for genuine strategic rivalry. Yet, over the longer term, new arms limitation negotiations between the great powers are very likely. Under what circumstances might we see renewed negotiations over limiting great power armaments? What might these negotiations look like? In the following section, I consider possible limitation of five categories of weapons, describing the current and likely future balance of capabilities among the great powers, and extrapolating what sorts of arms control policies the United States should adopt.

Strategic Nuclear Weapons: Strategic nuclear weapons are an area where the United States is strong, but not dominant. The United States and Russia enjoy roughly similar strategic nuclear arsenals, but the relevant Chinese and Indian forces are an order of magnitude smaller.[580] Chinese and Indian nuclear forces are likely to expand over the long term, though observers remain uncertain about how large their arsenals will ultimately become.[581] Chinese and Indian

579. Apurva Sanghi and Shahid Yusuf, "Russia's Uphill Struggle with Innovation," The World Bank, 17 September 2018, https://www.worldbank.org/en/news/opinion/2018/09/17/russias-uphill-struggle-with-innovation; Michael Beckley, "China's Economy Is Not Overtaking America's," *Journal of Applied Corporate Finance* 32, 2 (2020), 10-23, https://doi.org/10.1111/jacf.12401.
580. "Nuclear Weapons: Who Has What at a Glance," *Arms Control Association*, August 2020, https://www.armscontrol.org/factsheets/Nuclearweaponswhohas-what.
581. For arguments that China and India will build moderately in coming years see: Hans M. Kristensen and Matt Korda, "Chinese nuclear forces, 2019," *Bul-*

leaders will need to weigh the benefits of larger strategic nuclear arsenals against the costs of expanding those arsenals, especially as they also race to build up theater-range missile capabilities.

At the same time, China, Russia, and the United States are all actively working to increase the quality of their strategic nuclear forces, and continued advances in sensing capabilities and weapon accuracy will increase counterforce capabilities. While weapon mobility and concealment will continue to complicate counterforce targeting, over the longer term improvements in sensing techniques and data processing will continue to erode the survivability of second-strike forces in the 2030s and beyond.[582] While retaining accurate missile capabilities will remain important, the locus of strategic nuclear rivalry is likely to shift into the information domain, as great powers increasingly compete to amass the targeting data necessary to attack adversary forces.[583] The search for targeting information is likely to take new and more active forms, including intrusive electronic and cyber measures, with potentially destabilizing consequences.[584]

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letin of the Atomic Scientists 75, 4 (2019), 171-178, https://doi.org/10.1080/00963402.2019.1628511, and Hans M. Kristensen and Matt Korda, "Indian nuclear forces, 2020," *Bulletin of the Atomic Scientists* 76, 4 (2020), 217-225, https://doi.org/10.1080/00963402.2020.1778378. For arguments that China especially may expand its arsenal significantly, see: Michael Mazza and Henry Sokolski, "China's Nuclear Arms Are a Riddle Wrapped in a Mystery," *Foreign Policy*, 13 March 2020, https://foreignpolicy.com/2020/03/13/china-nuclear-arms-race-mystery/; and Peter Huessy and Bradley A. Thayer, "China's nuclear developments reflect its growing ambition," *The Hill*, 7 November 2019, https://thehill.com/opinion/national-security/468972-chinas-nuclear-developments-reflect-its-growing-ambition.

582. Austin Long and Brendan Green, "Stalking the Secure Second Strike: Intelligence, Counterforce, and Nuclear Strategy," *Journal of Strategic Studies* 38, 1-2 (2015), 38-73, https://doi.org/10.1080/01402390.2014.958150; Keir A. Lieber and Daryl G. Press, "The New Era of Counterforce: Technological Change and the Future of Nuclear Deterrence," *International Security* 41, 4 (2017), 9-49, https://doi.org/10.1162/ISEC_a_00273.

583. Paul Bracken, "The Intersection of Cyber and Nuclear War," *The Strategy Bridge*, 17 January 2017, https://thestrategybridge.org/the-bridge/2017/1/17/the-intersection-of-cyber-and-nuclear-war.

584. Bryan Clark, "2019 Forecast: Hard Choices on Invisible Warfare," *Breaking Defense*, 4 January 2019, https://breakingdefense.com/2019/01/2019-fore-

Given the uncertainties surrounding this information contest, the United States and its great power rivals are likely to hedge against major counterforce breakthroughs by retaining sizeable nuclear arsenals to bolster their survivability.[585]

The need to maintain sufficiently large strategic nuclear forces to improve their survival will have significant implications for future arms limitation efforts. For the United States and Russia, the search for survivability in numbers will likely mean an end to the decades-long process of mutual, agreed reduction of their nuclear arsenals.[586] Further marginal reduction of American or Russian forces may still occur, depending on the fiscal situation of the two countries, but such reductions are unlikely to occur according to a mutual negotiated plan, given the potential for serious future counterforce threats.[587]

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cast-hard-choices-on-invisible-warfare/; Niall Firth, "How to fight a war in space (and get away with it)," *MIT Technology Review*, 26 June 2019, https://www.technologyreview.com/2019/06/26/725/satellite-space-wars/; James Johnson and Eleanor Krabil, "AI, Cyberspace, and Nuclear Weapons," *War on the Rocks*, 31 January 2020, https://warontherocks.com/2020/01/ai-cyberspace-and-nuclear-weapons/.

585. Long and Green, "Stalking the Secure Second Strike;" Lieber and Press, "The New Era of Counterforce."

586. Charles L. Glaser, "The Instability of Small Numbers Revisited: Prospects for Disarmament and Nonproliferation," in *Rebuilding the NPT Consensus*, ed. Michael May (Stanford, CA: Center for International Security and Cooperation, 2008), 217-230, https://cisac.fsi.stanford.edu/publications/rebuilding_the_npt_consensus; Thomas C. Schelling, "A world without nuclear weapons?" *Daedalus* 138, 4 (2009), 124-129, https://doi.org/10.1162/daed.2009.138.4.124.

587. For recent discussions of reducing spending on American nuclear forces, see: William D. Hartung, "Now isn't the time to push for nuclear modernization," *Defense News*, 21 April 2020, https://www.defensenews.com/opinion/commentary/2020/04/21/now-isnt-the-time-to-push-for-nuclear-modernization/; Steven Pifer, "How COVID-19 might affect US nuclear weapons and planning," Brookings, 18 May 2020, https://www.brookings.edu/blog/order-from-chaos/2020/05/18/how-covid-19-might-affect-us-nuclear-weapons-and-planning/; and Kingston Reif, "Debating US nuclear spending in the age of the coronavirus," *Bulletin of the Atomic Scientists*, 10 June 2020, https://thebulletin.org/2020/06/debating-us-nuclear-spending-in-the-age-of-the-coronavirus/. On Russia's fiscal-military challenges, see: Susanne Oxenstierna, "Russia's defense spending and the economic decline," *Journal of Eurasian Studies* 7, 1

For China and India, bolstering force survivability will likely mean expanding and diversifying their nuclear forces into full triads.[588]

American strategic nuclear arms limitation policy will have to evolve significantly in the coming years as the Chinese arsenal grows in size. For decades, the smaller size of the Chinse arsenal has allowed the United States to retain roughly equal numbers of strategic launchers with *both* of its major rivals, China and Russia. In recent years, the United States has maintained 655 strategic missiles and bombers, while Russia and China have deployed a combined total of 621.[589] The United States should do everything it can to sustain this enviable position as long as possible by limiting the size of Chinese strategic nuclear forces, even if it means conceding

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(2016), 60-70, https://doi.org/10.1016/j.euras.2015.06.001; Pavel Baev, "Russian Nuclear Modernization and Putin's Wonder-Missiles: Real Issues and False Posturing," Ifri, August 2019, https://www.ifri.org/sites/default/files/atoms/files/baev_russian_nuclear_modernization_2019.pdf; Keith Crane, Olga Oliker, and Brian Nichiporuk, *Trends in Russia's Armed Forces: An Overview of Budgets and Capabilities* (Santa Monica, CA: The RAND Corporation, 2019), https://www.rand.org/content/dam/rand/pubs/research_reports/RR2500/RR2573/RAND_RR2573.pdf.

588. On Chinese nuclear modernization, see: Lt. Gen. Robert P. Ashley, Jr., "Russian and Chinese Nuclear Modernization Trends," Remarks, Hudson Institute, 29 May 2019, https://www.dia.mil/News/Speeches-and-Testimonies/Article-View/Article/1859890/russian-and-chinese-nuclear-modernization-trends/; Kristensen and Korda, "Chinese nuclear forces, 2019," https://doi.org/10.1080/00963402.2019.1628511; *Military and Security Developments Involving the People's Republic of China, 2020: Annual Report to Congress* (Washington, DC: Office of the Secretary of Defense, 2020), https://media.defense.gov/2020/Sep/01/2002488689/-1/-1/1/2020-DOD-CHINA-MILITARY-POWER-REPORT-FINAL.PDF. On Indian nuclear modernization, see: Kristensen and Korda, "Indian nuclear forces, 2020," https://doi.org/10.1080/00963402.2020.1778378.

589. The American and Russian arsenals are monitored under the New START Treaty ("New START Treaty Aggregate Numbers of Strategic Offensive Arms," Department of State, 1 March 2020, https://www.state.gov/new-start-treaty-aggregate-numbers-of-strategic-offensive-arms-13/). As of early 2019, China was estimated to deploy around 90 intercontinental ballistic missiles and 46 submarine-launched ballistic missiles (Kristensen and Korda, "Chinese nuclear forces, 2019," https://doi.org/10.1080/00963402.2019.1628511).

superiority to China and Russia in areas where the United States is weaker, like theater nuclear weapons. One important tool for limiting the scope of the Chinese nuclear arsenal could be greater controls on the production of nuclear-weapons-grade fissile material, of which the United States maintains large stockpiles and which China is working to expand.[590] American negotiators might gain greater leverage in limiting fissile material if American allies like Japan and South Korea also agreed to such limitations, which would clearly be in Beijing's interest.[591] Barring some limitation of Chinese nuclear production, however, the United States is unlikely to sustain its "two-power standard" in strategic nuclear weapons in an unlimited contest over the longer term. As the Chinese arsenal grows, the United States may have to fall back to a position of "equality" with *each* of its rivals' arsenals – that is, allowing Russia and China to each have as many strategic nuclear weapons as the United States.

While the United States should do what it can to forestall the growth of the Chinese nuclear arsenal, the number of Chinese and Russian weapons is likely to be less decisive in future great power rivalry than the quality of information guiding them. In this regard, the

590. On Chinese fissile material production, see: Henry Sokolski, "China's Nuclear Weapons and Fissile Materials Holdings: Uncertainties and Concerns," Testimony before the U.S.-China Economic and Security Review Commission. 26 March 2012, http://www.npolicy.org/article.php?aid=1168&tid=4, and Bill Gertz, "Exclusive: China's 'secretive, crash' nuclear buildup revealed," *Washington Times*, 12 November 2020, https://www.washingtontimes.com/news/2020/nov/12/china-expanding-nuclear-arms-plants-revealed/. On limiting fissile material production, see: James M. Acton, Thomas Macdonald, and Pranay Vaddi, "Revamping Nuclear Arms Control: Five Near-Term Proposals," Carnegie Endowment for International Peace, 14 December 2020, https://carnegieendowment.org/2020/12/14/revamping-nuclear-arms-control-five-near-term-proposals-pub-83429, and Tong Zhao, "Practical Ways to Promote U.S.-China Arms Control Cooperation," Carnegie-Tsinghua Center for Global Policy, 7 October 2020, https://carnegietsinghua.org/2020/10/07/practical-ways-to-promote-u.s.-china-arms-control-cooperation-pub-82818.

591. Michael Mazza and Henry Sokolski, "America Must Dissuade China's Interest in Nuclear Arms," *The National Interest*, 14 December 2019, https://nationalinterest.org/feature/america-must-dissuade-chinas-interest-nuclear-arms-105117.

United States is likely to enjoy significant and durable advantages in access to large volumes of high-quality information. While China and Russia each have significant information gathering capabilities and strong incentives to cooperate against the United States, their efforts to pool and share scientific and informational resources are hampered by their own track records of espionage and intellectual property theft, including from each other.[592] By comparison, the United States not only enjoys its own powerful intelligence capabilities, but also the deepest intelligence cooperation with allies and partners around the world, providing an unparalleled reservoir of information for future targeting.[593] Even in a more numerically equal world, the United States would thus still enjoy greater qualitative informational strategic nuclear capability than its major rivals.[594]

Although the United States has a much deeper bench of intelligence partners than China or Russia, it might still want to consider negotiations to limit active cyber intrusions against nuclear forces. Aside from the possibility that such intrusions could be highly destabilizing, they are also an area where China and Russia seem to have significant capabilities, as gauged by the high-profile hacking campaigns of recent years.[595] While the United States has significant cy-

592. Samuel Bendett and Elsa Kania, "Resilience of Sino-Russian High-Tech Cooperation," *War on the Rocks*, 12 August 2020, https://warontherocks.com/2020/08/the-resilience-of-sino-russian-high-tech-cooperation/.
593. Noah Barkin, "Exclusive: Five Eyes intelligence alliance builds coalition to counter China," *Reuters*, 12 October 2018, https://www.reuters.com/article/us-china-fiveeyes/exclusive-five-eyes-intelligence-alliance-builds-coalition-to-counter-china-idUSKCN1MM0GH; Vivek Raghuvanshi, "India, US sign intel-sharing agreement amid tension with neighboring China," *Defense News*, 28 October 2020, https://www.defensenews.com/space/2020/10/28/india-us-sign-intel-sharing-agreement-amid-tension-with-neighboring-china/; "RESOLVED: Japan is Ready to Become a Formal Member of the Five Eyes," *CSIS Debating Japan* 3, 8 (December 2020), https://www.csis.org/analysis/resolved-japan-ready-become-formal-member-five-eyes.
594. Paul Bracken, "In the Second Nuclear Age, Information Advantage Defines the Balance of Power," *Yale Insights*, 11 August 2020, https://insights.som.yale.edu/insights/in-the-second-nuclear-age-information-advantage-defines-the-balance-of-power.
595. Jordan Robertson and Michael Riley, "The Big Hack: How China Used a

ber capabilities of its own, the relative balance of these capabilities is difficult for the public to assess.[596] If American leaders calculate that Chinese and Russian cyber intrusions help them compensate for their lack of significant multilateral intelligence sharing, however, then negotiations to limit active cyber measures, especially against nuclear forces, would ultimately play to American strengths. Of course, cyber arms control faces significant obstacles, including the challenges of specifying the capabilities or activities to be limited *and* the difficulties of verifying restraints on covert cyber activities.[597] Limiting the cyber-attacks against nuclear forces would thus likely involve less formal commitments by the major powers to show mutual restraint in cyber intrusions, with verification ensured primarily by unilateral technical means.[598] If such informal agreements could bolster American informational advantages, then they would be well worth pursuing.

Long-Range Conventional Weapons: When it comes to theater conventional weapons (up to 5,500 km in range), the United States

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Tiny Chip to Infiltrate U.S. Companies," *Bloomberg*, 4 October 2018, https://www.bloomberg.com/news/features/2018-10-04/the-big-hack-how-china-used-a-tiny-chip-to-infiltrate-america-s-top-companies; David E. Sanger, "Russian Hackers Broke Into Federal Agencies, U.S. Officials Suspect," 13 December 2020, https://www.nytimes.com/2020/12/13/us/politics/russian-hackers-us-government-treasury-commerce.html.

596. Joshua Rovner, "More Aggressive and Less Ambitious: Cyber command's Evolving Approach," *War on the Rocks,* 14 September 2020, https://warontherocks.com/2020/09/more-aggressive-and-less-ambitious-cyber-commands-evolving-approach/.

597. Erica D. Borghard and Shawn W. Lonergan, "Why Are There No Cyber Arms Control Agreements?" *Council on Foreign Relations*, 16 January 2018, https://www.cfr.org/blog/why-are-there-no-cyber-arms-control-agreements; Andrew Futter, "What does cyber arms control look like? Four principles for managing cyber risk," European Leadership Network, June 2020, https://www.europeanleadershipnetwork.org/wp-content/uploads/2020/06/Cyber-arms-control.pdf.

598. Christopher Ashley Ford, "Rules, Norms, and Community: Arms Control Discourses in a Changing World," Remarks, European Union Conference on Nonproliferation, Brussels, 13 December 2019, https://www.state.gov/rules-norms-and-community-arms-control-discourses-in-a-changing-world/.

is in an ambiguous position. Today, the United States is by far the world leader in sea- and air-based theater conventional weapons, with an arsenal of thousands of sea- and air-launched cruise missiles, while China has the world's greatest ground-based capabilities, including nearly a thousand truck-launched medium- and intermediate-range ballistic missiles.[599] This current balance is unlikely to be durable, however, as the end of the INF Treaty frees the United States to pursue its own ground-based capabilities, while the rapid buildup of Chinese and Indian naval forces challenge America's long-standing naval preeminence.[600] Yet assuming that it can keep its allies onboard, the United States will enjoy durable advantages in theater conventional strikes given its large network of alliances throughout Europe and Asia. American weapons deployed on and near allied territory can strike adversaries like China or Russia directly, while Chinese and Russian intermediate-range weapons can strike American allies and bases, but not the United States itself.[601] Furthermore, that same network of alliances constrains the ability of Chinese or Russian naval forces to project power outside of their home regions, further worsening the theater conventional balance.[602] Over the longer-term, the contest for theater conventional weapons is likely to cause greater harm to the security of Eurasian powers

599. Eric Heginbotham *et al*, *The U.S.-China Military Scorecard: Forces, Geography, and the Evolving Balance of Power, 1996-2017* (Santa Monica, CA: The RAND Corporation, 2015), https://www.rand.org/pubs/research_reports/RR392.html.

600. Sydney J. Freedberg, Jr., "What Weapons Will the US Build After The INF Treaty," *Breaking Defense*, 22 October 2018, https://breakingdefense.com/2018/10/what-weapons-will-the-us-build-after-the-inf/; Andrey Baklitskiy, "What the End of the INF Treaty Means for China," Carnegie Moscow Center, 12 February 2019, https://carnegie.ru/commentary/80462; Franz-Stefan Gady, "India Test Fires Intermediate-Range, Submarine-Launched Ballistic Missile," *The Diplomat*, 20 January 2020, https://thediplomat.com/2020/01/india-test-fires-intermediate-range-submarine-launched-ballistic-missile/.

601. Maurer, "The Dual-Track Approach," https://warontherocks.com/2019/04/the-dual-track-approach-a-long-term-strategy-for-a-post-inf-treaty-world/.

602. Michael Beckley, "The Emerging Military Balance in East Asia: How China's Neighbors Can Check Chinese Naval Expansion," *International Security* 42, 2 (2017), 78-119, https://www.mitpressjournals.org/doi/pdf/10.1162/ISEC_a_00294.

than to the United States which, even in the missile age, enjoys an advantageous isolation in the Western Hemisphere.

While the technical characteristics of theater-range weapons favor the United States and its network of allies, reliance on security partners poses significant political challenges that rivals like China and Russia do not face. American theater missile deployments require partners to agree to host American missiles, a difficult political proposition. Indeed, in the immediate aftermath of the INF Treaty, allied governments rejected or downplayed the possibility of hosting new American missiles, leading many analysts to conclude that American allies would never agree to host such weapons.[603] Yet as the INF Treaty recedes into the past and military rivalry continues unabated, many American partners are taking a second look at the potential utility of theater-range conventional missiles, providing opportunities for fruitful collaboration.[604] Ironically, Chinese and Russian efforts to disrupt cooperation between the United States and its al-

603. On allied responses, see: "Australia won't host U.S. missiles, prime minster says," *Reuters*, 5 August 2019, https://www.reuters.com/article/us-australia-usa-missiles/australia-wont-host-u-s-missiles-prime-minister-says-idUSKCN1UV0IB; Robin Harding and Lionel Barber, "Japan sounds warning on China's growing military might," *Financial Times*, 31 October 2019, https://www.ft.com/content/eb5191ee-fbbf-11e9-a354-36acbbb0d9b6; Kingston Reif, "AS INF Treaty Falls, New START Teeters," *Arms Control Association*, March 2019, https://www.armscontrol.org/act/2019-03/news/inf-treaty-falls-new-start-teeters. For initial assessments, see: Pranay Vaddi, "Leaving the INF Treaty Won't Help Trump Counter China," Carnegie Endowment for International Peace, 31 January 2019, https://carnegieendowment.org/2019/01/31/leaving-inf-treaty-won-t-help-trump-counter-china-pub-78262; Tom Countryman and Kingston Reif, "Intermediate-Range Missiles are the Wrong Weapon for Today's Security Challenges," *War on the Rocks*, 13 August 2019, https://warontherocks.com/2019/08/intermediate-range-missiles-are-the-wrong-weapon-for-todays-security-challenges/; "The U.S. Will Find Fewer Takers in the Western Pacific for Its Missiles," Stratfor, 21 August 2019, https://worldview.stratfor.com/article/us-will-find-few-takers-western-pacific-its-missiles-china-russia.

604. Jeffrey W. Hornung, "Is Japan's Interest in Strike Capabilities a Good Idea?" *War on the Rocks*, 17 July 2020, https://warontherocks.com/2020/07/is-japans-interest-in-strike-capabilities-a-good-idea/; "Australia partners with US to develop hypersonic missiles," *CNN*, 1 December 2020, https://www.cnn.com/2020/12/01/australia/hypersonic-missile-australia-us-intl-hnk/index.html.

lies may also provide opportunities to strengthen allied resolve, as heavy-handed intimidation and coercion provokes allies into taking stronger stances against American adversaries.[605] By investing in its alliances and taking advantage of rival missteps, the United States can create the political conditions under which it can exploit its advantages in theater-range weapons.

When it comes to arms limitation, the American position on theater-range weapons is ambiguous. On the one hand, the United States' advantages in theater conventional forces suggest that it should forgo arms limitation in this category and instead deploy such weapons and encourage allies to do the same.[606] On the other hand, the United States may see greater advantage in controlling theater conventional weapons, so long as those controls are equal. The cost and complexity of theater-range missiles make it difficult to amass them in sufficient numbers to coerce adversaries directly in wartime. Instead, theater conventional weapons will disrupt enemy wartime activities and create windows of opportunity for massive shorter-range forces to exploit. For example, China plans to use theater conventional missiles as part of its anti-access strategy, delaying American entry into the Western Pacific long enough for Chinese forces to invade or coerce their neighbors.[607] Similarly, the United States plans to

605. Jung H. Pak, "Trying to Loosen the Linchpin: China's Approach to South Korea," Brookings Global China, July 2020, https://www.brookings.edu/wp-content/uploads/2020/07/FP_20200606_china_south_korea_pak_v2.pdf; Mihir Sharma, "China's Bullying Tactics Will Only Unite Its Foes," *Bloomberg*, 19 November 2020, https://www.bloomberg.com/opinion/articles/2020-11-19/china-s-trade-pressure-on-australia-will-likely-fail; Luke Patey, "China is an Economic Bully – and Weaker Than It Looks," *Foreign Policy*, 4 January 2021, https://foreignpolicy.com/2021/01/04/china-is-an-economic-bully-and-weaker-than-it-looks/.

606. Andrew S. Erickson, "Good Riddance to the INF Treaty: Washington Shouldn't Tie Its Own Hands in Asia," *Foreign Affairs*, 20 August 2019, https://www.foreignaffairs.com/articles/china/2019-08-29/good-riddance-inf-treaty.

607. Andrew F. Krepinevich and Barry Watts, *Meeting the Anti-Access and Area-Denial Challenge* (Washington, DC: Center for Strategic and Budgetary Assessments, 2003), https://csbaonline.org/research/publications/a2ad-anti-access-area-denial; Eric Heginbotham *et al*, *Chinese Attacks on U.S. Air Bases in Asia: An Assessment of Relative Capabilities, 1996-2017* (Santa Monica, CA:

use theater conventional fires to suppress enemy anti-access systems thus allowing American ships and tactical aircraft to close with and destroy the adversary.[608] Yet the United States and its allies might be able to achieve similar results using cheaper, shorter-range weapons.[609] If theater conventional weapons were strictly limited or even eliminated, then the United States and its allies might actually be *even better off* in their ability to maneuver around China and Russia's maritime peripheries while denying that same maneuver to the Eurasian challengers.

In the realm of theater conventional weapons, the United States' geopolitical position offers it a wealth of advantages, whether it chooses to push for low and equal limitations or simply to compete vigorously with its rivals. To best exploit these advantages, however, American leaders should decide *which* approach they wish to pursue, and soon. The choice is more than academic, as it bears directly on the question of whether the United States should proliferate theater conventional weapons to its partners, or not. Proliferating missiles to allies will entail fewer alliance political problems in the shorter term, allowing a larger allied missile force to be deployed more quickly in China and Russia's vicinities. If the longer-term objective is an equal and low limitation of theater conventional weapons, however, American control would dramatically simplify

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The RAND Corporation, 2015), https://www.rand.org/pubs/research_briefs/RB9858z2.html.

608. Jan van Tol *et al*, *AirSea Battle: A Point-of-Departure Operational Concept* (Washington, DC: Center for Strategic and Budgetary Assessments, 2010), https://csbaonline.org/research/publications/airsea-battle-concept; Sydney J. Freedberg, Jr., "Army Rebuilds Artillery Arm For Large-Scale War," *Breaking Defense*, 27 April 2020, https://breakingdefense.com/2020/04/army-rebuilds-artillery-arm-for-large-scale-war/; Douglas Birkley, "The DoD needs to rethink long-range strike in its joint war fighting concept," *Defense News*, 21 August 2020, https://www.defensenews.com/opinion/commentary/2020/08/21/the-dod-needs-to-rethink-long-range-strike-in-its-joint-war-fighting-concept/.

609. Beckley, "The Emerging Military Balance in East Asia," https://www.mitpressjournals.org/doi/pdf/10.1162/ISEC_a_00294; Eric Heginbotham and Richard J. Samuels, "Active Denial: Redesigning Japan's Response to China's Military Challenge," *International Security* 42, 4 (2018), 128-169, http://dx.doi.org/10.1162/isec_a_00313.

the ultimate deal with China and/or Russia because fewer countries would sit at the negotiating table.

Over time, range of conventional weapons may increase to intercontinental distances greater than 5,500 km.[610] While the United States *could* compete in this new category of weapon, intercontinental conventional weapons would reduce some of the utility of American allies as missile bases, since rival intercontinental missiles would be just as capable of hitting the United States. American rivals might also find such limitation attractive since conventional intercontinental missiles would compete with other acquisition priorities for scarce resources like rocket boosters and guidance systems. An approach to limit a non-existent weapon system that no power sees as militarily decisive might be a useful short-term measure to begin a multilateral arms control dialogue, even if racing continues in other missile capabilities.

Theater Nuclear Weapons: When it comes to theater nuclear weapons, the United States is not particularly strong, nor does it need to be. American leaders opted to divest from most of the theater nuclear arsenal in the 1990s, even though China and Russia did not.[611] American nuclear divestment was militarily sound, as the rapid proliferation of precision conventional weapons has rendered most theater nuclear weapons militarily redundant, even for

610. Bruce M. Sugden, "Speed Kills: Analyzing the Deployment of Conventional Ballistic Missiles," *International Security* 34, 1 (2009, 113-146, https://doi.org/10.1162/isec.2009.34.1.113; Amy F. Woolf, *Conventional Prompt Global Strike and Long-Range Ballistic Missiles: Background and Issues* (Washington, DC: Congressional Research Service, 2020), https://crsreports.congress.gov/product/pdf/R/R41464; Henry Sokolski, "What Missile-driven Competition with China Will Look Like," *American Purpose*, 21 October 2020, https://www.americanpurpose.com/articles/missile-driven-competition-china-sokolski/.
611. Susan J. Koch, *The Presidential Nuclear Initiatives of 1991-1992* (Washington, DC: National Defense University Press, 2012), https://ndupress.ndu.edu/Portals/68/Documents/casestudies/CSWMD_CaseStudy-5.pdf; Hans M. Kristensen, "US Navy Instruction Confirms Retirement of Nuclear Tomahawk Missile," *Federation of American Scientists*, 18 March 2013, https://fas.org/blogs/security/2013/03/tomahawk/.

America's great power rivals.[612] Despite this, theater nuclear weapons retain some *political* utility. First, countries that cannot procure enough advanced conventional weapons to meet their potential wartime needs - like Pakistan - may still rely on the battlefield effects of nuclear weapons against more powerful conventional adversaries.[613] Second, countries that fear defeat on the battlefield by conventionally-superior adversaries may still see theater nuclear weapons as useful signaling tools to terminate conflicts through escalation, regardless of the weapon's actual battlefield impact.[614] Third, countries that border great power rivals in Eurasia may use cheaper theater-range nuclear weapons to supplement their core strategic forces for mis-

612. Robert Tomes, "The Cold War Offset Strategy: Assault Breaker and the Beginning of the RSTA Revolution," *War on the Rocks*, 20 November 2014, https://warontherocks.com/2014/11/the-cold-war-offset-strategy-assault-breaker-and-the-beginning-of-the-rsta-revolution/; David E. Johnson, *Shared Problems: The Lessons of AirLand Battle and the 31 Initiatives for Multi-Domain Battle* (Santa Monica, CA: The RAND Corporation, 2018), https://www.rand.org/pubs/perspectives/PE301.html; Cynthia Roberts, "Revelations About Russia's Nuclear Deterrence Policy," *War on the Rocks*, 19 June 2020, https://warontherocks.com/2020/06/revelations-about-russias-nuclear-deterrence-policy/; Fiona S. Cunningham and M. Taylor Fravel, "Assuring Assured Retaliation: China's Nuclear Posture and U.S.-China Strategic Stability," *International Security* 40, 2 (2015), 7-50, https://doi.org/10.1162/ISEC_a_00215; Caitlin Talmadge, "Would China Go Nuclear? Assessing the Risk of Chinese Nuclear Escalation in a Conventional War with the United States," *International Security* 41, 4 (2017), 50-92, https://doi.org/10.1162/ISEC_a_00274; Walter C. Ladwig, III, "A Cold Start for Hot Wars? The Indian Army's New Limited War Doctrine," *International Security* 32, 3 (2007/2008), 158-190, https://doi.org/10.1162/isec.2008.32.3.158.

613. Sadia Tasleem, "Pakistan's Nuclear Use Doctrine," Carnegie Endowment for International Peace, 30 June 2016, https://carnegieendowment.org/2016/06/30/pakistan-s-nuclear-use-doctrine-pub-63913.

614. Keir A. Lieber and Daryl G. Press, "Coercive Nuclear Campaigns in the 21st Century: Understanding Adversary Incentives and Options for Nuclear Escalation," Project on Advanced Systems and Concepts for Countering Weapons of Mass Destruction, Report Number 2013-001, March 2013, https://calhoun.nps.edu/bitstream/handle/10945/34337/nps08-040813-01.pdf?sequence=1&isAllowed=y; Henry Sokolski, "A Peek into Our Nuclear Future," *The American Interest*, 5 August 2020, https://www.the-american-interest.com/2020/08/05/a-peek-into-our-nuclear-future/.

sions of coercion and counterforce.[615] To ensure robust deterrence against these sorts of provocations, the United States should retain some limited theater nuclear capabilities.[616] But there is no need to compete quantitatively with adversaries in deploying theater nuclear weapons. Nor is there any political appetite in the United States for dramatically expanding the theater nuclear footprint – new American theater-range missiles will almost certainly be conventionally-armed.[617]

Since the United States is weaker in this field, it should consider limiting theater nuclear capabilities – on its adversaries' terms. Russia especially maintains a massive legacy stockpile of tactical nuclear weapons that makes a numerically-equal agreement difficult to conceive, since none of the other great powers intend to build thousands of new theater nuclear weapons.[618] At the same time, it is difficult to imagine Russia making large unilateral cuts to its nuclear stockpile, on which Russian leaders continue to rely for both security and prestige.[619] Nor are China or India likely to accept limitations easily on weapons that they see as crucial to deterring regional rivals, includ-

615. Christopher P. Twomey, "Asia's Complex Strategic Environment," *Asia Policy* 11 (2011), 51-78, https://www.jstor.org/stable/24905026; Gregory D. Koblentz, *Strategic Stability in the Second Nuclear Age* (New York: Council on Foreign Relations, 2014), file:///C:/Users/John/AppData/Local/Temp/Second%20Nuclear%20Age_CSR71.pdf.
616. Keir A. Lieber and Daryl G. Press, "The Nukes We Need: Preserving the American Deterrent," *Foreign Affairs* November/December 2009, https://www.foreignaffairs.com/articles/2009-11-01/nukes-we-need; Mark B. Schneider, "Deterring Russian First Use of Low-Yield Nuclear Weapons," *Real Clear Defense*, 12 March 2018, https://www.realcleardefense.com/articles/2018/03/12/deterring_russian_first_use_of_low-yield_nuclear_weapons_113180.html.
617. Jon Harper, "Options About for New Intermediate-Range Missiles," *National Defense*, 31 October 2019, https://www.nationaldefensemagazine.org/articles/2019/10/31/options-abound-for-new-intermediate-range-missiles.
618. *Nonstrategic Nuclear Weapons* (Washington, DC: Congressional Research Service, 2020), https://fas.org/sgp/crs/nuke/RL32572.pdf#page=26.
619. Anya Loukianova Fink and Olga Oliker, "Russia's Nuclear Weapons in a Multipolar World: Guarantors of Sovereignty, Great Power Status & More," *Daedalus* 149, 2 (2020), 37-55, https://doi.org/10.1162/daed_a_01788.

ing each other.[620]

Although great powers have historically been loath to concede superiority to their rivals in arms limitation talks, in the case of theater nuclear weapons the United States would be wise to recognize its adversaries' advantages, so long as that recognition came with Chinese and Russian concessions in other fields. Specifically, the United States should offer adversaries "equivalent" theater nuclear capabilities in exchange for freezing the currently-favorable strategic nuclear balance, in which the United States has approximately as many strategic launchers as China and Russia combined.[621] Freezing this status quo – in which the United States retains its strategic nuclear advantages, while China and Russia retain their theater nuclear advantages – would ultimately play to American strengths, especially in its relations with China. Such a "freeze" of both strategic and theater nuclear capabilities might be made more enticing to China if it included not just the United States and Russia, but also regional nuclear forces like India, or latent nuclear countries like Japan. Indeed, given its paucity of theater nuclear capabilities, the United States might gain more leverage by positioning itself as a "broker" between China and its neighbors in limiting theater nuclear capabilities.

Missile Defenses and Space Forces: The United States is far ahead of its rivals in missile defense technology, and should do what it can to remain that way. As noted above, dramatic increases in the accuracy of weapons are increasing the importance of active de-

620. Robert Einhorn and Waheguru Pal Singh Sidhu, *The Strategic Chain: Linking Pakistan, India, China, and the United States* (Washington, DC: Brookings Institution, 2017), https://www.brookings.edu/research/the-strategic-chain-linking-pakistan-india-china-and-the-united-states/.

621. Under New START, the United States currently deploys 655 strategic launchers, while Russia deploys only 485 ("New START Treaty Aggregate Numbers of Strategic Offensive Arms," Department of State, 1 March 2020, https://www.state.gov/new-start-treaty-aggregate-numbers-of-strategic-offensive-arms-13/). China is estimated to deploy 90 intercontinental ballistic missiles and 46 submarine-launched ballistic missiles (Kristensen and Korda, "Chinese nuclear forces, 2019," https://doi.org/10.1080/00963402.2019.1628511).

fenses against missiles at all levels of conflict. The United States is moving ahead rapidly here, working to field a full spectrum of ballistic missile defenses (BMD) that can attack incoming missiles during their boost, midcourse, and terminal phases.[622] Aside from traditional BMD, concerns about the increasing lethality of conventional weapons are also driving the United States to pursue additional active defenses for bases, ships, submarines, and perhaps even aircraft.[623] Over the longer term, emerging technologies in sensing and data processing are likely to make defenses even more accurate, while new types of interceptors with deeper magazines may help alleviate cost and expand coverage.[624] Chinese and Russian missile

622. *Missile Defense Review* (Washington, DC: Office of the Secretary of Defense, 2019), https://www.defense.gov/Portals/1/Interactive/2018/11-2019-Missile-Defense-Review/The%202019%20MDR_Executive%20Summary.pdf; "Current U.S. Missile Defense Programs at a Glance," *Arms Control Association*, August 2019, https://www.armscontrol.org/factsheets/usmissiledefense.
623. Breaking Defense Staff, "How Active Protection Systems Knock Down Anti-Armor Threats for Both Legacy and Future Combat Vehicles," *Breaking Defense*, 17 January 2020, https://breakingdefense.com/2020/01/how-active-protection-systems-knock-down-anti-armor-threats-for-both-legacy-and-future-combat-vehicles/; Aaron Amick, "The Shadowy World of Submarine and Ship-Launched Torpedo Countermeasures," *The Drive*, 14 May 2020, https://www.thedrive.com/the-war-zone/33467/the-shadowy-world-of-submarine-and-ship-launched-torpedo-countermeasures-an-explainer; Joseph Trevithick, "Tiny Missile Interceptor to Defend Aircraft Against Enemy Missile Attacks Moves Forward," *The Drive*, 22 July 2020, https://www.thedrive.com/the-war-zone/35038/tiny-missile-interceptor-to-defend-aircraft-against-enemy-missile-attacks-moves-forward; Connie Lee, "Army Charts New Path for Air and Missile Defense," *National Defense*, 10 June 2019, https://www.nationaldefensemagazine.org/articles/2019/6/10/army-charts-new-path-for-air-and-missile-defense.
624. Jon Harper, "Just In: Pentagon Contemplating Role of AI in Missile Defense," *National Defense*, 7 October 2019, https://www.nationaldefensemagazine.org/articles/2019/10/7/pentagon-contemplating-role-of-ai-in-missile-defense; John Keller, "Military eyes prototype megawatt-class laser weapon for ballistic missile defense in next seven years," *Military & Aerospace Electronics*, 2 April 2019, https://www.militaryaerospace.com/sensors/article/16722085/military-eyes-prototype-megawattclass-laser-weapon-for-ballistic-missile-defense-in-next-seven-years; Lockheed Martin, "Next-Gen Interceptor: A New Layer of Missile Defense," *Breaking Defense*, 30 July 2020, https://breakingdefense.com/2020/07/next-gen-interceptor-a-new-layer-of-missile-defense/.

defenses are limited in comparison to those of the United States. Russia has traditionally taken a more incremental approach, seeking to add greater missile defense capabilities to its existing air defense systems.[625] Over the shorter term, China is likely to follow the Russian model of incremental modernization, though over the longer-term it may pursue more dedicated missile defenses along American lines.[626]

Because the United States leads its rivals in ballistic missile defenses, China and Russia regularly demand that the United States dismantle them.[627] Both rivals rely heavily on long-range missiles, and fear that American missile defenses could grow into an effective countermeasure.[628] Yet because the United States is *so* far ahead of its adversaries in this field, it makes little sense to compromise. Trading away such a valuable capability for concessions from the

625. Missile Defense Project, "Russian Air and Missile Defense," *Missile Threat*, Center for Strategic and International Studies, 14 June 2018, https://missilethreat.csis.org/system/russian-air-defense/.
626. "Chinese and Russian Missile Defense: Strategies and Capabilities," Department of Defense, 28 July 2020, https://media.defense.gov/2020/Jul/28/2002466237/-1/-1/1/CHINESE_RUSSIAN_MISSILE_DEFENSE_FACT_SHEET.PDF; Jim Garmonde, "Missile Defense Becomes Part of Great Power Competition," *DoD News*, 28 July 2020, https://www.defense.gov/Explore/News/Article/Article/2291331/missile-defense-becomes-part-of-great-power-competition/.
627. Gordon Lubold and Julian E. Barnes, "U.S. Dismisses Putin's Objection to European Missile Systems," *The Wall Street Journal*, 13 May 2016, https://www.wsj.com/articles/u-s-dismisses-putins-objection-to-european-missile-systems-1463172958; Matt Stiles, "Upset over a U.S. missile defense system, China hits South Korea where it hurts – in the wallet," *Los Angeles Times*, 28 February 2018, https://www.latimes.com/world/asia/la-fg-china-south-korea-tourism-20180228-htmlstory.html.
628. Stephen J. Cimbala and Adam Lowther, "Putin and Missile Defense Malaise: Broadening US Options," *Journal of European, Middle Eastern, & African Affairs* 2, 2 (2020), 4-20, https://media.defense.gov/2020/Jun/09/2002313275/-1/-1/1/CIMBALA.PDF; Tong Zhao, "Narrowing the U.S.-China Gap on Missile Defense: How to Forestall a Nuclear Arms Race," Carnegie-Tsinghua Center for Global Policy, 29 June 2020, https://carnegietsinghua.org/2020/06/29/narrowing-u.s.-china-gap-on-missile-defense-how-to-help-forestall-nuclear-arms-race-pub-82120.

Chinese and Russians may seem appealing, but would only be worthwhile if China or Russia offered *major* concessions in another important field, which (given their repeated demands for unilateral dismantling of American defenses) seems unlikely. Even if the United States *did* want to bargain with China and Russia over missile defenses, it would quickly run into further difficulties. American missile defenses are aimed primarily at second-tier threats like Iran and North Korea, so American leaders are likely to resist limitations on missile defense that do not also curtail the rogue state threat.[629] China and Russia will also resist limitation of their own dual-use air and missile defense systems, which both rely on to counter American airpower. The United States would do better to seek negotiating leverage in other ways, by modernizing its own strategic nuclear forces and by compromising in areas of American weakness, like theater nuclear weapons.

Another potential argument for limiting missile defenses is that such limitation would also enable controls on space weapons, since many missile defense systems also have latent anti-satellite capability.[630] If limiting missile defenses would somehow render space systems invulnerable, then it would certainly be worth pursuing, but in fact limiting missile defenses will do little to demilitarize outer space. The ongoing revolution in missile accuracy places a premium on the ability both to gather information at long ranges and to degrade the opponent's information-gathering capabilities. Missile enabling systems in outer space will therefore be increasingly important to all the great powers, as will capabilities to disrupt each other's space assets.[631] The importance of military space systems would only de-

629. Brad Roberts, "On the Strategic Value of Ballistic Missile Defense," *Proliferation Papers* 50 (Paris: Ifri, 2014), https://www.ifri.org/sites/default/files/atoms/files/pp50roberts.pdf.
630. Laura Grego, "The Anti-Satellite Capability of the Phased Adaptive Approach Missile Defense System," Federation of American Scientists, Winter 2011, https://fas.org/pubs/pir/2011winter/2011Winter-Anti-Satellite.pdf; Sophia Chen, "Missile-Defense Systems May Risk Space Warfare," *APS News* 27, 8 (2018), https://www.aps.org/publications/apsnews/201808/missile-defense.cfm.
631. Defense Intelligence Agency, "Challenges to Security in Space," January 2019, https://www.dia.mil/Portals/27/Documents/News/Military%20Power%20

crease over the longer term if emerging technologies decrease the military utility of outer space – for example, by replacing expensive and vulnerable satellite constellations with swarms of cheaper and easier-to-replace drones, or by improving inertial navigation systems to the point that orbital radio-navigation like GPS becomes redundant.[632] Until such time, none of the great powers are likely to surrender their space weapons, regardless of the status of missile defense programs.

Aside from the strategic appeal of anti-satellite weapons, limiting anti-satellite capabilities is especially difficult because many emerging anti-satellite technologies are dual-use. While existing kinetic anti-satellite missiles bear some similarity to American hit-to-kill missile interceptors, future anti-satellite weapons are more likely to take the form of maneuvering orbital spacecraft capable of rendezvous proximity operations (RPO), in which one satellite approaches another and interacts with it via robotic appendages.[633] RPO-capable spacecraft have important peaceful utility for repairing or enhancing existing satellites, but the same technology would also allow an attacker to disable or even destroy crucial satellites with tremendous speed and precision.[634] Similarly, adversaries might target important

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Publications/Space_Threat_V14_020119_sm.pdf; C. Todd Lopez, "Defense Space Strategy Addresses Militarization, Competition," *DoD News*, 18 June 2020, https://www.defense.gov/Explore/News/Article/Article/2224914/defense-space-strategy-addresses-militarization-competition/; Rajeswari Pillai Rajagopalan, "From earth to space: India and China's space programs gear up for intense competition ahead," *Observer Research Foundation*, 29 June 2020, https://www.orfonline.org/research/from-earth-to-space-68717/.

632. Matt Sivacek, "Is it time? Ending the Military's Reliance on GPS," *Real Clear Defense*, 28 February 2018, https://www.realcleardefense.com/articles/2018/02/28/is_it_time_ending_the_militarys_reliance_on_gps__113131.html; Mike Cherney, "Drone Ambitions Soar to the Stratosphere," *The Wall Street Journal*, 26 August 2019, https://www.wsj.com/articles/drone-ambitions-soar-to-the-stratosphere-11566822941.

633. Brian G. Chow, "Stalkers in Space: Defeating the Threat," *Strategic Studies Quarterly* 11, 2 (2017), 82-116, https://www.airuniversity.af.edu/Portals/10/SSQ/documents/Volume-11_Issue-2/Chow.pdf.

634. Anuradha Damale, "Rendezvous Proximity Operations: Not operating in isolation," *Europna Leadership Network*, 12 August 2020, https://www.euro-

satellites with ground-based laser systems, blinding fragile sensors and perhaps eventually frying critical electrical components.[635] Like RPO-capable spacecraft, however, accurate high-powered lasers have important peaceful uses in space navigation and scientific experimentation.[636] Given their important peaceful utility, prohibition of RPO-capable spacecraft and high-powered lasers seems unlikely. The United States should ensure that it keeps abreast of these important capabilities.

Although prohibition of anti-satellite weapons seems unlikely, the United States would still benefit tremendously from pursuing clearer "rules of the road" with partners and adversaries regarding the use of anti-satellite capabilities. After all, the United States remains the world's foremost user of outer space for military missions, and so has the most to lose if space-based systems are destroyed.[637] Nor is the United States' disproportionate military reliance on outer space likely to change even as China and Russia deploy their own space-based sensing and navigation systems: after all, in the event of conflict it is the American military that will need to play the "away game" in the adversary's back yard, where adversaries can more easily rely upon ground- and air-based systems to make up for space-based losses.[638] One possible approach would be for coun-

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peanleadershipnetwork.org/commentary/rendezvous-proximity-operations-not-operating-in-isolation/.

635. Patrick Tucker, "Russia Claims It Has Lasers to Shoot Satellites," *Defense One*, 26 February 2018, https://www.defenseone.com/technology/2018/02/russia-claims-it-now-has-lasers-shoot-satellites/146243/; Sandra Erwin, "Pentagon report: China amassing arsenal of anti-satellite weapons," *Space News*, 1 September 2020, https://spacenews.com/pentagon-report-china-amassing-arsenal-of-anti-satellite-weapons/.

636. "Satellite Laser Ranging and Earth Science," NASA Space Geodesy Program, https://ilrs.gsfc.nasa.gov/docs/slrover.pdf.

637. "UCS Satellite Database," Union of Concerned Scientists, 1 August 2020, https://www.ucsusa.org/resources/satellite-database. Over time, we might even see commercial and military exploitation of space beyond Earth's immediate orbit; see, Peter Garretson, "What War in Space Might Look Like Circa 2030-2040," Nonproliferation Policy Education Center, 13 August 2020, http://www.npolicy.org/article.php?aid=1501&tid=2.

638. Daniel Cebul, "How the Air Force plans to use space to project power in

tries to agree not to pre-position RPO-capable spacecraft near each other's satellites, perhaps by establishing a "self-defense" or "warning" zone around each satellite in which other countries would enjoy the right of "innocent passage" but within which countries would not permanently position satellites in a threatening configuration.[639] Similarly, countries could agree not to target each other's satellites with high-powered lasers in peacetime, which would at least limit the exposure of American satellites to regular adversary attacks, and agree to publicize the location of peaceful high-powered lasers to improve transparency.[640] Finally, the United States should take unilateral steps to improve the resilience of its space-based assets, especially in developing cheaper launch systems and constellations of smaller satellites better able to weather adversary attacks.[641]

Exotic Strike Technologies: Although today the great powers are scrambling to build more ballistic and cruise missiles, they are also working to develop new types of projectiles that could reshape their contest for long-range attack, conventional *and* nuclear. Much of

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the 21st century," *DefenseNews*, 18 September 2018, https://www.defensenews.com/newsletters/digital-show-daily/2018/09/18/how-the-air-force-plans-to-use-space-to-project-power-in-the-21st-century-2/.

639. Chow, "Stalkers in Space," https://www.airuniversity.af.edu/Portals/10/SSQ/documents/Volume-11_Issue-2/Chow.pdf; Michael Cerny *et al*, "Countering Co-Orbital ASATs: Warning Zones in GEO as a Lawful Trigger for Self-Defense," Nonproliferation Policy Education Center, 30 June 2020, http://www.npolicy.org/article.php?aid=1485&tid=2. The French government has already announced self-defense zones around its critical satellites (Brian G. Chow and Henry Sokolski, "The United States should follow France's lead in space," *Space News*, 9 September 2019, https://spacenews.com/the-united-states-should-follow-frances-lead-in-space/.

640. Brian G. Chow and Henry Sokolski, "U.S. satellites increasingly vulnerable to China's ground-based lasers," *Space News*, 10 July 2020, https://spacenews.com/op-ed-u-s-satellites-increasingly-vulnerable-to-chinas-ground-based-lasers/.

641. Theresa Hitchens, "Build, Upgrade Satellites Fast for Space Resilience: Aerospace Corp.," *Breaking Defense*, 24 March 2020, https://breakingdefense.com/2020/03/build-upgrade-satellites-fast-for-space-resilience-aerospace-corp/; Dax Linville and Robert A. Bettinger, "An Argument against Satellite Resiliency: Simplicity in the Face of Modern Satellite Design," *Air & Space Power Journal* 34, 1 (2020), 43-53, https://www.airuniversity.af.edu/Portals/10/ASPJ/journals/Volume-34_Issue-1/V-Linville_Bettinger.pdf.

this contest for future capabilities is focused on building faster and more lethal missiles, especially new hypersonic weapons that combine the speed of ballistic missiles with the maneuverability and evasion of cruise missiles.[642] Since hypersonic technology is still in its infancy, many have called for preemptive arms control to prevent its emergence.[643] Yet the technology's very immaturity makes it hard to assess, since it remains to be seen which of the great powers will predominate in this field.[644] If the contest for hypersonic weapons remains close, then the United States might find opportunities to use arms limitation to enhance whatever relative American advantages emerge, but probably not until such weapons are thoroughly tested and fielded. Nor are adversaries likely to favor limitation, especially since China and Russia link their budding hypersonic programs to the need to counter American ballistic missile defenses, which the United States should not agree to limit.[645]

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642. Michael T. Klare, "An 'Arms Race in Speed': Hypersonic Weapons and the Changing Calculus of Battle," *Arms Control Association*, June 2019, https://www.armscontrol.org/act/2019-06/features/arms-race-speed-hypersonic-weapons-changing-calculus-battle; Richard Stone, "'National pride is at stake.' Russia, China, United States race to build hypersonic weapons," *Science*, 8 January 2020, https://www.sciencemag.org/news/2020/01/national-pride-stake-russia-china-united-states-race-build-hypersonic-weapons; *Hypersonic Weapons: Background and Issues for Congress* (Washington, DC: Congressional Research Service, 2020), https://fas.org/sgp/crs/weapons/R45811.pdf.

643. John Borrie, Amy Dowler, and Pavel Podvig, *Hypersonic Weapons: A Challenge and Opportunity for Strategic Arms Control* (New York: The United Nations, 2019), https://www.un.org/disarmament/publications/more/hypersonic-weapons-a-challenge-and-opportunity-for-strategic-arms-control/; Douglas Barrie, "Unstable at speed: hypersonics and arms control," *IISS Military Balance Blog*, 18 October 2019, https://www.iiss.org/blogs/military-balance/2019/10/hypersonics-arms-control; Cameron Tracy, "Fitting Hypersonic Weapons into the Nuclear Arms Control Regime," *All Things Nuclear*, 1 April 2020, https://allthingsnuclear.org/ctracy/fitting-hypersonic-weapons-into-the-nuclear-arms-control-regime.

644. Steven Pifer, "As US-Russian arms control faces expiration, sides face tough choices," Brookings Institution, 23 March 2020, https://www.brookings.edu/blog/order-from-chaos/2020/03/23/as-us-russian-arms-control-faces-expiration-sides-face-tough-choices/.

645. Erika Solem and Karen Montague, "Updated – Chinese Hypersonic Weapons Development," *China Brief* 16, 7 (2016), https://jamestown.org/program/

While hypersonics have attracted the most attention in recent years, there is also good reason to be skeptical of their ultimate utility. Hypersonic weapons may enjoy some advantages over existing ballistic missiles, but the high-performance hypersonic weapons being tested today will remain subject to the existing economics of long-range strike, in which increases in weapon range and complexity inevitably entail decreases in volume of fire.[646] Even if hypersonic weapons have a role, therefore, their cost means that they will not replace traditional ballistic and cruise missiles, any more than those missiles replaced shorter-range gravity bombs and artillery. Instead, truly transformative long-range strike will require upending current missile economics by creating weapons that can deliver high volumes of fire at low cost over long ranges. Such transformative weapons might take the form of much cheaper variants of existing missiles, such as reusable boosters launching ballistic or hypersonic warheads.[647] But future high-volume, long-range weapons might also be entirely different from existing missiles, perhaps through combining advances in robotics and machine autonomy to create swarms of intelligent loitering weapons.[648] As with hypersonics, the rapid technical progress in autonomous weapons makes it difficult to assess which great power leads its development.[649] However, the

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updated-chinese-hypersonic-weapons-development/; Patrick Tucker, "Pentagon Seeks a Way to Shoot Down Putin's 'Invincible' Hypersonic Missiles," *DefenseOne*, 28 January 2020, https://www.defenseone.com/technology/2020/01/pentagon-seeks-way-shoot-down-putins-invincible-hypersonic-missiles/162717/.

646. Ivan Oelrich, "Cool your jets: Some perspective on the hyping of hypersonic weapons," *Bulletin of the Atomic Scientists* 76, 1 (2020), 37-45, https://doi.org/10.1080/00963402.2019.1701283.

647. Jeff Becker, "When It Comes to Missiles, Don't Copy Russia and China – Leapfrog Them," *War on the Rocks*, 30 June 2020, https://warontherocks.com/2020/06/when-it-comes-to-missiles-dont-copy-russia-and-china-leapfrog-them/.

648. Paul Scharre and Michael C. Horowtiz, *An Introduction to Autonomy in Weapon Systems* (Washington, DC: Center for a New American Security, 2015), https://www.files.ethz.ch/isn/188865/Ethical%20Autonomy%20Working%20Paper_021015_v02.pdf; Zachary Kallenborn, "The Era of the Drone Swarm is Coming, and We Need to be Ready for It," *Modern War Institute*, 25 October 2018, https://mwi.usma.edu/era-drone-swarm-coming-need-ready/.

649. Adrian Pecotic, "Whoever Predicts the Future Will Win the AI Arms Race,"

United States certainly has the most experience operating robotic attack aircraft over large areas at long ranges, which could prove an important advantage over less experienced adversaries.[650] In the meantime, the United States should do more to assess the proliferation of advanced robotics technology, including dual-use commercial technology, to retain what advantages it can in this field.[651]

Conclusion

The competitive arms control negotiations of the coming years will be much more trying than the autopilot negotiations of the post-Cold War period. We should expect the great powers to strive for advantage in emerging military technologies, and to use negotiations as tools to shape the balance of power in their favor. If arms limitation is to have continued relevance to American national security, then we need to take steps now to reorient our arms control policy and incorporate it into a holistic strategic approach. To this end, American leaders should keep in mind the following advice.

Prepare for Rivalry: Competitive arms control thrives on a cycle of contest and negotiation, each of which feeds off of the other. Successful military-technical preparation drives arms limitation negotiations; if you don't compete, you don't get to negotiate. American leaders should take steps necessary to modernize key forces and expand into new capabilities. Negotiations will also drive future rounds of military-technical contest. American negotiators need to bargain hard and be willing to walk away from bad compromises

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Foreign Policy, 5 March 2019, https://foreignpolicy.com/2019/03/05/whoever-predicts-the-future-correctly-will-win-the-ai-arms-race-russia-china-united-states-artificial-intelligence-defense/.

650. Larry Lewis and Diane Vavrichek, *Rethinking the Drone War: National Security, Legitimacy, and Civilian Casualties in U.S. Counterterrorism Operations* (Quantico, VA: Marine Corps University Press, 2016), https://fas.org/man/eprint/drone-war.pdf.

651. Export Controls Working Group, *UAV Export Controls and Regulatory Challenges* (Washington, DC: Stimson, 2015), https://www.stimson.org/wp-content/files/file-attachments/ECRC%20Working%20Group%20Report.pdf.

that would undermine American power. Long-term military-technical advantages must be both the first step and the final goal towards a new, sustainable framework of arms control.

The Soviet Union's historical demand for "equivalent" forces should also underline the importance of husbanding and sustaining American advantages. Although demands for "equivalent" forces are often smokescreens for self-serving proposals, Eurasian rivals are correct to worry that the United States enjoys significant technological and geopolitical advantages over them. While China and other countries have made significant inroads challenging American technical superiority, they have been far less effective at replicating America's advantageous political geography, including its vast network of alliances and security partners. Any long-term strategy for advantage must lean *into* those advantages, rather than alienating or disengaging from our alliance network.

Deploy Arms Limitation Strategically: Arms limitation negotiations offer tremendous opportunities to enhance American strengths and weaken rivals, but only if American leaders understand their relative strengths and structure negotiations accordingly. Where the United States enjoys significant, durable advantages – such as missile defenses and perhaps theater conventional weapons – it should avoid arms limitation negotiations, and pursue its strengths. Where the United States is strong – such as strategic nuclear weapons – it should pursue arms limitation on the basis of strict equality with adversaries, ideally its existing rough equality with *both* Chinese and Russian forces, but possibly eventual equality with *each*. Where the United States is not strong – such as theater nuclear weapons – it should offer to ratify adversary advantages in exchange for more important objectives, like strategic nuclear advantages. Finally, the United States should not rush into negotiations prohibiting emerging technologies until the impact of those technologies on the balance of power is better understood. American leaders should instead seek normative restrictions that shore up potential vulnerabilities, especially in the cyber and space domains.

Lay the Multilateral Groundwork: Multilateral great power arms limitation is a laudable goal, but it is also one that will only be real-

ized over the long term and with significant American effort. Although successful negotiations are unlikely to emerge in the near future, there are still important steps the United States can take to promote its arms limitation agenda. First, the United States must insist on Chinese participation in arms control talks. China will undoubtedly resist, but the United States should continue to advance the idea that China's status as a "responsible stakeholder" requires participating in arms limitation discussions. Second, the United States should double down on relations with sympathetic partners in future negotiations, especially India. This should include expanding Indian-American dialogue to discuss each country's expectations in future arms limitation negotiations, both for notional bilateral agreements and potential multilateral agreements with third parties, with an eye towards positioning India as a partner in future talks with China. Similar discussions with traditional partners including Australia, Britain, France, Germany, Israel, Japan, and South Korea would also be wise, both to enlist their aid in talks, and to ensure that rivals cannot use negotiations as a ploy to divide the United States from its partners.

Third, the United States should not neglect Russian-American bilateral dialogue. Although the Cold War negotiating framework is crumbling in the face of new geopolitical realities, properly-structured Russian-American discussions can have continuing relevance in the new era of multilateral rivalry. Despite their differences, the United States and Russia both benefit from competing less with each other and focusing more on China. Extending New START is a good first step to ensure that the United States can direct resources towards long-term strategic rivalry with China, rather than racing Russia in the short term to retain aging legacy systems.