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Design by Stephanie Koeshall

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EDITOR'S NOTE

Welcome to the third issue of the *Journal of Policy & Strategy* in 2025. This issue's Analysis section includes a Special Feature that offers three articles adapted from a comprehensive July 2025 study entitled, *A New Strategic Review for a New Age: 2025*. The first article in this Special Feature is by Thomas Scheber. It examines the U.S. nuclear infrastructure, including identifying what progress has been made, and what yet needs to be done, for the infrastructure to perform its designated mission. The second article in this Special Feature is by Keith Payne. It presents the reasons why the United States needs to expand the mission and capabilities of today's rudimentary strategic missile defense system, and addresses criticisms of the initiative to do so. The third article in this Special Feature is by David Trachtenberg. It provides a review of arms control history and explains why, as a rule, U.S. arms control goals are beyond reach when the other parties to an agreement are actively hostile to the United States. The fourth article in this issue is by Paul Amato. It examines the U.S. transition from a "two war" standard of adequacy for U.S. forces to a "one war" standard and explains why this standard is inadequate for U.S. nuclear strategy. The fifth article is a graduate student contribution. It is by Sarah Faris and examines the history of nuclear deterrence "tailoring," from its conception to its bipartisan adoption as U.S. policy, and explains why "tailoring" has become a recognized requirement for U.S. deterrence policy. The final article in this issue's Analysis section is by Safdar Hussain a Visiting Fellow at the University of Reading, UK. It provides an analysis of China's Belt and Road Initiative from a societal framework.

This issue's Interviews section features interviews by Michaela Dodge with Kenton White, Lecturer, Department of Politics and International Relations, University of Reading, UK, and David Lonsdale, Senior Lecturer in War Studies and Director Postgraduate Taught Programmes, Hull University, UK.

This issue's Proceedings section highlights speakers' presentations from National Institute for Public Policy's webinars held in April and June 2025. The April webinar focused on a recent National Institute study by Matthew Costlow entitled, *Opportunistic and Coordinated Aggression: the New Pacing Threats?* It includes remarks by David J. Trachtenberg (moderator), Matthew Costlow, and Christopher Ford. The June webinar was held in honor of the late Dr. John S. Foster Jr. Several of Dr. Foster's colleagues provided a discussion that highlighted his unparalleled personal characteristics and professional stature in the U.S. defense community. Remarks presented here were made by Keith B. Payne (moderator), Bryan Gabbard, Mim John, Tom Ramos, and Tom Scheber.

The Literature Review section offers assessments of two recent books: Paul Robinson's *Russia's World Order: How Civilizationism Explains the Conflict with the West*, reviewed by David Trachtenberg; and, Matthew Fuhrmann's *Influence Without Arms: The New Logic of Nuclear Deterrence*, reviewed by Michaela Dodge.

The Documentation section in this issue contains three significant sources. The first is a "Statement by PM Benjamin Netanyahu." The second is the "Introduction" and "Overview" from the U.K Ministry of Defence's *Strategic Defence Review, 2025*. The third is from the 119th Session, U.S. Congress, *An Act, January 3, 2025, Sec. 20008, Enhancement of Resources for Nuclear Forces*.

Finally, this issue's Archive section includes two documents. The first is the Executive Summary from, George Miller, Paul S. Brown, Carol Alonso, "Report to Congress on Stockpile Reliability, Weapon Remanufacturing, and the Role of Nuclear Testing," Lawrence Livermore National Laboratory, October 1987. The second is Chapter 7 from Secretary of Defense Donald Rumsfeld's, *Annual Report to the President and the Congress* (Washington, D.C.: Department of Defense, 2002).

As always, we hope you, the readers, will enjoy and find useful this issue of the *Journal of Policy & Strategy*.





ANALYSIS

RESPONSIVE INFRASTRUCTURE

Thomas Scheber

Executive Summary

Beginning in 1989, after over four decades of continuous operation, the nuclear warhead infrastructure of the United States was shutdown, missions transferred to other sites, aging warheads were life-extended instead of replaced with new warheads, and nuclear testing ceased. The infrastructure has not been fully operational since 1989. Now, over thirty years later, the infrastructure is still not fully operational. The infrastructure is tasked with being ready to assess the reliability of the U.S. nuclear warheads, to evaluate the nuclear arsenals of adversaries, and to respond with warhead life extension programs, other modifications, or new designs in a timely manner. However, the responsive infrastructure needed for that role is still years—perhaps a decade—away. Significant improvements are needed if it is to be capable of that mission.

First, the national laboratories responsible for nuclear warhead designs and reliability assessments will need to restore a more complete skill set for warhead design and development. The current approach for life-extending warheads exercises only a limited set of critical skills for warhead development and production at a time. Prototype or new warhead development programs will be needed to more fully exercise critical skills that have atrophied in order to train a new generation of warhead developers. Also, there exists a lack of balance between computational analysis and experiments at the laboratories. Today, the nuclear warhead development community is overly dependent on computer simulation. Greater emphasis needs to be placed on experimental activities so that inexperienced warhead designers and engineers can push the limits of design, explore concepts, and develop judgment skills that will be critical in the years ahead.

Second, the facilities for warhead component production have yet to be fully modernized and the overall complex is not fully operational. Several actions are needed in the near term to help achieve a responsive and resilient infrastructure. All are important. Several require urgent attention.

Recommendations requiring urgent action include the following: For plutonium processing and fabrication, proceed with greater urgency to achieve an operational pit fabrication capability at Los Alamos, accelerate the second fabrication site at the Savannah River Site (SRS), and develop plans for each site to be able to scale up plutonium pit production quantities in a timely manner.

For nuclear test readiness, survey test readiness capabilities and take immediate corrective action to restore a readiness capability to conduct a fully instrumented nuclear test within two years; also, appropriate funds for test readiness and keep the funding in an “escrow” account to be used, when needed, to begin test preparations.



For the Department of Defense (DoD) and the National Nuclear Security Administration (NNSA) program integration, proceed apace on W93 warhead development and give high-level attention to DoD/NNSA integration activities for the W93 program.

Other important recommended actions include accelerating the construction of the replacement uranium and lithium fabrication facilities at Oak Ridge, expanding capacity for non-nuclear component production at the Kansas City Plant and at Sandia, and accelerating the completion of the Tritium Finishing Facility and other modernization projects at SRS.

Introduction: Responsive Infrastructure

The government-owned infrastructure needed to build, sustain, and modify nuclear warheads is of particular concern. A capability that is responsive to changing national security needs and resilient to technical and geopolitical surprises is a necessary part of a risk management approach for the United States and its allies.

The lack of an operational nuclear warhead infrastructure has been discussed as a concern for the past thirty years. For example, a September 2008 white paper signed jointly by Secretary of Defense Robert Gates and Secretary of Energy Samuel Bodman states: “The United States is now the only nuclear weapon state party to the NPT (Nuclear Nonproliferation Treaty) that does not have the capability to produce a new nuclear warhead.”¹ That statement remains true today. The 2009 report of the Perry-Schlesinger Strategic Posture Commission stated that some facilities to produce nuclear components are “genuinely decrepit” and much remains to be done to put in place a modern nuclear infrastructure to serve national security goals for the long term.² In the more than fifteen years since these two reports were published, some significant progress has been made toward a responsive infrastructure, but the overall goal of an operational and responsive infrastructure remains elusive with completion projected well into the future.

Background

To fully understand the challenge of reestablishing a responsive infrastructure for the United States, some background is helpful. The U.S. nuclear warhead infrastructure operated continuously from its inception in the 1940’s until 1989. The business model for this enterprise involved three design laboratories and numerous large-capacity plants which operated continuously for over four decades. The manufacturing plants were geographically dispersed with a final assembly plant in Texas. Deployed warheads were typically replaced with newer warhead designs before the end of service life. Nuclear testing was used to

¹ Robert M. Gates and Samuel W. Bodman, “National Security and Nuclear Weapons in the 21st Century,” September 2008, p. 19, available at https://www.bits.de/NRANEU/docs/NucPol21Century_092308.pdf. (This unclassified report was an edited and redacted version of a classified report on the same subject sent to Congress in February 2008.)

² William J. Perry and James R. Schlesinger, et al., *America’s Strategic Posture: The Final Report of the Congressional Commission on the Strategic Posture of the United States* (Washington, D.C.: United States Institute of Peace Press, 2009), p. 8.

determine the proper function of warheads in development and in the stockpile. Since 1989, four major changes, perhaps better described as *shocks*, have transformed the operation, location, and planning regarding the business model for this enterprise.

- **Shutdown.** The first major shock was the sudden, unplanned break in serial warhead production. In 1989, the Rocky Flats plutonium pit production plant was closed abruptly because of regulatory noncompliance. At that time, plutonium pits for W88 warheads were in production at Rocky Flats and the overall nuclear weapons complex was operating to complete the planned build of W88 warheads for Trident II missiles. In 1991, then-President George H. W. Bush announced that the plant would not be reopened and the planned build of W88 warheads would be truncated with only about a third of the planned number of W88 warheads completed. (This was one element of the second Presidential Nuclear Initiative intended to respond to the new, more cooperative relationship between the United States and the Soviet Union, later Russia.) After more than forty years of continuous operation, production lines for warhead components fell silent.
- **Reconfiguration.** The second major shock was the plan to reconfigure the nuclear complex. This plan was initiated by the Department of Energy (DOE) in 1991. With warhead production lines idle and no prospect of resumed production in the near term, DOE sought to reduce future costs and improve efficiency by permanently closing some sites and consolidating the functions at other, larger sites. For example, the Rocky Flats pit production plant in Colorado was to be permanently closed and the functions moved to New Mexico and reconstituted as part of Los Alamos National Laboratory; the functions then performed at the Mound Facility in Ohio that produced nonnuclear parts for arming, fusing, and firing devices would be moved to the DOE plant at Kansas City, Los Alamos, and Sandia laboratories.³
- **Mission Change.** The third major shock to the system was the change in strategy to sustain the nuclear stockpile for the future. Instead of replacing older nuclear warheads with newly produced warheads when they reached the end of service life, warheads would be “modified” to extend the service life. The national laboratories would be responsible for determining the components to be replaced and designing and certifying the life extension programs. At the same time, the laboratories were to maintain the capability to design, develop, and certify new types of nuclear weapons, if required.
- **Cessation of Nuclear Testing.** Finally, a variety of factors led to the abrupt cessation of testing in 1993. The cessation of testing was mandated by the new Clinton Administration without any period of final preparation for a no-testing environment. As of this report, the most recent underground nuclear test performed by the United

³ Department of Energy, *Nuclear Weapons Complex Reconfiguration Study*, January 1991, p. 15, available at <https://www.osti.gov/servlets/purl/6077838>.

States was conducted in the fall of 1992. Prior to the cessation of testing and pursuit of a Comprehensive Test Ban Treaty, the United States had tested nuclear warhead designs under development as well as those in the stockpile in order to assess functionality throughout the stockpile-to-target environment and understand physics concepts.

After over four decades of continuous operation, the nuclear warhead infrastructure of the United States was shutdown, missions transferred to other sites, replacement was changed to life extension, and testing ceased. The infrastructure has not been fully operational since 1989. Now, over thirty years later, the infrastructure is still not fully operational. At the same time, the infrastructure is tasked with being ready to assess the reliability of the U.S. stockpile, to evaluate the nuclear arsenals of adversaries, and to respond with life extension programs, other modifications, or new designs in a timely manner.

Response Role for the Infrastructure

The 2001 *Nuclear Posture Review* (NPR) report from DoD called for deep reductions in the number of operationally deployed nuclear warheads and a significant reduction in the total stockpile of nuclear warheads. In order to respond to potential vulnerabilities from arms buildups or advances by adversaries, the 2001 NPR called for a responsive infrastructure that would be able to resume design and production of nuclear warheads, if needed, in the future.⁴ This new posture was to be in place within a decade. Similarly, the 2018 NPR noted that the necessary responsiveness of the infrastructure was far from being a reality and called for “an effective, responsive, and resilient nuclear weapons infrastructure.”⁵ More recently, the 2023 report bipartisan Strategic Posture Commission (SPC) listed a functioning infrastructure as a necessary component of a “hedge against risk, geopolitical, technical, operational, and programmatic risks that could render U.S. nuclear forces insufficient ...”⁶

What follows is a discussion of the status of, and plans for, several important elements of a responsive and resilient infrastructure.

National Laboratories

The national laboratories that designed nuclear warheads in the extant stockpile must be capable of surveilling and assessing the status of each type of warhead, designing

⁴ Department of Defense, *Nuclear Posture Review Report*, December 2001, p. 14, available at https://www.esd.whs.mil/Portals/54/Documents/FOID/Reading%20Room/NCB/06-F-1586_Nuclear_Posture_Review.pdf.

⁵ Department of Defense, *Nuclear Posture Review Report*, 2018, p. XIV, available at <https://fas.org/wp-content/uploads/media/2018-Nuclear-Posture-Review-Version-2.pdf>.

⁶ Madelyn Creedon and Jon Kyl, et al., Congressional Commission on the Strategic Posture of the United States, *America's Strategic Posture, The Final Report of the Congressional Commission on the Strategic Posture of the United States* (Alexandria, VA: Institute for Defense Analysis, 2023), p. 27, available at <https://www.ida.org/-/media/feature/publications/a/am/americas-strategic-posture/strategic-posture-commission-report.ashx>.

modifications, as needed, for life extension and upgrades, and developing new, different, or modified warheads as national security needs dictate.

In the early 1990's, after warhead production lines were idled and advanced warhead development was suspended, funding for the nuclear infrastructure was slashed. DOE developed a strategy for infrastructure sustainment that would give priority to maintaining a healthy scientific community at the national laboratories at the expense of modernizing aging production facilities. Senior leaders at DOE defended this strategy by noting that "the body will die without a head."⁷

With new design and development activities suspended at the laboratories, DOE initiated the development of unique scientific facilities at each of the labs. Research at each of these facilities was to be relevant to the science of nuclear weapons and designed to attract and retain scientists and engineers. Toward this goal, the National Ignition Facility (NIF) was constructed at Lawrence Livermore National Laboratory, the Dual-Axis Radiographic Hydrotest Facility (DARHT) at Los Alamos, and the Microsystems Engineering Science and Applications (MESA) Facility at Sandia. Each of these facilities is a world-class scientific facility; all are currently operational, and upgrades continue to be pursued. In addition, each of the laboratories was included in a supercomputing initiative that has produced some of the most advanced computer systems in the world. These accomplishments are to be applauded for their contributions to science and the ability to attract talented scientists to the laboratories.

In general, the plan to maintain healthy design laboratories is considered to be a success story. For example, the labs have developed enhanced stockpile surveillance capabilities to better understand warhead aging and to propose timely life extension programs (LEPs). The initial LEPs have been completed or are currently in-work for almost all the warheads in the stockpile. However, one former laboratory director cautioned that, to date, the life extension programs completed have been "modest" in complexity, have required "very long timelines," and "often encountered significant difficulties."⁸

In 2015, National Institute for Public Policy (NIPP) commissioned an assessment of U.S. readiness to Design, Develop and Produce Nuclear Warheads—essentially the potential responsiveness of the nuclear infrastructure.⁹ Among the key findings of that assessment (Scheber-Harvey Report) were the following:

⁷ George Miller, "Stockpile Stewardship: What Were We Thinking? How Did It Work Out?," in Brad Roberts (eds.), *Stockpile Stewardship in an Era of Renewed Strategic Competition* (Livermore, CA: Center for Global Security Research, April 2022), p. 7, available at https://cgsr.llnl.gov/sites/cgsr/files/2024-08/CGSR_Occasional_Stockpile-Stewardship-Era-Renewed-Competition.pdf.

⁸ *Ibid*, pp. 12, 18.

⁹ Thomas Scheber and John R. Harvey, *Assessment of U.S. Readiness to Design, Develop and Produce Nuclear Warheads: Current Status and Some Remedial Steps* (Fairfax, VA: National Institute Press, 2015), available at https://nipp.org/monographs_cpt/assessment-of-u-s-readiness-to-design-develop-and-produce-nuclear-warheads-current-status-and-some-remedial-steps/.

- Not all critical nuclear skills at the laboratories and plants are being exercised. The approach for life-extending warheads exercises only a limited set of critical skills for warhead development and production at a time.¹⁰
- There exists a lack of balance between computational analysis and experiments at the laboratories. The nuclear warhead development community is overly dependent on computer simulation. As one experienced warhead designer stated, “The codes always lie.” Without sufficient experimental activities against which to test the results of computer simulations, new designers and engineers may not recognize where the codes are unreliable and why. This imbalance between computation and experiments impedes the development of professional judgment to train the next generation of warhead designers and engineers that will be needed in the future.¹¹
- Infrastructure modernization has been delayed repeatedly, and completion remains elusive.¹²

Concerns about test readiness are long-standing, have not abated over the course of years. A 2002 high-level review panel concluded that a much more responsive test readiness posture is needed. In its final report to Congress in March 2002, the Panel to Assess the Reliability, Safety, and Security of the United States Nuclear Stockpile (The Foster Panel) wrote:

The President should have the latitude for a timely and effective response to unexpected events, whether due to problems in the stockpile or an international situation. Current test readiness of two to three years does not provide a viable option for a timely response. The Panel’s assessment is that test readiness should be no more than three months to a year, depending on the type of test.¹³

Current Assessment of Readiness to Respond

Now, a decade after the 2015 Scheber-Harvey assessment briefly summarized above, not much has changed. For example:

- Critical skills. Warhead life extension programs still dominate the workload at the laboratories. No complete, end-to-end exercise of critical design and development skills has been undertaken for decades. This would involve developing a new, or at least different, warhead design and taking it through development to production (at least prototyping) and, perhaps even flight testing. This type of activity would tell senior managers a lot about the real state of readiness to respond in a timely manner to technical or geopolitical surprise. To its credit, Congress has done its part to ensure

¹⁰ Ibid., p. xiv.

¹¹ Ibid.

¹² Ibid.

¹³ John S. Foster, et al., *Final Report of the Panel to Assess the Reliability, Safety, and Security of the United States Nuclear Stockpile*, March 15, 2002, p. ES-2, available at <https://nuke.fas.org/control/ctbt/text/foster99.pdf>.

that the laboratories have explicit authorization to undertake such comprehensive activities as needed to train the next generation of weapon scientists. For example, the FY 2016 National Defense Authorization Act established the Stockpile Responsiveness Program. This legislation states,

It is the policy of the United States to identify, sustain, enhance, integrate, and continually exercise all capabilities required to conceptualize, study, design, develop, engineer, certify, produce, and deploy nuclear weapons to ensure the nuclear deterrent of the United States remains safe, secure, reliable, credible, and responsive.

Unfortunately, the NNSA annual reports on stockpile stewardship and management have not reported any specific actions toward this goal except to acknowledge the legislative tasking.

- **Lack of balance between computation and experiments.** The imbalance between computational assessments and complex experiments at the laboratories has not been corrected. The laboratories remain overly reliant on computer simulations and in need of more confirmatory experiments. For example, the 2015 assessment noted that one experienced designer had opined that the number of hydrodynamic experiments conducted in support of the stockpile stewardship program should be about one per month: twelve per year. The 2015 assessment noted that only four hydrotest experiments had been conducted in FY2013 and seven in 2014.¹⁴ Another complex experimental capability exists in the form of subcritical experiments in Nevada. The 2015 assessment noted that only one subcritical nuclear experiment per year had been carried out in the previous few years. The FY 2024 Stockpile Stewardship and Management Plan (SSMP) states that during 2023, only four hydrodynamic tests were conducted at DARHT¹⁵ Similarly, only one subcritical test was conducted in 2024. The imbalance between computation and experiments appears to persist.
- **Infrastructure modernization.** The 2015 assessment noted that infrastructure modernization had been delayed repeatedly. In 2015 the NNSA plan was to develop the capability to produce 50-80 plutonium pits per year at Los Alamos. That goal was to have been accomplished by 2023.¹⁶ As will be discussed more fully later, there is currently no operational capability for the production of plutonium pits. The estimate for a production capacity meeting the congressionally mandated minimum capacity

¹⁴ Scheber and Harvey, *Assessment of U.S. Readiness to Design, Develop and Produce Nuclear Warheads: Current Status and Some Remedial Steps*, op. cit., p. 30.

¹⁵ Department of Energy, *Fiscal Year 2024 Stockpile Stewardship and Management Plan*, November 2023, p. F-21, available at https://www.energy.gov/sites/default/files/2023-11/FY24SSMP_FINAL_NOVEMBER_2023_0.pdf.

¹⁶ Scheber and Harvey, *Assessment of U.S. Readiness to Design, Develop and Produce Nuclear Warheads: Current Status and Some Remedial Steps*, op. cit., p. 32.

of eighty pits per year¹⁷ by 2030 has slipped to about 2035. The 2015 assessment noted that the replacement facility for uranium and lithium processing had not yet begun construction. The assessment called for a new facility and the shutdown of the existing Uranium Processing Facility (UPF) by 2025.¹⁸ NNSA has been making progress toward these goals, but the eighty-year-old UPF is still in operation and the two new construction facilities to process highly enriched uranium and lithium components are estimated by NNSA to be complete by 2029 and 2031 respectively, barring further delays.

In sum, not much has changed since the 2015 assessment. Next, this report will discuss the status of several key components of a responsive infrastructure.

Plutonium Pit Production Capabilities

One of the key capabilities needed in a responsive infrastructure is a facility capable of manufacturing plutonium pits for weapon primaries. During the height of the Cold War, the United States produced between one thousand and two thousand pits per year. However, the United States has not had the capability for serial production of plutonium pits since 1989. The relocation of pit fabrication capabilities from Rocky Flats in Colorado to Los Alamos, New Mexico, seemed relatively straightforward when it was proposed in the early 1990s. Equipment would be moved from Rocky Flats and installed at the Los Alamos plutonium facility that was already operational. This facility, known as PF-4, was primarily for scientific research on pits and the fabrication of plutonium heat sources for applications such as long-duration space probes.

However, soon after some of the equipment was installed and tested at Los Alamos, some problems were encountered. Specifically, the welding machine for plutonium parts did not perform correctly. The same machines, doing the same tasks, and operated by some of the same operators as at Rocky Flats, did not create acceptable welds for the assembly of plutonium parts. Eventually, this problem was traced to the difference in pressure altitude between central Colorado and the mountains of New Mexico. The determination of cause led to a successful fix. This unexpected sensitivity of plutonium welding underscores the complexity of plutonium metal in its various forms. A 2021 article on the history of working with plutonium referred to “the incredible, confounding complexity of plutonium ...”¹⁹

Over the past 30+ years, DOE has proposed several different plans for restoring a plutonium pit fabrication capability. The plans considered have included doing all of the pit fabrication at Los Alamos, moving this capability elsewhere because of earthquake concerns in New Mexico, and the current two-site strategy.

¹⁷ Department of Energy, *Fiscal Year 2025 Stockpile Stewardship and Management Plan*, op. cit., pp. 3-28.

¹⁸ Scheber and Harvey, *Assessment of U.S. Readiness to Design, Develop and Produce Nuclear Warheads: Current Status and Some Remedial Steps*, op. cit., p. 33.

¹⁹ Joseph C. Martz, Franz J. Freibert, and David L. Clark, “The Taming of Plutonium: Pu Metallurgy and the Manhattan Project,” *Nuclear Technology*, Vol. 207 (2021), p. S267, available at <https://www.tandfonline.com/doi/epdf/10.1080/00295450.2021.1913035?needAccess=true>.

The effort to restore this capability has had some notable successes through the years. One such success is demonstrating the production of pits of different stockpile warheads that could pass the rigorous certification inspection and be “diamond-stamped” which signifies acceptance as a stockpile component. In 2024, the plutonium facility at Los Alamos completed this demonstration goal when it produced a diamond-stamped W87 pit for the Minuteman III intercontinental-range ballistic missile.²⁰

Other notable accomplishments include the production of thirty-one pits for W88 warheads for submarine-launched ballistic missiles (SLBMs) over a period of about five years (2007-2011). This supply of newly produced pits is important to replace older W88 warhead pits that are removed from service, one per year, and destructively tested to observe aging trends and estimate reliability.²¹ Recall that the W88 warhead build was terminated abruptly in 1989 when Rocky Flats was closed and, therefore, many fewer W88 warheads were produced than planned. This build of thirty-one W88 pits allows for deployment of a constant number of W88 warheads for 31 years since the pits removed for reliability sampling can be replaced by these newly built pits.

In 2018, the DoD and NNSA released a joint statement that, instead of developing a single pit production facility at Los Alamos, a two-site option would be pursued. The second site is to be a modification of the Mixed-Oxide Fuel Fabrication Facility (MFFF) at the Savannah River Site (SRS) in South Carolina. The stated production goal at the SRS site is at least fifty pits per year. In response to language in the 2019 Senate Energy and Water Appropriations Bill, NNSA commissioned The Institute for Defense Analyses (IDA) to conduct an independent analysis of various pit production options including an expanded single site at Los Alamos and a two-site option. The IDA final report concluded that “None of the rejected alternatives is demonstrably superior to the two-site option announced by DOE/NNSA and certified by the NWC [Nuclear Weapons Council].” The two-site option provides resilience and redundancy for the Nuclear Security Enterprise. Additionally, the IDA report concluded that the goal of thirty pits per year at Los Alamos was “potentially achievable given sufficient time, resources, and management focus, although not on the schedules or budgets currently forecasted.”²² The assessment concluded that eventually achieving a production rate of eighty pits per year is possible but will be extremely challenging. None of the options can be expected to achieve the goal of eighty pits per year by 2030 as required by the law.²³ The IDA assessment cautioned that DoD would need to decide how to respond to this shortfall.²⁴

When the IDA report was published in 2019, NNSA listed a goal of 2026 for achieving a thirty pit per year production capability at Los Alamos. The most recent SSMP states that

²⁰ Department of Energy, *Fiscal Year 2025 Stockpile Stewardship and Management Plan*, op. cit., p. X.

²¹ Arnie Heller, “Monitoring a nuclear weapon from the inside,” *Science & Technology* (June 2008), pp. 13-14, available at <https://str.llnl.gov/sites/str/files/2024-04/2008.07.pdf>.

²² David E. Hunter, et al., *Independent Assessment of the Two-Site Pit Production Decision: Executive Summary*, Institute for Defense Analyses, May 2019, p. 4, available at <https://www.ida.org/-/media/feature/publications/i/in/independent-assessment-of-the-two-site-pit-production-decision-executive-summary/d-10711.ashx>.

²³ War and National Defense, 50 U.S. C. § 2538a, available at <https://www.law.cornell.edu/uscode/text/50/2538a>.

²⁴ Hunter, et al., *Independent Assessment of the Two-Site Pit Production Decision: Executive Summary*, op. cit., p. 5.

the completion date has slipped to 2028 and the NNSA estimated timeframe for commencement of pit production at SRS is now 2035.²⁵ Clearly, the congressionally mandated goal of a plutonium pit production capacity of at least eighty pits per year by 2030 will not be met. The historical trend in tracking the progress of complex, one-of-a-kind facilities that are key for responsiveness and resilience for the nuclear complex indicates that these dates may well slip further unless significant resources and management focus are expended.

The lack of a plutonium pit production facility of sufficient capacity to provide responsiveness for the stockpile is arguably the most important shortfall to be corrected in the current complex. Eighty pits per year is unlikely to be sufficient for the long-term. The United States needs to plan for a pit production capacity that is greater than that just based on current stockpile levels as a hedge.

Recommendations for Plutonium Processing and Fabrication

- Proceed with greater urgency and purpose to achieve an operational capability at Los Alamos and accelerate the pit fabrication site at SRS.
- Develop plans and facility readiness to be able to scale-up plutonium pit production quantities beyond eighty pits per year in a timely manner.

Production Capabilities for Highly Enriched Uranium and Lithium Components for Warhead Secondaries

The following discussion of warhead capabilities to fabricate highly enriched uranium (HEU) and lithium parts for warhead secondaries is more straightforward than the preceding discussion on plutonium pits.

The secondary is where the lion's share of explosive yield is generated in a modern nuclear weapon. While the primary generates a few thousands of pounds of explosive yield, the secondaries of modern weapons generate tens or hundreds of thousands of pounds of yield.

For the past eighty years, HEU and lithium parts for secondaries have been fabricated at a plant at the Y12 site in Oak Ridge, Tennessee. One of the essential facilities for these parts at Y12 is the Uranium Processing Facility (UPF) which is over eighty years old. During the deliberations of the Perry-Schlesinger Strategic Posture Commission, commission members toured several locations in the nuclear weapons complex. One of the visits was to the UPF (building 9212) at Y12. This plant dates to the Manhattan Project and has been operated continuously to fabricate HEU parts. It is considered by many to be the poster child for decrepit and outdated facilities in the nuclear weapons complex.

²⁵ Department of Energy, *Fiscal Year 2024 Stockpile Stewardship and Management Plan*, op. cit., pp. 5-10.

According to a 2020 NNSA fact sheet:

Building 9212 is a large chemical processing facility that was completed in November 1945 as a chemical recovery operation to recycle uranium. It was the location of the first production of uranium metal at Y-12 and the earliest nuclear weapons production facility at Y-12. Since then, it has been modified many times to meet changing national security missions, but, generally speaking, is optimized for a large nuclear weapons production mission necessary during the buildup of U.S. thermonuclear forces in the 1950's and 1960's. It continues to serve as one of the primary chemical processing and enriched uranium production facilities at Y-12.²⁶

This facility has been maintained with great effort and expense. In the Perry-Schlesinger commission's final report, commission members referred to this and other outdated facilities as "genuinely decrepit."²⁷ Touring the facility was compared to visiting a museum that displays technology from the 1940's and 50's—controlled by valves, dials, and manual controls instead of digital technology.

It is significant to note that this "decrepit" facility is still operating and in the 1990's it was key when Y-12 was called upon to build warhead secondaries as replacement components for a warhead type that remains in the modern stockpile.

Construction of modern replacement facilities for HEU and lithium parts is in work. The most recent SSMP calls for the new Uranium Processing Facility (UPF) to be completed and operational by 2029 and the lithium facility completed by 2031.²⁸

Recommendations for Uranium Processing and Fabrication

- To the extent possible, accelerate the completion of the replacement UPF and lithium facilities at Y-12.

Production Capabilities for Warhead Arming, Fusing, and Firing Systems, Neutron Generators, and Other Non-nuclear Components

In addition to the facilities specializing in components with special nuclear materials, the weapons complex needs a variety of non-nuclear components that are critical for the safe, secure operation and control of nuclear warheads. These non-nuclear components include arming, fusing, and firing systems as well as neutron generators. Most of these components are manufactured at the Kansas City National Security Complex (KCNSC) and at Sandia National Laboratories.

²⁶ "Y-12 Facility Descriptions," August 2020, available at <https://www.energy.gov/nnsa/articles/y-12-facility-descriptions>.

²⁷ Perry and Schlesinger, et al., *America's Strategic Posture: The Final Report of the Congressional Commission on the Strategic Posture of the United States*, op. cit., pp. 47-51.

²⁸ Department of Energy, *Fiscal Year 2025 Stockpile Stewardship and Management Plan*, op. cit., p. X.

In 2014, the activities at Kansas City were moved into a newly constructed site which is currently undergoing further expansion. Between Sandia and Kansas City, the non-nuclear needs for stockpile life extension programs have been successfully met by these facilities. However, capacity at both Kansas City and Sandia will need to be expanded to accommodate the future workload and to be able to respond to unplanned contingencies.

Recommendations for Non-nuclear Components

- Expand capacity at both the Kansas City Plant and at Sandia to enable greater capacity and, thereby, provide resilience.

Tritium Production and Handling Capabilities

Tritium is a radioactive isotope of hydrogen that is used in modern nuclear weapons to “boost” the explosive yield. Since tritium decays at a rate of about five percent per year, the supply of tritium must be replenished periodically. Until the late 1980s, the production of tritium and the filling/refilling of tritium reservoirs was done at the Savannah River Site (SRS). Tritium was produced in reactors and extracted in order to transfer the tritium produced into reservoirs and installation into nuclear weapons. Nuclear arms reduction agreements and the end of the Cold War resulted in dramatic reductions in the number of deployed nuclear weapons. This resulted in a glut of tritium extracted from retired warheads. As a result, the aged reactors at SRS were shut down in the late 1980’s.

During the 1990’s the DOE evaluated options for resuming the production of tritium. In late 1998, DOE announced that it had chosen as the primary means of producing tritium irradiating lithium rods in a light water reactor. In 2003, after several developmental experiments, the first batch of lithium fuel rods were loaded into a reactor at the Watts Bar Nuclear Plant in Tennessee. In 2005, the rods were removed and shipped to SRS for the extraction of tritium.²⁹

Since the initial run in 2005, the process of irradiating lithium rods at Watts Bar and subsequent tritium extraction at SRS has been refined. However, one important tritium handling facility at SRS is over sixty-five years old and is badly in need of replacement. While construction of a new Tritium Finishing Facility (TFF) has been approved and initial funding appropriated, construction is not projected to be complete until about 2034.³⁰ The fundamental approach to tritium production for the future appears to be on track, but the construction of modern facilities for tritium handling needs to be accelerated.

²⁹ United States Nuclear Regulatory Commission, “Tritium Production,” *Backgrounder*, June 2005, available at <https://www.nrc.gov/docs/ML0325/ML032521359.pdf>.

³⁰ Department of Energy, *Fiscal Year 2024 Stockpile Stewardship and Management Plan*, November 2023, pp. 3-22, available at https://www.energy.gov/sites/default/files/2023-11/FY24SSMP_FINAL_NOVEMBER_2023_0.pdf.

Recommendations for Tritium

- Accelerate the completion of the TFF and other needed modernization projects at SRS.
- Ensure that tritium production can be scaled up to meet operational needs should the number of operationally deployed warheads be significantly increased.

Nuclear Test Readiness

As noted earlier, the United States ceased nuclear testing in late 1992. At that time, the near-term resumption of testing was anticipated with the goal of improving the safety and security of nuclear warheads. However, in early 1993, President Clinton extended the test moratorium indefinitely in pursuit of a global, “zero-yield” Comprehensive Test Ban Treaty (CTBT). Later, in August 1995, President Clinton signed a directive establishing “safeguards” to be maintained in a no-testing environment. Those safeguards included: the conduct of a Science-Based Stockpile Stewardship Program, the maintenance of the “basic capability to resume nuclear testing,” and conditions under which the President would be prepared to withdraw from the CTBT under the “supreme national interests” clause to conduct whatever testing was required.³¹ Clinton directed that after FY 1996, the United States readiness posture for resuming nuclear testing would be based on testing within two to three years following a decision to proceed.

Today, most of the nuclear testing safeguards remain relevant and have been adequately maintained. However, one of these safeguards has not been fully maintained and is of particular concern: the safeguard to maintain the readiness to conduct a nuclear test, which may become necessary. According to DOE/NNSA, there has been no funding specifically for nuclear test readiness since FY 2010. NNSA has maintained that the routine activities being conducted for subcritical nuclear experiments at the National Security Site in Nevada essentially fulfill this readiness requirement. DOE/NNSA asserts that the current “test readiness strategy is to reconstitute underground nuclear explosive testing if or when needed, rather than maintaining obsolete facilities and capabilities.”³² In 1997, a former director of Los Alamos supported this approach and stated that most of the key skills needed for test readiness are being exercised in the conduct of subcritical testing in Nevada.³³

Currently, NNSA tasks its Nevada site with being “ready to perform an underground nuclear test using a test article drawn from the existing stockpile and limited diagnostics within 36 months.” NNSA also assumes that a nuclear test would be conducted only when the President has declared a national emergency or other similar contingency.³⁴ A 36-month

³¹ U.S. Department of State, “Comprehensive Test Ban Treaty Safeguards,” *Fact Sheet*, available at <https://usinfo.org/usia/usinfo.state.gov/topical/pol/arms/ctbt/factsafe.htm>.

³² Department of Energy, *Fiscal Year 2024 Stockpile Stewardship and Management Plan*, op. cit., pp. 4-21.

³³ Siegfried S. Hecker, “Letter to Hon. Jon Kyl,” September 24, 1997, available at <https://www.govinfo.gov/content/pkg/CHRG-105shrg44720/html/CHRG-105shrg44720.htm>.

³⁴ Department of Energy, *Fiscal Year 2024 Stockpile Stewardship and Management Plan*, op. cit., pp. 4-20.

readiness timeline for testing appears to be inconsistent with the assumption of a national emergency.

At least one high-level review panel agreed that a much more responsive test readiness posture is needed. In its final report to Congress in March 2002, the Panel to Assess the Reliability, Safety, and Security of the United States Nuclear Stockpile (The Foster Panel) wrote:

The President should have the latitude for a timely and effective response to unexpected events, whether due to problems in the stockpile or an international situation. Current test readiness of two to three years does not provide a viable option for a timely response. The Panel's assessment is that test readiness should be no more than three months to a year, depending on the type of test.³⁵

John Hopkins, a former associate director for nuclear weapons technology and former Director for Nuclear Testing at Los Alamos, has been an outspoken critic of the NNSA test readiness posture. For example, in 2017, Hopkins argued that:

- much, if not most, of the equipment and technology required for nuclear testing in the past has not been adequately maintained, is obsolete, or has been sold or salvaged;
- the knowledge needed to conduct a nuclear test, which comes only from testing experience, is all but gone; and
- the whole testing process—whether to conduct one test or several—would in essence have to be reinvented, not simply resumed.³⁶

The potential funding for one or more nuclear tests is an important issue. There are at least two important aspects of this funding issue:

- First is the overall cost of conducting a nuclear test. No credible cost data exists to estimate the cost of a fully instrumented nuclear test in the current environment. The best estimate is to extrapolate from 1992 when a nuclear test cost around \$100 million dollars. Of course, in 1992, all the necessary equipment was ready and operational. In short, a test would be expensive.
- Second is the uncertainty over whether the cost of a test would be taken from the annual budgets for the laboratories or funded by a separate appropriation. For more than thirty years, the nuclear weapon laboratory directors have certified that the stockpile of warheads meet reliability and performance standards and there is no immediate need to resume nuclear testing. That judgement call has likely been biased somewhat by the view that, if a nuclear test is requested, the funding for the test

³⁵ Foster, et al., *Final Report of the Panel to Assess the Reliability, Safety, and Security of the United States Nuclear Stockpile, Report to the Senate Armed Services Committee*, op. cit., p. ES-2.

³⁶ Bill Gertz, "Los Alamos Expert: U.S. Unable to Conduct Nuclear Tests," *Washington Free Beacon*, March 2, 2017, available at: <https://freebeacon.com/national-security/los-alamos-expert-u-s-unable-conduct-nuclear-tests/>.

would likely come at the expense of other laboratory programs. For example, a former lab director argued against testing by stating,

data is not free ... to get more data of one type, you have to sacrifice something else. ... e.g., if you have to give up advanced computing or all laboratory experiments to afford full-scale nuclear testing, it is a poor bargain, in my opinion.³⁷

How important is testing? Some test-experienced senior managers at the nuclear labs have argued that the scientific foundation for assessing the performance of warheads in the stockpile is eroding without nuclear testing. For example, in a 2019 article, one former associate laboratory director and a senior warhead designer listed several concerns about the health of warheads in the stockpile. Those concerns include the fact that:

... the physical state of weapons in today's stockpile differs from what it was when their performance (e.g., yield) was tested, and second, the current nuclear test moratorium precludes a decisive determination of whether these changes in physical state adversely affect performance.³⁸

If a confirmatory nuclear test was to be scheduled in the near term, a life-extended W76 warhead would be a good candidate for testing to determine whether the modifications have affected performance, and if so, in what way. Why the W76? The now-complete W76 life extension program for submarine-launched ballistic missiles was extensive. According to one description, it involved

... changes to both the reentry body and the warhead package; replacing detonators; replacing chemical high explosives; refurbishing the secondary; adding a new arming, fusing and firing (AF&F) system; adding a new gas reservoir and transfer support system; and a new lightning arrestor connector.³⁹

Finally, if the United States decides to conduct a nuclear test, the collection of as much test data as possible should be a priority to make the best use of this opportunity. It is unclear from the available documentation whether NNSA still maintains the required capability to build and deploy test sensors and radiochemical collection and analysis capabilities to support a fully instrumented nuclear test. Collection of this data would enable scientists at the labs to benchmark the latest computer codes for future use.

Recommendations for nuclear test readiness:

³⁷ Miller, "Stockpile Stewardship: What Were We Thinking? How Did It Work Out?," op. cit., p. 16.

³⁸ John C. Hopkins and David Sharp, "The Scientific Foundation for Assessing the Nuclear Performance of Weapons in the US Stockpile is Eroding," *Issues in Science and Technology* Vol. XXXV, No. 2, (Winter 2019), p. 23, available at <https://issues.org/the-scientific-foundation/>.

³⁹ Pat Host, "W76-1 Life Extension Program Reaches Production Phase Halfway Point," *Defense Daily*, October 31, 2014, available at <https://www.defensedaily.com/w76-1-life-extension-program-reaches-production-phase-halfway-point/navy-usmc/>.

- Since nuclear testing may be needed, we need to survey test readiness capabilities and take immediate corrective action to restore a readiness capability to conduct a fully instrumented nuclear test; and
- Appropriate funds for test readiness improvements and keep the funding in an “escrow” account that could be immediately used to begin test preparations after concerns over one or more stockpile warheads results in decision to seek presidential approval to test. This escrow fund would help alleviate the concerns at the labs over having to immediately cut other nuclear weapon programs in order to begin preparations for a nuclear test.

DoD and NNSA Integration for Nuclear Weapons Development

No complex industrial process can be expected to restart without serious problems after having been shut down for decades, having had a huge turnover of the work force, and having had plants and processes moved to different locations. That is the challenge that will face the nuclear weapons complex as it develops new warheads and integrates them with modern DoD-developed weapon delivery systems.

The most recent warhead to successfully go from concept development to the deployed stockpile is the W88 warhead for Navy SLBMs. That development occurred about forty years ago during a time when the serial production of warheads in the complex was the norm. In the intervening forty years, a few new warhead acquisition programs have been proposed and some have begun development. However, senior government officials have, until now, found reasons to terminate these programs before completion.

NNSA integration with DoD program offices gets exercised within the project officer groups for each warhead type. Life extension programs have helped to exercise this integration activity to a limited degree. However, completely new warhead development is more complex and involves the creation of military characteristics and survivability criteria in nuclear environments which the new warheads design will have to meet. The initiative to develop and deploy the W93 warhead is likely to encounter numerous challenges. It is the first newly developed warhead planned for deployment in forty years and should not be delayed further.

Recommendations for DoD and NNSA Integration:

- Give high-level attention to DoD/NNSA integration activities for the development of the W93 warhead.

Contractor-based Infrastructure for Strategic Bombers, Intercontinental-Range and Submarine-Launched Ballistic Missiles, Cruise Missiles, and Maneuvering Hypersonic Delivery Vehicles

Discussion of a responsive infrastructure would not be complete without at least some observations about the commercial defense industry responsible for nuclear weapon delivery vehicles (e.g., heavy bombers, ballistic missiles, and cruise missiles).

DoD is deep into a generational modernization of its nuclear force. Already well underway are the development and production of the B21, a next-gen strategic bomber, and a Long-Range Standoff Missile (LRSM). The LRSM has undergone numerous flight tests and is slated to be operational by the end of the decade. The B21 is reported to be in low-rate initial production, however, the fleet of long-range bombers will need adequate tanker support in order to complete their missions. At present, the number of long-range aerial refueling aircraft to support bomber operations is insufficient and additional tankers and improved capabilities are needed.⁴⁰

Less further along are programs to field the Sentinel ICBM to replace Minuteman III and the Columbia SSBN to replace Ohio-class SSBNs. Both acquisition programs have faced significant challenges. For example, in January 2024, DoD reported to Congress that the Sentinel program was in breach of Nunn-McCurdy due to significant cost overruns. To meet the Navy's goals for ballistic missile submarines and attack submarines, two U.S. shipbuilders, General Dynamics Electric Boat and Newport News, are executing the most significant increase in nuclear-powered submarine and ship construction in over 30 years.⁴¹ Both programs, Sentinel and Columbia, are high priority programs, but are behind schedule and over cost.

Recommendations for DoD and the contractor-based infrastructure:

- Do not further delay funding for the recapitalization of any strategic nuclear force programs now underway;
- Increase the build of Columbia-class SSBNs. The planned number of these submarines which carry fewer missiles than Ohio-class submarines is insufficient to maintain the current level of SLBMs at sea; and
- Increase the fleet of tankers to better support long-range bombers.

⁴⁰ Caleb Egli, "Fueling a Superpower: Reprioritizing the US Air Refueling Fleet for Great Power Conflict," *Journal of Indo-Pacific Affairs*, May 8, 2024, available at <https://www.airuniversity.af.edu/JIPA/Display/Article/3768313/fueling-a-superpower-reprioritizing-the-us-air-refueling-fleet-for-great-power/>.

⁴¹ United States Government Accountability Office, *Columbia Class Submarine: Overcoming Persistent Challenges Requires Yet Undemonstrated Performance and Better-Informed Supplier Investments*, GAO-24-107732 (Washington, D.C.: Government Accountability Office, September 30, 2024), p. 3.

Cautionary Lessons from Industry

The nuclear warhead complex is government-owned and unique in several ways. However, it is an industry that involves specialized manufacturing processes and, therefore, lessons learned from other industries may well apply. Significant problems have already been encountered when trying to restart production of components for warheads during life extension programs.

Industrial problems in the commercial sector reveal some parallels with that of the nuclear complex. Consider the recent example of problems involving Boeing 737 aircraft. Boeing for decades was an aerospace pioneer, but it's been 20 years since Boeing introduced a new airplane. Since then, the jet maker has instead made updates to its existing models.⁴² Two aircraft crashes in 2018 and 2019 resulted in 346 fatalities. In 2024, a door blew off a 737 aircraft in flight. These incidents led to investigations into the Boeing corporate culture and industrial practices. One assessment of problems at Boeing cites a change in the previously engineering-centric corporate culture at Boeing following the 1997 merger of Boeing and McDonnell Douglas. One analysis stated,

For most of its history, Boeing had what you might call an engineering-centric culture, with power in the company resting in the hands of engineering and design. ... Executives from McDonnell Douglas ended up dominating and remaking Boeing. They turned it from a company that was relentlessly focused on product to one more focused on profit.⁴³

A former CEO of Boeing who had formerly been CEO of McDonnell Douglas is quoted as saying, "I changed the culture of Boeing, that was the intent, so that it's run like a business rather than a great engineering firm."⁴⁴

The change in the corporate culture at Boeing resulted in the outsourcing of some assembly procedures and the creation of "shadow factories" that were essentially production lines where engineers and mechanics work on fixing, maintaining or updating aircraft instead of new ones." One Boeing official reported, "It seems like 30% of everybody's job is fixing something that's bad quality or late product or something that shouldn't have happened."⁴⁵ The incident of the door of a 737 that had blown off in flight was traced to procedural errors at one of the shadow factories and work that had been outsourced.

⁴² Sharon Terlep and Andrew Tangel, "Can Boeing Be Fixed? Aerospace Leaders Offer a Repair Manual," *The Wall Street Journal*, January 6, 2025, available at https://www.wsj.com/business/airlines/boeing-plane-aerospace-leaders-advice-cb4c846c?gaa_at=eafs&gaa_n=ASWzDAGIKF00ZQX2POZH2RTETBg052WOUcRPLpZ3wxAHWt575417XzgbCOu1&gaa_ts=687bdf02&gaa_sig=CpV_Hx27S7Xbq0Iis-_7Npn8yyrnxpPIEa2TNU02_Gdd4gxnSTDfi7RSbm9nc-n8INl6uWtXbNVEgdGk93fQ%3D%3D.

⁴³ James Surowiecki, "What's Gone Wrong at Boeing," *The Atlantic*, January 15, 2024, available at: <https://www.theatlantic.com/ideas/archive/2024/01/boeing-737-max-corporate-culture/677120/>.

⁴⁴ Ibid.

⁴⁵ Sharon Terlep, "Boeing's Push to Boost 737 Production Starts with Closing 'Shadow Factory,'" *The Wall Street Journal*, February 14, 2025, available at https://www.wsj.com/business/airlines/boeing-shadow-factory-plane-repairs-fb80dfed?gaa_at=eafs&gaa_n=ASWzDAhagn-

The Boeing case study is one of many possible examples that appears to have parallels with the nuclear warhead complex. Has the corporate culture of the nuclear complex changed since it was shut down in 1989? You bet! In the past the nuclear complex was driven by designers, engineers, and production experts with years of experience in the nuclear industry. It is now driven primarily by analysts and computer simulation personnel that have never designed and produced a new nuclear warhead. Lessons from industry provide concerns that any attempted restart of serial warhead production is not likely to be a smooth process.

For the nuclear warhead enterprise to be successfully returned to functionality, competent leadership and accountability at the National Nuclear Security Administration (NNSA) will be essential. A November 2014 report of the Mies-Augustine Panel that examined the management of NNSA reported that:

NNSA's Stockpile Stewardship Management Plan, which is intended to communicate long-range plans and cost estimates, has varied from year to year in the costs and schedules for the delivery of several major life extension programs and nuclear facilities. The panel concluded that the lack of a stable, executable plan for modernization is a fundamental weakness for NNSA.⁴⁶

Furthermore, the panel concluded that "NNSA is on a trajectory toward crisis unless strong leadership arrests the current course and reorients its governance to better focus on mission priorities and deliverables."⁴⁷ Strong, competent leadership at NNSA and accountability for performance will be required to restore the nuclear enterprise to full operation.

How Do Nuclear Warheads Work? Are Concerns Regarding Reliability Warranted?

Modern nuclear warheads in the U.S. stockpile are much more complex than the chemical explosives found in conventional bombs and missile warheads. Each nuclear warhead in the U.S. inventory involves chemical explosives as well as exotic materials necessary for both nuclear fission and fusion. One warhead in the stockpile is made up of over 5,900 parts.⁴⁸

o7jpCBSiTfSwRZx1Xz5MUI6xINICIL1uYvL7HZFUJYH4XrybO&gaa_ts=687bdf8c&gaa_sig=0kUpudR7dliCpfnVYd8dj3pkBI5irjMcvhbyT51JueT95o2wFhgTflqcCO0PDIIS14UWgKdhGSD5zp1jidUgcw%3D%3D.

⁴⁶ Quoted in Government Accountability Office, "National Nuclear Security Administration: Observations on Management Challenges and Steps Taken to Address Them," GAO-15-532T (Washington, D.C.: Government Accountability Office, April 15, 2015), p. 4, available at <https://www.gao.gov/products/gao-15-532t>.

⁴⁷ Richard M. Jones, "Hearing Underscores Problems at the National Nuclear Security Administration," *American Institute of Physics*, April 24, 2014, available at <https://www.aip.org/fyi/2014/hearing-underscores-problems-national-nuclear-security-administration>.

⁴⁸ "B61 Nuclear Gravity Bomb," *Brookings*, available at [https://www.brookings.edu/b61-nuclear-gravity-bomb/#:~:text=Three%20views%20of%20a%20B61,weapon's%205%2C919%20parts%20\(foreground\)](https://www.brookings.edu/b61-nuclear-gravity-bomb/#:~:text=Three%20views%20of%20a%20B61,weapon's%205%2C919%20parts%20(foreground)).

The warhead designs involve precise timing and multiple, reactive processes for proper operation.

Most U.S. nuclear warheads are two-stage devices. The first stage, or primary, includes a subcritical sphere-like shell made of an isotope of plutonium and/or highly enriched uranium. This shell is surrounded by chemical explosive materials, often called lenses. The term lens refers to the function of the explosive material. Just as glass lenses bend and redirect light to aid a vision-impaired individual, the high explosive lenses focus the explosive shock waves so that they compress the plutonium/uranium shell into a dense, somewhat spherical ball.

Some readers may be familiar with photos of early nuclear weapons. Movies such as “Oppenheimer” featured mock-ups of the earliest devices. The “Fat Man” nuclear device depicted in that movie was huge—about a five-foot diameter sphere with many explosive detonators attached to the explosive lenses. Modern primaries feature only a very small number of detonators and the size of the first stage has been greatly reduced and redesigned to enable the completed two-stage warhead to fit into a compact bomb case, missile compartment, or ballistic missile reentry cone.

The detonators have to be fired in a precise, coordinated manner to ignite the high explosives and create the focused shockwave that compresses the plutonium/uranium core into a smaller core that, as a result of its compact size and density, achieves criticality—a self-sustaining nuclear reaction. To enhance the energy release, at the optimal time determined by designers, a source of neutrons is introduced into the now super-critical assembly to initiate an exponentially increasing fission chain reaction and resultant nuclear explosion.⁴⁹

Additionally, there is another important process involved in the detonation of the first stage of a modern nuclear warhead. A mixture of deuterium and tritium atoms are injected into the primary. Both deuterium and tritium are isotopes of hydrogen atoms. (The hydrogen atom is the lightest atom of the elements in the periodic table. Each hydrogen atom has only one neutron while deuterium and tritium have two and three neutrons, respectively.) The compression and ignition process creates pressure and heat sufficient to fuse deuterium and tritium atoms into helium atoms and the resulting process releases energy and expels a neutron which helps “boost” the growing fission process.

There are numerous ways in which this initial ignition process in the primary can go wrong. For example, the timing of the firing of the detonators can be off, the consistency of the high explosive material can be compromised and result in a shock wave that does not properly compress the plutonium/uranium material, or the introduction of the neutrons can be injected at a time that is slightly different from the precise timing required.

⁴⁹ Bruce T. Goodwin, “Nuclear Weapons Technology 101 for Policy Wonks, Center for Global Security Research,” (Livermore, CA: Center for Global Security Research, August 2021), pp. 18-21, available at https://cgsr.llnl.gov/sites/cgsr/files/2024-08/CGSR_NW101_Policy_Wonks_11-04-21_WEB_v5.pdf.

The process described above is just the beginning of the explosion process for a modern nuclear weapon. The explosive power of most primaries (first stages) is less than ten kilotons of yield. The high yield of modern weapons is generated in the second stage.

As the primary is imploding and creating an explosion to produce fission and fusion processes, it creates heat that is so hot that “it glows, not red hot or white hot, but glows in the X-ray spectrum.” The challenge is to contain those X-rays for a very short time in a radiation case and direct them to “compress the secondary, resulting in a thermonuclear detonation” which produces the enormous yield of the H-bomb.⁵⁰

For a modern nuclear warhead to operate as designed, all of these processes have to function in a precise manner while the warhead is literally blowing itself apart. In addition, this series of interactions must all be completed properly within one ten-thousandth of a second. What could go wrong?

One more thing. For the ignition process to send a properly coded signal to fire the detonators, that signal must pass through multiple logic circuits. These circuits are referred to as “use-control” devices and have two primary purposes. First, the use-control circuits are designed to ensure that a firing signal from a verifiably authorized source reaches the detonators. And second, use-controls are designed to ensure that if an adversary, such as a terrorist, gets control of a nuclear weapon and tries to bypass security logic circuits and detonate it, the logic circuit senses the deviation from proper protocols and prevents detonation.

Nuclear warhead designs are engineered to function properly after being subjected to harsh, often violent environments such as from the launch of a ballistic missile and reentry into the atmosphere. The materials must be able to withstand the intense cold of very high altitude and searing heat and G forces of reentry. Each warhead design may also include specialized materials to help the warhead survive and operate in an environment of intense nuclear effects (e.g., neutron flux, X-rays, thermal).

The purpose of this highly condensed description of the operation of a modern nuclear weapon is provided here to provide readers with a basic understanding of the complexity of these weapons and that their reliability and proper operation as they age and are modified should not be taken for granted. To date, most (but not all) warhead life extension programs have been modest in scope. As the existing warheads continue to age, more complex modifications will be required. Each modification represents a change in the certified design of these complex systems. Proper operation, if needed, should not be assumed, and eventually, these warheads will have to be replaced. In the meantime, it is not unreasonable to consider nuclear testing to verify the proper functioning of U.S. nuclear weapons that are years beyond their design life and that have been modified to replace or upgrade components deemed unreliable due to aging.

For readers who seek more details on the design and operation of nuclear warheads, Bruce Goodwin at Lawrence Livermore National Laboratory has published an excellent tutorial and history of nuclear weapons technology. Much of the description of warhead

⁵⁰ Ibid, pp. 23-24.

operation in this paper is a highly condensed version of material from his publication.⁵¹ Also, the Union of Concerned Scientists has a useful article on how nuclear weapons work on their website.⁵²

What about Russia and China? Do They Have Similar Issues Regarding the Operation of Their Nuclear Warhead Infrastructures?

The serial production of nuclear warheads in the United States was abruptly halted in 1989. As the numerous changes, discussed earlier, to the U.S. business model for designing and producing nuclear warheads took effect in the early 1990s, the situation regarding the nuclear warhead complexes in Russia and China were very different from that of the United States. In the early 1990s, the nuclear complex of the United States was considered to be more capable than those in Russia and China, with the sole exception of the U.S. plutonium pit facility that had been closed but was planned to be relocated. What follows is a condensed description of changes to the nuclear infrastructures of Russia and China over the past three decades.

Russia

The breakup of the Soviet Union resulted in significant challenges for Russia's ability to sustain its huge nuclear force. Following the Soviet Union dissolution, large numbers of nuclear weapons were located in other former Soviet Republics. The physical security of those weapons was an international concern. The United States helped negotiate agreements to return strategic nuclear weapons from Ukraine, Belarus, and Kazakhstan and tactical nuclear weapons from a variety of eastern European countries to Russia. The Nunn-Lugar Program was initiated and funded by the United States to help decommission some of the former Soviet nuclear weapon deployment sites, dismantle warheads, and provide security for those weapons returned to Russia.

In the early 1990s, Russia deployed about ten thousand nuclear warheads on strategic weapons and had about twenty thousand tactical nuclear weapons of various types.⁵³ According to one Russian source,

The disintegration of the Soviet Union also resulted in significant changes in the military industry, affecting Russia's ability to maintain and modernize its strategic forces. The missile production industry was affected the most, since many key research and production facilities were located in Ukraine. Other industries

⁵¹ Ibid.

⁵² "How Do Nuclear Weapons Work?" *Union of Concerned Scientists*, August 23, 2023, available at <https://www.ucsusa.org/resources/how-nuclear-weapons-work#:~:text=Modern%20nuclear%20weapons%20work%20by,pressure%20needed%20to%20ignite%20fusion>.

⁵³ Pavel Podvig, "The Russian Nuclear Arsenal," *Center for International Security and Cooperation, Stanford University*, November 2005, available at <https://ciaotest.cc.columbia.edu/casestudy/case003/case003.html>.

suffered major disruptions in their subcontractor chains. One notable exception was the nuclear weapons production complex, which historically had all its vital research and production facilities located in Russia.⁵⁴

One exception to the exception above that was the Semipalatinsk Russian nuclear test complex which was in Kazakhstan and, therefore was no longer accessible by Russia and had been closed.

When the Strategic Arms Reduction Treaty (START) entered into force in 1994, the treaty permitted Russia to deploy up to six thousand accountable strategic nuclear warheads. Russia and the United States negotiated START II which would have capped the number of accountable strategic nuclear warheads at 3,000 to 3,500 and would have eliminated all multiple warhead ICBMs. Both START and START II included verifiable dismantlement provisions and deadlines. Russia complained that under the treaty provisions it would need to produce several hundred new single-warhead ICBMs to keep pace with the United States and this, along with the dismantlement provisions, were beyond its economic capability. START II was eventually eclipsed by the 2002 Strategic Offensive Reductions Treaty in May 2002 and a month later Russian President Putin announced that Russia was no longer bound by the provisions in START II.

Immediately after the so-called end-of-the-Cold-War, Russia had large numbers of existing nuclear weapons, a nuclear warhead complex that was in-tact within Russian borders, but was shackled by a weak economy. Under Russian President Yeltsin, government spending in Russia was shifted away from military readiness and priority was given to rebuilding the Russian economy. Throughout the 1990s, the United States and Russia explored opportunities for cooperation instead of military confrontation. It was in this environment that the Clinton Administration sharply cut funding for the U.S. nuclear complex and terminated all new nuclear warhead development and testing.

The improved relationship between the United States and Russia began to change after President Putin succeeded Yeltsin in 2000. Putin is famous for his April 2005 address to the nation in which he declared that “The collapse of the Soviet Union was the greatest geopolitical catastrophe of the [twenty-first] century.”⁵⁵

Over the past twenty years Russia has put highest priority on rebuilding and modernizing its nuclear forces and the production complex needed to support those forces. It has replaced the closed nuclear testing facility at Semipalatinsk with a revitalized and expanded facility, Novaya Zemlya, above the Arctic Circle, and has conducted numerous experiments at this new test facility.

With a great deal of activity at this revitalized nuclear test facility, Russia’s compliance with its CTBT commitments have been questioned. In fact, the Perry-Schlesinger Strategic Posture Commission report stated in 2009 that “Apparently Russia and possibly China are

⁵⁴ Ibid.

⁵⁵ “Putin Address to Nation: Excerpts,” *BBC*, April 25, 2005, available at <http://news.bbc.co.uk/2/hi/europe/4481455.stm>.

conducting low yield tests.”⁵⁶ In May 2019, Lt. Gen. Robert P. Ashley, Jr., then-Director of the Defense Intelligence Agency, stated:

Russia’s development of new warhead designs and overall stockpile management efforts have been enhanced by its approach to nuclear testing. The United States believes that Russia probably is not adhering to its nuclear testing moratorium in a manner consistent with the “zero yield” standard.⁵⁷

In late 2023, the Russian government announced that it was revoking its ratification of the CTBT. In September 2024, Andrei Sinitsyn, head of Russia’s central nuclear test site at Novaya Zemlya, stated that,

The test site is ready for the resumption of full-scale testing activities. It is fully ready. Laboratory and testing facilities are ready. The personnel are ready. If the order comes, we can start testing at any moment.⁵⁸

While the United States, has been very cautious about any new nuclear warhead development over the past thirty years, Russia has designed and produced numerous new warheads for its deployed weapons systems.⁵⁹

In 2019, Lt. Gen. Robert Ashley, the Director of the Defense Intelligence Agency, talked openly about Russian and Chinese nuclear developments. He stated,

Russia’s stockpile of nonstrategic nuclear weapons, already large and diverse, is being modernized with an eye towards greater accuracy, longer ranges and lower yields to suit their potential war-fighting role.⁶⁰

He also stated that “during the past decade Russia has improved and expanded its [nuclear weapons] production complex, which has the capacity to process thousands of warheads annually.”⁶¹ He elaborated further,

Russia claims to be developing new warhead designs for strategic systems such as a new high-yield, earth-penetrating warhead to attack hardened military targets, like the U.S., allied and Chinese command and control facilities. Russia’s

⁵⁶ Perry and Schlesinger, et al., *America’s Strategic Posture: The Final Report of the Congressional Commission on the Strategic Posture of the United States*, op. cit., p. 83.

⁵⁷ Robert P. Ashley, Jr., “The Arms Control Landscape,” *Transcript*, The Hudson Institute, May 31, 2019, available at <https://www.hudson.org/national-security-defense/transcript-the-arms-control-landscape-ft-dia-lt-gen-robert-p-ashley-jr>.

⁵⁸ Astri Edvardsen, “All Clear for Nuclear Testing at Novaya Zemlya, Says Russian Head of Test Site,” *High North News*, September 23, 2024, available at <https://www.highnorthnews.com/en/all-clear-nuclear-testing-novaya-zemlya-says-russian-head-test-site>.

⁵⁹ Mark Schneider, “How Many Nuclear Weapons Does Russia Have? The Size and Characteristics of the Russian Nuclear Stockpile,” *Occasional Paper* Vol. 3, No. 8 (Fairfax, VA: National Institute Press, August 2023), available at <https://nipp.org/wp-content/uploads/2023/09/Vol.-3-No.-8.pdf>.

⁶⁰ Ashley, Jr., “The Arms Control Landscape,” op. cit.

⁶¹ Ibid.

development of these new warhead designs and overall stockpile management has been enhanced by its approach to nuclear testing.⁶²

The 2025 DIA Worldwide Threat Assessment states:

Russia is expanding its nuclear forces by adding new capabilities, including nuclear air-to air missiles and novel nuclear systems. Russia probably maintains a nuclear stockpile of about 1,550 deployed strategic warheads and up to 2,000 non-strategic warheads. Russia is expanding its nuclear posture to Belarus by establishing missile and nuclear-capable aircraft capabilities, renovating a nuclear weapons storage site, and training Belarusian crews to handle tactical nuclear weapons. Throughout the Russia-Ukraine conflict, Russia has used nuclear related rhetoric and military exercises to signal its resolve and deter Russia-perceived Western involvement in the conflict.⁶³

In summary, Russia has revitalized its nuclear warhead infrastructure from its greatly weakened status in the early 1990s to that of a nuclear powerhouse today. It has designed and produced numerous new types of nuclear warheads, is capable of producing over a thousand new warheads each year, and has relocated and revitalized its nuclear testing site. The contrast with the United States, which has produced no nuclear warheads, new or otherwise, since 1989, and has no test readiness program, is stark.

China

In the early 1990s, China could be described as a regional nuclear power. Its nuclear force was estimated to include less than one hundred warheads on ballistic missiles of which only about seventeen had enough range to reach the far western coast of the United States. China also had only one rudimentary ballistic missile submarine which never deployed far from its home base.⁶⁴

Even in the early twenty-first century, U.S. assessments of Chinese military developments dismissed any serious nuclear threat from the People's Republic of China (PRC) nuclear forces. For example, a DoD report to Congress confidently stated,

The technological level of China's defense industrial complex is too far behind that of the West to produce weaponry that could challenge a technologically advanced foe such as the United States or Japan for an indefinite period of time.⁶⁵

⁶² Ibid.

⁶³ Defense Intelligence Agency, *2025 Worldwide Threat Assessment*, 2025, p. 15, available at https://armedservices.house.gov/uploadedfiles/2025_dia_statement_for_the_record.pdf.

⁶⁴ Ron Montaperto, "China as a Military Power," National Defense University Strategic Forum, No. 56, December 1995, available at <https://apps.dtic.mil/sti/pdfs/ADA394422.pdf>.

⁶⁵ Department of Defense, *Annual Report on the Military Power of the People's Republic of China*, June 2000, p. 8, available at <https://apps.dtic.mil/sti/pdfs/ADA381499.pdf>.

That characterization of Chinese military technology has changed dramatically since it was published in June 2000. The most recent assessments by DoD of Chinese nuclear capabilities provide quite a different picture. The DoD assessment in 2024 was that China had about 400 ICBMs in its arsenal, all of which could reach the continental United States.⁶⁶ No longer were the Chinese missiles limited to carrying a single warhead. China has now deployed multiple-warhead missiles. China has also recently constructed three new silo fields for ballistic missiles and probably has begun loading missiles into the silos. The PRC nuclear arsenal also includes road-mobile ICBMs and intermediate-range ballistic missiles (IRBMs). It has fielded two types of ballistic missile submarines and is now capable of conducting near-continuous at-sea missile patrols and targeting the United States from its littoral waters. In addition, the PRC has joined the ranks of countries with a strategic nuclear triad by equipping its bombers with a refueling capability as well as the ability to carry air-launched ballistic missiles.⁶⁷

The pace of nuclear developments in China appears to be accelerating. For example, the 2020 report on China's military developments estimated that China possessed an operational nuclear warhead stockpile of about 200 warheads and that by 2030 that number would at least double.⁶⁸ Just four years later, DoD estimates that the Chinese operational stockpile of nuclear warheads has surpassed 600 and will exceed one thousand by 2030—several years before the U.S. completes its planned infrastructure modernization.⁶⁹ The Defense Intelligence Agency estimates that:

China will continue to increase the size of its force until at least 2035. This supports the PLA's objective to achieve a more diverse nuclear force, comprising systems including low-yield precision strike missiles and ICBMs with multi-megaton yields, to provide a broader range of nuclear response options.⁷⁰

China continues to produce weapons-grade nuclear materials and is expanding its nuclear warhead production infrastructure. In addition, recent upgrades and possible preparation for testing at its Lop Nur nuclear test site have raised concerns about its testing plans.⁷¹ The newly developed nuclear capabilities being fielded by China may well provide a compelling rationale for them to conduct nuclear tests to confirm proper functioning of those warheads.

⁶⁶ Department of Defense, *Military and Security Developments Involving the People's Republic of China*, 2024, p. 65, available at <https://media.defense.gov/2024/Dec/18/2003615520/-1/-1/0/MILITARY-AND-SECURITY-DEVELOPMENTS-INVOLVING-THE-PEOPLES-REPUBLIC-OF-CHINA-2024.PDF>.

⁶⁷ *Ibid.*, pp. 103-107.

⁶⁸ Department of Defense, *Military and Security Developments Involving the People's Republic of China*, 2020, p. xiv, available at <https://media.defense.gov/2020/sep/01/2002488689/-1/-1/1/2020-dod-china-military-power-report-final.pdf>.

⁶⁹ Department of Defense, *Military and Security Developments Involving the People's Republic of China*, 2024, *op. cit.*, pp. 107, 109.

⁷⁰ Defense Intelligence Agency, *2025 Worldwide Threat Assessment*, *op. cit.*, pp. 8-9.

⁷¹ *Ibid.*

Russia-China Nuclear Cooperation. The rapid modernization of Russian and Chinese nuclear forces is a serious concern in itself. That concern is heightened further by the potential for cooperation by Russia and China against the United States and its allies. In May 2025, a DoD official with responsibilities for nuclear deterrence testified,

Today, the United States faces one of the most unprecedented strategic environments in our Nation's history. China and Russia are modernizing and diversifying their nuclear forces at breathtaking pace, and the Democratic People's Republic of Korea (DPRK) continues to demonstrate its ability to execute a strategic attack. Additionally, our adversaries are increasing their level of coordination and cooperation, which also raises the possibility of simultaneous conflicts with multiple nuclear-armed adversaries.⁷²

During the early part of the twenty-first century, U.S. officials may have felt comfortable with the slow pace of reconfiguring the U.S. nuclear warhead complex. However, the rapid modernization of nuclear forces in Russia and China and the dramatic gap in capability between Russian and Chinese nuclear infrastructures and the capability of the United States is now a valid cause for alarm.

In June 2025, one former DoD official warned that the possibility of a combined Sino-Russian nuclear attack is now a mandatory planning scenario for the United States. He states that his is not just a theoretical concern. As evidence, he cites recent joint Chinese-Russian strategic bomber patrols near Alaska.⁷³

Summary Findings

The need to restore to operation the nuclear warhead design and industrial capabilities of the United States is an urgent concern. Restoring this capability is unlikely to be smooth and without further difficulties. Accomplishments in modernizing nuclear component production facilities initiated over the past two decades provide a useful base for pushing ahead. However, additional funding, high level attention, and acceleration of current infrastructure plans are required to provide the capability to discourage nuclear racing and brinkmanship by Russia and China. The recommended actions cited in this report are the minimum of what is necessary to help restore the nuclear warhead complex to functionality.

⁷² Statement of Brandi Vann before the House Armed Services Committee, Subcommittee on Strategic Forces, May 7, 2025, p. 3, available at https://armedservices.house.gov/uploadedfiles/passback_bln-119-14d_defense_vann_hasc_nuclear_posture_hearing_statement.pdf.

⁷³ Eric S. Edelman, "America's Latest Problem: A Three-Way Race," *Foreign Policy*, June 2, 2025, available at <https://foreignpolicy.com/2025/06/02/us-nuclear-weapons-deterrence-command-control-nc3-decapitation-strike-china-russia-strategy-geopolitics/>.

Summary of Recommendations for Responsive Infrastructure for Nuclear Warheads

Below are recommended actions needed in the near term to help achieve a responsive and resilient infrastructure. All are important. Several require urgent attention.

Recommendations requiring urgent action:

- **Plutonium processing and fabrication:** proceed with greater urgency to achieve an operational pit fabrication capability at Los Alamos; accelerate the second fabrication site at SRS; and develop plans for each site to be able to scale-up plutonium pit production quantities in a timely manner.
- **Nuclear test readiness:** survey test readiness capabilities and take immediate corrective action to restore a readiness capability to conduct a fully instrumented nuclear test within two years; also, appropriate funds for test readiness and keep the funding in an “escrow” account to be used, when needed, to begin test preparations.
- **DoD and NNSA Integration:** proceed apace on W93 development and give high-level attention to the DoD/NNSA integration activities for the W93 warhead.

Other important recommended actions:

- **Uranium processing and fabrication:** to the extent possible, accelerate the construction of the replacement UPF and lithium facilities at SRS.
- **Non-nuclear components:** expand capacity at both the Kansas City Plant and at Sandia to provide resilience.

Tritium production and handling: accelerate the completion of the TFF facility and other needed modernization projects at SRS; and ensure that tritium production can be scaled up to meet operational needs should the number of operationally deployed warheads be significantly increased.

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ANALYSIS

WHY DOES AMERICA NEED GOLDEN DOME?

Keith B. Payne

Executive Summary

President Trump’s January 27, 2025 Executive Order, *The Iron Dome for America*, calls for a versatile U.S. missile defense system to protect America’s citizens, territory, infrastructure, and military forces against all opponents’ “ballistic, hypersonic, and cruise missiles, and other advanced aerial attacks. The Trump Administration has given the label “Golden Dome” to a homeland defense against all opponents’ missiles.

This guidance departs from past policy and practice: since 1976, no Republican or Democratic administration has deployed missile defenses to reduce the condition of homeland vulnerability to Russian or Chinese strategic missiles. The existing rudimentary homeland missile defense system is intended and largely designed to protect against the missile threats from North Korea.

However, Washington’s practice of not deploying more than a minimalist homeland defense against North Korean missiles is dangerous given the looming nuclear threats of a Russian, Chinese, and North Korean “axis of upheaval” that has the clear goal of overthrowing the liberal world order, by force if necessary. Moving progressively now to protect citizens, infrastructure and nuclear forces will help preserve the credibility and capability of U.S. deterrence strategies that must serve to keep the peace. The protection of U.S. nuclear retaliatory capabilities, including nuclear command, control, and communications, is an urgent priority in this regard. The more effectively the United States provides this protection, the more able it will be to deter war—there are no trade-offs in this regard.

The 2025 Iran-Israel Twelve-Day War included a dramatic duel between Iran’s offensive missiles and the defensive interceptors protecting Israel. The outcome of the Twelve-Day War would have been horrific for Israel in the absence of Israel’s missile defense capabilities—particularly because Iran targeted civilian centers for destruction. It provides lessons regarding the prospective value of Golden Dome’s missile defenses for allies and the U.S. homeland. The approximately 90 percent success rate of layered missile defenses illustrates their potential effectiveness for denying the coercive effects of Russian, Chinese, and North Korean offensive missile threats, i.e., deterring their coercion, and helping to undercut the potential military effects of even large-scale nuclear attacks—thereby helping to deter such strategies. The Twelve-Day War also demonstrated that missile defenses can contribute critically to saving lives and limiting escalation. It also demonstrated: 1) the great value of missile defense as an essential complement to offensive air operations intended to destroy enemy missile capabilities; 2) that “cost-effective at the margin” must not be a decisive criterion for fielding missile defense; and finally, 3) that the United States and allies must move urgently to produce, stockpile, and field layered missile defense capabilities in a



timely way and in quantities potentially sufficient for multiple, and possibly simultaneous, great power missile threats and attacks.

Critics of Golden Dome now repeat tired arguments against homeland missile defense that date to the 1960s. These arguments have driven U.S. missile defense policy for decades. But for all their repetition and policy influence, they were suspect during the Cold War and are demonstrably bogus or logically incoherent in the contemporary threat context. If, as seems likely, U.S. technological innovation, in cooperation with allies, can make Golden Dome for the American homeland and allied lands practicable, there should be no going back.

Introduction

President Trump's January 27, 2025 Executive Order, *The Iron Dome for America*, calls for a versatile U.S. missile defense system to protect America's citizens, territory, infrastructure, and military forces against all opponents' "ballistic, hypersonic, and cruise missiles, and other advanced aerial attacks."¹ It also calls for the examination of cooperation with allies to protect their territories, populations and military forces. This is a sweeping directive for the defense of the United States the likes of which have not been seen since Ronald Reagan's 1983 Strategic Defense Initiative. That research and development program ultimately led to the rudimentary U.S. homeland defense system now deployed to protect against North Korea's long-range ballistic missiles, but not against Russian or Chinese missiles.

The goal of defending American citizens, infrastructure and nuclear forces may seem self-evidently sensible. That, however, is a naïve view given long-standing U.S. missile defense policy. Since 1976, no Republican or Democratic administration has deployed missile defenses to reduce the condition of homeland vulnerability to Russian or Chinese strategic missiles. Americans typically react to this harsh reality with shocked disbelief;² why else should U.S. taxpayers spend hundreds of billions of dollars on defense every year if not—at a minimum—to protect the country from attack?

Washington's archaic policy *against* deploying anything beyond a minimalist homeland defense against North Korean missiles is dangerous given the looming nuclear threats of a Russian, Chinese, and North Korean "axis of upheaval" that has the clear goal of overthrowing the liberal world order, by force if necessary. Russia has explicitly lowered its threshold for using nuclear weapons and frequently issues coercive nuclear threats; China's leadership has identified 2027 as a possible timeline for taking Taiwan,³ and has not ruled out the use of nuclear weapons to do so, if necessary. Both have been engaged in an extensive expansion of their nuclear forces for well over a decade.

¹ The White House, Presidential Actions, *The Iron Dome for America*, January 27, 2025, available at <https://www.whitehouse.gov/presidential-actions/2025/01/the-iron-dome-for-america/>.

² See polling data on public views of missile defense during the Cold War in, Keith B. Payne, *Strategic Defense: "Star Wars" in Perspective* (Lanham, MD: Hamilton, 1986), pp. 233-247.

³ See Olivia Victoria Gazis, "CIA Director William Burns: 'I wouldn't underestimate' Xi's ambitions for Taiwan," *CBS News*, February 23, 2023, available at <https://www.cbsnews.com/news/cia-director-william-burns-i-wouldnt-underestimate-xis-ambitions-for-taiwan/>.

Republican and Democratic administrations foolishly expected the post-Cold War international system to be a cooperative “new world order,”⁴ governed by a near-universal liberal enlightenment. To the dismay of Western capitals, Russia, China, and North Korea (and Iran) instead see themselves at war with the United States because it is the impediment to their common goal. Washington and the West are only now awakening to the harsh reality of this war.

An American homeland defense against all opponents’ missiles, now labeled “Golden Dome” by the Trump Administration,⁵ is an urgent step Washington must take to strengthen deterrence and, concurrently, to prepare for the possibility that deterrence will fail, i.e., both to prevent war and prepare for the possibility of war.

Golden Dome and the Deterrence of War

As described by the Executive Order and Pentagon, Golden Dome will “progressively” protect U.S. citizens, critical infrastructure and nuclear capabilities.⁶ No one should expect Golden Dome to emerge fully mature to defend against all opponents’ missiles. But moving progressively to protect citizens, infrastructure and nuclear forces will help preserve the credibility of U.S. deterrence strategies that must serve to keep the peace. The protection of U.S. nuclear retaliatory capabilities, including nuclear command, control, and communications, is the urgent priority in this regard. The more effectively the United States provides this protection, the more able it will be to deter war. How so?

First, a basic necessity for deterrence is that U.S. nuclear forces and infrastructure are able to survive any nuclear first strike intended to destroy them; they must be able to pose an enduring threat of retaliation. Golden Dome’s protection of U.S. nuclear forces and infrastructure may become increasingly key for the fundamental requirement that U.S. forces be survivable. As Russian and Chinese long-range nuclear missile capabilities continue to expand, and Moscow and Beijing increasingly coordinate and cooperate, the potential nuclear strike threat to eliminate U.S. retaliatory deterrence capabilities will become severe, and the active defense of those U.S. capabilities may be essential for their survival and capacity to pose a retaliatory threat.

More specifically, also necessary for deterrence is the U.S. capability to “tailor” deterrence by holding at risk those particular assets that opponents value most.⁷ Golden

⁴ See for example, President George H. W. Bush, *Address Before a Joint Session of the Congress on the Persian Gulf Crisis and the Federal Budget Deficit*, September 11, 1990, George H. W. Bush Presidential Library and Museum, available at <https://bush41library.tamu.edu/archives/public-papers/2217>.

⁵ *Secretary of Defense Pete Hegseth Statement on Golden Dome for America*, May 20, 2025, available at <https://www.defense.gov/News/Releases/Release/Article/4193417/secretary-of-defense-pete-hegseth-statement-on-golden-dome-for-america/>.

⁶ *Ibid.*

⁷ The 2024 Biden Administration’s nuclear employment guidance said, “The Guidance continues to emphasize the need to, first and foremost, hold at risk what adversaries value most. It also reiterates the need to maintain counterforce capabilities to reduce potential adversaries’ ability to employ nuclear weapons against the United States and its allies and partners....” U.S. Department of Defense, *Report on the Nuclear Employment Strategy of the United States*, November 2024,

Dome's potential protection of U.S. ICBMs and nuclear infrastructure will help preserve the U.S. capability to threaten the many hardened and underground military and political sites that likely constitute the highest values of Russia's, China's and North Korea's autocratic rulers—their “tools of power and control.”⁸ The need for such a deterrent capability against Moscow was recognized as far back as 1983 by the bipartisan President's Commission on Strategic Forces. Its report concluded that, for deterrence, the United States “...must be able to put at risk those types of Soviet targets—including hardened ones such as military command bunkers and facilities, missile silos, nuclear weapons and other storage, and the rest—which the Soviet leaders have given every indication by their actions they value most and which constitute their tools of power and control.”⁹ This basic deterrence principle almost certainly applies to today's autocratic rulers. Golden Dome's unique protection of the specific U.S. capabilities needed to pose such a deterrent threat, and thereby tailor deterrence to contemporary autocratic foes, is likely to become key to preventing great power war.

Second, Russian and Chinese regional “theories of victory” over U.S. allies and partners include coercive nuclear threats to America intended to destroy the U.S. will to act in defense of allies, and thus the credibility of U.S. deterrence commitments.¹⁰ The priority goal is to paralyze U.S. leaders with fear of Russian and/or Chinese nuclear escalation or, if necessary, to destroy the U.S. military infrastructure needed for U.S. power projection abroad—either way leaving U.S. allies without American support and highly vulnerable to defeat. The 1962 Cuban Missile crisis and the contemporary war in Ukraine both demonstrate U.S. leaders' understandable fear of nuclear escalation against U.S. territory,¹¹ and the potential effectiveness of opponents' coercive nuclear threat strategies. U.S. leaders, Republican and Democrat, have repeatedly expressed the fear of escalation as their reason for great caution with regard to support for Ukraine. As Russia and China expand their cooperation “without limits,” protecting U.S. citizens and military infrastructure against Russian and Chinese coercive nuclear threats intended to destroy U.S. will and power projection capabilities will become increasingly critical for the credibility of America's extended deterrence “umbrella” for allies.

p. 3, available at <https://media.defense.gov/2024/Nov/15/2003584623/-1/-1/1/REPORT-ON-THE-NUCLEAR-EMPLOYMENT-STRATEGY-OF-THE-UNITED-STATES.PDF>.

⁸ *Report of the President's Commission on Strategic Forces* (April 1983), p. 6, available at <http://web.mit.edu/chemistry/deutch/policy/1983-ReportPresCommStrategic.pdf>

⁹ *Ibid.*

¹⁰ For an early discussion of contemporary “Red” “theories of victory,” see, Brad Roberts, *The Case for U.S. Nuclear Weapons in The 21st Century* (Stanford, CA: Stanford University Press, 2016), pp. 35, 99, 103-104, 192-194, 260-262, 268-271.

¹¹ For a useful discussion of the Cuban Missile Crisis see, Matthew R. Costlow, “Deterring Opportunistic Aggression During the Cuban Missile Crisis: Necessary Reminders and Applications for Today,” *Information Series*, No. 624 (Fairfax, VA: National Institute Press, May 6, 2025), available at https://nipp.org/information_series/matthew-r-costlow-deterrence-is-integrated-in-theory-but-not-in-practice-the-problem-and-partial-solution-no-614-february-3-2025/. For a discussion of Russian nuclear threats in the Ukraine War, see Michaela Dodge, *What Do Russia's Nuclear Threats Tell Us About Arm Control Prospects?*, *Occasional Paper*, Vol. 4, No. 1 (Fairfax, VA: National Institute Press, January 2024), available at <https://nipp.org/papers/what-do-russias-nuclear-threats-tell-us-about-arms-control-prospects/>.

Russian and Chinese commentators have charged that America's Golden Dome will upset deterrence "stability" and must be rejected. However, the fact that both Moscow and Beijing have long pursued their own missile defense shields and, in fact, that Russia has a long-standing *nuclear-armed* national missile defense system, shows their criticism of Golden Dome to be agitprop intended to stop an American defensive program that threatens to strengthen U.S. deterrence capabilities against their respective theories of victory.

Golden Dome and Preparation for Conflict

Deterrence has long been the primary goal of U.S. nuclear policy and strategic forces. However, the increasing potential for deterrence failure or irrelevance is likely given multiple, dedicated opponents who are willing to risk military conflict, emphasize the role of nuclear weapons, and have the common goal of overturning the existing global order. Nuclear escalation in a regional conflict is perhaps most likely. This is an unprecedented threat context in which the United States must prioritize both deterrence and the preparation for deterrence failure. In the event of war, Golden Dome's defense of citizens, infrastructure and nuclear forces could uniquely save lives, reduce damage and contribute to the resiliency of U.S. military forces and operations. Deterrence must, of course, remain a priority goal; but the preparation to defend in the event of war also must be a priority. Fortunately, the more capable U.S. defenses are in the event of war, the more likely Washington will be able to deter war. There are no trade-offs in this regard.

Lessons from the Twelve-Day War

There are several basic lessons from the 2025 Israel-Iran Twelve-Day War regarding the likely value of missile defenses, particularly for, but not limited to, missile threats to U.S. allies. During the war, Israel's layered missile defenses reportedly intercepted some 90 percent of the 500-550 missiles Iran launched at Israel.¹² Apparently 36 of the Iranian missiles that penetrated Israeli defenses detonated in population centers, killing 28 persons, inflicting thousands of injuries, and displacing over 13,000 Israelis.¹³

While Iran pursued diverse offensive missile systems for decades, Israel focused on fielding multiple layers of missile defenses, including different defensive systems optimized to intercept incoming missiles at different altitudes, thereby increasing the odds of

¹² Sebastien Roblin, "How Did Israel's Air Defense Fare Against Iran's Ballistic Missiles?" *Forbes*, July 2, 2025, available at <https://www.forbes.com/sites/sebastienroblin/2025/06/30/how-did-israels-air-defenses-fare-against-irans-ballistic-missiles/>.

¹³ Amy Spiro, "These are the 28 victims killed in Iranian missile attacks during the 12-day conflict," *Times of Israel*, June 29, 2025, available at [https://www.timesofisrael.com/these-are-the-28-victims-killed-in-iranian-missile-attacks-during-the-12-day-conflict/#:~:text=Twenty%2Deight%20people%20were%20killed,at%20home%20with%20his%20family](https://www.timesofisrael.com/these-are-the-28-victims-killed-in-iranian-missile-attacks-during-the-12-day-conflict/#:~:text=Twenty%2Deight%20people%20were%20killed,at%20home%20with%20his%20family.). See also, Emanuel Fabian, "The Israel-Iran war by the numbers after 12 days of fighting," *Times of Israel*, June 24, 2025, available at [https://www.timesofisrael.com/the-israel-iran-war-by-the-numbers-after-12-days-of-fighting/#:~:text=Iran's%20remaining%20capabilities,launchers%2C%20according%20to%20IDF%20estimates.&text=In%20terms%20of%20Iran's%20defenses,IAF%20fighter%20jets%20and%20drones](https://www.timesofisrael.com/the-israel-iran-war-by-the-numbers-after-12-days-of-fighting/#:~:text=Iran's%20remaining%20capabilities,launchers%2C%20according%20to%20IDF%20estimates.&text=In%20terms%20of%20Iran's%20defenses,IAF%20fighter%20jets%20and%20drones.).

successful intercepts. In particular, a multi-layered defensive system can enable “shoot-look-shoot,” in which an initial defensive intercept, if unsuccessful, is followed by a second intercept shot that is aided by improved information regarding the location and likely destination of the attacking missile. Israel’s considerable defensive success during the Twelve-Day War may have benefited from Israel’s multiple layers of missile defenses and corresponding “shoot-look-shoot” opportunities.¹⁴

The effectiveness of Israel’s layered defenses demonstrates their potential value for the deterrence of aggression by decisively denying aggressors the expectation that their missiles will be of reliable military or coercive use. This value of layered defenses is applicable to regional missile threats to allies and to intercontinental nuclear missile threats to the U.S. homeland. Russia, China and North Korea appear to anticipate that limited missile threats to the United States will enable them to coerce Washington away from coming to the aid of U.S. allies—thereby enabling their expansionist plans against U.S. allies.¹⁵ Layered U.S. missile defenses provided by Golden Dome could usefully deny opponents’ confidence in such coercive threats to the United States and restore the effectiveness of U.S. extended deterrence for allies; layered defenses could also undercut their confidence in the potential military effects of even large-scale nuclear attacks—thereby helping to deter such attacks.

The war also demonstrated the unparalleled value of defenses in the event deterrence fails. The outcome of the Twelve-Day War would have been far more destructive of lives, property and infrastructure in the absence of Israel’s layered missile defense capabilities—particularly because Iran targeted civilian centers for destruction. The up to 470 Iranian missiles that were intercepted over Israel almost certainly would have inflicted thousands of additional casualties and billions of dollars in additional civilian and military destruction.¹⁶

This point again applies to regional missile threats to allies and to intercontinental nuclear missile threats to the U.S. homeland. There are, of course, considerable differences in protecting against Iran’s hundreds of conventionally armed missiles and defending against thousands of nuclear warheads on intercontinental missiles. Even Israel’s remarkably successful 90 percent defensive success rate against hundreds of Iran’s conventionally armed missiles could lead to intolerable destruction if an attack against the United States involved thousands of Russian and Chinese nuclear missile warheads. Critics of Golden Dome seem to emphasize this type of scenario in their effort to cast doubt on the potential value of missile defense.¹⁷ However, that scenario is only one of many possible nuclear attack scenarios confronting Washington, and perhaps the most likely to be deterred by the U.S. potential to defeat adversaries’ offensive military goals with the help of missile

¹⁴ Roblin, “How Did Israel’s Air Defense Fare Against Iran’s Ballistic Missiles?,” op. cit.

¹⁵ See Brad Roberts, *The Case for U.S. Nuclear Weapons in The 21st Century* (Stanford, CA: Stanford University Press, 2016), pp. 35, 99, 103-104, 192-194, 260-262, 268-271.

¹⁶ Roblin, “How Did Israel’s Air Defense Fare Against Iran’s Ballistic Missiles?,” op. cit.

¹⁷ See for example, “Trump ‘Golden Dome’ plan tricky and expensive: experts,” *Le Bourget* (France), June 20, 2025, available at <https://www.france24.com/en/live-news/20250619-trump-golden-dome-plan-tricky-and-expensive-experts>.

defenses and the corresponding threat of a massive U.S. nuclear reply. In other very plausible conflict scenarios, missile defense protection of society and infrastructure could prove extremely valuable in limiting damage. For example, as noted above, even imperfect defenses could help not only to deter Russian, Chinese, or North Korean coercive nuclear threats but, if deterrence failed to prevent Putin's coercive threats of nuclear attack, layered defenses could greatly reduce the consequent U.S. civilian casualties and damage to infrastructure and society.

“Cost Effective at the Margin”

The war also readily demonstrated that the past U.S. self-imposed requirement, that missile defenses be “cost effective at the margin,”¹⁸ is an absurd standard—worthy of peacetime accounting, not wartime realities. That accounting standard mandates that defensive interceptors must not cost more to produce and deploy than do the offensive missiles to be intercepted. However, the likelihood that Iranian missiles cost considerably less to produce and deploy than the Israeli interceptors that defended against them was hardly the priority concern for Israel as its missile defenses prevented the destruction of hundreds of civilian and military infrastructure targets. A more useful comparison is of the alternative approaches to defeating offensive missiles in varying contexts. A more useful comparison is of the effectiveness of alternative approaches to defeating offensive missiles in varying contexts, e.g., offensive strikes against opponents' missile systems prior to their launch, and ground-based, sea-based, and space-based missile defenses.

Limiting Escalation

In addition, in the absence of Israel's layered defenses, the repeated barrages of attacking Iranian missiles would certainly have led to a much greater escalation of the war. In that case, Israel would have been compelled to engage in much more extensive offensive operations against Iran to destroy Iranian missiles, launchers, and storage sites on the ground prior to their launch. During the war, even with near-absolute air superiority over Iran, discriminate Israeli air strikes apparently destroyed approximately 50 percent of Iran's launchers, and Iranian missile launches continued until the very end of the fighting.¹⁹ In effect, while Israeli air attacks against Iranian missile capabilities on the ground were of great importance, these so-called “left-of-launch” operations to destroy Iranian missile capabilities on the ground were inadequate. The effectiveness of Israeli missile defenses was a necessary complement to and enabled a critical limit on Israel's escalation of the war. This

¹⁸ See the discussion in Matthew R. Costlow, “A Curious Criterion: Cost Effectiveness at the Margin for Missile Defense,” *Information Series*, No. 537 (Fairfax, VA: National Institute Press, October 21, 2022), available at https://nipp.org/information_series/matthew-r-costlow-a-curious-criterion-cost-effective-at-the-margin-for-missile-defense-no-537-october-21-2022/.

¹⁹ Roblin, “How Did Israel's Air Defense Fare Against Iran's Ballistic Missiles?”, op. cit.

potential value of missile defenses as a means of limiting war escalation again applies to regional conflicts and threats to allies and to intercontinental nuclear missile threats to the U.S. homeland.

Defense Production and Inventories

Finally, the Twelve-Day War demonstrated conclusively the importance of readily available interceptor quantities. The multiple waves of Iranian missile attacks apparently stressed the available inventory of U.S. interceptors, particularly had they been needed elsewhere simultaneously.²⁰ For example, given the rate of use in the Middle East, the U.S. Patriot missile defense system reportedly was reduced to only 25 percent of the number of interceptors needed to support broader Pentagon plans.²¹ Prior to the war, Iran reportedly possessed approximately 2,500 ballistic missiles and was producing 50 additional missiles per month.²² Had the war occurred months or years later, it could have been a contest between the greater number of Iranian offensive missiles and readily available defensive interceptors. Given the Iranian rate of missile production, this competition may have been disastrous for Israel given the limited production rate of interceptor missiles in Israel and the United States. The question of Iran's nuclear potential, of course, likely was critical with regard to the timing of Israel's attack. However, this question of competing inventories of Iranian missiles vs. available interceptors must also have driven Israeli considerations. This is an important lesson from the Twelve-Day War to be learned for the defense of the United States. The total number of deployed U.S. interceptor launchers for homeland defense now stands at 44—an absurdly low inventory given the much greater missile threats now facing the United States.

In short, the sufficient production and fielding of missile defense capabilities must be shaped by the number and character of the missile threats to be deterred and defeated. The United States and allies now confront the large and growing missile arsenals of Russia, China and North Korea. NATO Secretary General Mark Rutte recently emphasized the chilling potential of Russia and China launching a simultaneous attack against the West, initiating World War III.²³ Unfortunately, this reality underscores the urgency of the bipartisan Commission on the National Defense Strategy conclusion in its 2024 report: "The commission found that U.S. industrial production is grossly inadequate to provide the

²⁰ See Amira El-Fekki, "US Missile Defenses Heavily Depleted in Shielding Israel: report," *Newsweek*, June 27, 2025, available at <https://www.newsweek.com/us-missile-defenses-heavily-depleted-shielding-israel-report-2091465>.

²¹ Hugo Lowell, "US has 25% of all Patriot missile interceptors needed for Pentagon's military plans," *The Guardian*, July 8, 2025, available at <https://www.theguardian.com/us-news/2025/jul/08/us-pentagon-military-plans-patriot-missile-interceptor>.

²² Fabian Hinz, "Israel's attack and the limits of Iran's missile strategy," *Online Analysis*, International Institute for Strategic Studies, June 18, 2025, available at <https://www.iiss.org/online-analysis/online-analysis/2025/06/israels-attack-and-the-limits-of-irans-missile-strategy/>.

²³ See Taryn Pedler and Will Stewart, "World War III will start with simultaneous Xi and Putin invasions," *Daily Mail.com*, July 6, 2025, available at <https://www.dailymail.co.uk/news/article-14879371/World-War-III-start-simultaneous-Xi-Putin-invasions-taking-globe-brink-Armageddon-warns-NATO-chief-Mark-Rutte.html>.

equipment, technology and munitions needed today, let alone given the demands of great power conflict. A protracted conflict, especially in multiple theaters, would require much greater capacity to produce, maintain and replenish weapons and munitions.”²⁴

In summary, the Twelve-Day War’s dramatic duel between Iran’s offensive missiles and the defensive interceptors protecting Israel provides lessons regarding the prospective value of Golden Dome’s missile defenses for allies and the U.S. homeland. In the absence of Israel’s layered missile defenses, Iran’s missile attacks would have inflicted much greater devastation. The success of layered missile defenses illustrates their potential effectiveness for denying the coercive effects of Russian, Chinese, and North Korean limited offensive missile threats, i.e., deterring their coercion, and helping to undercut the potential military effects of even large-scale nuclear attacks—thereby helping to deter such strategies. The Twelve-Day War also demonstrated that missile defenses can contribute critically to saving lives and limiting escalation. It also demonstrated: 1) the great value of missile defense as an essential complement to offensive air operations intended to destroy enemy missile capabilities; 2) that “cost-effective at the margin” must not be a decisive criterion for fielding missile defense; and finally, 3) that the United States and allies must move urgently to produce, stockpile, and field layered missile defense capabilities in a timely way, and in quantities potentially sufficient for multiple, and possibly simultaneous, great power missile threats and attacks.

The Arguments Against Golden Dome

Critics of Golden Dome now repeat tired arguments against homeland missile defense that date to the 1960s.²⁵ These arguments are that: 1) mutual vulnerability to nuclear destruction is necessary for “stable” deterrence, and thus Golden Dome’s protection must be rejected as “destabilizing”; 2) missile defenses will not protect perfectly, and short of near perfection, they are not worth the cost; and, 3) the deployment of Golden Dome will start an “action-reaction” arms race, while rejecting homeland missile defense enables nuclear arms control.²⁶ In short, critics argue that Golden Dome would be imperfect, “destabilize” deterrence, and cause an arms race, while the continuing absence of serious homeland defense is the basis for arms control. These are the standard arguments rolled out once again

²⁴ As reported in, Tom Jurkowsky, “National Defense Strategy Commission: We Are Not Prepared,” *RealClearDefense*, October 21, 2024, available at https://www.realcleardefense.com/articles/2024/10/21/national_defense_strategy_commission_we_are_not_prepared_1066457.html?utm_campaign=dfn-ebb&utm_medium=email&utm_source=sailthru.

²⁵ These critical arguments from the Cold War are reviewed in, Payne, *Strategic Defense: “Star Wars” in Perspective*, op. cit., pp. 29-178; more recently see, David J. Trachtenberg, *Next Steps in Homeland Missile Defense, Occasional Paper*, Vol. 5, No. 1 (Fairfax, VA: National Institute Press, January 2025), available at <https://nipp.org/papers/next-steps-in-homeland-missile-defense/>.

²⁶ See for example, Celia McDowall and Ankit Panda, “Trump wants denuclearization and a ‘Golden Dome.’ He can’t have both,” *Bulletin of the Atomic Scientists*, April 29, 2025, available at https://thebulletin.org/2025/04/trump-wants-denuclearization-and-a-golden-dome-he-cant-have-both/?utm_source=SocialShare&utm_medium=CopyLink&utm_campaign=CopyLink&utm_term.

to reach the desired conclusion that continued vulnerability to Russian and Chinese nuclear missiles is preferable to missile defenses.

These arguments have driven U.S. missile defense policy for decades. But for all their repetition and policy influence, they were suspect during the Cold War and are demonstrably bogus in the contemporary threat context. Each can be addressed in order.

First, as should be most obvious, American homeland vulnerability is not necessary for deterrence. In fact, homeland vulnerability is detrimental to U.S. deterrence strategies. It is the *vulnerability of opponents* to U.S. deterrence threats that enables U.S. deterrence strategies to be effective, not U.S. vulnerability to opponents' threats. Defending U.S. civilians, infrastructure and nuclear forces will strengthen the credibility of those deterrence threats for the reasons discussed above. The well-worn critique that U.S. homeland missile defense is somehow detrimental to U.S. deterrence goals is logically incoherent, but that does not seem to discourage critics from advancing it.

Second, Golden Dome need not protect perfectly to be of great value—perfection rarely exists and is a contrived standard by which to criticize U.S. missile defense. Golden Dome's "progressive" protection of U.S. citizens, critical infrastructure and nuclear capabilities, even though imperfect, will contribute to the credibility and capability of U.S. deterrence strategies. And, in the event of war, less than perfect defenses could help limit damage to U.S. society, particularly in the event of limited coercive nuclear attacks, and strengthen the resiliency of U.S. nuclear and non-nuclear power-projection forces—thereby contributing to the forward defense of allies and defeat of opponents.

Third, history demonstrates conclusively that the U.S. deployment of homeland missile defenses does *not* preclude arms control, nor does the absence of U.S. missile defense somehow reliably *enable* effective arms control. The 2002 Moscow Treaty with Russia imposed deep nuclear reductions and was negotiated and implemented *concurrently* with the U.S. decisions to deploy homeland defenses for the first time in decades. And, the 1972 ABM Treaty, which effectively precluded homeland missile defense and was rationalized as the basis for ending further Soviet nuclear expansion, was immediately followed by an enormous increase in Soviet nuclear forces—despite continuing U.S. arms control efforts. In fact, Soviet officials said that the ABM Treaty was welcomed in Moscow because reduced spending on missile defense enabled them to *expand* Soviet nuclear forces.²⁷ Confident predictions to the contrary, the absence of U.S. missile defense actually *promoted an increase* in Soviet offensive nuclear forces, not arms control.

In short, it is clear from empirical evidence that U.S. homeland missile defense did *not* preclude nuclear arms control in 2002, nor did its absence with the ABM Treaty *enable* effective arms control. The aged arms control criticisms of missile defense, that Golden Dome will preclude arms control, while its absence would reliably enable arms control, are fully inconsistent with historical realities. Again, that historical fact does not discourage continued claims that arms control and homeland missile defense are mutually exclusive.

²⁷ As discussed in William E. Odom's classic text on the Soviet military, *The Collapse of the Soviet Military* (New Haven, CT: Yale University Press, 1998), pp. 71, 85-86.

Conclusion

In conclusion, every past or prospective deployment of strategic forces has pro and con arguments. That is the nature of the subject. That said, in the looming, unprecedentedly dangerous threat context, the need for Golden Dome's homeland missile defense to strengthen deterrence and prepare for possible conflict is overwhelming. In contrast, the aged arguments against homeland missile defense, now replayed yet again against Golden Dome, are demonstrably bogus or logically incoherent. Those arguments do not reflect thoughtful analyses, but a long-standing political agenda opposed to U.S. missile defense. The 2025 Twelve Day War, featuring Iran's missile attacks and Israel's missile defenses, provides ample illustrations of the great value of layered missile defenses, for both allies and the U.S. homeland. If, as seems likely, U.S. technological innovation, in cooperation with allies, can make Golden Dome for the American homeland and allied lands practicable, there should be no going back.

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ANALYSIS

WHY ARMS CONTROL MUST FAIL

David J. Trachtenberg

Executive Summary

Americans typically believe that fundamental disagreements can be overcome through the patient application of logic, reasoning, and common sense. This applies to negotiations with adversaries; it is often assumed that international tensions and the risk of war, especially nuclear war, can be alleviated through arms control agreements. This is a culturally egotistical view that assumes opponents share the same goals and objectives as the United States and that, with due diligence, the United States can succeed in concluding agreements that not only enhance U.S. security but provide outcomes that make the overall strategic environment more stable and secure. Though a noble sentiment, this view is naïve, unsupported by history, ignores contemporary realities, and is unlikely to produce the desired positive results.

There is a growing body of evidence supporting the proposition that U.S. adversaries do not share such goals and objectives. In simple terms, both China and Russia—which pose the greatest threat to U.S. security—are not interested in “stability” as the United States defines it. Rather, their goal is to work against a stability that preserves the status quo. America’s primary rivals, China and Russia, believe the time has come to change the existing world order in a way that displaces the United States as the predominant global power—militarily, economically, and politically. They seek a world order more accommodating to their authoritarian worldviews and interests. These opposing objectives are what make meaningful arms control impossible.

As long as Russia and China continue to view the United States as the main impediment to their drive for global supremacy, arms control is destined to fail. It is simply unrealistic to assume that Moscow or Beijing will agree to any meaningful limitations on their respective military buildups, as those buildups underpin their drive for global dominance. This reality, disappointing though it may be, must be recognized and acknowledged lest the United States repeat past follies and suffer the disillusionment of policy failures yet again. In the current international environment, such failures can have catastrophic consequences.

Introduction

Americans typically believe that fundamental disagreements can be overcome through the patient application of logic, reasoning, and common sense. In international relations, creative diplomacy is often seen as the key to solving intractable problems. This applies to negotiations with adversaries; it is often assumed that international tensions and the risk of war, especially nuclear war, can be alleviated through arms control agreements. Though a



noble sentiment, this view is naïve, unsupported by history, ignores contemporary realities, and is unlikely to produce the desired positive results.

This stark conclusion runs counter to the American cultural belief that disagreements among opponents can always be overcome with good faith dialogue and discussion. Such a belief is premised on the notion that all sides share a common desire to bridge their differences in ways that lead to mutually beneficial outcomes.

This is a culturally egotistical view that assumes opponents share the same goals and objectives as the United States and that, with due diligence, the United States can succeed in concluding agreements that not only enhance U.S. security but provide outcomes that make the overall strategic environment more stable and secure.

The central problem with this belief is that there is a growing body of evidence supporting the proposition that U.S. adversaries do not share such goals and objectives. In simple terms, both China and Russia—which pose the greatest threat to U.S. security—are not interested in “stability” as the United States defines it. Rather, their goal is to work against a stability that preserves the status quo. These opposing objectives are what make meaningful arms control impossible.

Different Worldviews, Irreconcilable Differences

The United States is a status quo power. The focus of U.S. foreign policy is on maintaining or restoring stability in the international environment. Why? Because global instability heightens the risk of upheaval and conflict, which can have catastrophic results with decidedly negative consequences for U.S. global interests. The view that arms control is the best way to ensure stability among rival powers has been reflected over the years in numerous policy and strategy documents. Most recently, for example, as the Biden Administration’s *2022 Nuclear Posture Review* (NPR) stated, “The United States will pursue a comprehensive and balanced approach that places a renewed *emphasis on arms control, non-proliferation, and risk reduction to strengthen stability...*”¹ Indeed, arms control is described as a way to “enhance strategic stability with the PRC [People’s Republic of China] and Russia...” and as offering “the most effective, durable, and responsible path to reduce the role of nuclear weapons in our strategy and to prevent their use.”² Yet the 2022 NPR also acknowledged that U.S. and Russian “priorities are not identical, underscoring the importance of dialogue, when conditions permit, to address each side’s differing goals and perceptions of military systems that affect strategic stability.”³ Indeed, the stability that the United States seeks to “strengthen” and “enhance” is one that works to resolve conflicts via international law and institutions vice the use of military force—characteristics of a world

¹ Department of Defense, *2022 Nuclear Posture Review*, October 27, 2022, p. 1, available at <https://media.defense.gov/2022/Oct/27/2003103845/-1/-1/1/2022-NATIONAL-DEFENSE-STRATEGY-NPR-MDR.pdf>. (emphasis added)

² *Ibid.*, p. 16.

³ *Ibid.*, pp. 16-17.

order created and nurtured by the United States after World War II. This is clearly not the kind of stability America's adversaries have in mind or wish to cement in practice.

Indeed, America's primary rivals, China and Russia, believe the time has come to change the existing world order in a way that displaces the United States as the predominant global power—militarily, economically, and politically. They seek a world order more accommodating to their authoritarian worldviews and interests. And their expanding military cooperation reflects a belief that they will more likely succeed by working together rather than separately. In the contemporary political environment, the phrase, “The whole is greater than the sum of its parts,” often attributed to Aristotle,⁴ can be interpreted as meaning that Beijing and Moscow can accomplish more in support of their common purpose through collaborative and coordinated actions than by acting separately.

The United States now must confront not one, but two, major nuclear powers. This is an unprecedented development that greatly complicates deterrence, as what may deter one party may be insufficient to deter the other, and the risks of opportunistic aggression may grow.⁵ In addition, U.S. allies may feel less secure as the United States tries to balance the demands of deterring both powers simultaneously while assuring allies of the U.S. commitment to their own security.

The Dangers of Wishful Thinking

Unfortunately, the United States has yet to come to grips with how best to address deterrence in a world of two nuclear peers. This has led to calls by some to advance arms control efforts as if limitations on armaments will help solve the deterrence problem by codifying a situation of strategic stability. For example, the chief American negotiator for the New START Treaty has argued that the United States should conduct “two parallel negotiations” with Russia and China and “exercise mutual restraint in order to avoid a nuclear arms race—in other words, arms control.”⁶ Despite difficulties in the U.S.-Russia-China relationship, she has asserted, “I do think that it is possible to move forward on negotiating an arms control deal.”⁷

The deal she envisions would be a 10-year arms control agreement that would focus on predictability in the nuclear relationship with China and lock in the numerical limits in New

⁴ See, for example, <https://se-scholar.com/se-blog/2017/6/23/who-said-the-whole-is-greater-than-the-sum-of-the-parts#:~:text=SE%20Philosophy%2C%20Emergence,%E2%80%9CThe%20whole%20is%20greater%20than%20the%20sum%20of%20the%20parts,properties%20of%20a%20system%3A%20Emergence>.

⁵ For a comprehensive discussion of this point, see Matthew R. Costlow, *Deterring the New Pacing Threats: Opportunistic and Coordinated Aggression, Occasional Paper*, Vol. 5, No. 3 (Fairfax, VA: National Institute Press, March 2025), available at <https://nipp.org/papers/matthew-r-costlow-deterring-the-new-pacing-threats-opportunistic-and-coordinated-aggression/>.

⁶ Rose Gottemoeller, “Arms Control Is Not Dead Yet: America Should Pursue Parallel Nuclear Negotiations With China and Russia,” *Foreign Affairs*, April 15, 2025, available at <https://www.foreignaffairs.com/united-states/arms-control-not-dead-yet>.

⁷ Interview with Rose Gottemoeller by the National Institute for Deterrence Studies, July 11, 2025, available at <https://www.youtube.com/watch?v=qEmJmgTFTZ0>.

START vis-à-vis Russia. “In short,” she notes, “with the Chinese, it is all about nuclear predictability. With the Russians, it is all about sustaining nuclear limits.... China should agree not to undermine the limits of New START by rushing to parity with the United States.... Our main goal should be to sustain a stable environment....”⁸ Consequently, she proposed “a ban on upload for the duration of the treaty,” asserting that uploading warheads “adds expense, adds complexity, [and] adds delays into our program of record.”⁹ Moreover, she asserted that if the United States uploaded warheads on its missiles, “Russia might do the same, and a form of arms race could begin.”¹⁰ In the absence of New START inspections and Russia’s 2023 “suspension” of participation in the treaty, Russia may have already uploaded warheads on its existing missiles.¹¹ Indeed, the assertion that U.S. actions are the driver of similar adversary reactions and that U.S. strategic restraint will result in similar adversary restraint is a Cold War theory that is demonstrably false.¹²

In addition, she proposed that missile defenses should “enter into our [arms control] considerations,” arguing that “we need a new discussion of what it means to undermine the strategic offensive deterrence of the great nuclear powers.”¹³ The belief that missile defenses undermine strategic offensive deterrence harkens back to another Cold War notion that defenses are “destabilizing” and that stability is best preserved by leaving society vulnerable to an adversary’s nuclear threats. This is the kind of convoluted thinking that led to the 1972 Anti-Ballistic Missile (ABM) Treaty, which prevented the United States from deploying nationwide defenses to protect against the expanding Soviet ballistic missile threat. In today’s world, where both Russia and China are expanding their nuclear weapons capabilities and brandishing nuclear threats against the United States and the West, such an approach is illogical and divorced from reality, and President Trump’s “Golden Dome” initiative is a long-overdue and necessary response to growing missile dangers.

Arguments that arms control with Russia and China is necessary “to sustain a stable environment” and that the United States should “convince Beijing that its interests lie in predictability and stability”¹⁴ ignore the fact that neither Moscow nor Beijing are interested in sustaining the “stability” that the United States favors, as that stability -- in the eyes of the Russian and Chinese leaderships – relegates them to second-class status on the world stage.

⁸ Ibid.

⁹ Ibid.

¹⁰ Rose Gottemoeller, “Arms Control Is Not Dead Yet: America Should Pursue Parallel Nuclear Negotiations With China and Russia,” op. cit.

¹¹ Keith B. Payne and Mark B. Schneider, “Deterrence Requirements and Low-Cost Nuclear Upload Options,” *Information Series*, No. 626 (Fairfax, VA: National Institute Press, June 5, 2025), available at <https://nipp.org/wp-content/uploads/2025/06/IS-626.pdf>.

¹² See Hon. David J. Trachtenberg, Dr. Michaela Dodge, and Dr. Keith B. Payne, *The “Action-Reaction” Arms Race Narrative vs. Historical Realities* (Fairfax, VA: National Institute Press, March 2021), available at <https://nipp.org/wp-content/uploads/2021/04/Action-Reaction-pub.pdf>.

¹³ Rose Gottemoeller, “Arms Control Is Not Dead Yet: America Should Pursue Parallel Nuclear Negotiations With China and Russia,” op. cit.

¹⁴ Ibid.

Despite an extensive record of historical evidence to the contrary, there is almost a messianic belief in the value of arms control for achieving U.S. national security objectives. As another former arms control negotiator opined, “Looking to the expiration of New START, the United States could pursue an interim regime of mutual restraint with Russia.... Decades of nuclear arms control have improved strategic stability and reduced the risk of nuclear conflict. Continued mutual restraint might help sustain these gains if risks can be managed.”¹⁵

Others contend that resuming arms control negotiations with Russia is imperative, noting that divisive issues like Ukraine “should not delay prompt attention by the United States and Russia to a restart of the dialogue on a post-New START agreement.... Ending or pausing their arms control dialogue will contribute to unnecessary force building and more uncertainty about the qualities of their weapons inventories.”¹⁶

The Arms Control Association has argued, “Today, nuclear arms control and disarmament are more important than ever. Now is the time to call on your Representative and Senators to show there is bipartisan support for strong U.S. leadership for nuclear arms control.”¹⁷ Last year, a resolution introduced in the House of Representatives called on the Biden Administration “to pursue nuclear arms control and risk reduction dialogue with the Russian Federation to maintain strategic stability.”¹⁸ An identical resolution was introduced in the Senate several days later.¹⁹ And as one former senior Obama and Biden Administration official has argued, “a new strategic [arms control] framework is urgently needed.... This is not a call to abandon arms control – far from it. It is a call to **reimagine** it.... the primary focus going forward must be stability....”²⁰ However, the notion that the path to stability lies through arms control is illusory, as the parties differ in what they seek to accomplish and how they see arms control as a tool to accomplish it.

This advocacy wrongly assumes a commonality of interests and objectives among Washington, Moscow and Beijing. For example, suggesting that arms control now will reverse China’s nuclear ambitions ignores the reality that Beijing’s nuclear buildup underpins its desire to expand its power and influence at America’s expense—a goal that China is unlikely to abandon by agreeing to negotiate arms limitations in the interest of “stability.” Similarly, decades of Soviet/Russian arms control cheating, coupled with the

¹⁵ William Courtney, “Averting Unconstrained Nuclear Risks with Russia,” RAND, April 15, 2025, available at <https://www.rand.org/pubs/commentary/2025/04/averting-unconstrained-nuclear-risks-with-russia.html>.

¹⁶ Lawrence J. Korb and Stephen Cimbala, “Why Trump Should Embrace Nuclear Arms Control,” *The National Interest*, April 16, 2025, available at <https://nationalinterest.org/feature/why-trump-should-embrace-nuclear-arms-control>.

¹⁷ Arms Control Association, “Enough is Enough,” April 2024, available at <https://www.armscontrol.org/blog/2024-04/inside-aca>.

¹⁸ H. Res. 1079, March 13, 2024, available at <https://www.congress.gov/bill/118th-congress/house-resolution/1079/text>.

¹⁹ S. Res. 593, March 19, 2024, available at <https://www.congress.gov/bill/118th-congress/senate-resolution/593/text>.

²⁰ Frank A. Rose, “The Future of Arms Control: Time for a New Strategic Framework,” *Just Security*, July 11, 2025, available at <https://www.justsecurity.org/116786/the-future-of-arms-control-time-for-a-new-strategic-framework/>. (emphasis in original)

massive buildup of Russian nuclear forces and the plethora of nuclear threats expressed by Russian officials, show that Moscow has no interest in “mutual restraint.”

There is no reason to believe China or Moscow have any interest in arms control to facilitate the U.S. definition of “stability.” Rather, they seek to upset the existing world order with assertive behavior and extensive military and nuclear capabilities—the antithesis of stability. Wishful thinking that they share U.S. goals is more likely to encourage further delays in the necessary and long-overdue U.S. strategic modernization program, further undermining the efficacy and credibility of the U.S. nuclear deterrent, including the U.S. extended nuclear deterrent. At a time when nuclear deterrence is under significant stress, this would be dangerous folly.

The Trilateral Challenge

In support of its national objectives, China has become increasingly aggressive in its posturing and its military activities, creating military bases in the South China Sea, challenging the territorial sovereignty of its neighbors, rejecting international arbitration of territorial disputes, threatening the autonomy of Taiwan, improving its military forces, and dramatically expanding its nuclear capabilities. China seeks to overturn American dominance and to take what Beijing envisions as its rightful place of prominence on the world stage. Indeed, as one former Chinese military official has declared, China’s rise is “unstoppable,” noting, “Even if the US wants to contain China, it can’t. The United States is tired of policing the world.”²¹ As the commander of U.S. Indo-Pacific Command recently testified, “Beijing’s aggressive maneuvers around Taiwan are not just exercises – they are dress rehearsals for forced unification.”²² Moreover, the Chinese leadership appears to have abandoned its self-proclaimed policy of minimal nuclear deterrence in favor of an aggressive buildup of its nuclear forces, which the former commander of U.S. Strategic Command has referred to as “breathhtaking” and a “strategic breakout.”²³

Russia likewise has decided to work against U.S. interests virtually across the board as it, too, seeks to upend the existing world order. Indeed, Russia considers NATO, and particularly the United States, its “main enemy.”²⁴ Vladimir Putin has stated that “We are witnessing the formation of a completely new world order, nothing like we had in the past....

²¹ Cited in Seong Hyeong Choi, “China’s rise ‘unstoppable’ as US grows tired of policing the world: Zhou Bo,” *South China Morning Post*, April 8, 2025, available at <https://www.scmp.com/news/china/military/article/3304275/chinas-rise-unstoppable-us-grows-tired-policing-world-zhou-bo>.

²² Statement of Admiral Samuel J. Paparo before the House Armed Services Committee, April 9, 2025, p. 3, available at https://armedservices.house.gov/uploadedfiles/indopacom_posture_statement_2025.pdf.

²³ John Vandiver, “‘Breathhtaking expansion’: US Strategic Command leader expects further revelations of China’s nuclear weapons advancement,” *Stars and Stripes*, October 18, 2021, available at <https://www.stripes.com/theaters/europe/2021-10-18/china-us-russia-nuclear-weapons-hypersonics-stratcom-3283272.html>.

²⁴ A new Russian naval doctrine signed in 2022 declared NATO to be an existential threat to Russia AFP, “Russia Says U.S., NATO ‘Main Threats’ to National Security,” *The Moscow Times*, July 31, 2022, available at <https://www.themoscowtimes.com/2022/07/31/russia-says-us-nato-main-threats-to-national-security-a78453>.

The former world arrangement is irreversibly passing away, actually it has already passed away, and a serious, irreconcilable struggle is unfolding for the development of a new world order.” Calling for “the development of a new international system that aligns with the interests of the global majority,” he noted Moscow’s desire to work with those who share Russia’s objectives—notably China—stating that “the level of trust between Russia and China is at its highest point in recent history.... China is our ally....”²⁵ Russia’s military and nuclear buildup over the past several decades has been astounding. Russian Foreign Minister Sergey Lavrov stated, “We’re self-sufficient. We have everything. We know how to ensure our defense capability. If they [the United States] feel that their nuclear arsenals are very outdated and continue to become obsolete against the backdrop of our upgraded weapons, then they should be probably interested in somehow correcting this discrepancy.”²⁶

Moscow and Beijing appear committed to an “irreconcilable struggle” to create a new world order. Such fundamental objectives cannot be papered over by arms control agreements. In this environment, arms control based on wishful thinking is a palliative that seeks to address the symptoms rather than the cause of the different political goals that drive Russian and Chinese armaments. Arms control advocates often confuse cause with effect. As Ronald Reagan used to say, “We don’t mistrust each other because we’re armed; we’re armed because we mistrust each other.”²⁷

A Dangerous Entente

In isolation, considering China’s and Russia’s increasingly aggressive behavior and their respective military buildups that underpin their more arrogant posture is worrisome enough. What U.S. policy makers must confront today is the reality of greater cooperation and collaboration between these two nuclear armed powers and the implications of this confederation for deterrence, extended deterrence, and Western security.²⁸

Russia’s growing entente with China appears to be more than just a marriage of convenience. The breadth and scope of Moscow’s cooperation and collaboration with Beijing is unprecedented. Numerous joint military exercises, including air and naval operations, have been conducted, with both countries’ strategic bombers landing in the other’s territory for the first time ever a few years ago. Sino-Russian cooperation extends to virtually all areas of the military sphere—from the joint development of novel offensive weapons systems and space technology to cooperation on defensive capabilities such as early warning and

²⁵ Vladimir Putin, “Valdai Discussion Club meeting,” November 7, 2024, available at <http://en.kremlin.ru/events/president/news/75521>.

²⁶ “Russia not to ‘offer anything to anyone’ on New START Treaty — Lavrov,” TASS, April 14, 2025, available at <https://tass.com/politics/1943571>.

²⁷ Quoted in The Ronald Reagan Presidential Foundation and Institute, “Ronald Reagan and Mikhail Gorbachev” (undated), available at <https://www.reaganfoundation.org/ronald-reagan/the-presidency/mikhail-gorbachev>.

²⁸ For a more detailed discussion of this point, see David J. Trachtenberg, “Deterrence Implications of a Sino-Russian Entente,” in James H. Anderson and Daniel R. Green (eds.), *Confronting China: US Defense Policy in an Era of Great Power Competition* (New York, NY: Bloomsbury Publishing, Inc., 2024), pp. 169-192.

integrated air and missile defense systems.²⁹ China is assisting Russia in its brutal war against Ukraine and, as the commander of U.S. Indo-Pacific Command has stated, is helping Moscow “rebuild its war machine” in exchange for Russian military assistance in other areas.³⁰

Discussions, *Da*; Negotiations, *Nyet*

Although arms control is unlikely to produce any meaningful results, this is not to argue against discussions or the desirability of engaging in open and regular communications. As Winston Churchill said in 1954, “Meeting jaw to jaw is better than war.”³¹ Yet, while supporters of increased dialogue tend to believe that this will lead to greater understanding among the parties³² and, hence, expose areas of common agreement that may have been elusive, it is also possible, and likely probable, that greater dialogue, rather than narrow the areas of disagreement, may actually expose more of them and highlight the “irreconcilable” nature of the parties’ goals and objectives.

Indeed, it strains credulity to believe that open lines of communication will reduce tensions and improve the overall strategic environment when the parties’ goals and objectives are diametrically opposed. Similarly, it is unlikely that greater “transparency” in armaments will lead Moscow or Beijing to accommodate the U.S. desire to preserve the existing world order, which they both believe is decidedly unfavorable to them. Tellingly, leading Russian spokespersons have declared Russia to be already at war with the United States. For example, as the director of the Center for Middle Eastern and Central Asian Studies in Moscow stated, “The United States is the enemy. It is our enemy. It is a hostile state that aims to destroy our country... We are at war!”³³ Such views, increasingly spread by Russian propagandists, reflect the worldview of a Russian leadership that believes, as Putin has stated, that Moscow is in an “irreconcilable struggle” with the United States and the West over the nature of the world order. In this struggle, Western notions of arms control as a

²⁹ See, for example, Dmitry Gorenburg, Elizabeth Wishnick, Paul Schwartz, and Brian Waidelich, “How Advanced Is Russian-Chinese Military Cooperation?,” *War on the Rocks*, June 26, 2023, available at <https://warontherocks.com/2023/06/29000/> and Brian G. Carlson, “The Growing Significance of China-Russia Defense Cooperation,” U.S. Army War College Strategic Studies Institute, September 18, 2024, available at <https://ssi.armywarcollege.edu/SSI-Media/Recent-Publications/Display/Article/3908561/the-growing-significance-of-china-russia-defense-cooperation/>.

³⁰ Lolita C. Baldor, “China, North Korea and Russia military cooperation raises threats in the Pacific, US official warns,” *Associated Press*, April 10, 2025, available at <https://apnews.com/article/pacific-russia-china-north-korea-weapons-ukraine-8ad7156898f1391557d5e53d5d09a02c>.

³¹ Former UK Prime Minister Harold Macmillan later adapted this phrase to say that “jaw-jaw is better than war-war.” See “Red Herrings: Famous Quotes Churchill Never Said,” International Churchill Society, available at <https://winstonchurchill.org/publications/finest-hour/finest-hour-141/red-herrings-famous-quotes-churchill-never-said/>.

³² One former arms control official has stated, “Washington should engage with Beijing to understand its objectives... the United States should be trying to build mutual understanding with China...” See Gottemoeller, op. cit.

³³ Cited in Julia Davis, *In Their Own Words: How Russian Propagandists Reveal Putin’s Intentions* (Hannover, Germany: ibidem-Verlag, 2024).

mutually beneficial endeavor and a stabilizing factor in international relations do not align with Russia's strategic objectives and, therefore, cannot succeed.

The United States has historically deluded itself into believing that U.S. strategic restraint would be reciprocated by adversaries; that American accommodation and good will would prompt China and Russia to become partners with the West rather than adversaries; that neither side benefits from escalating tensions or instability; and that arms control agreements would serve as a catalyst for improved political relations. Each of these expectations, and similar optimistic hopes, have been dashed by reality. As one trenchant analysis concluded, the U.S. government's "systemic delay" in calling out Russia's repeated arms control violations, the "enduring lack of government openness regarding the immense Chinese nuclear build-up," and the long-delayed U.S. nuclear modernization program have not produced the kind of reciprocal restraint or improved political relationships that U.S. decision makers expected. Indeed, U.S. arms control policy has been driven by self-deception.³⁴ And in today's environment, there is little reason to believe the results will be different. As the statement, often attributed (or misattributed) to Albert Einstein, goes, "The definition of insanity is doing the same thing over and over again and expecting different results."³⁵

There are existing channels for communication that could be resuscitated in an effort to seek greater insight into Russian posture and programs. For example, although the Congress severely restricted U.S.-Russian military-to-military interactions after Russia's illegal invasion of Crimea in 2014, the legislation did not prevent military-to-military communication.³⁶ But even military-to-military discussions are liable to prove disappointingly inadequate as long as Russian strategic objectives remain contrary to U.S. national security interests. Above all, the United States should refrain from turning dialogue into a negotiation with the expectation that concrete results can be achieved to the benefit of all parties as though this is a zero-sum game. It is not. The United States must be prepared to acknowledge and accept that certain disputes are unbridgeable, no matter how creative U.S. diplomacy is and how determined American diplomats are in seeking common ground. Even Russian officials have acknowledged that political realities make meaningful arms control negotiations with the United States unlikely. As Kremlin spokesman Dmitry Peskov recently stated, "At the moment, it is very difficult to imagine the beginning of such

³⁴ Keith B. Payne, *Deterrence and Arms Control: Ending the Deceptive "Holiday from History," Information Series*, No. 616 (Fairfax, VA: National Institute Press, February 10, 2025), available at https://nipp.org/information_series/keith-b-payne-deterrence-and-arms-control-ending-the-deceptive-holiday-from-history-no-616-february-10-2025/.

³⁵ Christina Sterbenz, "12 Famous Quotes That Always Get Misattributed," *Business Insider*, October 7, 2013, available at <https://www.businessinsider.com/misattributed-quotes-2013-10>.

³⁶ Kevin Baron and Patrick Tucker, "After Secret Trump Meeting, Russia Offers to Resume Military Relations," *Defense One*, July 18, 2018, available at <https://www.defenseone.com/threats/2018/07/russia-wants-resume-us-military-relations-after-mysterious-trump-putin-meeting-surprising-pentagon-congress/149865/>. Also see, "Ukraine crisis: US suspends military cooperation with Russia," *The Telegraph*, March 4, 2014, available at <https://www.telegraph.co.uk/news/worldnews/europe/ukraine/10674777/Ukraine-crisis-US-suspends-military-cooperation-with-Russia.html>.

negotiations.”³⁷ Indeed, the process of negotiation takes time and, in typical U.S. practice, negotiations are accompanied by the delay or cancellation of programs that are the subjects of negotiations. In the contemporary context, negotiations that are highly unlikely to help solve imminent security challenges would delay or cancel urgently needed programs for the sake of hapless diplomacy. The United States must not allow itself to fall into this trap again.

The Lessons of History

The eminent strategist Colin Gray often said that arms control works best when needed least.³⁸ In other words, arms control agreements are easier to reach among countries who share the same worldview, political goals, and objectives. But these are precisely the countries for which arms control agreements are unnecessary. The United States neither wants nor needs arms control agreements with Britain or France. Where arms control is seen as necessary, however, is with adversaries. Yet, the differing goals and objectives of U.S. adversaries make such agreements either impossible to conclude or unlikely to benefit U.S. national security interests.

This basic principle was either forgotten or ignored during the Cold War, when it was thought the Soviet Union’s agreement to arms control treaties reflected a common belief and a shared commitment to stability. In fact, the Soviet approach was to seek unilateral advantage and to stem American technological progress in areas where the Soviets were lacking. The 1972 ABM Treaty was the poster child for this approach. U.S. officials believed the treaty reflected a common belief in the principle of Mutual Assured Destruction and that banning nationwide strategic defenses and leaving the American population deliberately vulnerable to Soviet nuclear attack would dissuade the Soviets from building large offensive nuclear forces. In reality, the opposite was the case as the greatest buildup of large Soviet counterforce capabilities occurred after the ABM Treaty was signed.³⁹ In general, the results of arms control have often been the opposite of what U.S. officials hoped for and expected.⁴⁰ Importantly, as a recent analysis concluded, “Russia’s and China’s actions are governed by their own perceptions of national security requirements and their own foreign policy goals

³⁷ Guy Faulconbridge and Dmitry Antonov, “Russia says the future of nuclear arms control with US and others looks bleak for now,” *Reuters*, April 8, 2025, available at <https://www.reuters.com/world/kremlin-says-it-is-hard-imagine-talks-with-us-new-nuclear-arms-reduction-treaty-2025-04-08/>.

³⁸ Cited in Keith B. Payne and David J. Trachtenberg, *Arms Control in the Emerging Deterrence Context, Information Series*, No. 559 (Fairfax, VA: National Institute Press, July 19, 2023), available at https://nipp.org/information_series/keith-b-payne-and-david-j-trachtenberg-arms-control-in-the-emerging-deterrence-context-no-559-july-19-2023/#:~:text=Colin%20S.,have%20inimical%20foreign%20policy%20objectives.

³⁹ For additional details, see Hon. David J. Trachtenberg, Dr. Michaela Dodge and Dr. Keith B. Payne, *The “Action-Reaction” Arms Race Narrative vs. Historical Realities* (Fairfax, VA: National Institute Press, March 2021), available at https://nipp.org/monographs_cpt/the-action-reaction-arms-race-narrative-vs-historical-realities/.

⁴⁰ Keith B. Payne and David J. Trachtenberg, *Arms Control in the Emerging Deterrence Context, Information Series*, No. 559, op. cit. Also see Keith B. Payne and David J. Trachtenberg *Deterrence in the Emerging Threat Environment: What is Different and Why it Matters, Occasional Paper*, Vol. 2, No. 8 (Fairfax, VA: National Institute Press, August 2022), pp. 60-66, available at <https://nipp.org/wp-content/uploads/2022/08/OP-Vol.-2-No.-8.pdf>.

and objectives; they are not simply mechanistically fashioned to be in line with U.S. requirements and goals—however self-evidently reasonable Washington believes its own policies and goals to be.”⁴¹

Repeated instances of Soviet cheating on arms control agreements also demonstrated that Soviet goals did not align with those of the United States, as the Soviets sought to exploit the American penchant to comply with its arms control obligations while cheating to achieve unilateral advantage. In fact, the record of Soviet arms control violations is a sobering one, and the Russian Federation’s record is hardly any better. Lest one forget, it was Moscow’s violation of the Intermediate-range Nuclear Forces (INF) Treaty and the Open Skies Treaty that led President Trump in his first term to withdraw the United States from those agreements.

Conclusion

As long as Russia and China continue to view the United States as the main impediment to their drive for global supremacy, arms control is destined to fail. It is simply unrealistic to assume that Moscow or Beijing will agree to any meaningful limitations on their respective military buildups, as those buildups underpin their drive for global dominance. Under these circumstances, the United States must not succumb to the temptation of accepting an agreement that appears attractive but in reality works against U.S. national security interests.

Both Russia and China recognize that the United States is reluctant to escalate a crisis and that instead Washington seeks de-escalation “off ramps” that will not upset the status quo. Yet, both Moscow and Beijing are willing to pursue escalation when they believe it will work to their relative advantage.⁴² The American concept of “stability” does not align with theirs. The Western desire to maintain the status quo, grounded in norms and rules of behavior intended to preserve the sanctity of national borders, runs counter to their desire to change the status quo and establish a new world order in their favor. Under these conditions, meaningful arms control that advances American security and national interests is a chimera.

This reality, disappointing though it may be, must be recognized and acknowledged lest the United States repeat past follies and suffer the disillusionment of policy failures yet again. In the current international environment, such failures can have catastrophic consequences.

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⁴¹ Ibid.

⁴² As Vladimir Lenin famously said, “You probe with bayonets: if you find mush, you push. If you find steel, you withdraw.” Quoted at <https://www.goodreads.com/quotes/6874779-you-probe-with-bayonets-if-you-find-mush-you-push>.



ANALYSIS

A “ONE-WAR” WARFIGHTING CONSTRUCT NO LONGER APPLIES TO U.S. NUCLEAR STRATEGY

Paul Amato

Policymakers, military strategists, and scholars have routinely debated U.S. strategic defense posture, in particular the type of contingencies the United States should prepare its military to confront, whether global conflict to one centered on one, one-and-a-half, or two major regional contingencies.¹ These approaches from the Cold War to the recent Biden Administration were a function of many factors, including a changing geopolitical environment, reorientation to new or evolving threats, policy choices and fiscal constraints.

As the Trump Administration undertakes the drafting of its National Defense Strategy (NDS), which likely will include a review of the Nation’s nuclear posture, it is likely that Department of Defense (DoD) officials will make China, as the most powerful and consequential threat to the United States today, the U.S. strategic priority and focus. While DoD officials in recent years have paid lip-service to the belief that the United States should, with significant assistance from its allies, be able to handle multiple simultaneous non-nuclear conflicts, current DoD leadership seems poised to settle on a defense strategy that singularly focuses on and prioritizes the challenge posed by China, while inducing greater allied participation to help address military shortfalls in other theaters and against other potential opponents, particularly Russia, Iran, and North Korea. But such an approach is still effectively a one-war framework.²

Realistically, given the deficit in U.S. military capabilities that has grown over the last two decades, such a one-war framework for conventional conflict may make sense. There is much ground that needs to be made up and a limit to what the United States can do in the short-term given fiscal constraints and a defense industrial base that is just awakening from a long slumber. As a result, a “one-war” strategy focused on China is certainly defensible given the scope of Indo-Pacific threats, and the residual U.S. and allied capabilities available in Europe in the event of crisis or conflict with Russia. But that should not be the end of the story.

As DoD develops its NDS, the emerging two-nuclear peer environment requires a different approach. It is time to distinguish between the historical U.S. conventional and nuclear force-sizing constructs in U.S. strategy. While it may make sense in the coming years

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¹ See David J. Trachtenberg, *The Demise of the “Two-War Strategy” and Its Impact on Extended Deterrence and Assurance*, *Occasional Paper*, Vol. 4, No. 6 (Fairfax, VA: National Institute Press, June 2024), available at <https://nipp.org/papers/the-demise-of-the-two-war-strategy-and-its-impact-on-extended-deterrence-and-assurance-david-j-trachtenberg/>; and, Michael O’Hanlon, “America’s Military Strategy: Can We Handle Two Wars at Once?,” *The National Interest*, June 6, 2024, available at <https://nationalinterest.org/feature/americas-military-strategy-can-we-handle-two-wars-once-211324>.

² O’Hanlon, “America’s Military Strategy: Can We Handle Two Wars at Once?” op. cit.



to focus our conventional force structure, acquisitions and planning to the China threat, such an approach should not apply to U.S. nuclear posture and forces.

There are three reasons why DoD should break from the traditional approach to formulating its strategy. First, as the Pentagon drafts the NDS it is critical to the strategy's success that conventional and nuclear force planning be integrated. Put simply, one-war force planning for non-nuclear forces should not constrain our approach to determining what is needed to deter nuclear attack in a two-peer environment. The drafters must recognize and account for the growing need to deter two nuclear peer powers and, if deterrence fails, to have a force available that is able to achieve objectives against both of them, sequentially or simultaneously, regardless of whether we focus non-nuclear planning and capabilities against China. The time is right to adopt in the next NDS a "two-war" nuclear force sizing framework even as we pursue what, for all intents and purposes, will likely be a one-war conventional strategy focused on China.

Second, adopting such an approach at the Departmental level will begin to alert the nation's most senior national security leaders, and the non-nuclear policy, strategy and academic communities who support them, of the urgent need to focus more of their attention on the nuclear domain. With the end of the Cold War and the ascension of the Global Zero movement encapsulated by President Obama and his Administration's "Prague Agenda," a generation of policymakers, military strategists, and scholars have taken a holiday from studying, understanding and accounting for the nuclear dimension of defense strategy. As the threat environment has evolved, large segments of the U.S. defense establishment have not evolved with it.

As former Biden Administration officials Vipin Narang and Pranay Vaddi recently stated, "nuclear concerns can no longer be treated as a niche issue managed by a small community of experts. Officials at the highest levels of government will need to incorporate them into core defense policy...."³ Breaking down the nuclear and non-nuclear silos in our approach to the NDS will aid in expanding an understanding of the breadth and depth of the nuclear challenges the nation faces—challenges that will only grow over the next ten years.

Third, distinguishing between nuclear and non-nuclear strategy and force sizing will make evident to policy makers and military planners the dynamics of 21st century conflict, where U.S. strategic deterrence has evolved from a two-body problem to a three-body problem placing the potential for nuclear escalation front and center in any great power face-off with Russia or China. This should include making the Nation's senior-most leaders aware of the need to consider nuclear force posture and size adjustments to confront this new environment. Such adjustments are needed. However, even if senior leaders choose not to make new or different investments in U.S. nuclear forces, enunciating a strategy that recognizes this dynamic allows DoD strategists and planners to better assess risk and to mitigate them accordingly. Articulating a two-war strategy for U.S. nuclear forces in the forthcoming NDS will facilitate examination of these tradeoffs in a transparent and forthright

³ Vipin Narang and Pranay Vaddi, "How to Survive the New Nuclear Age: National Security in a World of Proliferating Risks and Eroding Constraints," *Foreign Affairs*, July/August 2025, p. 125.

manner, allowing senior leadership, up to and including the President, to make fully informed decisions on how to address the threats and apportion risk.

The Time to Break from the Past is Now

U.S. conventional and nuclear strategy are inextricably linked and must be developed in tandem to ensure consistency and effectiveness. As a general proposition, conventional war strategy and force sizing should be a downstream exercise from nuclear force sizing and strategy as all the conventional forces in the world will do no good if an adversary believes it has a path to victory through nuclear escalation. In conceiving and drafting the NDS, therefore, Trump Administration officials must from the outset properly harmonize the role of nuclear and non-nuclear domains.

The place of nuclear weapons in the world has evolved over the last 15 years and U.S. nuclear posture has not evolved with it. As described in the 2023 bipartisan Strategic Posture Commission report:

The new global environment is fundamentally different than anything experienced in the past...Today the United States is on the cusp of having not one, but two nuclear peer adversaries, each with ambitions to change the international status quo, by force, if necessary: a situation which the United States did not anticipate and for which it is not prepared.⁴

The NDS will harmonize the nuclear and non-nuclear domains by acknowledging that, while the United States may choose to pursue a one-war non-nuclear construct that prioritizes China, we must explicitly adopt a two-war nuclear construct that recognizes the continued (and increasing) salience of nuclear weapons in both the Indo-Pacific and Europe, and that enables the United States to prosecute a conventional conflict with either Russia or China without undermining U.S. confidence in the ability of strategic deterrence to hold in the second theater.

In light of this development, the old model of structuring and sizing the entire U.S. military for one, one-and-a-half or two major regional contingencies is outdated. As seems evident from public statements by Administration officials, we can certainly choose to size our non-nuclear forces primarily for a China fight and rely on European allies to carry the bulk of a non-nuclear conflict in Europe. But even with this approach, the U.S. must size and posture its nuclear forces for a “two-war” strategy, a decision that needs to be incorporated now.

The previous administration’s experience demonstrates the importance of nuclear policy to the overall defense strategy. Shortly after the Biden Administration took office, Secretary Austin committed to an integrated deterrence strategy, which included a combined approach

⁴ Madelyn Creedon, et al., *America’s Strategic Posture: The Final Report of the Congressional Commission on the Strategic Posture of the United States* (Alexandria, VA: Institute for Defense Analysis, October 2023), p. v, available at <https://www.ida.org/-/media/feature/publications/a/am/americas-strategic-posture/strategic-posture-commission-report.ashx>.

to the NDS, the Nuclear Posture Review and Missile Defense Review. But the reviews could not be completed without a decision on nuclear declaratory policy.

As Vice President, and during his Presidential campaign, Mr. Biden evinced a desire to adopt a “sole purpose” nuclear declaratory policy.⁵ Consistent with this sentiment, the U.S. interagency during the strategy reviews considered a variety of declaratory policy options, including sole purpose, and prepared pros and cons for each of them for the President’s consideration.⁶

Had President Biden selected a sole purpose declaratory policy, it would have meant that U.S. conventional forces in a confrontation with a nuclear-armed adversary would have been called upon to assume a greater military burden as the U.S. nuclear arsenal would not have been available to help at any point before adversary nuclear attack, even if the adversary had engaged in chemical, biological or other non-nuclear strategic attack. In other words, under a sole purpose policy, U.S. and allied non-nuclear forces would have to “fight it out” until the adversary employed nuclear weapons.⁷ Not only would this be a different approach from that which the United States has followed for the last 70 years, but it would have required a more significant commitment to non-nuclear military capabilities and resources than at any time since the advent of nuclear weapons.

While the President ultimately decided to maintain a declaratory policy of calculated ambiguity, the key takeaway from this example was the importance of integrating a nuclear declaratory policy as a foundational component of the overall NDS.

The NDS gives DoD the opportunity to take a concrete step in acknowledging and accounting for the changed nuclear security environment—one where both Russia and China have increased the salience of nuclear weapons in their doctrines and strategies, and which presents a growing risk of opportunistic aggression by a second nuclear-armed adversary in the event of a crisis or conflict with the first of them.

And the risk of opportunistic aggression cannot be waved away. There is a worrisome trend of growing alignment, coordination and outright support between and among, China, Russia, North Korea and Iran.⁸ This is why it is time to dispense with the idea of a “one-war” military force sizing construct for both nuclear and non-nuclear forces and accept the fact that—even if the non-nuclear elements of the NDS focus on China—the United States must

⁵ Ankit Panda and Vipin Narang, “Sole Purpose Is Not No First Use: Nuclear Weapons and Declaratory Policy,” *War on the Rocks*, February 22, 2021, available at <https://warontherocks.com/2021/02/sole-purpose-is-not-no-first-use-nuclear-weapons-and-declaratory-policy>.

⁶ U.S. Department of Defense, *Nuclear Posture Review*, 2022, p. 9, available at <https://media.defense.gov/2022/Oct/27/2003103845/-1/-1/1/2022-NATIONAL-DEFENSE-STRATEGY-NPR-MDR.pdf>.

⁷ *America’s Strategic Posture*, op. cit., p. 28. As the Commission wrote: “The objectives of U.S. strategy must include effective deterrence and defeat of simultaneous Russian and Chinese aggression in Europe and Asia using conventional forces. If the United States and its Allies and partners do not field sufficient conventional forces to achieve this objective, U.S. strategy would need to be altered to increase reliance on nuclear weapons to deter or counter opportunistic or collaborative aggression in the other theater.”

⁸ See for example, Adm. Samuel J. Paparo, Commander U.S. Indo-Pacific Command, “Statement Before the House Armed Services Committee on U.S. Indo-Pacific Command Posture” (written statement, House Armed Services Committee, 119th Cong. 1st sess., April 9, 2025), pp. 4-5, available at https://armedservices.house.gov/uploadedfiles/indopacom_posture_statement_2025.pdf.

be aware of the need to deter both China and Russia and, if needed, to achieve objectives against either or both of them with nuclear capabilities. While the Administration can certainly pursue a “one-war” conventional strategy—especially given resourcing constraints—it should recognize that a “two-war” nuclear construct is needed for the Nation to better manage the evolving security environment.

DoD has the opportunity to adopt a two-war nuclear construct in the current NDS and should do so. The security environment has changed, the existential threat to the United States from nuclear conflict has grown, and the explicit acknowledgement in a DoD strategy document of the increasing risk of conflict with multiple nuclear-armed peer adversaries is something that must be acknowledged. Only then can policy makers, strategists and senior-leaders properly analyze and plan for the full array of risks that will manifest in the event of a crisis with China, Russia, or both.

A Two-War Nuclear Strategy Will Highlight (Again) the Risks of Great Power Conflict

In the 1970’s and 1980’s the National Security Advisor, Secretary of State, Secretary of Defense and their senior-most advisors, were intimately familiar with U.S. nuclear strategy and doctrine, and were conversant in terms such as countervalue, counterforce and throw-weight. This did not distract from their knowledge of and focus on non-nuclear capabilities and strategy. To the contrary, while recognizing the immense risk of nuclear war, they did not shy away from understanding the import of nuclear weapons to our overall strategy and were clear-eyed about the role of nuclear weapons in our strategy.

Despite this history, renowned nuclear scholar, Therese Delpech, noted in 2012 that such nuclear literacy had waned, writing “Deterrence is a very difficult undertaking [that] suffers from intellectual and policy neglect.”⁹ She went on to note a finding from a 2008 DoD report that there is “a distressing degree of inattention to the role of nuclear weapons in deterrence among many senior DoD military and civilian leaders”....¹⁰

A 2014 DoD independent review struck a similar tone, finding “a significant disconnect between the ownership, passion, and dedication to the nuclear deterrent mission [of the service men and women performing it] and what the forces perceive to be the commitment to mission ownership by higher level leaders throughout [DoD] and the nation.”¹¹ As Narang

⁹ Therese Delpech, *Nuclear Deterrence In the 21st Century: Lessons from the Cold War for a New Era of Strategic Policy* (Santa Monica, CA: RAND Corp., 2012), p. 14, available at https://www.rand.org/content/dam/rand/pubs/monographs/2012/RAND_MG1103.pdf.

¹⁰ James R. Schlesinger, Chairman, *Report of the Secretary of Defense Task Force on DoD Nuclear Weapons Management (Phase II): Review of the DoD Nuclear Mission*, U.S. Department of Defense, March 2008, p. iv, available at <https://apps.dtic.mil/sti/pdfs/ADA492647.pdf>.

¹¹ Larry D. Welch, General USAF (Ret.) and John C. Harvey Jr., Admiral (USN) Ret., *Independent Review of the Department of Defense Nuclear Enterprise*, U.S. Department of Defense, p. 1, June 2, 2014, available at <https://www.globalsecurity.org/wmd/library/report/2014/independent-nuclear-enterprise-review-report-20140630.pdf>. This disconnect is not unique to the United States. In its recent Strategic Deterrence Review, the United Kingdom called for additional “intellectual investment” to ensure NATO civilian and military leaders “understand the

and Vaddi note, given the gravity of today's nuclear threats, it is no longer viable for nuclear deterrence to remain "a 'niche issue' managed by a small community of experts."¹²

While there is a general consensus¹³ in the nuclear deterrence expert community of the nuclear threats the Nation faces and the need for action, "perhaps the biggest hurdle to making good on this consensus is the fact that most Department of Defense (DoD) officials with responsibility for Pentagon strategy, force development, and budget decisions are generally not steeped in nuclear deterrence issues, and that they are less likely than many nuclear experts to see the risk of two simultaneous or near-simultaneous nuclear wars as realistic."¹⁴

But these are the very individuals who are leading NDS drafting. Because of this, there is a risk of bias toward implementing a so-called "one-war" force sizing construct that gives short-shrift to the evolving two nuclear peer environment. This would be a disservice to senior Administration officials and to the defense establishment, *writ large*, and to the President who will be the singular individual forced to confront, and manage, the risk of nuclear escalation in the event of the most stressing warfighting scenarios. This NDS provides an opportunity to make a fundamental change that will begin to alert leaders at all levels of government to the growing risks of nuclear conflict.

Announcing a strategy that focuses U.S. non-nuclear planning and resourcing on a one-war construct focused on China, while also acknowledging the reality that the United States must be cognizant of and able to manage a two-peer nuclear power deterrence challenge, will begin to push back on the lingering "intellectual and policy neglect" referenced by Delpech, and position the Nation to make informed tradeoffs on how to manage this growing risk.

This does not necessarily mean that new or different nuclear capabilities will displace the very urgently needed modernization and expansion of U.S. non-nuclear military capabilities for a looming China fight. Rather, it will help to break down the persistent nuclear and non-nuclear silos that impede a broader understanding of the breadth and depth of the nuclear challenges the nation faces—challenges that will only grow over the next ten years—and enable senior leadership to make informed tradeoffs.

nuclear dimension of any future crisis or conflict...." United Kingdom Ministry of Defense, *Strategic Defence Review 2025*, p. 99, June 2, 2025, available at https://assets.publishing.service.gov.uk/media/683d89f181deb72cce2680a5/The_Strategic_Defence_Review_2025_-_Making_Britain_Safer_-_secure_at_home_strong_abroad.pdf.

¹² Narang and Vaddi, "How to Survive the New Nuclear Age," op. cit., p. 125.

¹³ See generally Robert Peters, *The New American Nuclear Consensus—and Those Outside It*, The Heritage Foundation, March 19, 2024, available at <https://www.heritage.org/defense/report/the-new-american-nuclear-consensus-and-those-outside-it>.

¹⁴ Paul Amato, "Many nuclear experts agree that the US needs new capabilities. Now they need to convince the Pentagon," *New Atlanticist*, June 11, 2025, available at <https://www.atlanticcouncil.org/blogs/new-atlanticist/many-nuclear-experts-agree-that-the-us-needs-new-capabilities-now-they-need-to-convince-the-pentagon/>.

What Should Come Next?

Distinguishing in the NDS between nuclear and non-nuclear strategy and force sizing will be a significant step toward addressing the dynamics of 21st century conflict. Acknowledging the problem, even if choosing not to respond, or responding only minimally, allows planners and strategists to better understand the risks and mitigate against them. Importantly, however, it is critical that the *President* understand the risks with this approach, as it is his flexibility and optionality that will be constrained in the event the most stressing scenarios eventually emerge. And it will not do any good to let him know of the risks as the crisis is upon us, as by that stage it will be too late to do anything meaningful about it.

If DoD's senior-most leaders do decide to go beyond simply acknowledging the need to address this emerging two-peer nuclear risk landscape, what should be done?

U.S. nuclear forces have historically provided “a range of response options in scope and scale...enabling an effective U.S. response to nuclear attack, at any level and in any context, in ways that will impose greater costs than any expected or hoped-for gain.”¹⁵ This range of response has historically included a mix of capabilities that are suited for both “central” and “regional” deterrence.

Certain U.S. forces, generally Intercontinental Ballistic Missiles and Submarine Launched Ballistic Missiles, primarily support “central deterrence”—i.e., capabilities that in the main deter strategic attacks against the Homeland. In the event deterrence fails, and an adversary launches a large-scale nuclear attack against the Homeland, these are the forces the President would have available to impose intolerable costs against what adversaries value most. This could include their nuclear forces and enabling capabilities, as well as other national assets that they highly value.¹⁶

Regional deterrence on the other hand implicates capabilities available to the President to manage what is generally perceived to be the most likely scenarios for adversary nuclear employment—namely, adversary nuclear attack arising from failed or failing regional aggression. To deter such attacks in the first instance, or to restore deterrence if such attacks do occur, the United States maintains lower-yield nuclear capabilities that are regionally-based, or regionally-deployable. These capabilities are key to ensuring adversaries do not

¹⁵ Center for Global Security Research Study Group, *China's Emergence as a Second Nuclear Peer: Implications for U.S. Nuclear Deterrence Strategy*, Center for Global Security Research, Lawrence Livermore National Laboratory, Spring 2023, p. 29, available at https://cgsr.llnl.gov/sites/cgsr/files/2024-08/CGSR_Two_Peer_230314.pdf.

¹⁶ U.S. Department of Defense, *Report on the Nuclear Employment Strategy of the United State*, November 15, 2024, p. 3, available at <https://media.defense.gov/2024/Nov/15/2003584623/-1/-1/1/REPORT-ON-THE-NUCLEAR-EMPLOYMENT-STRATEGY-OF-THE-UNITED-STATES.PDF>. For a general discussion of counterforce targeting strategy, see Brad Roberts, ed., *Counterforce in Contemporary U.S. Nuclear Strategy*, Center for Global Security Research, Lawrence Livermore National Laboratory, May 2025, available at <https://cgsr.llnl.gov/sites/cgsr/files/2025-05/2025-0529-CGSR-Occasional-Paper-Counterforce-In-Contemporary-US-Nuclear-Strategy.pdf>.

miscalculate the potential consequences of using limited nuclear strikes to coerce or to defeat U.S. and allied regional forces.¹⁷

The United States has long maintained a mix of capabilities that enables it to tailor its deterrence to the diverse nuclear threat actors it faces, and a balance between central and regional nuclear capabilities has been key to a stable deterrence posture. But as the nuclear threat environment has evolved the mix of U.S. capabilities has not evolved with it, and U.S. flexibility has eroded. In this respect, the SPC found that “the current U.S. strategic posture will be insufficient to achieve the objectives of U.S. defense strategy in the future due to the rapid advancement of the threat, particular the nuclear threat of two peer adversaries,” and that “[u]rgent, significant change” in the overall U.S. strategic posture “is required.”¹⁸

There is a growing body of writing in the expert and academic community about proposed modifications to address this challenge,¹⁹ and steps that are necessary to address it.²⁰ Putting aside the more fulsome discussions of specific nuclear force adjustments addressed in these and other sources, the non-nuclear community must more closely examine why the nuclear community believes they are necessary.

First, the continued credibility of U.S. nuclear capabilities in the two-peer environment should matter to conventional strategists and planners because we do not know which conflict will start first. While the NDS may enunciate a China-focused strategy, it is not at all certain that a war in the Indo-Pacific will be the first to occur. For example, if the Ukrainian conflict evolves into a NATO-Russia conflict, and NATO Allies capably bear the brunt of the non-nuclear fight, U.S. nuclear capabilities will still be needed to undergird Allied efforts in the theater. What then of a potential U.S.-China conflict in the Indo-Pacific over Taiwan? Will the United States “have enough,” or the right mix, of nuclear capabilities to maintain nuclear deterrence both in Europe and the Indo-Pacific while allies continue to lead the fight with Russia and the United States takes the lead in the Indo-Pacific? U.S. conventional advantage in the Indo-Pacific, and Allied conventional advantage in Europe, will be of cold comfort if either Russia or China believes nuclear escalation will help them out of their conventional war dilemma.

Second, deterrence in the first instance is about influencing adversary decision calculus. This depends upon the United States being seen as having a credible capability to impose greater costs on an adversary than any expected or hoped-for gain by their employment of nuclear weapons. But to enable such cost imposition, the United States must have a mix of capabilities that are flexible enough to restore deterrence, whether deterrence has failed due

¹⁷ U.S. Department of Defense, *2022 Nuclear Posture Review Fact Sheet: U.S. Extended Deterrence*, (2022), available at <https://www.defense.gov/Portals/1/Spotlight/2022/NDS/NUCLEAR%20STRATEGY%20AND%20POLICY%20-%20NPR%20Factsheet.pdf>.

¹⁸ *America's Strategic Posture*, op. cit., p. 35.

¹⁹ See CGSR Study Group, *China's Emergence as a Second Nuclear Peer*, op. cit.; Peters, *The New American Nuclear Consensus*, op. cit.; and, Narang and Vaddi, “How to Survive the New Nuclear Age,” op. cit.

²⁰ See *America's Strategic Posture*, op. cit.; and, Narang and Vaddi, “How to Survive the New Nuclear Age,” op. cit., pp 132-35.

to adversary regional attacks or due to attacks on the U.S. Homeland. In the two-peer context:

The second peer may see its interests best served by remaining neutral; but this is neither foreseeable nor guaranteed. The second-peer's calculus will likely be influenced by a range of factors that are difficult to discern, but their perception of U.S. and allied preparedness to counter their aggression and possible escalation will likely be the most important of those factors. We should seek to affect their perception of that factor, as we cannot yet rule out either possibility.²¹

Thus, should the second adversary—regardless of which one—assess that the United States is not prepared to counter their aggression and possible escalation, aggression and escalation may be exactly what ensues. To this end, the best laid non-nuclear strategy, in the absence of an accounting of the risk of opportunistic, nuclear-backed aggression, could be the very thing that brings on the second country's attack, and the potential for nuclear escalation—escalation that will no doubt impede our ability to achieve conventional war plan objectives.

This issue, in particular, goes to the question of numbers. While it is not critical that the United States deploy nuclear forces that equal or exceed the combined forces of China and Russia, numbers do matter. The United States needs a sufficient number of ICBMs and SLBMs to credibly threaten both Russia and China with intolerable costs—that is, a credible capability to hold at risk what each one of them values most, including their strategic forces.²² Given the increasing number of such targets due to China's nuclear expansion, more capacity is needed to maintain central deterrence and enable the U.S. ability to impose intolerable costs on either Russia, China or both.

Third, success in the conventional domain depends on nuclear deterrence holding. As mentioned above, conventional war strategy and force sizing should be a downstream exercise from nuclear force sizing and strategy as the most exquisite conventional strategy will be of little value if an adversary believes it has a path to victory through nuclear escalation. As such, the United States needs a flexible nuclear toolkit so that it can credibly and effectively deter Russia or China from attempting to escalate their way out of failed or failing conventional conflict. And, if deterrence does fail, the President needs flexible tools to restore deterrence without making a general nuclear exchange inevitable.

The United States does not have that flexibility today—nor is it likely to have it once the nuclear modernization program is complete, even with the eventual deployment of a nuclear sea-launched cruise missile (which Congress has directed DoD to pursue). This should matter to nonnuclear strategists, as the goal is to deter adversary nuclear employment in the first instance and, if deterrence fails, to expeditiously restore deterrence in a way that preserves for regional commanders the freedom of action necessary to prosecute their

²¹ CGSR Study Group, *China's Emergence as a Second Nuclear Peer*, op. cit. p. 40.

²² Department of Defense, *Report on the Nuclear Employment Strategy of the United States*, op. cit., p. 3.

conventional plans to a successful conclusion. Said another way, nuclear weapons underpin the United States' ability to successfully conduct conventional operations.

Conclusion

The ongoing NDS drafting exercise provides an opportunity for the Pentagon to begin to address, in a meaningful way, the intellectual pivot necessary to align conventional and nuclear strategy. Formally adopting a two-war nuclear strategy, even as DoD focuses its non-nuclear strategy on China, will help policymakers, military strategists, planners, and national leadership understand and begin to account for the emerging two-peer nuclear environment. Not only will this ensure proper integration of nuclear and non-nuclear thinking but will help reestablish a nuclear literacy that has atrophied among non-nuclear experts. While this would be a significant step forward, more can be done. Nuclear posture adjustments are needed to effectuate the chosen strategy enunciated in the NDS, and those officials that have responsibility for articulating that strategy must understand that such adjustments will help make the chosen strategy approach more credible and effective.

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ANALYSIS

TAILORING DETERRENCE: WHAT AND WHY?

Sarah Faris

The need to adjust U.S. deterrence policy to the particular values and perceptions of the Soviet leadership was well-established during the Cold War.¹ However, the need for “tailoring” deterrence to a variety of opponents and potential opponents in the “Second Nuclear Age” was recognized soon after the Cold War. Doing so mandates adjusting U.S. deterrence strategies to a broad range of opponents via a close and ongoing understanding of their respective values, perceptions and calculations—their decision-making frameworks. This “tailoring” approach to deterrence was introduced very early in the post-Cold War period in a briefing by Professor Keith Payne at U.S. Strategic Command.²

This article defines “tailoring” as it applies to U.S. nuclear deterrence policy and identifies factors that should be considered under the tailoring framework. It also addresses why tailoring is necessary—as opposed to basing deterrence planning on generic “rational actor” expectations of opponents’ behavior. As an illustration of why tailoring is necessary, this article includes several case studies discussing the ways in which leaders’ decision making can be influenced by a variety of factors, including their cultural, ideological, and religious priorities. The need to tailor U.S. deterrence strategies follows directly from this diversity in decision-making frameworks.

Tailoring

Tailoring consists of adapting deterrence strategies to opponents’ decision-making frameworks, and the context of the engagement. This means that the character of U.S. deterrence threats, how and when they are communicated, must be based on an understanding of factors driving opponents’ perceptions and decision making. Opponents’ diverse decision-making frameworks will shape how they respond, in potentially unique ways, to U.S. deterrence strategies and red lines. Consequently, understanding these frameworks, to the extent practicable, and structuring U.S. deterrence strategies accordingly,

This article is adapted from, Sarah Faris, “Tailoring Deterrence: What and Why?,” *Information Series*, No. 634 (Fairfax, VA: National Institute Press, September 2, 2025).

¹ See, for example, President’s Commission on Strategic Forces, *Report of the President’s Commission on Strategic Forces* (April 1983), available at <http://web.mit.edu/chemistry/deutch/policy/1983-ReportPresCommStrategic.pdf>. See also, Kyle Balzer, “Knowing Your Enemy’: James R. Schlesinger and the Rise of Tailored Deterrence,” *Journal of Policy & Strategy*, Vol. 4, No. 3 (2024), pp. 39-54.

² Keith B. Payne, “Deterring Emerging Nuclear Actors?,” Presentation at the Strategic Options Assessment Conference, sponsored by U.S. Strategic Command, Dougherty Conference Center, Offutt Air Force Base, July 7, 1993. Payne also discussed the need for “tailoring” deterrence and how to do so in, *Deterrence in the Second Nuclear Age* (Lexington, KY: University Press of Kentucky, 1996), pp. 123-129, and *The Fallacies of Cold War Deterrence* (Lexington, KY: University Press of Kentucky, 2001), pp. 97-111.



can be critical to their reliability and effectiveness.³ The contrary approach to deterrence assumes that opponents' responses to U.S. deterrence threats and red lines are generally predictable because their behavior will follow a generic "rational actor model" of behavior. Historical studies, however, demonstrate that this approach is prone to failure because rational leaderships often do not follow a generically predictable pattern of decision making and behavior.⁴

Understanding the Opponent

An opponent's decision-making framework can be informed by a multitude of factors, including, religion; ideology; geopolitics; culture; psychology and cognitive function; domestic politics; government structure of authority and power; and the possession or lack of nuclear weapons.⁵ This is not an exhaustive list of decision-making factors, but they have been shown to be important in past case studies. An opponent's decision-making framework may be informed by a combination of factors or highly influenced by one overarching factor.

Religious beliefs, for example, can have a significant impact on a decision maker's motivations and framework. For followers of Judaism and Christianity, the *Bible* can significantly inform the way in which they view goals, risk, costs and benefits, and warfare. The *Tanakh* (Hebrew Bible) includes many different stories in which the victory of the ancient Israelite armies is attributed to their faith in God, not their military prowess. As noted by Israeli scholar, Dr. Shmuel Bar, in *Understanding Deterrence*, "the religious moral from ... stories in the Bible is clear: the true believer should not be deterred by a stronger enemy, as God will give him victory and hence in such situations, deterrence is not a viable option."⁶ This message is delivered time and time again in the Biblical narratives.

An opponent with such a decision-making framework may believe that, despite any apparent disadvantage, victory in war is guaranteed if it is the will of its deity. In fact, the risk of offending the deity may be considered much greater than violating a U.S. red line—regardless of the U.S. deterrence threat. If so, effective tailoring would need to consider if and how to deter in that context. While religious beliefs may be only one of multiple contributing factors driving decision making, they appear to have contributed significantly in the past. Two widely divergent examples follow.

³ Keith B. Payne, "Deterrence is not Rocket Science, it is More Difficult," National Institute for Public Policy, *Information Series*, No. 527 (July 6, 2022), p. 9.

⁴ See, for example, Peter Karsten, et al., *Military Threats: A Systematic Historical Analysis of the Determinants of Success* (Westport, CT: Greenwood Press, 1984), passim. See also, Therese Delpech, *Nuclear Deterrence In the 21st Century* (Santa Monica, CA: RAND Corp., 2012), p. 88, https://www.rand.org/content/dam/rand/pubs/monographs/2012/RAND_MG1103.pdf.

⁵ Keith B. Payne, "Understanding Deterrence," in, *Understanding Deterrence*, Keith B. Payne, ed. (New York: Routledge, 2013), p. 9.

⁶ Shmuel Bar, "God, Nations, and Deterrence: The Impact of Religion on Deterrence," in, Payne, *Understanding Deterrence*, op. cit., pp. 39-63, p. 49.

General George Washington's Faith

General George Washington often referred to the importance of his faith during the American Revolution.⁷ His beliefs appear to have informed not only his perception of events as they unfolded but were also foundational to his perspective that the American cause was favored by God.⁸ At both high and low points during the war, Washington's correspondence included numerous examples of him discussing the hand of Providence in events.

In January 1776, for example, the American armies were facing low supplies and low morale.⁹ In a letter to Joseph Reed, his secretary at the time, General Washington expressed the desire to be in the ranks or even out of the war altogether and "retired to the back country."¹⁰ Ultimately, however, he concluded that, "If I shall be able to rise superior to these, and many other difficulties, which might be enumerated, I shall most religiously believe that the finger of Providence is in it, to blind the eyes of our enemies; for surely if we get well through this month, it must be for want of their knowing the disadvantages we labor under."¹¹

Washington maintained this faith in the sovereignty of "Providence" throughout the war. His correspondence is filled with examples of his belief that "Providence" was in control of the outcome of the events, to the Americans' benefit. For example, General Washington made the following statement to Brig. Gen. Thomas Nelson following the Battle of Monmouth: "The hand of Providence has been so conspicuous in all this that he must be worse than an infidel that lacks faith, and more than wicked, that has not gratitude enough to acknowledge his obligations—but—it will be time enough for me to turn preacher, when my present appointment ceases; and therefore I shall add no more on the Doctrine of Providence...."¹²

Washington was confident in God's intervention given his belief that the American cause was righteous, and therefore, favored by God.¹³ He is a prime example of a leader whose beliefs significantly informed his viewpoint and decision making in wartime. His careful optimism and his willingness to make strategic gambles were likely informed by this confidence in the righteousness of the American cause and his belief that all events were ultimately controlled by God.

⁷ John C. Fitzpatrick, "George Washington and Religion," *The Catholic Historical Review*, Vol. 15, No. 1 (April 1929), pp. 23-42.

⁸ *Ibid.*

⁹ David McCullough, *1776* (New York: Simon & Schuster Paperbacks, 2005), p. 79.

¹⁰ *Ibid.*

¹¹ *Ibid.*

¹² "George Washington to Brigadier General Thomas Nelson, Jr., 20 August 1778," *Founders Online*, National Archives, <https://founders.archives.gov/documents/Washington/03-16-02-0373>. [Original source: *The Papers of George Washington, Revolutionary War Series*, Vol. 16, 1 July-14 September 1778, David R. Hoth, ed. (Charlottesville: University of Virginia Press, 2006), pp. 340-342.]

¹³ See, Fitzpatrick, "George Washington and Religion," *op. cit.*, p. 36.

Adolf Hitler's Brutal Beliefs

Adolf Hitler's decision making provides a striking example of a leader whose particular beliefs led to a destructive path—one very different from that trod by General Washington. Hitler's beliefs were driven by a dangerous amalgam of factors—including a horrific disregard for human life corresponding to a lethal interpretation of the “laws of nature,” and a strongly held belief that he alone was the appointed savior of Germany.

According to historian Richard Weikart, Hitler is best described as a “pantheist” who believed that nature, or the cosmos, is God.¹⁴ Weikart concludes that, “Hitler's devotion to nature as a divine being had a grim corollary: the laws of nature became his infallible guide to morality. Whatever conformed to the laws of nature was morally good, and whatever contravened nature and its ways was evil.”¹⁵ Hitler's self-revealing text, *Mein Kampf*, reflects such a dark view.¹⁶ For example, “Those who want to live, let them fight, and those who do not want to fight in this world of eternal struggle do not deserve to live.”¹⁷ Hitler's infamous “Nero orders” of March 18 and 19, 1945, reflected his willingness to destroy surviving Germans whom he deemed had failed him in Germany's defeat.¹⁸ Indeed, Hitler's first mass execution program in 1939, the so-called T-4 program, involved the murder of tens of thousands, and ultimately hundreds of thousands, of Germans with mental and physical disabilities. Reflecting Hitler's ghastly view of the “law of nature,” they were deemed “unworthy” of life.¹⁹

Such ideas were derived from Social Darwinism, which gained popularity within the intellectual community in Germany during the late 1800s.²⁰ The central concept of dreadful Nazi racial ideology was that natural selection had created a superior race and forced “euthanasia” (and subsequently mass murder) was justified as furthering its advancement.²¹

In addition, Hitler placed high confidence in guidance from an “inner voice.”²² Hitler placed such a value on this perceived guidance that he chose to trust it to the exclusion of

¹⁴ Richard Weikart, *Hitler's Religion: The Twisted Beliefs that Drove the Third Reich* (Washington, D.C.: Regnery History, 2016), p. xiii.

¹⁵ Ibid.

¹⁶ See, for example, Adolf Hitler, *Mein Kampf*, Translated by Ralph Manheim (Boston: Houghton Mifflin Company, 1971), pp. 131-132, 134, 151, 153, 288, 403-408.

¹⁷ Ibid., p. 289.

¹⁸ See the discussion in, Sebastian Haffner, *The Meaning of Hitler* (Cambridge, MA: Harvard University Press, 1979), pp. 158-160. See also, Whitney Harris, *Tyranny on Trial* (Dallas: Southern Methodist University Press, 1999), pp. 472-473.

¹⁹ See, James M. Glass, “*Life Unworthy of Life*” (New York: Basic Books, 1997), pp. 61-62. See also, Haffner, *The Meaning of Hitler*, op. cit., pp. 132-133; and, Eberhard Jäckel, *Hitler in History* (London: University Press of New England, 1984), pp. 12, 50, 90.

²⁰ Richard Weikart, “Social Darwinism in Germany 1859-1895,” *Journal of the History of Ideas*, Vol. 54, No. 3 (July 1993), pp. 469-488.

²¹ Richard Weikart, “The Role of Darwinism in Nazi Racial Thought,” *German Studies Review*, Vol. 36, No. 3 (October 2013), pp. 551-552.

²² Quoted in Payne, *The Fallacies of Cold War Deterrence and a New Direction*, op. cit., p. 69. See also, Weikart, *Hitler's Religion*, op. cit., p. 64.

outside advice. Indeed, Hitler scorned confidence in “sober considerations,”²³ believing that “...if the voice speaks, then I know the time has come to act.”²⁴ Hitler often described his decision making accordingly. For example, “The spirit of decision consists simply in not hesitating when an inner conviction commands you to act.”²⁵

With this framework for decision making, Hitler dispensed with any pretense of following advisors’ guidance. He was significantly influenced by his deeply held, horrific beliefs that ultimately justified mass murder, including Germans—in this regard he said, “Here too I am cold as ice.”²⁶ He essentially isolated himself beyond the reach of advisors, answering only to his “inner voice.” Establishing a deterrence strategy against an adversary with such a decision-making framework would require understanding that framework, or possibly concluding that any practicable approach to deterrence would be too uncertain to pursue.

The Context of the Engagement

Another important factor for tailoring deterrence strategies is an understanding of the character of the context. A key historical example of this is the 1962 Cuban Missile Crisis.

The Cuban Missile Crisis is famously regarded as the time when the United States and the Soviet Union came closest to nuclear conflict.²⁷ Although Soviet leader Nikita Khrushchev and Cuban leader Fidel Castro had similar ideological goals, their viewpoints diverged in an exceedingly important way. During the crisis, Castro reportedly encouraged the Soviet Union to launch a nuclear strike against the United States.²⁸ Che Guevara, the political theoretician to Castro, stated in hindsight that, “If the rockets had remained, we would have used them all and directed them against the heart of the United States, including New York, in our fight against aggression.”²⁹ Soviet military leader, Col. Viktor Semykin, recalled that Cubans were urging the Soviets to use nuclear weapons, assuring Moscow that Cuba was willing to sacrifice itself in the name of socialism.³⁰

However, the Soviet leadership had a different view of the stakes involved in the crisis. Although the Soviet Union was also ideologically driven, it had a different perspective on the consequences of launching a nuclear strike—seeing them as unacceptable. The Soviet Deputy Premier Anastas Mikoyan responded to Che Guevara’s insistence by saying, “We see

²³ Adolf Hitler, *Hitler’s Secret Book* (New York: Bramhall House, 1986), pp. 5-7.

²⁴ Quoted in, Hermann Rauschning, *Hitler Speaks* (London: Thornton Butterworth, 1939), p. 181. See also, Weikart, *Hitler’s Religion*, op. cit., p. 61.

²⁵ Quoted in, Rauschning, *Hitler Speaks*, op. cit., p. 184.

²⁶ Quoted in, Jäckel, *Hitler in History*, op. cit., p. 89.

²⁷ “The Cuban Missile Crisis, October 1962,” The Department of State, The Office of the Historian, available at <https://history.state.gov/milestones/1961-1968/cuban-missile-crisis>.

²⁸ Payne, *The Fallacies of Cold War Deterrence*, op. cit., pp. 50-51.

²⁹ Quoted in, Enrique Krauze, “The Return of Che Guevara,” *The New Republic*, Vol. 218, No. 6 (February 9, 1998), p. 34.

³⁰ Payne, *Fallacies of Cold War Deterrence*, op. cit., p. 51.

your readiness to die beautifully, but we believe that it isn't worth dying beautifully."³¹ Soviet and Cuban leaders displayed strikingly different perspectives on the stakes of the crisis, and on acceptable risks and costs. These differences appear to have shaped the course of events and the effects of U.S. deterrence threats.

Why is Tailoring Necessary?

Given the above illustrations of diverse decision-making frameworks, it is worth considering why tailoring is necessary. Are the potential differences in decision-making frameworks and perceptions significant to opponents' responses to U.S. deterrence strategies and red lines? Or, is there an alternative approach to deterrence that is generally applicable to all opponents—making tailoring unnecessary?

At its core, tailoring is necessary because human decision making underlying behavior is variable. There is no universal "rationality" that renders diverse leaderships' calculations of value, priorities, costs and risks generally predictable. This reality and its implications are addressed in detail in Emanuel Derman's *Models Behaving Badly*. Derman, a physicist turned financial "quant," concludes that models of decision making based on the expectation of a common rationality perform poorly because rational individuals often make decisions differently than is suggested by the notion of a universal rationality. While Derman is predominantly discussing models of financial decision making, his discussion fully applies to considerations of deterrence strategies. He states that, "In physics you're playing against God, and He doesn't change his laws very often. In finance you're playing against God's creatures, agents *who value assets based on their ephemeral opinions*."³² "Ephemeral opinions" can shape leadership calculations of risk and benefit regarding deterrence threats and red lines, and thus their responses.

Derman also contrasts the way in which physics can be modeled versus that of social science. He states that, "It's not only the past that leaves its trace on humans. In physics, effects propagate only forward through time, and the future cannot affect the present. In the social sciences the *imagined future* can affect the present, and thereby the actual future too."³³ As applied to deterrence, this refers to the way opponents behave based on their *expectations* of future outcomes, which then affect contemporary decision making.

Indeed, deterrence theory presumes that opponents' imagined outcomes will shape their cost and benefit calculations, decision making, and behavior, i.e., opponents are expected to be deterred from an action when the anticipated costs of that action outweigh the possible benefits. This is the "crystal ball" effect that enables deterrence.³⁴ However, opponents may hold exceedingly varied "ephemeral opinions" regarding imagined costs, benefits and

³¹ Quoted in, Krauze, op. cit., p. 34.

³² Emanuel Derman, *Models Behaving Badly: Why Confusing Illusion with Reality Can Lead to Disaster, on Wall Street and in Life* (New York: Free Press, 2011), p. 140. (Emphasis added).

³³ Ibid., p. 156. (Emphasis added).

³⁴ Albert Carnesale, et al., *Living with Nuclear Weapons* (New York: Bantam Books, 1983), p. 44.

outcomes. Consequently, deterrence strategies that are informed by the best possible understanding of opponents' perceptions and decision-making frameworks will likely be more reliable than those that are not so informed.

An historical illustration of how the anticipated future can shape immediate decision making can be found in Japanese decision making during World War II. The decision to attack Pearl Harbor was a strategic calculation based at least in part on the belief that U.S. actions would lead to Japan's collapse with or without war and, as such, going to war was the most honorable option.³⁵ Historian Louis Morton wrote of Japanese leaders: "In their view, Japan had no alternative but to go to war while she had the power to do so. She might lose, but defeat was better than humiliation and submission. 'Japan entered the war,' wrote a prince of the Imperial family, 'with a tragic determination and in desperate self-abandonment.' If it lost, 'there will be nothing to regret because she is doomed to collapse even without war.'"³⁶

Perceptions of honor also appear to have been instrumental to some Japanese leaders' fateful behavior at the end of World War II. Japanese War Minister Korechika Anami opposed surrender even following the U.S. atomic bomb attacks—believing that national honor demanded continuation of the war. Fear of the potential destruction of Japan appears not to have driven General Anami's thinking in this regard. Rather, he argued, "Would it not be wondrous for this whole nation [Japan] to be destroyed like a beautiful flower?"³⁷

In August 1941, Assistant Secretary of State Dean Acheson assured President Franklin Roosevelt that "no rational Japanese could believe an attack on us could result in anything but disaster for his country."³⁸ Clearly, Acheson did not understand Japanese reasoning.

In short, decision making and consequent behavior is subject to influence by a variety of factors that can lead opponents to different responses to U.S. deterrence strategies, depending on their particular decision-making frameworks and their particular perceptions and expectations. Consequently, understanding opponents' decision-making frameworks, including their possibly unique factors driving decision making, can provide insight into the needed character of U.S. deterrence strategies.

"Rational Man"

Since an opponent's assessment of costs and benefits can be driven by "ephemeral opinions," as well as expectations of the future, confidence in an opponents' response to U.S. deterrence strategies predicated on the presumption of an opponent's generic "rationality" will likely lead to mistaken expectations regarding U.S. deterrence threats and red lines.

³⁵ Keith B. Payne, *The Great American Gamble* (Fairfax, VA: National Institute Press, 2008), p. 267.

³⁶ Quoted in, Louis Morton, "Japan's Decision for War," in *Command Decisions*, Kent Greenfield, ed. (Washington D.C.: USGPO, 1990), p. 122.

³⁷ See the discussion in, David McCullough, *Truman* (New York: Simon and Schuster, 1992), p. 459.

³⁸ Quoted in, Scott Sagan, "The Origins of the Pacific War," *Journal of Interdisciplinary History*, Vol. 18, No. 4 (Spring 1988), p. 906.

A generic “rational man” or “economic man” approach to deterrence does not demand tailoring. It posits a theoretical abstraction in which decisions are based on maximizing one’s self-interest, with the presumption of similarly “ideal decision-makers with complete rationality, perfect access to information, and consistent, self-interested goals.”³⁹ U.S. officials and prominent commentators have often advocated such an approach. For example, following the Cold War, former Principal Deputy Undersecretary of Defense Jan Lodal claimed, “Nuclear deterrence worked throughout the Cold War, it continues to work now, it will work into the future...The exact same kinds of nuclear deterrence calculations that have always worked will continue to work.”⁴⁰

The presumption of such a generic approach to deterrence is that opponents’ decision making will follow a predictably similar pattern that U.S. observers deem “rational” according to familiar standards.⁴¹ This essentially dismisses the possibility of opponents having vastly divergent decision-making frameworks and perceptions, with some willingly risking the possibility of nuclear war or self-destruction. It ignores the reality of Cuban decision making during the 1962 Crisis, Hitler’s “Nero orders” in March 1945, and General Korechika Anami’s thinking in August 1945, as discussed above.

Applying Tailoring to U.S. Deterrence Policy

Since its early post-Cold War introduction, “tailoring” has become a well-established element of the U.S. approach to deterrence, on a bipartisan basis. The Department of Defense’s 2004 *Strategic Deterrence Joint Operating Concept* elaborated on the information needed to support tailoring deterrence.⁴² Subsequently, its 2006 *Deterrence Operations Joint Operating Concept* (DO JOC) states that “DOD must develop strategies, plans and operations that are tailored to the perceptions, values, and interests of specific adversaries.”⁴³ The 2018 and 2022 *Nuclear Posture Reviews*, the 2023 report of the Congressional Commission on the Strategic Posture of the United States, and numerous additional official reports, identify “tailoring” as a necessary requirement for deterrence.⁴⁴

³⁹ James Chen, “What is Homo Economicus? Definition, Meaning, and Origins,” *Investopedia.com*, Updated July 31, 2021. Available at <https://www.investopedia.com/terms/h/homoeconomicus.asp>.

⁴⁰ Jan Lodal in, Jan Lodal (P)DUSD and Ashton Carter ASD (International Security), with selected reporters, 31 July 1995, Washington, D.C., News Conference Transcript, pp. 9-10 (mimeographed). Found in Keith B. Payne, *Shadows on the Wall: Deterrence and Disarmament* (Fairfax, VA: National Institute Press, 2023), p. 73.

⁴¹ Payne, “Understanding Deterrence,” op. cit., p. 3.

⁴² See, Director, Policy, Resources and Requirements, United States Strategic Command, Offutt Air Force Base, Department of Defense, *Strategic Deterrence Joint Operating Concept*, February 2004, Appendix B. This references Payne’s earlier work in, *Deterrence in the Second Nuclear Age*, op. cit., pp. 126-127.

⁴³ Department of Defense, *Deterrence Operations: Joint Operating Concept* (DO JOC), Version 2.0 (August 2006), p. 3, available at https://www.jcs.mil/Portals/36/Documents/Doctrine/concepts/joc_deterrence.pdf.

⁴⁴ See, for example, Department of Defense, *Nuclear Posture Review*, 2018, pp. VIII, XII, available at <https://media.defense.gov/2018/feb/02/2001872886/-1/-1/1/2018-nuclear-posture-review-final-report.pdf>. See also, Department of Defense, *Nuclear Posture Review*, 2022, pp. 9-10, available at <https://media.defense.gov/2022/Oct/27/2003103845/-1/-1/1/2022-NATIONAL-DEFENSE-STRATEGY-NPR-MDR.pdf>; and, Madelyn R. Creedon, Jon L. Kyl, et al., *The Final Report of the Congressional Commission on the Strategic Posture of the*

A tailored approach calls for the ability to employ a variety of nuclear deterrence threats flexibly. The variability of opponents' perceptions and decision-making frameworks mandates the U.S. ability to deter in a variety of ways to provide the greatest opportunity for effective deterrence. This flexibility pairs well with tailoring because it provides Washington with the means to deter a spectrum of opponents, which may require diverse means given their unique calculations of cost and benefit. Specifically, a tailored approach to deterrence provides the fundamental rationale for a diverse arsenal, with both nuclear and non-nuclear capabilities, as a means for deterring multiple opponents simultaneously, including the flexibility of the nuclear Triad and regional nuclear capabilities. For example, the 2018 NPR says, "the triad's synergy and overlapping attributes help ensure the enduring survivability of our deterrence capabilities against attack and our capacity to hold at risk a range of adversary targets throughout a crisis or conflict."⁴⁵

These documents from the early post-Cold War years to the present demonstrate the bipartisan acceptance of tailoring, and the corresponding need for diverse, flexible deterrence capabilities.

Conclusion

Tailoring deterrence requires developing an understanding of opponents' unique characteristics, including their decision-making frameworks in the context of the engagement. The unique characteristics that inform decision making can follow from a variety of factors. Historical case studies demonstrate the variation in the factors driving opponents' decision making and consequent behavior.

Tailoring has become an accepted principle of U.S. deterrence policy. It is the alternative to deterrence based on a generic "rational actor model" of decision making which assumes that all rational opponents calculate similarly and can be deterred similarly. Tailoring mandates deterrence forces that are sufficiently flexible to provide the spectrum of deterrent threats that may be needed given opponents' unique characteristics and varied decision-making frameworks. No approach to deterrence is foolproof because opponents' decision making will always include some elements of uncertainty. Nevertheless, tailoring, as opposed to presuming opponents' generic rationality, can reduce those uncertainties and provide a potentially more reliable approach to deterrence.

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United States, October 2023, available at <https://www.ida.org/-/media/feature/publications/a/am/americas-strategic-posture/strategic-posture-commission-report.ashx>.

⁴⁵ *Nuclear Posture Review*, 2018, op. cit., p. X.



ANALYSIS

ASSESSING CHINA'S BELT AND ROAD INITIATIVE: A SOCIETAL FRAMEWORK

Safdar Hussain

Summary

This study explores China's Belt and Road Initiative (BRI) through the theoretical lens of Karl Wittfogel's concept of "hydraulic societies." Wittfogel's theory, which posits that centralized control over infrastructure leads to authoritarian regimes, provides a framework for understanding the BRI's geopolitical implications. The study begins by examining Wittfogel's concept and then traces the origins and development of the BRI, emphasizing its constitutional enshrinement within the Chinese Communist Party (CCP). The BRI's inclusion in the CCP's constitution demonstrates its centrality to China's long-term strategic aims and displays a determination to consolidate power both domestically and globally. Specific case studies, that include the Gwadar Deep Sea Port and the China-Pakistan Economic Corridor (CPEC), show how the BRI consolidates power and generates a potentially crippling dependency among partner governments, eroding local governance and encouraging authoritarian tendencies. The CPEC route issue, as well as China's strong influence in decision-making, demonstrate centralization and control practices.

This study fills a vital lacuna in the existing scholarship by extending Wittfogel's theory to modern geopolitical global projects, providing new insights into how infrastructure control is used as an instrument for political centralization in the twenty-first century. It presents a comprehensive examination of the BRI's impact on local governance and global power structures, drawing on both primary and secondary sources, including BRI documents and official declarations, as well as scholarly publications and media studies. The findings highlight the need for inclusive, transparent, and sustainable measures to ensure the BRI has beneficial, equitable long-term effects that do not disproportionately favor China or the CCP.

Introduction

China's Belt and Road Initiative (BRI) has attracted significant interest, particularly for its potential to shift geopolitics by drawing lesser-developed nations into China's sphere of dominance.¹ A great deal of the earlier international writing on the BRI focuses on China's

¹Jean Blanchard & Colin Flint, "The Geopolitics of China's Maritime Silk Road Initiative," *Geopolitics*, Vol. 22 ,No. 2 (April 2017), pp. 223–245, available at <https://www.tandfonline.com/doi/citedby/10.1080/14650045.2017.1291503?scroll=top&needAccess=true>; Ruli Ramadhon, et al., *China's Belt and Road Initiative (BRI) Influence on Potential United States of America Power Shifts in the Asia Pacific Region* (Routledge, 2025), pp. 531–545; Nadège Rolland, "China's 'Belt and Road Initiative': Underwhelming or



initiative and strategic goals. This narrative emphasizes the Chinese desire of establishing a China-centric global order through infrastructure development, economic integration with smaller states, and ultimately drawing them into Beijing's political sphere.²

Other discussions, however, have focused on how Western countries are reacting to China's quest for global supremacy through the Belt and Road Initiative. In response, the European Union unveiled the Global Gateway, and the United States established the Build Back Better World (B3W) initiatives, both of which seek to offset China's BRI.³ In more recent times, the subject matter has evolved to the concept of a "debt trap." It is argued that China keeps increasing loans beyond recipient countries' repayment capacity, eventually leaving them in a position of economic reliance and susceptibility to Chinese influence.⁴ The Belt and Road Initiative's incorporation in the Chinese Communist Party's constitution is a significant move that has gone underappreciated in past work. This unprecedented development suggests a significant commitment by the CCP to the BRI, embedding it within the country's long-term strategic framework.

The relationship between infrastructure development and governance has been a recurring theme in research on political and societal organizations. While Wittfogel's theoretical perception has been widely applied to historical hydraulic empires, there is a void in the literature regarding how large-scale, transnational infrastructure projects such as the BRI contribute to modern forms of centralized power. Karl Wittfogel's major work, *Oriental Despotism: A Comparative Study of Total Power*, developed the concept of "hydraulic societies," suggesting that the maintenance of large-scale irrigation systems in ancient civilizations required centralized bureaucratic authority. This centralized control, Wittfogel contended, gave rise to despotic regimes, where the state exerted immense authority over resources and people.⁵ While his theory has come under criticism for its deterministic approach, its core premise—the relationship between infrastructure management and

Game-Changer?," *The Washington Quarterly*, Vol. 40, No. 1 (Spring 2017), pp. 127–142, available at <https://www.tandfonline.com/doi/abs/10.1080/0163660X.2017.1302743>.

² William Callahan, "China's 'Asia Dream': The Belt Road Initiative and The New Regional Order," *Asian Journal of Comparative Politics*, Vol. 1, No. 3 (May 2016), pp. 226–243, available at <https://doi.org/10.1177/20578911166647>; Nadège Rolland, *China's Eurasian Century? Political and Strategic Implications of the Belt and Road Initiative*, National Bureau of Asian Research, 2017, available at <https://muse.jhu.edu/book/52595>.

³ Vinod Aggarwal. "Pseudo Institutions: A Comparative Analysis of China's BRI and the US-Led B3W," in *Great Power Competition and Middle Power Strategies: Economic Statecraft in the Asia-Pacific Region*, Cham: Springer Nature Switzerland (2023), pp. 27–50, available at https://link.springer.com/chapter/10.1007/978-3-031-38024-2_2; M. Arif Khan and Nawaz Khan, "BRI vs. B3W: A rivalry for Economic Hegemony: An Archival Research," *Journal of Social Sciences and Humanities*, Vol. 61, No. 1 (June 2022), pp. 31–44, available at <https://jssh.uok.com/oj/index.php/jssh/article/view/596>; Cristian Clinci, "Global Gateway vs. Belt and Road Initiative: Towards Stronger or Weaker Global Governance?," Jean Monnet EU Centre of Excellence, *Working paper 19*, Korean University, (May 2022).

⁴ Michal Himmer & Zdeněk Rod. "Chinese Debt Trap Diplomacy: Reality or Myth?," *Journal of the Indian Ocean Region*, Vol. 18, No. 3 (2022), pp. 250–272 available at <https://www.tandfonline.com/doi/pdf/10.1080/19480881.2023.2195280>; Nian Peng & Ming Yu Cheng, *The Reality and Myth of BRI's Debt Trap* (Springer 2024).

⁵ Karl Wittfogel, *Oriental Despotism: A Comparative Study of Total Power* (Yale University Press, 1957).

political centralization—is still a helpful analytical lens for interpreting modern geopolitical developments.

China's Belt and Road Initiative makes a strong case for reconsidering Wittfogel's approach. The BRI is one of the most enormous infrastructure projects in history, having been launched in 2013 and officially included into the Chinese Communist Party's constitution in 2017.⁶ The incorporation of the Belt and Road effort in the Chinese Communist Party's constitution reinforces its strategic relevance, raising it from a development effort to an essential part of China's internal and foreign policy. This latest approach emphasizes the BRI's dual purpose as both an economic instrument and a means of solidifying political and ideological control, making it a modern-day counterpart to Wittfogel's hydraulic societies.

As a result, this study investigates how the BRI, like ancient hydraulic systems, expands China's centralized control domestically while also exerting worldwide influence, transforming power dynamics through infrastructure dependency. Pakistan, a key BRI member, demonstrates this pattern with the China-Pakistan Economic Corridor (CPEC). This program not only illustrates the strategic imperatives that support Chinese investments, but also shows how they can intensify centralized governance, stifle opposition, and favor foreign interests over local democratic processes.

One of the most contentious features of CPEC has been the rerouting of its main commerce and infrastructure corridors. Originally intended to benefit underdeveloped regions such as Baluchistan and Khyber Pakhtunkhwa, the route was changed to favor the more economically viable Punjab province at the behest of China. This decision excluded provincial stakeholders, discriminated against ethnic minorities, and reinforced the appearance of official favoritism—all hallmarks of authoritarian government that hinders participative decision-making. Khyber Pakhtunkhwa Information Minister Iftikhar Ahmed slammed the federal government for intentionally generating a controversy surrounding the proposed CPEC route adjustment, which he claims indicates a disrespect for the needs and development of smaller provinces, and reminded "We will resist any change in route."⁷ The route appears to have originally run from Gwadar to Quetta, then north to Zhob before deviating east towards Dera Ismail Khan in Khyber Pakhtunkhwa.

Gwadar Port, frequently referred to as the "crown jewel" of the China-Pakistan Economic Corridor, is a prime example of how BRI initiatives may unintentionally aid in the weakening of democratic institutions and the strengthening of authoritarian tendencies in recipient countries. Gwadar Port is situated in the Baluchistan province on the Arabian Sea on Pakistan's southwest coast. It is roughly 170 kilometers east of Chabahar Port in Iran and 120 kilometers southwest of Turbat. Although there had been plans since 1954 to build Gwadar as a deep-sea port, the project wasn't formally launched until 2002. China assisted

⁶ Wade Shepard, "Why China just added the Belt and Road initiative to its constitution," *Forbes*, (October 2017), available at <https://www.forbes.com/sites/wadeshepard/2017/10/25/why-china-just-added-the-belt-and-road-initiative-to-its-constitution/>.

⁷ Syed Ali Shah, "Economic Corridor: ANP Denounces Change in Route, Calls APC," *Dawn* (May 1, 2015), available at <https://www.dawn.com/news/1179361>.

in the completion of the project, and Pervez Musharraf, Pakistan's president at the time, officially opened the port in 2002. The port became an important component of the CPEC in 2015, with plans for additional development specified. Gwadar Port is strategically important because of its position, which provides China with an alternate way to avoid the Malacca Strait for oil shipments and global trade. It also provides Pakistan with tremendous opportunities for economic growth and regional connections.

Although Gwadar was initially touted as the "lynchpin of the China-Pakistan Economic Corridor" and a "gateway to economic prosperity" for Pakistan, the reality of its operations shows how BRI initiatives can stray from their original objectives. There are questions about how much Pakistan will actually gain from this strategically important facility given the 40-year lease given to the Chinese state-owned China Overseas Port Holding Company. It has effectively transferred operational control of Gwadar deep sea port from Pakistan to COPHC.⁸ This essentially means Pakistan has limited direct control over how the port is run. Basically, the distribution of economic gains is at the heart of the problem. Although Gwadar Port can boost Pakistan's economy by facilitating commerce, building infrastructure, and creating some jobs, the magnitude of these advantages is in doubt because a Chinese business controls the port's operations. The question is whether the majority of the earnings are going abroad or if Pakistan is receiving a fair portion of the economic pie.

Gwadar and the surrounding area are undergoing a major securitization process as a result of security concerns arising from Baloch dissent. In the face of continuing tensions with certain local Baloch residents, this entails the deployment of more security personnel and the application of more stringent security measures to protect Chinese employees, businesses, and CPEC-related assets. Therefore, the securitization of Gwadar and its surrounding areas has led to widespread discontent among local Baloch communities as they view it as an expropriation of their land and resources. The Pakistani government's crackdown on dissent in Gwadar—justified under the guise of maintaining security for Chinese investments—has only deepened the perception that CPEC advances a neo-colonial agenda, prioritizing Chinese strategic objectives over local autonomy. These developments illustrate how the BRI can inadvertently—or deliberately—entrench authoritarian governance in partner states. By aligning national policies with Beijing's strategic imperatives, governments often suppress local voices, centralize power, and prioritize foreign interests.

In Pakistan, the BRI has not only transformed the country's economic environment, but it has also reinforced pre-existing authoritarian inclinations, resulting in increased state control, diminished provincial autonomy, and suppression of dissent. Pakistan's experience with CPEC demonstrates this problem, emphasizing the importance of increased openness, inclusivity, and accountability in BRI implementation. Without these safeguards, the BRI might become a tool for authoritarian rule, reflecting Wittfogel's theory of hydraulic despotism: control over key resources helps centralized political power.

⁸ Anil Chawla & Jabin Jacob. *"Gwadar Seaport, Pakistan": Chinese Overseas Ports in Southeast and South Asia* (Routledge, 2024), pp. 112-133.

This research aims to answer the following critical questions: How does Karl Wittfogel's concept of hydraulic societies apply to the Belt and Road Initiative? What is the significance of incorporating the BRI into the Chinese constitution, and how does this reflect the CCP's long-term strategic goals? To what extent does the BRI reinforce authoritarian tendencies in partner states? And finally, can the BRI be considered a modern parallel to ancient systems of infrastructure-driven despotism?

This research begins by looking at Karl Wittfogel's concept of hydraulic societies. It then discusses the origins and growth of the Belt and Road Initiative, as well as its unique position in the Chinese Communist Party's constitution. The paper then investigates specific case studies, such as the Gwadar Deep Sea Port and the China-Pakistan Economic Corridor, to demonstrate how the BRI may contribute to authoritarianism in partner countries.

This paper is considered seminal as it addresses a critical lacuna in the existing body of literature. While Karl Wittfogel's "Oriental Despotism" has been recognized for its valuable insights into the intricate relationship between infrastructure and centralized power in the context of ancient hydraulic societies, its relevance to contemporary governance, particularly within the framework of global initiatives such as China's Belt and Road Initiative, has been largely overlooked by scholarly discourse. This work, which revives and adapts Wittfogel's theory to contemporary state-driven projects, provides a new perspective on how infrastructure control continues to serve as a tool for political centralization in the twenty-first century, making a significant contribution to political science and geopolitics studies.

This qualitative investigation uses both primary and secondary sources. Primary sources include publicly available BRI documents, CPEC websites, government policy declarations, and parliamentary debates. Secondary sources come from a variety of sources, including scholarly papers, government reports, and media analysis from China, Pakistan, and Western academic and journalistic institutions.

Theoretical Foundation: Karl Wittfogel's Concept of Hydraulic Societies

This section examines Karl Wittfogel's concept of hydraulic societies and their relationship to centralized power as a framework for later study. Karl Wittfogel, a well-known historian and political scientist, first presented the concept of hydraulic societies in his important work *Oriental Despotism: A Comparative Study of Total Power* (1957). Wittfogel argued that the majority of historic nations arose from hydraulic civilizations, which he defined as societies in which elites ruled people through control of the water supply. These civilizations usually relied on complex irrigation systems that required central management.⁹ Wittfogel's argument is based on the assumption that certain ancient civilizations, especially those in

⁹ Karl Wittfogel, *Oriental Despotism: A Comparative Study of Total Power* (Yale University Press, 1957).

arid or semi-arid locations, relied on large-scale irrigation systems to maintain agricultural output and economic stability.

The hydraulic state's emphasis on state-controlled infrastructure encouraged centralized and authoritarian rule. The development, maintenance, and management of these systems necessitated substantial cooperation, expertise in technology, and centralized authority, which influenced the social and political structures of these nations. Wittfogel asserted that this reliance on state-controlled infrastructure facilitated the establishment of autocratic regimes in which governing elites retained ultimate control over resources, labor, and governance.¹⁰ The bureaucratic network directed forced labour for irrigation projects. As a result, Karl Wittfogel's vision of the hydraulic state included a highly centralized and bureaucratic type of governance.

The hydraulic state represented a management state. The state has the potential to exercise enormous influence over the populace by controlling key resources such as water. This centralized authority frequently resulted in the suppression of independent social and political forces as the state fought to preserve power. The state's control over water resources enabled it to regulate economic activity, redistribute wealth, and maintain social order. This level of control stifled innovation, restricted individual liberty, and maintained a rigid social structure. Wittfogel commented:

The hydraulic state is a genuinely managerial state. The fact has far-reaching societal implications. As manager of hydraulic and other mammoth construction, the hydraulic state prevents the nongovernmental forces of society from crystallizing into independent bodies strong enough to counterbalance and control the political machine.¹¹

The hydraulic state was essentially a potent instrument for social engineering, molding the lives of its people to suit the goals of the state. The main thrust of Karl Wittfogel's theory is that considerable coordination and control were necessary for large-scale irrigation systems, which were essential to ancient cultures' agricultural output and survival. According to Wittfogel, flood monitoring and irrigation water distribution are the two most notable applications of hydraulic management.

The monopolization of vital infrastructure made it possible for leaders to have total control over their subjects' lives and the economy. As Fekri Hassan contended:

Control over the vital resource of water gave rise to social classes and widespread specializations typical of centralized urban life, while it also gave the government

¹⁰ Shmuel Eisenstadt, "The study of Oriental despotisms as systems of total power," *The Journal of Asian Studies*, Vol. 17, No. 3 (1958), pp. 435-44, available at <https://www.cambridge.org/core/journals/journal-of-asian-studies/article/abs/study-of-oriental-despotisms-as-systems-of-total-power/780B99ECF3F6D16618FAE4C343AD1C2C>.

¹¹ Karl Wittfogel, *Oriental Despotism*, op. cit., p.49.

power of life and death over its population. Thus, a particularly extreme form of despotism is typical of hydraulic empires.¹²

The reliance on the state for existence resulted in a hierarchical social order that strengthened dictatorship. This dependency on the state for existence hindered the formation of autonomous institutions and effective checks on authority, promoting a hierarchical social order that perpetuated tyranny. Rulers maintained authority through a variety of direct and indirect tactics, frequently relying on a centralized bureaucracy to carry out and enforce their policies.

The centralized bureaucracy, led by a powerful elite, helped to strengthen the ruler's power by repressing opposition and limiting social and political plurality. The bureaucracy, which was loyal to the central authority, helped to strengthen the ruler's power by repressing opposition and limiting social and political plurality. The bureaucratic machinery, which was frequently headed by a powerful elite, evolved as a crucial tool of state control. By controlling resource allocation and administering critical parts of society, the state efficiently suppressed dissent and maintained its supremacy, fending off threats to its power. Frederick Mote claims that:

Despotism was one of 'total power' because it permitted neither effective constitutional checks nor effective societal checks upon itself; there were also no checks in 'laws of nature' or 'patterns of cult.'¹³

The consequent governance paradigm was one in which political, economic, and social power was concentrated at the top, with little participation or influence from the larger population.

Wittfogel contended that the centralized governance and robust state machinery of hydraulic societies served as a model for authoritarian governments throughout history. Large-scale irrigation projects were required in Mesopotamia, Egypt, and the Indus Valley to ensure consistent agricultural production. As stated by Arnab Roy Chowdhury:

China was the epitome of a hydraulic society, according to Wittfogel (1957), but that view has also been contested. Though to some extent northern Vietnam can be considered an example of a hydraulic society, Wittfogel's view is particularly insightful for civilisations like ancient Egypt, Indus Valley, and Mesopotamia.¹⁴

Wittfogel contended that bureaucrats in these hydraulic societies functioned with limited oversight, limiting individual autonomy and grassroots engagement. The hierarchical organization emboldened authorities, giving them broad influence over the population with

¹² Fekri Hassan, *Water history for our times*, IHP essays on water history, 2, SC-2011/WS/5, Paris: United Nations Educational, Scientific and Cultural Organization, available at <https://unesdoc.unesco.org/ark:/48223/pf0000210879>, p.74.

¹³ Frederick Mote, "The Growth of Chinese despotism: A critique of Wittfogel's theory of Oriental Despotism as applied to China," *Oriens extremus*, Vol. 8, No. 1 (1961), p.1, available at <https://www.jstor.org/stable/43382295>.

¹⁴ Arnab Chowdhury & Sanjay Kumar, "Revisiting Wittfogel: 'Hydraulic society' in colonial India and its post-colonial legacies in hydropower management," in *Theory, Policy, Practice* (Routledge, 2021), p.124.

little supervision. This lack of transparency and accountability allowed bureaucratic elites to consolidate power, aligning their interests with the governing class. The reliance on centralized administration generated a dependency that strengthened the state's control, leaving little room for independent initiatives or local decision-making. This institutionalization of control guaranteed the survival of hierarchical government, impeding the creation of alternative systems or more egalitarian power distributions.

Wittfogel recognizes that competing forces, such as independent military leaders or religious groups, may challenge the state's monopoly on power. While these pressures may have had some effect or power to undermine the state's authority, Wittfogel contends that the sheer scope and complexity of hydraulic systems naturally favored the state in the long run. Military commanders and religious groups frequently lacked the organizational strength, resources, and coordination required to sustain a large-scale, efficient irrigation system. Wittfogel suggested:

In some cases, the rise of hydraulic despotism was probably contested by the heads of powerful clans or by religious groups eager to preserve their traditional autonomy. In others, semi-independent military leaders may have tried to prevent the masters of the hydraulic apparatus from attaining total control. But rival forces lacked the propriety and organizational strength ...¹⁵

Wittfogel contended that hydraulic civilizations were intrinsically resistant to change due to their centralized power structure. The centralization of power resulted in a strict hierarchical structure, in which the elite's control over resources inhibited innovation and prevented alternative governance models. The massive infrastructure required for irrigation was both expensive and complex, impeding the development of decentralized systems or alternative forms of government. Also, the bureaucratic system was self-sustaining, with officials intensely committed to maintaining the status quo to protect their power.

While Wittfogel's theory has had an impact, it has also been criticized for its deterministic approach and wide generalizations. Scholars have questioned how much irrigation systems alone can explain the formation of authoritarian administration, pointing to other elements such as geography, culture, and foreign threats.¹⁶ Furthermore, Wittfogel's categorization of Asian civilizations as particularly dictatorial has been criticized for its Eurocentric perspective, which downplays the diversity of government arrangements in non-Western contexts.¹⁷ Several critics have called out that a complicated framework and network of hydraulic works was not necessary for the formation of a centralized, strong, bureaucratic, and totalitarian state; alternative historical antecedents led to such a state in Sri Lanka.¹⁸

¹⁵ Karl Wittfogel, *Oriental Despotism*, op. cit., p.49.

¹⁶ Anne Bailey & Josep Llobera, "Karl A. Wittfogel and the Asiatic mode of production: A reappraisal," *The Sociological Review*, Vol. 27, No. 3 (1979), pp. 541-559, available at <https://journals.sagepub.com/doi/abs/10.1111/j.1467-954X.1979.tb00349.x>.

¹⁷ Charles Redman, *The Rise of Civilization: From Early Farmers to Urban Society in The Ancient Near East* (Freeman, 1978).

¹⁸ Arnab Chowdhury & Sanjay Kumar, "Revisiting Wittfogel: 'Hydraulic Society,'" op. cit., p.124.

Despite these objections, Wittfogel's notion of hydraulic societies provides a useful framework for analyzing the relationship between infrastructure and power, particularly in circumstances where centralized control over resources is a distinguishing feature of governance. This theoretical framework gives a perspective through which to study modern geopolitical phenomena, such as China's Belt and Road Initiative. The BRI offers a modern manifestation of this dynamic, just as ancient hydraulic societies relied on state-controlled infrastructure to consolidate authority. By investing in large-scale infrastructure projects that develop economic dependency and boost political influence, China mirrors the practices of hydraulic societies, but on a global scale.

The Belt and Road Initiative: Origins, Scope, and Constitutional Significance

This section examines the Belt and Road Initiative's origins, breadth, and constitutional importance. Chinese President Xi Jinping launched the Belt and Road Initiative in 2013, making it one of the most ambitious infrastructure and economic undertakings in modern history.¹⁹ Xi Jinping is frequently considered as a president with a significant emphasis on foreign policy, pursuing an ambitious agenda that highlights his efforts to consolidate power and cement his reputation as a revolutionary leader in modern Chinese history.²⁰ His ambition manifests itself in the BRI's broad scope and strategic importance, which seeks to increase China's worldwide influence through significant investments in infrastructure and commercial ties across numerous regions. The Belt and Road Initiative, sometimes known as the "new Silk Road," seeks to resuscitate ancient trade routes by establishing a vast network of infrastructure corridors across Asia, Europe, Africa, and elsewhere. The initiative's combined focus on overland (the Belt) and maritime (the Road) connectivity emphasizes its goal of integrating global markets, stimulating economic development, and positioning China as the center hub of a linked world.

Under President Xi, BRI has emerged as a cornerstone of China's foreign policy, aiming to enhance global connectivity through substantial infrastructure development, expansive commercial networks, and strategic relationships that span Asia, Africa, Europe, and beyond.²¹ Center for Strategic and International Studies (CSIS), under its China Power Project noted:

¹⁹ Michael Clarke, "The Belt and Road Initiative: China's New Grand Strategy?," *Asia Policy* (July 24), pp. 71-79, available at <https://doi.org/10.1353/asp.2017.0023>.

²⁰ Pedro Falcone, "Chinese Nationalism and Foreign Policy under Xi Jinping: China's Role in International Society" (Master's thesis), University of Coimbra (2024), available at https://estudogeral.uc.pt/retrieve/276291/PF_CSFM.pdf.

²¹ Matthew Enright, "Chinese foreign policy in the age of Xi Jinping: a 'fundamental' shift or staying the course? An analysis of the Xi presidency's foreign policy direction," July 2021, available at <https://ruor.uottawa.ca/server/api/core/bitstreams/8ca00fe7-043c-46bc-8890-5ccbda391971/content>; Robert Blackwill & Kurt Campbell, *Xi Jinping on the global stage: Chinese foreign policy under a powerful but exposed leader* (Council on Foreign Relations Press, 2016).

The Belt and Road Initiative (BRI) is Chinese president Xi Jinping's signature foreign policy project aimed at strengthening China's connectivity with the world. It combines new and old projects, covers an expansive geographic scope, and includes efforts to strengthen hard infrastructure, soft infrastructure, and people-to-people ties.²²

Xi's commitment to the Belt and Road Initiative goes beyond economic goals; it represents a larger ideological and geopolitical plan to establish China as a dominating global power, challenging Western-led institutions and ideals.²³ It represents a shift in global power dynamics, with China emerging as a major player on the world stage.²⁴ As Goldstein has emphasized, the BRI is part of China's bigger aim to change the global economic and strategic landscape.²⁵

In fact, the Belt and Road Initiative provides significant economic and political incentives to China. China's official policy communiqués expressly identify a number of these benefits. For example, the BRI helps China expand its export markets, boosting economic growth and fostering trade ties. Furthermore, the effort supports the internationalization of China's currency, the Renminbi (RMB), increasing China's financial power on a worldwide scale. Moreover, by eliminating trade frictions, including customs and transportation costs, the BRI aims to simplify commerce and enhance economic efficiency.²⁶ From a theoretical point of view, the BRI's emphasis on infrastructure development and connectivity increases China's economic relations with participating countries while also broadening its geopolitical horizons. Strategic investment in important regions enables China to secure essential supply chains, exert influence over regional trade routes, and establish economic ties that strengthen its global position. This multidimensional approach demonstrates China's desire to transform the world economic and strategic environment, establishing itself as a key factor in global affairs.

The Belt and Road Initiative is a large and ambitious project that spans over 150 nations, merging global infrastructure and trade networks to position China as a dominant force in global growth.²⁷ It is structured around six major economic corridors, including the China-Pakistan Economic Corridor and the New Eurasian Land Bridge. These corridors connect

²² "How is the Belt and Road Initiative advancing China's interests?," Center for Strategic and International Studies (CSIS), under its *China Power*, 2017 available at <https://chinapower.csis.org/china-belt-and-road-initiative/>.

²³ Suisheng Zhao, *China's Big Power Ambition under Xi Jinping: Narratives and Driving Forces* (Routledge, 2021).

²⁴ John Garrick & Yan Chang Bennett. "Xi Jinping Thought: Realisation of the Chinese Dream of National Rejuvenation?," *China Perspectives* 2018, No. 2018/1-2 (November 2020), pp. 99-105, available at <https://journals.openedition.org/chinaperspectives/7872>.

²⁵ Avery Goldstein, "China's grand strategy under Xi Jinping: Reassurance, reform, and resistance," *International Security*, Vol. 45, No.1, 2020, p. 22.

²⁶ Jing Yuan, "Research on China's One Belt and Road Initiative: From the perspective of geopolitics" (Master's thesis), UiT Norges arktiske universitet (2019), available at <https://munin.uit.no/bitstream/handle/10037/16462/thesis.pdf?sequence=2>.

²⁷ Bora Ly, "Retracted Article: China and global governance: leadership through BRI," *Cogent Social Sciences*, Vol. 6, No. 1 (2020), pp. 1-23, available at <https://www.tandfonline.com/doi/pdf/10.1080/23311886.2020.1801371>.

highways, railways, ports, and energy projects, resulting in physical and digital infrastructure that promotes trade and investment. The maritime element is focused on strategic port development, connecting vital nodes across the Indian Ocean, Mediterranean, and South Pacific.

China just opened the Chancay megaport in Peru, a \$1.3 billion investment designed to boost trade between South America and the Asia-Pacific. This port is part of a larger goal to establish a "21st-century maritime Silk Road" and strengthen China's presence in Latin America.²⁸ The Chancay Multipurpose Port Terminal is a large infrastructure project located around 70 kilometers north of Lima. Cosco Shipping Ports Perú S.A. partnered with Volcan Compañía Minera S.A.A. to create this megaproject, which is part of China's Belt and Road Initiative.²⁹ The port is equipped to handle containerized, general, and rolling goods, including the world's largest container ships. It is anticipated to span 992 hectares and manage up to one million twenty-foot equivalent units (TEUs) each year once it is finished. The project is being developed in two stages. Four ports (two for containers and two for multipurpose use), an administrative and logistics complex, and a 1.8-kilometer tunnel linking the logistics complex and the operating zone are all part of the first stage, which was funded with 1.3 billion USD. Eleven more docks will be added in the second stage, increasing the total number of berths to 15.³⁰

The Chancay megaport symbolizes China's strategic strategy to increase its influence in Latin America. The port is planned to cut congestion and logistical costs at Peru's main port, the Lima-Callao hub, while also positioning itself as a critical gateway to Asia and a global economic hub for cargo redistribution. However, this collaboration has prompted concern regarding Chinese influence in key Peruvian industries, the impact on local people, and the possibility of reliance on an external actor with its own goals. The project also emphasizes the larger geopolitical consequences of China's increasing dominance in the region. While the immediate economic benefits include attracting investment and creating local jobs, the long-term hazards include possible geopolitical and social issues.

In terms of finances, the BRI is backed by Chinese state-owned banks and institutions such as the Silk Road Fund and the Asian Infrastructure Investment Bank. The overall expected investment surpasses \$1 trillion, with monies earmarked for infrastructure, industrial parks, and energy projects. The World Economic Forum reported:

²⁸ Juan Cardenal, "China in Peru: The Unspoken Costs of an Unequal Relationship," U.S. Institute of Peace (July 2024), available at <https://www.jstor.org/stable/pdf/resrep61323.pdf?acceptTC=true&coverpage=false&addFooter=false>.

²⁹ Elia Apostolopoulou and Alejandra Pizarro, "Contesting the Anticipated Infrastructural City: A Grounded Analysis of Silk Road Urbanization in The Multipurpose Port Terminal in Chancay, Peru," *Annals of the American Association of Geographers*, Vol. 115, No. 1 (2025), pp. 223-241, available at <https://www.tandfonline.com/doi/pdf/10.1080/24694452.2024.2415718>.

³⁰ Mark Townsend, "China's \$1.3 Billion Peru Gamble Redraws Global Trade," *Global Finance* (December 4, 2024), available at <https://gfmag.com/news/china-peru-chancay-port-deal-bri/>.

Total BRI spending has already surpassed \$1 trillion—an enormous sum China plans to recoup through various debt repayment plans. Today, BRI lending has made China the world’s largest debt collector.³¹

This vast amount of investment places China as a prominent factor in global infrastructure development, threatening established multilateral institutions such as the World Bank.

The Belt and Road Initiative and the Constitution of the Chinese Communist Party: Interplay and Implications

During its 19th National Congress in 2017, the CCP made two significant amendments to its constitution. One amendment was the enshrining of “Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era.”³² This inclusion marked a notable shift, as it was the first time a sitting leader’s ideology was incorporated into the constitution since Mao Zedong. What surprised many was the inclusion of the BRI in the constitution. The amendment emphasized “following the principle of achieving shared growth through discussion and collaboration and pursuing the Belt and Road Initiative.”³³ This move underscored the importance of the BRI in China’s strategic vision and its commitment to global infrastructure development. It is important to note that even though Jiang Zemin introduced significant reforms, he did not include his name in the constitution. Instead, he incorporated his “Three Represents” theory. Similarly, Hu Jintao added his “Scientific Outlook on Development” to the constitution without personal attribution.³⁴ The inclusion of Xi Jinping’s name and the BRI highlights the unique and elevated status of these initiatives in China’s political and strategic framework. Wade Shepard noted:

Basically, Xi Jinping Thought and what could be called Xi Jinping action have both been etched into China’s premier governing charter, further implanting President Xi Jinping—the public architect of the Belt and Road (BRI)—deeper into the wheelworks of the Chinese future.³⁵

³¹ Spencer Feingold, “China’s Belt and Road Initiative Turns 10. Here’s What to Know,” *World Economic Forum* (November 2023), available at <https://www.weforum.org/stories/2023/11/china-belt-road-initiative-trade-bri-silk-road/>.

³² Wade Shepard, “Why China Just Added the Belt and Road Initiative to Its Constitution,” *Forbes* (October 25, 2017), available at <https://www.forbes.com/sites/wadeshepard/2017/10/25/why-china-just-added-the-belt-and-road-initiative-to-its-constitution/>.

³³ *Ibid.*

³⁴ *Ibid.*

³⁵ *Ibid.*

Shepard further elaborated, BRI:

Is a program that is inseparably connected with Xi Jinping, which could turn out to be on a similar level as the Great Leap Forward is connected with Mao and Reform and Opening with Deng Xiaoping. The writing of this initiative into the constitution could very well be used as a driver to extend Xi's leadership a little farther into the future.³⁶

This strategic move not only reinforced President Xi Jinping's leadership within the CCP's ideological framework but also elevated the BRI to the status of a national strategic priority.³⁷ By institutionalizing the BRI within the party's constitution, Beijing underscored its unwavering commitment to realizing its vision of global connectivity and economic integration. This formal inclusion serves several critical functions. First, it solidifies the BRI as an integral component of China's long-term strategic agenda, ensuring continuity and stability in its implementation. This institutionalization centralizes the governance of the BRI within the highest echelons of Chinese leadership, facilitating coordinated and efficient execution of the initiative. Furthermore, it aligns the project with Xi's broader objectives of enhancing China's global influence and domestic legitimacy, thereby consolidating his political power and ensuring the party's unified support.³⁸ From an analytical perspective, embedding the BRI in the CCP's constitution signifies a deliberate effort to integrate economic and geopolitical ambitions into the party's core mission.

This action is part of a larger goal to increase China's worldwide influence by leveraging infrastructure development and commercial ties, confronting Western-dominated institutions and redefining international norms and power dynamics. This constitutional authorization establishes a strong legal and intellectual underpinning for the BRI, easing the mobilization of resources and investments required for large-scale infrastructure projects across numerous nations. It also ties the project with the CCP's overarching strategic goals of regional stability, economic growth, and strategic alliance formation, smoothly combining local and international ambitions. Thus, by putting the BRI into the party's primary goal, the Chinese Communist Party has successfully linked the initiative's success to its own legitimacy. This strategic effort lifts the BRI to the level of national pride and strategic importance, emphasizing its centrality in China's political and economic framework.

Likewise, by institutionalizing the BRI, the CCP increases its domestic legitimacy and establishes legal frameworks that enable state actors to pursue more aggressive development efforts abroad. This constitutional backing serves as a legal framework for the BRI's broad reach, expanding the party's oversight into foreign policy problems, consolidating authority, and providing a unified front in international debates. It also highlights the crucial corridors stressed by the BRI, as well as the projects' ability to influence

³⁶ Ibid.

³⁷ Ibid.

³⁸ John Garrick & Yan Chang Bennett, "Xi Jinping Thought: Realisation of the Chinese Dream of National Rejuvenation?," *China Perspectives* (2018/1-2), pp. 99–105. available at <https://journals.openedition.org/chinaperspectives/7872>.

global trade dynamics in China's favor. The focus on critical corridors displays the strategic implementation of infrastructure to consolidate power and extend China's geopolitical influence, aligning with Wittfogel's argument that control over essential resources is fundamental to maintaining a hierarchical and centralized governance structure.

Ultimately, the BRI's placement in the CCP constitution demonstrates the initiative's importance to China's internal and external affairs. By putting it into the constitution, the CCP has elevated it from a flagship economic program to a critical component of China's long-term strategic plan, ensuring its continuation and priority during leadership transitions. This tactic connects the BRI to the party's ideological goals of declaring China's rise to global prominence, as well as its governance policy of supporting centralized, state-led development, thereby positioning China as a leader in global infrastructure development and fostering economic and diplomatic ties that challenge Western-led institutions.

One could posit that the constitutional enshrinement of BRI in the CCP constitution provides a strong shield against internal opposition or inspection, echoing Wittfogel's notion of a hydraulic society's lack of accountability and transparency. This move protects the effort against any challenges from legislators, academics, and the general public. Opposing the BRI would undermine not merely a specific policy, but also the CCP's overall vision of China's economic development and global aspirations. This insulation is strengthened by the centralized character of Chinese governance, where policies stated in the party's constitution are followed with steadfast consistency, as suggested by Wittfogel's model of unaccountability and non-transparency.

Although private investors or banks are permitted to finance or participate in projects under the Belt and Road Initiative, the Chinese government retains ultimate authority to regulate and approve such financing and projects, particularly in developing nations.³⁹ This focused control over decision-making indicates a larger goal of power consolidation, similar to Karl Wittfogel's concept of hydraulic societies. In these cultures, the management of key resources—such as water—was centralized to retain control over populations and assure cooperation with the ruling authority.

Furthermore, Chinese investment often involves Chinese companies. For example, contracts for roads, ports, airports, hospitals, and other infrastructure projects under the Belt and Road Initiative are frequently awarded to Chinese firms. Even when projects benefit from Chinese expertise, this raises concerns about potential dependency and a lack of local ownership. This dynamic can lead to economic and political dependencies on China, which may limit the host countries' sovereignty and influence, e.g., in Pakistan's China-Pakistan Economic Corridor, major infrastructure and energy projects were predominantly financed by Chinese banks and companies, all of which required approval from Beijing. This dynamic has led to the prioritization of projects that align with China's strategic interests, often at the expense of local governance or democratic input. The Gwadar Port development in Baluchistan exemplifies this, where Chinese state-owned enterprises spearheaded the

³⁹ Spencer Feingold, "China's Belt and Road Initiative Turns 10," *op. cit.*

project under agreements largely negotiated by Pakistan's central government, bypassing significant input from regional authorities or communities.

Another such example is Sri Lanka's Hambantota port. The port was initially financed using Chinese loans, but due to Sri Lanka's failure to meet financial requirements, it was leased to a Chinese business for 99 years. This arrangement highlights the centralized structure of Chinese oversight in the BRI, where financial ties are used to exert control, diminishing recipient states' autonomy. Projects like the Hambantota Port development recall strategies used by 19th-century European imperialists against Qing dynasty China, emphasizing the strategic importance of these projects.⁴⁰ It is consistent with Wittfogel's theory that control over critical resources—whether water in hydraulic civilizations or infrastructure in the modern era—serves as a vehicle for consolidating power and maintaining a hierarchical structure. The BRI's finance and project approval processes successfully put China at the center of decision-making, cementing its role as a dominant power in the economic and political landscapes of emerging nations.

The BRI's Centralization of Control and Its Impact on Authoritarianism in Partner States

This section examines how CPEC, a key component of BRI, has aroused controversy and raised concerns about expanding Chinese influence in the Pakistani government, bypassing provincial input and legislative approval. Two key concerns have emerged: the CPEC conflict and the handover of Gwadar Port control to a Chinese corporation. It is suggested from the onset that the CPEC and Gwadar developments have exacerbated authoritarian tendencies in Pakistan by centralizing authority in the executive, marginalizing local government, and consolidating control in the hands of a few political and military leaders.

The China-Pakistan Economic Corridor

CPEC is a flagship project of the BRI. CPEC was announced in 2013, but was officially launched in April 2015, when Xi visited Pakistan. It represents a multi-billion-dollar investment in infrastructure, energy, and trade connectivity between China and Pakistan.⁴¹ The initial investment for CPEC was announced to be \$46 billion, focusing on infrastructure projects such as roads, railways, energy corridors, and economic zones, however, the scope and investment have since expanded, with estimates now reaching \$62 billion.⁴²

⁴⁰ J. W Yu Ji, "What is China's Belt and Road Initiative (BRI)?," Chatham House-International Affairs Think Tank (September 2021), available at <https://www.chathamhouse.org/2021/09/what-chinas-belt-and-road-initiative-bri>.

⁴¹ David Sacks, "The China-Pakistan Economic Corridor-Hard Reality Greet's BRI's Signature Initiative" (2021), FIU Security Research Hub, available at <https://digitalcommons.fiu.edu/srhreports/cybersecurity/cybersecurity/845/>.

⁴² Ibid.

CPEC aims to link China's western Xinjiang region with Pakistan's Gwadar Port on the Arabian Sea, providing China with a shorter and more secure trade route to the Middle East, Africa, and Europe.

Prime Minister Shabazz Sharif has remarked:

Pakistan-China friendship is deep rooted and eternal. This friendship is rooted in the hearts of people of the two countries. The all-weather strategic cooperation relationship has stood the test of time. Over the time, the bilateral cooperation between China and Pakistan has witnessed new culmination with addition of new dimensions of cooperation in multifaceted sectors under the China Pakistan Economic Corridor (CPEC) framework, a principle strategic component of Belt and Road Initiative... We are committed to ensure the high quality development of CPEC initiatives with 'Pakistan speed' and take it forward to new heights.⁴³

CPEC consists of three major routes: eastern, western, and central. However, effort has mostly been concentrated on the Eastern Route, with approximately 90% of projects on that route nearing completion. For China, CPEC bears enormous geopolitical value by growing its influence in South Asia, strengthening its energy security, and integrating its undeveloped western regions, such as Xinjiang, into the global economy. Zheng Shanjie, Chairman of China's National Development and Reform Commission, noted that CPEC is: "An important loop in the larger chain of the Belt and Road Initiative and would enable the possibility of a 21st Century Maritime Road."⁴⁴

It offers China substantial strategic advantages, particularly in the context of potential conflicts with the United States or other nations. For instance, China imports the majority of its oil from the Middle East, utilizing both the Strait of Malacca and the Strait of Hormuz. As Geoffrey Sloan notes in *Geopolitics, Geography and Strategic History* (2017), China's seaborne "oil supplies have to pass through strait of Hormuz and Malacca. In 2012, 80 per cent of China's oil imports went through the second of these straits."⁴⁵ Sloan further maintains that the U.S. Navy, being the most powerful and capable of projecting its power, remains dominant in these straits. This could pose a challenge for China, as it depends on these risky routes for its maritime activities.

Sloan postulates that the Strait of Malacca represents a significant chokepoint due to its narrow passage and the high volume of trade passing through it. At its narrowest point, the strait is only 1.7 miles wide, increasing the risks of collisions and groundings.⁴⁶ Also, the considerable volume of oil supplies delivered through this route provides a continual concern for Chinese strategic experts, as any disruption could have severe consequences for China's energy security and economic stability.

⁴³ CPEC Secretariat, Ministry of Planning, Development and Special Initiatives, Government of Pakistan, "Response to Western Media Reports on CPEC," China-Pakistan Economic Corridor (CPEC), available at <https://cpec.gov.pk/news/100>.

⁴⁴ "How is the Belt and Road Initiative advancing China's interests?" op. cit.

⁴⁵ Geoffrey Sloan and Colin S. Gray, *Geopolitics, Geography and Strategic History* (Routledge, 2017), p.209.

⁴⁶ Ibid.

Gwadar and CPEC both help to alleviate China's strategic issue caused by the Strait of Malacca. For example, China is developing ports at Gwadar and Hambantota, Sri Lanka, a tactic sometimes referred to as the "String of Pearls" by India.⁴⁷ As Sloan argues, by constructing a network of ports, China is altering the geopolitical landscape to counter these strategic vulnerabilities.⁴⁸ This infrastructure expansion enables China to secure other maritime routes, lessening its dependency on the Strait of Malacca and increasing its strategic flexibility and resilience.

Historically, moving oil from the Middle East to eastern Chinese ports has been expensive and time-consuming, putting a strain on China's economy and exposing it to a number of risks. The CPEC reduces these risks by providing a more efficient and secure route. Arguably, by importing oil to Pakistan's Gwadar Port and then transferring it via the CPEC-developed road and railway networks, China may drastically reduce transit time and costs. Nonetheless, this alternative route provides continued access to critical oil supplies, even in the event of a disruption in the Strait of Malacca. Under the project "Up-gradation and Dualization of ML-1 and establishment of Dry Port near Havelian," China and Pakistan are collaborating on the development and improvement of the ML1 railway line, with investments amounting to billions of dollars.⁴⁹

Nonetheless, it will benefit Pakistan's infrastructure, which needs a massive upgrade to fuel economic development and industrialization. The Pakistan Institute of Parliamentary Services maintains:

A major infrastructure project under the China – Pakistan Economic Corridor (CPEC), the ML-1 (Main Line 1) project aims to modernize Pakistan's railway network, particularly its main rail artery from Karachi to Peshawar. With an estimated cost \$6.8 billion, this project is expected to improve Pakistan's transportation capabilities, shorten travel time and boost the effectiveness of both passengers and freight movement as part of Pakistani border connectivity strategy with Central Asia.⁵⁰

The railway network, combined with the road infrastructure connecting western China to Gwadar, is intended to ensure China's uninterrupted supply lines. By building alternate channels, the program intends to limit any interruptions and maintain a continuous flow of logistics, strengthening China's strategic resilience in the region.

⁴⁷ Rajeshwari Mitra & Jaspreet Gill, "The Strength of the String: The Realities of the String of Pearls Theory," *Calcutta Journal of Global Affairs* (2019), available at <https://www.globaljournalceners.org/article.php?e=55>.

⁴⁸ Geoffrey Sloan and Colin S. Gray, *op. cit.*, p.210

⁴⁹ Ministry of Planning, Development and Special Initiatives, Government of Pakistan, "Up-gradation and Dualization of ML-1 and Establishment of Dry Port near Havelian," China-Pakistan Economic Corridor (CPEC), available at <https://cpec.gov.pk/project-details/30>.

⁵⁰ Fakiha Mahmood, *ML1 Project of CPEC and Pakistan's Connectivity with Central Asia Through Rail and Road*, Briefing Paper No. 05, Pakistan Institute for Parliamentary Services (September 25, 2024), available at <https://www.pips.gov.pk/wp-content/uploads/2024/09/Briefing-Paper-No.-5-CPEC-AND-ML1-project.pdf>.

China's western area falls well behind its eastern counterparts in terms of development. To rectify this discrepancy, China intends to invest billions of dollars in infrastructure and resources to spur growth in the western China. Transporting these goods from eastern ports over thousands of miles is costly and time-consuming.⁵¹ Using the Gwadar Port and its large infrastructure network, China can efficiently move raw materials to its western areas, reducing geopolitical risks and saving time and resources. Furthermore, CPEC provides critical access to the landlocked western area by connecting it to global markets via Gwadar, supporting greater economic integration and development.

Despite China's geopolitical advantages, Pakistan stands to earn considerably from both Gwadar and the CPEC. It provides access to the landlocked Central Asian states, and if stability returns to Afghanistan, Pakistan might benefit considerably in terms of dividends. Pakistan hopes to benefit from trade through Gwadar because these countries will pay transit fees, enhancing Pakistan's economic prospects.⁵²

In essence, CPEC is viewed by Pakistan as a transformative initiative capable of addressing longstanding economic and infrastructure challenges. The corridor has facilitated the introduction of large-scale energy projects aimed at resolving chronic electricity shortages and reducing power deficits.⁵³ Additionally, it has spurred the construction of highways, railways, and special economic zones, thereby boosting trade and industrial activity.⁵⁴ CPEC also strengthens the bilateral ties between China and Pakistan, increasing Pakistan's economic reliance on China while furthering Beijing's geopolitical strategy in the Indian Ocean region. This project counterbalances India's regional dominance and the US-led Indo-Pacific strategy, strengthening China's influence and strategic stance in South Asia.

CPEC: A Chinese Blueprint or a Pakistani Path? Analyzing Route Shifts and Their Implications, with Emphasis on Gwadar Deep Sea Port Representation

Despite the reciprocal benefits of CPEC, the project has been marred by controversy, mismanagement, and disagreements over route alignment. CPEC consists of three routes:

⁵¹ Hassan Butt, "China's Belt and Road Initiative 2.0-A Recipe for Development-A Case Study of the CPEC," *Tidal View from Boao: Building Belt and Road in the Past Decade* (2023), pp. 120, available at <https://amro-asia.org/wp-content/uploads/2024/02/1700550202984373.pdf#page=127>.

⁵² Nawaz, et al., "Pakistan's Economic and Trade Potential in Regional and Global Power Shifts: A Way Forward," *Journal of Asian Development Studies*, Vol. 13, No. 2 (2024), pp. 623-635, available at <https://poverty.com.pk/index.php/Journal/article/view/535>.

⁵³ Helen Blackwell, "Pakistan Refocuses on Counter-Terrorism to Protect China's Investments," *International Institute for Strategic Studies* (September 2019), available at <https://www.iiss.org/online-analysis/online-analysis/2019/09/sasia-pakistan-protects-chinese-investments>.

⁵⁴ Umar Farooq & Asma Shakir, "China-Pakistan economic corridor: geo-political implications, regional constraints and benefits of CPEC," *South Asian Studies*, Vol. 34, No. 2 (2020), available at <http://111.68.103.26/journals/index.php/IJSAS/article/viewFile/3287/1413>.

central, eastern, and western. The Central Alignment links Gwadar and Talagang via Basima, Khuzdar, Sukkur, Rajanpur, Layyah, Muzaffargarh, and the Brahma Bahtar-Yarik Motorway. The Eastern Route, which spans 2,686 kilometers, connects Khunjerab to Gwadar via Burhan, Faisalabad, Multan, Khuzdar, and Basima, with a 793-kilometer overlap with other roads. The Western Alignment begins in Quetta, connects Surab via the N25, links to Hoshab via the N85, and ends in Gwadar via the M8 Motorway.

The route dispute revolves around the perceived priority of certain regions of Pakistan over others, which raises concerns about equitable development and regional inclusion. Initially, the proposed CPEC route aimed to develop disadvantaged and conflict-prone areas, including Baluchistan and Khyber Pakhtunkhwa. This route would have proceeded via western Pakistan (western route), connecting Gwadar to the economically challenged districts of southern Baluchistan and central Khyber Pakhtunkhwa (KPK), offering to elevate marginalized communities through infrastructure development, trade, and employment opportunities.

However, further adjustments to the CPEC plans shifted the emphasis to the eastern alignment, highlighting Punjab and Sindh, Pakistan's more developed and politically influential provinces. This move targeted areas with existing relatively stronger infrastructure and economic conditions, such as Lahore and Karachi. Proponents of the new route said that the eastern alignment was more realistic due to improved road networks, ease of execution, and higher returns on investment, given Punjab and Sindh's larger markets and established businesses. As a result, the Eastern route was prioritized over the Western and Central lines.

The CPEC route experienced substantial revisions due to China's demand, leaving the Pakistani government with limited options other than to comply with Chinese orders.⁵⁵ A report in 'China Power' suggests:

The BRI can also win China political gains. Beijing may be able to exploit its financial largesse to influence partner country policies to align with its own interests, particularly in certain countries in Central and South Asia that lack good governance and robust rule of law.⁵⁶

There is an argument to be made that this underscores the project's complicated power dynamics, with China's influence and Pakistan's reliance on Chinese investment and expertise playing critical roles in determining the corridor's growth. Just as rulers in hydraulic cultures used control over irrigation systems to govern outlying regions and preserve authority, China uses its economic resources and expertise to impose the conditions of the CPEC. This dynamic strengthens a centralized decision-making framework, with Pakistan's government and military ignoring local voices and democratic processes to fit China's strategic goals. Bypassing the Western route exacerbates feelings of isolation and

⁵⁵ Filippo Boni & Katharine Adeney. "The impact of the China-Pakistan economic corridor on Pakistan's federal system: the politics of the CPEC," *Asian Survey*, Vol. 60, No. 3 (2020), pp. 441-465, available at <https://www.jstor.org/stable/48735729>.

⁵⁶ "How is the Belt and Road Initiative advancing China's interests?," op. cit.

marginalization in regions like Baluchistan, where hostility toward the federal authority has traditionally fueled insurgent activities.⁵⁷ Similarly, people in Khyber Pakhtunkhwa have expressed dissatisfaction with the missing prospects for economic development and integration into the larger CPEC framework.

The Pakistani government has mainly controlled the CPEC's design and execution since its inception, with central officials in Islamabad making crucial choices concerning routes, infrastructure projects, and investments, frequently in close collaboration with China. Pakistan and China formed the Joint Cooperation Committee (JCC) as the CPEC's highest decision-making body. This committee is made up of representatives from Pakistan and China, and it makes all major project decisions together. While this centralized approach has been justified by expediency and national security considerations, it has left little possibility for democratic engagement with local communities. Communities in Baluchistan, which is strategically vital due to the Gwadar Port, have felt ignored in decision-making.⁵⁸ Baloch nationalist leaders and local activists have criticized the lack of transparency and consultation, claiming that their region's development requirements and local viewpoints have been overlooked in favor of economic and geopolitical objectives.

Similar reservations have been expressed in Khyber Pakhtunkhwa, with the provincial government condemning the region's exclusion from major CPEC projects. Local leaders in Baluchistan and KPK have complained that centralization of decision-making has exacerbated regional imbalances and damaged the democratic process, which requires people to have a say in choices that directly affect their lives and livelihoods. These grievances have caused political instability, with demands for more provincial autonomy and the devolution of power over CPEC-related projects.

The militarization of the CPEC has been a major worry, particularly in sensitive regions like Baluchistan and KPK. As CPEC projects spread throughout Pakistan, the military's role increased, prompting concerns about the balance of power between civilian governance and military oversight. The military's growing engagement in infrastructure security, project monitoring, and strategic decision-making has raised worries about power consolidation within the military establishment and the weakening of civilian oversight. One of the most visible signs of militarization is the establishment of the CPEC Security Division, intended to defend the infrastructure and personnel involved in CPEC projects, particularly in dangerous regions. This division was primarily motivated by the necessity to safeguard Chinese workers who were threatened by terrorist incidents around the country, as well as China's demand of the Pakistani government to improve Chinese worker protection. Baluchistan has witnessed a considerable military presence due to the strategic importance of the Gwadar Port and ongoing insurgency issues.

⁵⁷ Ishaque Gul, & M. Asghar, "Impact of China-Pakistan Economic Corridor (CPEC) on National and Integration in Pakistan" (2021), *Global Political Review*, available at <https://www.gprjournal.com/article/impact-of-chinapakistan-economic-corridor-cpec-on-national-development-and-integration-in-pakistan>.

⁵⁸ Filippo Boni & Katharine Adeney. "The impact of the China-Pakistan economic corridor on Pakistan's federal system," op. cit.

Baluchistan has witnessed a significant military presence due to the strategic importance of Gwadar Port and ongoing insurgency issues. To defend the port and its surroundings, the Pakistani military has set up many checkpoints, outposts, and patrols across the region. Baluchistan has a much higher military presence than other portions of Pakistan, owing to a combination of strategic and security considerations. In comparison, other parts of Pakistan, such as Punjab and Sindh, have a lesser military presence. These regions are more politically stable and economically developed, with less insurgency problems. The military presence in these locations largely focuses on border security and counter-terrorism activities.

Baluchistan's military presence, on the other hand, is motivated by the need to secure the Gwadar Port, a critical component of the China-Pakistan Economic Corridor, as well as to combat the ongoing insurgency headed by separatist groups such as the Baluchistan Liberation Army (BLA). The military's mission in Baluchistan includes not only securing the port but also preserving law and order, carrying out counter-insurgency operations, and ensuring the safety of Chinese workers and investments in the province.

Thus, the military's involvement in protecting CPEC infrastructure has expanded beyond security to encompass administrative and logistical support in a variety of areas. This change in responsibility has sparked worries about civilian authorities' declining influence in the design and implementation of CPEC projects. The military's role has grown in tandem with the political marginalization of Baluchistan's indigenous population. In areas such as Baluchistan, where nationalist movements and insurgencies have long existed, greater military presence under the premise of CPEC protection is sometimes interpreted as an attempt to repress dissent and cement control over resource-rich regions. This has aggravated the already hostile political climate in the region, as local populations and political leaders have expressed discontent with the military's expanding involvement in both governance and economic affairs.

The Management of Gwadar Port by China Overseas Ports Holding Company (COPHC)

Gwadar Port is strategically placed near the mouth of the Persian Gulf, right below the Strait of Hormuz. It serves as Pakistan's third commercial port, after Karachi and Qasim. While the two older ports handle 95 percent of Pakistan's seaborne business, their capacity is fully utilized, with no room for expansion. In response, China has made considerable expenditures in the development of the Gwadar Deep Sea Port, which is located near the strategic Strait of Hormuz, a vital route for global oil transportation. The development of Gwadar Port is a vital component of the ambitious CPEC, illustrating the strength of the Sino-Pakistani partnership and the broad scope of China's geopolitical aims. According to the vision statement of the Gwadar Port Authority, government of Pakistan, "Gwadar deep sea

port is the second great monument of Pakistan-China friendship after the Karakoram Highway linking Pakistan and China.”⁵⁹

Gwadar offers an essential substitute because Pakistan’s current major ports are very close to capacity and have little space for growth. Gwadar Port, which can handle one million tons of cargo annually, will be an important commercial center as well as an essential piece of infrastructure for the energy, transportation, and industrial sectors, greatly boosting Pakistan’s economic potential. A previously unknown group of fishing villages on Pakistan’s Makran coast, Gwadar has become a vital component of the \$62 billion CPEC. South Asia’s ‘New Great Game,’ as the region’s growing geopolitical rivalry is known, has made Gwadar, which is only 172 kilometers from Chabahar, an Iranian port under Indian development, a focal point.⁶⁰ The Gwadar Port’s expansion plans include a floating liquefied natural gas terminal with a daily capacity of 500 million cubic feet, a desalination facility, and a 2,292-acre special economic zone. The planned investment for these new infrastructure projects is \$1.62 billion.⁶¹

In a significant shift, the Pakistani government handed over operation of Gwadar Port to the Port of Singapore Authority for a 40-year period in 2007. This move was partly prompted by U.S. fears over China’s expanding influence in the region.⁶² However, rising tensions between the United States and Pakistan, particularly over Pakistan’s policies in Afghanistan, forced Islamabad to reconsider its foreign policy. In 2013, Pakistan handed over control of Gwadar Port to China Overseas Ports Holding Company (COPHC) for a 43-year period, hoping to counteract U.S. influence and gain Beijing’s backing.⁶³

To regain its massive investment, COPHC would get a considerable share of the money generated by Gwadar Port’s operations: 91% from port and terminal activities, and 85% from the accompanying free zone.⁶⁴ While the port is expected to handle one million tonnes of cargo annually, there have been suspicions in Pakistan that the revenue-sharing pact will unfairly benefit Chinese enterprises.

The Pakistani government has granted considerable sovereign guarantees for Chinese investments, some at high interest rates. However, a significant portion of these funds did not enter the Pakistani financial system. Instead, they primarily moved from Chinese financial institutions to Chinese infrastructure development companies. While Pakistani

⁵⁹ Kartik Gurmeet, “Pakistan’s Gwadar Port: A New Naval Base in China’s String of Pearls in the Indo-Pacific,” *CSIS Briefs*, Center for Strategic & International Studies (April 2018), pp. 1-5, available at <https://www.csis.org/analysis/pakistan-gwadar-port-new-naval-base-chinas-string-pearls-indo-pacific>.

⁶⁰ Fazl-e-Haider, “Gwadar: an emerging centre of the New Great Game,” *ISPI policy brief 162* (2009), available at https://www.ispionline.it/sites/default/files/publicazioni/pb_162_2009_0.pdf.

⁶¹ Frédéric Grare, “Along the Road: Gwadar and China’s Power Projection,” *Carnegie Endowment for International Peace* (July 2018), available at <https://carnegieendowment.org/posts/2018/07/along-the-road-gwadar-and-chinas-power-projection?lang=en>.

⁶² Ibid.

⁶³ Ibid.

⁶⁴ Isaac Kardon, et al., “China Maritime Report No. 7: Gwadar: China’s Potential Strategic Strongpoint in Pakistan” (2020), U.S. Naval War College, available at <https://digital-commons.usnwc.edu/cgi/viewcontent.cgi?article=1006&context=cmsi-maritime-reports>.

businesses reaped minimal benefits from these investments, the Pakistani government is ultimately responsible for repaying the loans and upholding the sovereign guarantee. In this regard, Wittfogel's insight provides a useful framework for understanding the power dynamics at work, in which China's control over the flow of money and infrastructure development mimics the control exercised by a hydraulic authority over water resources in a conventional hydraulic society.

The building of Gwadar Port in Baluchistan, like the CPEC, has created tension. Despite their abundance of natural riches, the people of Baluchistan have long felt ignored by the federal government, which has concentrated power and economic rewards in more politically significant provinces such as Punjab and Sindh. Local Baloch stakeholders claim disenfranchisement, claiming that they have little say in the planning, execution, and development of Gwadar Port and its associated developments, including Gwadar Airport, hospitals, and free trade zones. They push for expanded Baloch ownership and control over development projects within Baluchistan and propose a shared ownership model with the federal government to guarantee that local interests are fully represented.

Can the BRI be Considered a Modern Parallel to Ancient Systems of Infrastructure-Driven Despotism?

The BRI's concentration on large-scale infrastructure projects has intriguing parallels with Wittfogel's concept of hydraulic societies. The BRI, like past civilizations that relied on complicated irrigation systems, requires centralized management over resource allocation and project implementation thanks to its large network of highways, ports, and energy projects. This concentrated control, which is frequently exerted by Chinese state-owned firms, has the ability to concentrate power and influence, limiting recipient nations' agency.

In a nutshell, CPEC, a key component of the BRI, is an example of this dynamic. The contentious change in the CPEC path, which was motivated by China's geopolitical objectives, demonstrates how Beijing influences Pakistani choices. Another example of how Chinese investment can have a big influence on a host country's strategic decisions is the initial awarding of Gwadar Port's management to a Singaporean business, which was later transferred to a Chinese entity. Additionally, Wittfogel's hydraulic societies' centralized management is echoed by the top-down approach to CPEC implementation, which has limited local involvement and prompted worries from smaller provinces about the federal government's supremacy in decision-making. These examples demonstrate that, while the BRI may provide economic benefits, it also has the potential to strengthen centralized power structures and limit participant states' autonomy.

Conclusion

This study has critically assessed the BRI via the theoretical lens of Karl Wittfogel's notion of hydraulic societies, making analogies between ancient civilizations' centralized control and

authoritarian inclinations and modern infrastructure-driven geopolitics. By examining the BRI's constitutional enshrinement and its consequences for Chinese domestic and foreign policy, we have shown how the project can be used to consolidate power both within China and among participating countries. The BRI's centralization of power not only boosts China's political and economic dominance but also generates dependency among partner governments, often eroding local governance institutions and promoting authoritarian paradigms.

This analysis has determined that the BRI centralizes authority in a manner similar to the bureaucratic systems of hydraulic societies. China's supremacy in financing, building, and managing key infrastructure projects gives it tremendous clout with participating countries, resulting in long-term dependence that can constrain political sovereignty and move governance toward more centralized, state-driven regimes. This pattern is particularly visible in nations like Pakistan and Sri Lanka, where Chinese participation has influenced decision-making and, in certain cases, the failure to repay loans has resulted in the cession of critical assets, such as the Hambantota Port.

One of the most significant critiques leveled at the BRI is the debt load it places on recipient countries, which can lead to economic dependency and strategic vulnerability. Sri Lanka's Hambantota Port is an excellent example of this dynamic. In the early 2010s, Sri Lanka borrowed around \$1.1 billion from Chinese state-owned banks to build the port, with the hope that it would become a significant regional commercial hub. However, the project failed to generate enough cash, leaving Sri Lanka unable to pay its loan. In 2017, the Sri Lankan government was obliged to lease the port and 15,000 acres of adjacent land to China Merchants Port Holdings Company for 99 years. This contract effectively handed over control of a strategically important marine asset to a Chinese state-owned firm, raising worries about Sri Lanka's sovereignty and China's expanding influence in the Indian Ocean region.

Similarly, Pakistan's participation in CPEC, the BRI's flagship project, has resulted in both benefits and challenges. CPEC includes more than \$25 billion in Chinese loans and investments to fund infrastructure projects such as roads, trains, power plants, and the expansion of Gwadar Port. While these expenditures have filled essential infrastructure gaps, they have also contributed to Pakistan's growing debt. Although these reports have been dismissed by the Pakistani state as misleading, factually inaccurate, and one-sided, they have been criticized for distorting facts and relying on irresponsible statements.⁶⁵

Gwadar Port, a vital component of CPEC, is operated by China Overseas Port Holding Company on a 40-year lease, giving China extensive influence over a strategically placed deep-sea port near the Strait of Hormuz. This raises concerns about Pakistan's long-term sovereignty and capacity to pursue independent economic and geopolitical strategies. Furthermore, the BRI's influence on governance patterns in partner nations demonstrates its propensity to strengthen authoritarian tendencies. While the program promises

⁶⁵ CPEC Secretariat, Ministry of Planning, Development and Special Initiatives, Government of Pakistan, "Response to Western Media Reports on CPEC," China-Pakistan Economic Corridor (CPEC), available at <https://cpec.gov.pk/news/100>.

economic growth, it frequently has considerable political consequences, as local government systems are bypassed or undermined, and democratic accountability is jeopardized. This pattern shows that the BRI, like the ancient hydraulic systems Wittfogel described, might serve as a vehicle of centralized control, limiting local political agency and promoting top-down governance.

Future study on the BRI should concentrate on the long-term political and economic implications of Chinese infrastructure investments for local governance models. Comparative case studies of BRI recipient nations could give information on how various political systems respond to or oppose China's influence. Furthermore, research on the BRI's environmental and social impacts, particularly on indigenous populations and local communities, would provide a more complete picture of its consequences. Finally, investigating the role of the BRI in transforming global power structures, particularly in regard to the decline of Western influence and the rise of China, will provide vital insights into the changing dynamics of global geopolitics.

In conclusion, while the BRI has the potential to boost economic growth, its broader ramifications for governance and authoritarianism must not be underestimated. As this project grows, it is critical that both China and its partner nations prioritize inclusive, transparent, and sustainable measures to guarantee that the BRI's long-term impact is good, equitable, and favorable to democratic principles.

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INTERVIEWS

This section of the *Journal* features interviews with Kenton White, Lecturer, Department of Politics and International Relations, University of Reading, UK; and David Lonsdale, Senior Lecturer in War Studies and Director Postgraduate Taught Programmes, Hull University, UK. The interviewees offer their perspectives on the recently released *UK Strategic Defense Review*, and place this *Review* in the context of similar such efforts over the past several years. While the document contributes to the public debate about the British government's defense spending, it remains to be seen whether the government will be able to provide the necessary funding to deliver capabilities the *Review* proposes.

An Interview with Kenton White, Lecturer, Department of Politics and International Relations, University of Reading, UK

Q. What is the significance of the UK Strategic Defense Review?

A. The Strategic Defense Reviews in the past articulated new defense policies or reconfirmed old policies, and they used to be done annually during the Cold War. It is a political device, rather than a military statement. The most recent version focuses on how we integrate defense concepts into everyday functioning of the state. It is also a document that justifies the defense spending.

The Strategic Defense Review is a tool for explaining to the public where the money has been spent. After the end of the Cold War, we invested the peace dividend into welfare, and now government has to justify domestic spending cuts to invest in defense. The current government announced a defense spending increase, although it is a bit vague on where this spending will come from. The idea that the United Kingdom will spend 3 percent of GDP on defense by the next Parliament, if it at all happens, is laughable in the context of the government saying it intends to be moving toward a warfighting posture. We should be spending 3-5 percent of GDP on defense already.

Overall, the Strategic Defense Review is an anodyne document that does not say much. It talks about technology, and reads more like a business plan than a document explaining defense of the country.

Q. In your opinion, what is the greatest obstacle to the implementation of recommendations outlined in the document? How likely is the British government to overcome it?

A. Money is the greatest obstacle, and a lack of a public understanding regarding the need for defense is another obstacle. Of course, it is hard for a government to get the public to understand why resources should be spent on something intangible like defense, which doesn't immediately benefit them, at least not in a way that funding for retirement or schools



or hospitals does. Today, the United Kingdom has too few tanks, no real capability, and a diminished Navy, which is a bad place to be for an island nation. This Strategic Defense Review facilitated interactions with members of the public. The document can help to raise awareness of these issues and of defense's profile in public discourse, but it is not clear to me it would be enough.

Q. In several instances, e.g. when discussing the need to adapt technological innovations for defense purposes quickly, the document calls for a “fundamental” transformation. In practice, fundamental transformations are extremely difficult to achieve in peacetime. What would it take to achieve these aspirations?

A. The use of the word “fundamental” is a prime example of the academia and business worlds impinging on defense. We do not need to transform defense, we want the armed forces to defend and protect us. To do that, we need people, machines, and technology; but technology alone does not win battles. These “fundamental” transformations are useful politics, because they are difficult to measure and provide nice sounding talking points, unlike let's say whether a government fielded 500 tanks or 100 jets, which would be imminently measurable.

These new terms are missing what the military is for. The natural habitat of the armed forces is war. The fundamental requirement for the armed forces is to be able to fight war, and if we do not have the capability to do that, technology does not matter. It is no good to have a great military cyber system if we run out of munitions on day 3. The government's statements that the United Kingdom has a warfighting posture is nonsense if factories cannot turn out equipment, and no amount of technology can fix that. We want the capability and flexibility to counter adversaries. So far, we have been failing to plan for a long-term threat.

Q. Where do you see the main benefit of publishing a document like the Strategic Defense Review? Is it worth the effort?

A. The Strategic Defense Review is a useful public relations exercise, and is a part of preparing the public for the necessary cuts in domestic spending to increase defense spending. The review is designed to justify the politicians' expected decisions, but flexible enough to accommodate future changes.

I am skeptical the review was worth the effort, partly because its objectives cannot be measured. For example, the document says several times that the United Kingdom will build “up to” 10 new attack submarines. So, if the government builds a 0.3 submarine, we are winning, right? Language like that obscures the real issues, e.g. a lack of spare parts for the Typhoon aircraft.

Q. The threat section describing the main adversaries the UK faces is fairly short. Is it because there is such a societal consensus that it does not need explaining, or because the consensus is not particularly robust?

A. The understanding that Russia is a threat is reasonably robust. Russia's invasion of Ukraine, particularly the full-scale invasion, shows that Russia cannot be trusted. The China threat is different, because the government is trying to maintain a trade relationship with China. The United Kingdom is too dependent on trade with China that it cannot disengage. We even rely on China for parts in our weapon systems! What kind of nation relies on components for its weapons on a potential adversary?

Then we have Iran and the Middle East. There is a perception that countries in the Middle East are victims of Western Europe. Immigration from the region, including anti-Israeli sentiments, possibly shapes UK's domestic politics. We are looking at almost a sliding scale of robustness in terms of threat perceptions, from Russia to China to Iran and the Middle East.

Q. Where is U.S.-UK defense cooperation headed based on your reading of the document?

A. The change in the U.S. administration has brought U.S.-UK relations into a sharp focus. The United Kingdom wants to hold onto the special relationship, and benefits from it more than the United States. We plan on fighting alongside our most important ally. UK forces are interoperable with U.S. forces.

The government is walking a tight rope in the document. On one hand, there is an endorsement of the United States. On the other we do not want to say we fully depend on it because it makes us look weak. So far, we have not heard an unequivocal endorsement of the special relationship from the United States. With regard to extended nuclear deterrence, the gap between the United States and the UK has widened and we have not fully trusted the United States perhaps since the 1961 Cuban missile crisis.

Q. The 2021 Integrated Review recommended that the UK should move to an overall nuclear weapon stockpile of no more than 260 warheads, an increase from no more than 225. Although the nuclear threat has arguably increased since then, the UK Strategic Defense Review is rather silent on this issue and specific steps the UK plans on taking to strengthen deterrence. Why?

Ambiguity has been the cornerstone of the UK policy. Nuclear deterrence is a very low-profile issue. People view nuclear deterrence generally poorly in this country, or rather they are happy to not think about it at all.

An Interview with David Lonsdale, Senior Lecturer in War Studies and Director Postgraduate Taught Programmes, Hull University, UK

Q. What is the significance of the UK Strategic Defense Review?

I am trying to be optimistic, but this is the third review in about four years, so there is a degree of a review fatigue and a catchy phrase fatigue. The Strategic Defense Review gives insight into the government's thinking in terms of geostrategic outlook (procurement strategy, sense of balance among services). The problem is that the government always seems surprised that the world changes, and is in a sense enamored with change. I just do not believe that, and I do not think that challenges are constantly worth reviewing. Take for example the language on warfighting readiness. Are we to assume we were not ready before? And if so, why is that not concerning? History tells us that the militaries are never ready. The Strategic Defense Review's focus on defense industry procurement is significant, but procurement seems to have been under review on and off for years, so why should we assume that this one will lead to a great step forward?

Q. In your opinion, what is the greatest obstacle to the implementation of recommendations outlined in the document? How likely is the British government to overcome it?

Funding and implementation. The three percent of GDP on defense is aspirational and subject to economic and fiscal conditions. This will be an important issue. The current government is unpopular and seems unable to implement policies, including regarding immigration, an increasingly more salient issue for an average voter. The government seems to be constantly reacting, so it is quite possible that the document will be obsolete by events sooner rather than later in today's review culture.

Q. In several instances, e.g. when discussing the need to adapt technological innovations for defense purposes quickly, the document calls for a "fundamental" transformation. In practice, fundamental transformations are extremely difficult to achieve in peacetime. What would it take to achieve these aspirations?

A. I am not sure this can be achieved at all without massive investments that we are unwilling to make for the time being. It is also worth keeping in mind that technologies do not win wars. They are important enablers, but it seems to me we are relying on technologies too much. How much should one transform, given that the newest and "shiniest" is not always the best? Additionally, while doing things quickly is important, it is yet more important to do them right. The need to be transformational just by itself is problematic. Transformation

requires a system that tolerates failure, wacky ideas, and culture of experimentation. We do not seem to have the budget, manpower, and materiel to support such a system right now.

Q. Where do you see the main benefit of publishing a document like the Strategic Defense Review? Is it worth the effort?

A. There is such a thing as too many reviews too often, so it is hard to get excited about this current iteration. UK institutions have gotten really good at writing these kinds of documents, but many of the terms are vacuous. For example, what does it mean when we say that the Army will be ten times more lethal? Like most things, lethality is contextual. There are so many aspirations that we have had before. It seems to me that the focus on technology is perhaps overly enthusiastic.

There are some significant points in the current review, e.g. the “NATO First” idea and the emphasis on the importance of the Euro-Atlantic region. U.S. policy seems to be shifting away from Europe, so the government’s emphasis on NATO seems significant. Similarly important is the document’s focus on industry procurement, but we have known for a while that our defense industrial base might struggle to mass produce many systems with which we fight.

Q. The threat section describing the main adversaries the UK faces is fairly short. Is it because there is such a societal consensus that it does not need explaining, or because the consensus is not particularly robust?

A. The review engaged with the public. The document itself has launched a national conversation about funding priorities that the government needs to have. In the UK, it would be difficult to find many people who think that Russia and China are direct threats to them. There does not seem to be a consensus on the threat between the government and the public. The public is more interested in national security implications of illegal immigration than Russian or Chinese threats and the debate is just not happening. On the government level, the threat is somewhat established with regard to Russia, China, and North Korea.

Q. Where is U.S.-UK defense cooperation headed based on your reading of the document?

A. The document is very standard with regard to U.S.-UK defense cooperation. The United States is the UK’s closest security ally. The document notices the shift in U.S. attention to the Indo-Pacific region. The UK does not have forces that would be capable of operating globally on any significant scale. European security would be very difficult to manage without the United States, but perhaps the emphasis on NATO and the Euro-Atlantic area indicates an acknowledgement that Britain’s capabilities are increasingly limited.

Q. The 2021 Integrated Review recommended that the UK should move to an overall nuclear weapon stockpile of no more than 260 warheads, an increase from no more than

225. Although the nuclear threat has arguably increased since then, the UK Strategic Defense Review is rather silent on this issue and specific steps the UK plans on taking to strengthen deterrence. Why?

A. This question is difficult to answer, because the review lacks details. We get “enhanced UK participation in NATO’s nuclear mission,” but it is not clear what it means. Perhaps the wording is an indication of a debate about whether we need to diversify nuclear capabilities. The Labour Party has a tradition of being somewhat cooler on nuclear weapons and perhaps does not want to lean forward too much. That being said, the government has just announced the purchase of 12 F35-As, which will be nuclear capable.



OPPORTUNISTIC AND COORDINATED AGGRESSION: THE NEW PACING THREATS?

The remarks below were delivered at a symposium on “Opportunistic and Coordinated Aggression: The New Pacing Threats?” hosted by the National Institute for Public Policy on April 28, 2025. The symposium was based on a recent NIPP Occasional Paper by Matthew Costlow on this subject that looks at the risks of opportunistic and coordinated aggression in the context of two historical case studies—that of the Korean conflict and the Cuban Missile Crisis—and analyzes these historical events for lessons learned that can be applied today.

David J. Trachtenberg (moderator)

David J. Trachtenberg is Vice President of the National Institute for Public Policy and served as Deputy Under Secretary of Defense for Policy.

Today’s event highlights a recent National Institute *Occasional Paper* by my colleague Matt Costlow, which looks at the risks of opportunistic and coordinated aggression in the context of two historical case studies—that of the Korean conflict and the Cuban Missile Crisis.¹

The paper analyzes these historical events in order to ascertain what lessons are applicable for the United States in seeking to deter opportunistic and coordinated aggression from U.S. adversaries today. One key conclusion is that U.S. strategic nuclear forces must be able to demonstrate that there is no possible escalatory path adversaries can take that will lead to an acceptable outcome for them. In other words, the consequences to an aggressor must be seen as intolerable and not worth the risk of aggression. As the paper suggests, this necessitates both implementing and augmenting the current nuclear modernization program of record.

American non-strategic nuclear forces, deployed in regional theaters, also contribute to deterrence, extended deterrence, and assurance of allies. And the report proposes a number of recommendations in this area to fill the gaps that exist between U.S. non-strategic nuclear capabilities and those of U.S. adversaries most likely to contemplate opportunistic aggression—including adding SLCM-N to the mix.

Missile defenses—including expanded homeland defenses against multiple types of missiles, from ballistic to cruise to hypersonic—as well as regional defenses may also help dampen pressures and the impetus for adversary opportunistic aggression by protecting the U.S. homeland, complicating an adversary’s attack plans, reducing risk, and bolstering the credibility of U.S. security guarantees to allies.

¹ Matthew R. Costlow, *Deterring the New Pacing Threats: Opportunistic and Coordinated Aggression, Occasional Paper*, Vol. 5, No. 3 (Fairfax, VA: National Institute Press, March 2025), available at <https://nipp.org/papers/matthew-r-costlow-deterring-the-new-pacing-threats-opportunistic-and-coordinated-aggression/>.



In light of the recommendations in this report, I would note that the House and Senate Armed Services Committees have just released proposed legislation to add \$25 billion for implementation of the president's Golden Dome initiative and \$13 billion to accelerate the nuclear modernization program and improve the readiness of and infrastructure for U.S. nuclear forces.

Given that members of the so-called "axis of authoritarians" now appear to be cooperating and coordinating their military operations more extensively than ever before, the challenge of deterring opportunistic and coordinated aggression takes on even greater urgency. Three of the four axis powers have nuclear weapons and the fourth appears committed to acquiring them. This situation is unlike any prior historical era, which means the United States must think creatively about how to raise the barriers to opportunistic aggression. This is what the report argues must be the new pacing threat.

As ADM Richard notes in the Foreword to this report, "The threats of opportunistic and coordinated aggression involving some combination of China, Russia, North Korea, and Iran are still dangerously underappreciated in U.S. and allied governments. Put simply, the United States and its allies risk incentivizing the very conflicts they wish to deter by failing to recognize the scope and severity of the threats they face, and the subsequent changes necessary to counter these threats."

This is the sobering backdrop for today's discussion. Now, without further ado, I would like to turn to our other panelists for their opening comments.

* * * * *

Matthew Costlow

Matthew Costlow is a Senior Analyst at the National Institute for Public Policy.

Thank you, Dave, and thank you to all the speakers in advance for their remarks. One of the main reasons I wrote this report that Dave mentioned is that I believe the threats of opportunistic and coordinated aggression receive far less analysis and thoughtful commentary than they deserve—especially given their worldwide implications.² This webinar will, I am sure, be another great example of National Institute providing a forum where some of the great minds in the field can come together to share their thoughts on what ADM Charles Richard labelled a growing "deterrence crisis."

Given the time constraints, I will quickly lay out how I studied opportunistic aggression in this report and then explain some major lessons learned. If you read my report, you will see that I use the Korean War and the Cuban Missile Crisis as two case studies to examine how U.S. leaders dealt with the myriad of challenges that deterring opportunistic aggression brings—whether that is anticipating the different forms of opportunistic aggression, the political and military actions made to avoid opportunistic aggression, assessing the

² Ibid.

adequacy of conventional and nuclear forces, and navigating the often contradictory signals that allies send to the United States while under the threat of opportunistic aggression.

After looking at these case studies, it struck me that perhaps one of the best ways of explaining why opportunistic and coordinated aggression are so uniquely dangerous is to think about how dangers are multiplied. Allow me to illustrate. Imagine the United States becomes heavily involved in a China-Taiwan scenario. It quickly becomes apparent that this is not simply, or *only*, a “China problem”—this is a “conflict with a peer adversary *while deterring* another different peer adversary problem.” The difference is enormous.

When facing opportunistic aggression, the consequences of failure in one theater are multiplied and may directly impact whether deterrence will hold in the second theater. Each failure of military strategy, diplomacy, etc., only becomes magnified because there are multiple adversary audiences who are *already* revisionist.

Regrettably, it only gets worse from here. There are two more factors that make the threats of opportunistic and coordinated aggression more likely, more deadly, or both. First, the United States simply is not postured conventionally to defeat a peer adversary and deter, much less defeat, a second adversary in a geographically distant second theater. If adversaries believe conventional force imbalances in their favor lower the risk of aggression, then deterrence may be more likely to fail. In other words, and to be blunt, weakness invites aggression. Second, China, Russia, North Korea, and Iran are increasingly connected politically, economically and militarily. They are discovering new economies of scale and divisions of labor that are mutually beneficial against their common adversaries: the United States and its allies.

All of these factors lead to what I believe are four dilemmas, or quandaries, that the threats of opportunistic and coordinated aggression impose on the United States.

First, the risk of conflict may grow as adversaries that otherwise would be willing to delay aggression see an opportunity where the risks and potential costs are acceptable—given U.S. and allied constraints, whether perceived military or political constraints. Second, without changes in conventional and potentially nuclear force postures, the United States may be forced to prioritize one set of allies over another in the case of opportunistic and coordinated aggression—ultimately causing damage to both. Third, without changes to the U.S. conventional force posture, the United States may need to rely more on its nuclear forces when deterring or defeating opportunistic and coordinated aggression. Finally, if political goals remain unchanged, the United States may need to rely on riskier, i.e., more escalatory, conventional and nuclear strategies during a conflict that hold out hope of a faster or more satisfactory resolution to an ongoing conflict—in the further hope of shifting forces to better deter a second conflict.

There are no “silver bullet” solutions to these dilemmas, but perhaps the first step in addressing them is ensuring that U.S. and allied policymakers have a realistic appreciation for the scope and scale of the threats—only then can they begin to tailor the appropriate solutions. With that I will end my remarks, and I look forward to the speakers’ presentations and the discussion afterwards.

Christopher Ford

Christopher Ford is former Assistant Secretary of State for International Security and Non-Proliferation and Special Assistant to the President and Senior Director for Weapons of Mass Destruction and Counterproliferation on the National Security Council staff.

Thanks for inviting me. Matt Costlow has done great work in his most recent NIPP *Occasional Paper* in providing a valuable look at the problem of opportunistic or coordinated aggression and putting it in historical context. My fellow panelists have also made excellent points drawing out various aspects of the problem and how we can help mitigate or manage these dangers, especially in connection with building a stronger conventional force and working with our allies.

For my contribution to this discussion, I'd like to offer a few thoughts about the aspect of this broader challenge that relates to our own nuclear posture: what I call "the problem of numbers and types." As always, I can only offer my personal opinions, which won't necessarily correspond to those of anyone else. But let's give it a go.

The Need for a Larger Arsenal

With respect to what we need to deter aggression and to limit damage in the event that deterrence were to fail, the potential for opportunistic or coordinated aggression between our adversaries clearly confronts us with huge challenges. In light of those challenges, is our arsenal big enough? If not, what do we need to have more of?

The Washington policy community has finally come around to understanding that we do have a numbers-and-types problem. The 2023 report of the Strategic Posture Commission took a huge stride in declaring—unanimously, on a bipartisan basis—that the current U.S. nuclear modernization Program of Record (POR) was "absolutely essential" but at the same time "not sufficient to meet the new threats posed by Russia and China." (We had hoped to say a bit more on such topics in the already-drafted report of a similarly bipartisan senior study group convened by the U.S. Institute of Peace (USIP), but our consensus document remains in limbo as a result of USIP's recent DOGE-ification.)

So, while the problem of numbers and types has been raised, it remains to be squarely addressed. It is increasingly understood that we do need more, but there is no broad agreement yet on exactly how many and of what.

In his paper, Matt urges that we start uploading more warheads on our Intercontinental Ballistic Missiles (ICBMs), purchase "at least four" additional Columbia-class ballistic missile submarines beyond the POR, and increase our planned buy of B-21 Raider bombers. He also suggests we speed up deployment of the nuclear-armed sea-launched cruise missile (SLCM-N), develop a nuclear-armed variant of the U.S. Army's Long-Range Hypersonic Weapon, and develop "a mobile, land-based, short- to medium-range, ballistic or hypersonic system, with

a low-yield warhead that is deployable in theater.” There’s a lot to be said for taking those steps, but we’re still some ways from circling in on broad agreement on a new, “beyond-the-POR” agenda.

How Many Do We Need?

Take, for instance, the question of how many weapons we need. We’ve felt reasonably comfortable for years vis-à-vis Russia with the U.S. arsenal at its current New START level of 1,550 operational strategic weapons. Even there, however—and assuming the Kremlin doesn’t start up-arming after that treaty expires next year, or even before—we face a growing problem due to the asymmetry in theater-level forces.

That asymmetry is destabilizing, with the Kremlin using its advantage in lower-yield and shorter-range systems for coercive diplomacy as it implements what I call an “offensive nuclear umbrella” strategy of invading its neighbors under what the Biden Administration called a “shield” of nuclear escalatory threats. This was a problem we recognized in the first Trump Administration, and which we at least tried to begin answering by deploying the W76-2 lower-yield weapon and by starting work on SLCM-N. But that problem is still worsening as Russia continues to develop its sub-strategic arsenal, and this has been exacerbated by the Biden Administration having dragged its feet on SLCM-N. Accordingly, even if we didn’t have a China problem at the same time—which, of course, we do—the United States would still need new nuclear systems that we presently do not have.

When you add in the challenge presented by China’s sprint toward what is likely to be at least nuclear parity in a decade, of course, the problem gets much worse. (And don’t forget the additional complicating factors of nuclear-armed North Korea and potentially soon also Iran, though I won’t address them here.) The number of targets we would need to be able to hold at risk in a few years’ time will presumably be significantly greater than the number we did when New START was ratified 15 years ago.

To be sure, it doesn’t necessarily follow that if 1,550 warheads are needed to deter one near-peer adversary then you need 3,100 to deter two of them, though conceivably it might. The question of numbers is actually a very challenging one, involving as it does questions not just about force size and the targeteering science of holding at risk specific types of assets or facilities, but also about what targets we want to hold at risk in the first place.

Deterrence vs. Damage Limitation

So, what does each adversary care about enough that threatening that thing would help deter aggression? And what would we need to be able to strike if deterrence failed, and we thus needed to minimize that adversary’s capacity to hit and hurt us in the fight?

Perhaps significantly, those two questions may well yield divergent answers, for the potential target set threats which would best deter the bad guy from starting a war in the first place might actually be a somewhat different set than you would want to destroy for purposes of damage limitation once fighting had begun.

What the adversary most prizes is an essentially empirical question—one that in principle should be decided on the basis of deep study of his thinking and circumstances, so that your deterrent signaling can be “tailored” to the minds one wishes to influence. If it turns out that he cares most about protecting his nuclear weapons, then I suppose a pure “nuclear-on-nuclear” counterforce approach would suffice for both deterrence and for damage limitation.

But if the thing he most cared about protecting isn’t his nuclear arsenal, the targeting requirements for deterrence and for damage limitation would tend to diverge. If they do—and if you still want to be capable of meeting both objectives—you might need to be able to cover both sets of targets. If you didn’t maintain the ability to cover more than what you’d need to target for pure damage limitation, after all, you would be less effective in deterring your adversary, since actually executing your deterrent threat would bring you below the number of weapons you want for damage limitation. This would make your deterrent threat less credible, and presumably thus also make aggression more likely. Accordingly, unless you were quite confident that the requirements of deterrence and damage limitation are exactly the same, you’d have reason to bump up your numbers to be able to handle both target sets—additively rather than alternatively.

In the short-term, our response to such numerical challenges can presumably only come through uploading, as both Matt and I have advocated. That wouldn’t really get us too much vis-à-vis Russia, of course, because the Russians could easily upload too (though just adding warheads to already-deployed delivery systems doesn’t necessarily drive up the number of aim-points you’d need to cover). At the least, however, uploading would at least delay the point at which China reaches parity, buying us a little more time in which to pursue better longer-term answers.

New Types of Weapons?

Beyond the stop-gap of uploading, such longer-term answers would surely involve complex trade-offs between capability, cost, and timing. In this respect, I suspect we still have a lot of intellectual spadework to do—not just on numbers but also with respect to questions about the potential long-term need for new types of nuclear weapons or delivery systems.

What new capability, for instance, would give us the most deterrent and potential warfighting value most inexpensively and rapidly? Do we need to shift more to cruder “Willys MB Jeep” or “VW Bug”-type nuclear devices that can be produced more quickly and cheaply in response to future needs than our current “Ferrari”-type designs?

To best deter our adversaries, should we develop new devices that can better do things that “normal” nuclear weapons have difficulty doing—such as destroying hardened and deeply-buried targets (HDBTs), or producing neutron-bomb-style area effects that would be handy against invading Russian battalion tactical groups (BTGs) on land, or Chinese amphibious flotillas at sea?

For maximum flexibility in responding rapidly and cost-effectively to the problem of theater overmatch and the need for quick and relatively unobvious force generation in a

crisis, do we need some kind of smaller nuclear device that can be swapped in and out on a modular basis with the non-nuclear warhead packages in a range of existing or planned conventional precision systems?

There's clearly a lot of complex trade space here. In light of that complexity, however, have our leaders ever really even been given a soup-to-nuts "menu" of potential future options—including potential "out of the box"-type possibilities—in the first place? If not, shouldn't they be? U.S. leaders have not had the chance to set a genuinely new course in nuclear force posture for several decades, and once set in place, programs of record develop enormous path-dependencies that make even modest alterations slow and costly. We are at a threshold moment, and our leaders deserve to be able to consider a broad range of possible choices—and rapidly.

That's why I'm so glad this webinar is calling attention to the possibility of opportunistic or coordinated aggression, for that threat greatly expands the range of nuclear tasks that our force posture might at some point need to handle at the same time, thus highlighting the need for such a serious rethink.

It's past time to limit ourselves simply to implementing the POR from 2010. We need to move out rapidly in figuring out what the next POR needs to be and setting it promptly in motion.



PROCEEDINGS

HONORING THE LATE DR. JOHN S. FOSTER JR.: A LIFETIME OF SERVICE TO THE NATION

The remarks below were delivered at a symposium “Honoring the Late Dr. John S. Foster Jr.: A Lifetime of Service to the Nation,” hosted by the National Institute for Public Policy on June 10, 2025. The symposium honored Dr. Foster, who passed away on April 25, 2025, at the age of 102. A former head of Lawrence Livermore National Laboratory and a senior Department of Defense official under two presidents and four Secretaries of Defense, Dr. Foster’s work drove the development of every nuclear weapon in the U.S. nuclear arsenal today.

Keith B. Payne

Keith B. Payne is President of the National Institute for Public Policy and previously served as Deputy Assistant Secretary of Defense for Forces Policy.

Dr. John S. Foster Jr. passed on April 25. He is a legend who deserved that title, an American and international hero. We are here today to honor him as a person, and for his many unparalleled accomplishments. To do so, we are fortunate to have a line-up of renowned, expert panelists who knew and worked with Dr. Foster for decades. They each deserve long introductions, but we will keep introductions very short given the time we have. These are:

- Dr. Miriam John, former Vice President of Sandia National Laboratories and recipient of the prestigious Lawrence Livermore National Laboratory John S. Foster Jr. Medal;
- Dr. Tom Ramos, physicist at Lawrence Livermore National Laboratory and author of the excellent biography of Dr. Foster, *Call Me Johnny*, and the great 2022 book, *From Berkeley to Berlin: How the Rad Lab Helped Avert Nuclear War*;
- Amb. Ronald Lehman, Counselor to the Director of Lawrence Livermore National Laboratory and former Director of the U.S. Arms Control and Disarmament Agency;
- Dr. Bryan Gabbard, CEO of NeuroGen Technologies, Inc., former Chair of the Global Security External Advisory Board for Sandia National Laboratories, and former Chair of the NIF Peer Review Panel at Lawrence Livermore National Laboratory;
- Mr. Thomas Scheber, former Vice President of the National Institute for Public Policy, Director of Strike Policy, OSD, and Director of the Military Applications Group at the Los Alamos National Laboratory.

This extraordinary panel will share anecdotes and also offer commentary on national security issues in which Dr. Foster played a central role. I would like to start with a telling anecdote, and then conclude with a brief discussion of Dr. Foster’s critical role in the development of U.S. deterrence policy.



Saving Lives in World War II

First the anecdote: I had the honor of working closely with Dr. Foster for well over 2 decades. He would often describe his amazing life experiences—always with characteristic humility. One such experience was during World War II. As a very young man, Dr. Foster worked with the 15th Army Air Force in the Mediterranean theater as an advisor on radar and countermeasures. He examined captured German radar equipment and came up with effective countermeasures to German air defenses. As a result, while still a young man, Dr. Foster saved the lives of many American aviators.

The part of this account that Dr. Foster enjoyed telling most was when, after the war, he met with German war veterans. Without knowing Dr. Foster's wartime role in U.S. radar countermeasures, the Germans mentioned that they could *not* figure out *how* American air forces were able to counter German radar defenses in the area where Dr. Foster had worked. He solved that mystery for them. Six decades later, during dinner, Dr. Foster shared that story with a well-deserved smile.

Deterrence Policy

Now to the question of Dr. Foster's role in U.S. deterrence policy. His technical contributions are legendary. But this gathering is a suitable occasion to recognize the significance of his work in the development of U.S. deterrence *policy*, and the *continuing value* of that work for contemporary U.S. nuclear deterrence requirements.

In February 1973, Dr. Foster, then Under Secretary of Defense for Research and Engineering, chaired an *ad hoc* working group to review U.S. nuclear policy. This working group "included [Ronald] Spiers, [Seymour] Weiss, [Gardiner] Tucker, David S. Brandwein, and Lieutenant General Louis T. Seith."¹ This "Foster Panel," as it came to be known, produced its summary findings in a lengthy report, National Security Study Memorandum 169 (aka NSSM-169).² Dr. Foster forwarded NSSM-169 to Secretary of Defense James Schlesinger, who endorsed it, and forwarded it to Henry Kissinger.³ NSSM-169 established the basis for the 1974 National Security Decision Memorandum 242 (NSDM-242),⁴ and associated Nuclear Weapon Employment Policy (NUWEP-74).⁵

¹ See, "Summary Report of the Inter-Agency Working Group on NSSM 169, June 8, 1973" at, *Foreign Relations of the United States: 1969-1976*, Vol XXXV, *National Security Policy 1973-1976*, Department of State (Washington, D.C.: USGPO, 2014), p. 47, available at <https://static.history.state.gov/frus/frus1969-76v35/pdf/frus1969-76v35.pdf>.

² See, *Ibid.*, pp. 19-20, 49-82.

³ *Ibid.*, p. 47.

⁴ See, Richard Nixon, *National Security Decision Memorandum 242: Policy for Planning the Employment of Nuclear Weapons* (Washington, D.C.: The White House, January 17, 1974), available at https://www.nixonlibrary.gov/sites/default/files/virtuallibrary/documents/nsdm/nsdm_242.pdf.

⁵ Office of the Secretary of Defense, *Policy Guidance for the Employment of Nuclear Weapons* (Washington, D.C.: Office of the Secretary of Defense, April 3, 1974), available at <https://nsarchive.gwu.edu/document/20307-national-security-archive-doc-22-office>.

NSSM-169, and the resultant nuclear guidance set in motion a much-needed re-direction of U.S. nuclear policy accepted by all subsequent Republican and Democratic administrations. Later guidance accepted, extended, and revised that direction.⁶ But NSSM-169 and its associated planning documents established a basic framework for U.S. nuclear deterrence policy that has endured to the present, including intentionally aligning the U.S. deterrence threat to opponents' goals and thinking, and providing limited and tailored nuclear threat options for *credible* extended deterrence. The arguments for these NSSM-169 innovations in policy are *overwhelming* today.

To be specific, the new policy direction that the Foster Panel established included the first actual pre-planned, *limited* strategic nuclear options, particularly for credible extended deterrence. *The smallest previous option employed 2,500 nuclear weapons.*⁷ NSSM-169 advanced the enduring deterrence need for much smaller options for deterrence purposes.

NSSM-169 also, for the first time, consciously put tailoring deterrence into practice—a practice now universally acknowledged as necessary. That is, declared U.S. deterrence threats must be designed to hold at risk the unique priority values of the opposing leadership. At the time, that meant the leadership in Moscow and deliberately holding at risk Soviet post-war recovery capabilities. Doing so did not get the title “tailoring” until over two decades later,⁸ but the Foster Panel set “tailoring” deterrence into motion. NSSM-169’s limited options and tailoring were fundamental and enduring changes in how we think about deterrence.

Fifty years ago, Dr. Foster and his working group successfully met the policy and strategy challenges of the Soviet Union unexpectedly reaching strategic nuclear parity. The Foster Panel reformed the then-existing U.S. strategy for extending deterrence, the credibility of which, in the memorable words of Secretary of State Dean Rusk, required that Moscow believe “we Americans are just [expletive deleted] fools.”⁹ In doing so, Dr. Foster set aside some long-standing deterrence policy fundamentals.

I will conclude by noting that dynamic geopolitical and nuclear threats, once again, compel us to re-consider U.S. nuclear deterrence policy. Senior civilian and military leaders frequently ask, “what should we do now about nuclear deterrence?” My sincere answer is

⁶ Jimmy Carter, *Presidential Directive/NSC-59* (Washington, D.C.: The White House, July 25, 1980), available at <https://nsarchive2.gwu.edu/nukevault/ebb390/docs/7-25-80%20PD%2059.pdf>. Ronald Reagan, *National Security Decision Directive 13* (Washington, D.C.: The White House, October 19, 1981), available at <https://irp.fas.org/offdocs/nsdd/nsdd-13.pdf>.

⁷ See, Department of State, Office of the Historian, *Summary Report of the Inter-Agency Working Group on NSSM-169*, at <https://history.state.gov/historicaldocuments/frus1969-76v35/d17>.

⁸ For the initial post-Cold War discussions of the need for “tailoring deterrence” and its requirements, see, Keith B. Payne, “Deterring Emerging Nuclear Actors?” Presentation at the Strategic Options Assessment Conference, sponsored by U.S. Strategic Command, Dougherty Conference Center, Offutt Air Force Base, July 7, 1993; Keith B. Payne, *Deterrence in the Second Nuclear Age* (Lexington, KY: University Press of Kentucky, 1996), pp. 123-129. See also, Department of Defense, *Deterrence Operations: Joint Operating Concept* (DO JOC), Version 2.0 (August 2006), p. 3, available at https://www.jcs.mil/Portals/36/Documents/Doctrine/concepts/joc_deterrence.pdf. For a later discussion see, M. Elain Bunn, “Can Deterrence be Tailored?,” *Strategic Forum*, National Defense University, No. 225 (January 2007), pp. 1-8.

⁹ Dean Rusk, *As I Saw It* (London: W.W. Norton & Company, 1990), p. 228. See also, Arnold Beichman, “How Foolish Khrushchev Nearly Started World War III,” *The Washington Times*, October 3, 2004, p. B 8.

that the first step in understanding what to do today is to study Dr. Foster's NSSM-169. See how an experienced team, chaired by the brilliant and somewhat iconoclast Johnny Foster, successfully moved U.S. policy forward in response to a fundamental worsening of the Soviet nuclear threat.

Now, I look forward to hearing from our august panel.

Miriam John

Miriam John is former Vice President of Sandia National Laboratories and recipient of the prestigious Lawrence Livermore National Laboratory John S. Foster Jr. Medal.

Let me start by thanking Keith Payne and his NIPP colleagues for this opportunity to honor someone who has meant so much to so many in the national security community. Johnny Foster's reach was far—even further than many of us appreciated until the outpouring of sentiment that has come with his passing. My colleagues who supported the webinar have done an exceptional job at covering his singular accomplishments and impact on the security of our nation. I was late to enter Johnny's orbit, long after he was a firmly established icon in the nuclear and broader defense communities. So I have focused on those things that make Johnny a true hero both in his time and for the uncertain future we face today.

Johnny, the Mentor

Johnny came by it naturally. No doubt a large number will claim him as a mentor as I do. I met him at my first Defense Science Board (DSB) summer study in 1996. What struck me as I entered that community of well-established individuals (that included a number of outsized egos) was how open and welcoming Johnny was. He seemed to inherently gravitate toward a coaching and mentoring role. Through the next several years, with his questions that would challenge my assumptions and logic, and his stories to illustrate some important lesson to be learned, he helped teach me what a good study should look like. He then went on to support me over the next two decades studying weapons effects and nuclear survivability, and nuclear proliferation monitoring and verification.

While it made me feel special to have drawn Johnny's interest, I was far from the only one. The sentiments that poured forth on his passing which talked about his mentoring could have been excerpted from a "who's who" in national security...such names as ADM Rich Mies (ret); ADM Fox Fallon (ret); Hon Frank Kendall; Mr. Rich Haver; Dr. Eric Evans; Mr. Jim Shields; Hon Anita Jones; Dr. Ted Gold; Hon Rich Wagner; Gen Larry Welch (ret). As Dona Crawford, former Associate Director of LLNL, noted: "*In many ways he was a mentor to thousands just by being who he was, by setting an example.*"

Johnny, the Sage

A couple of bookends in his long professional life illustrate his innate wisdom in addition to the better known examples discussed by my colleagues. In the first instance, Rich Wagner tipped me off to something Johnny practiced near the start of his time at LLNL called “pre-mortems” (vs. post-mortems). Asking Johnny about it a few years ago, I observed that he—even at that early stage of his career—intuitively understood the value of critical self-assessment. In his telling, he deflected credit to his boss, then lab director Herb York, who “encouraged” him to do everything he could think of to avoid yet a fourth nuclear test failure by the infant laboratory. Johnny added a new step shortly before the test date. Pulling the design and engineering groups together, he started the conversation with “it’s the morning after, the test was a dud...what happened?” It forced a conversation in which the team relooked at every detail together and challenged each other to convince themselves collectively that no detail, regardless of who was responsible, would be the source of failure. While a straight line between cause and effect cannot be drawn, LLNL nuclear tests started to be successful.

Fast forward to the other bookend for a second example when Dona Crawford and I visited Johnny in Santa Barbara last year about this time...we went to update him on the undergraduate fellowship we had established through the Livermore Lab Foundation in his name. I also couldn’t let the opportunity to pick his brain once more go to waste, this time on nuclear survivability, a topic which our DSB subcommittee had been asked to take up once more. He came prepared for the conversation with four pages of notes through which he reminded us of the principles that were developed in the early days of the Cold War and the many avenues to investigate to create a survivable force. He then summed it all up simply with the statement that became the study’s tag line: *“There is no deterrence without survivability.”*

Johnny and His Crystal Ball

The next facet that contributed to Johnny’s hero status was his foresight. In the wake shortly after Johnny’s passing, Rob Soofer resurfaced one of Johnny’s guiding principles: *“Take a big enough step so that things get a little radical. Don’t look so far ahead that you really don’t know what you’re talking about.”*

The Foster Panel of 1973, about which Keith Payne so skillfully re-educated us, is possibly the penultimate example. But two lesser known stories make this point as well and illustrate how wide ranging his thinking could be.

The first has to do with Sandia’s presence “across the street” from LLNL. While I did not meet Johnny until the mid-1990s, he had already played a pivotal role in my own career. Fact and fiction have become inseparably intermingled over the years as to why Sandia has a lab across the street from Lawrence Livermore, where I am grateful to have spent all 28 years of my national laboratory career. The version I like best is Johnny’s own. In the mid-’50s, Johnny and his colleagues were doing a lot of commuting to Albuquerque to work with Sandia

engineers on weaponizing the Livermore concepts. Johnny often stayed with Jim McRae, who was head of Sandia at the time. He mentioned to Jim at breakfast one morning that the 12+ hour trip one-way at that time was difficult and time consuming, even when travel went as planned. He asked if Jim had ever considered locating a few folks from Sandia in Livermore. Johnny had already scouted an old barracks on the south side of East Avenue that could serve as an initial base camp, and he noted that both labs could get a lot more done with day-to-day contact.

Jim was non-committal, but a few months later, Jack Howard showed up with a dozen people and set about establishing SNL/Livermore (SNL/L). Jack, by the way, is a legend in Sandia's history, as Johnny is in Livermore's. Within a couple of years, the initial dozen Sandians grew to over 1000 focused on partnering with LLNL on Livermore Valley weapons design and development.

Jack and Johnny went on to be close friends and colleagues—so much so that both of them confirmed separately to me that even the mumps couldn't stop them from meeting an important deadline. Jack got the mumps, but undeterred, Johnny just showed up at Jack's bedside to get things done in time.

That trusting partnership set the tone for successive decades in the Cold War of seamless teaming—and often energetic arguing—between the north and south sides of East Avenue, something that geography prevented the New Mexico labs from replicating. To help solidify Sandia's presence in Livermore, Johnny also supported SNL/L assuming greater responsibilities for weaponization than Los Alamos did with Sandia Albuquerque—in particular, gas transfer systems, around which the tech base that developed led to a string of new research endeavors and programs for Sandia in Livermore that included combustion research and extreme ultraviolet lithography. Looking back to that breakfast conversation, Johnny could foresee that a strong Sandia partnership and moreover, a strong Sandia in Livermore were important to his own lab's success, and he did his part to make it work.

The second story takes place in the parking lot of the Beckman Center at UC Irvine. When I met Johnny at that DSB study in the mid-1990s, he was famously known to spend part of each afternoon there flying his remotely piloted helicopter. Michael Bayer, who has held numerous positions within and outside government supporting both DoD and DOE, related an encounter with Johnny there: *"I remember Johnny came to the Army Science Board to visit when I was Chair (in the late 1990s). That evening he flew a small, remotely controlled helicopter from the Beckmann parking lot. Watching him fly it, I told him I thought it was a great toy. Johnny looked at me as only he could, and said 'this is not a toy, it's the future'."*

Some of us are such slow learners that it took a quarter century and another country – Ukraine—to drive home that prediction.

Johnny, the "People Person"

The last aspect about Johnny that solidifies his hero status is what a pleasure it was to work with him. Anita Jones, one of Johnny's successors in the DDRE role, said it best: *"Johnny connected with others, mentored with graciousness, and spiced work with fun."* By starting

with “*Just call me Johnny,*” he put a new acquaintance at ease. And he did indeed enjoy having some fun, as well. Drawing an example from my earliest encounters with him, many know that Johnny always greeted me, not as Mim, but as Ferragamo. The origin of the story was a DSB task force in which he complimented me on whatever it was that I happened to be wearing that day. In turn, I had noticed that Johnny himself had excellent sartorial sense and always stood out in a crowd of scientists and engineers who are not usually known for their up-to-date fashions. So it was easy to return the compliment. He beamed and joked that he bet I surely patronized the Ferragamo brand...and as luck would have it that day, I took off my shoe to show him. That also made the decision for what shoes I should pack for a trip when I knew I would probably see him.

The many stories about individual encounters and relationships with Johnny could easily fill a very thick book. But stepping back to try to sum it all up, the sentiment from Gen. Larry Welch, another hero in our national security world, says it best. Such is his admiration for Johnny that he has maintained that being awarded the Foster Medal meant more to him than the countless other accolades that he received during his long career, both in the military and after. On Johnny’s passing, Larry wrote:

“I don’t know why we preface such announcements ‘with great sadness.’ Johnny’s passing is a time to honor his life and the effect on the nation and all our personal lives. A great mind full of knowledge and understanding, still always open to new thoughts. A great heart that made all he touched better for the experience. Unparalleled integrity, dedication, and contribution. A legacy that lives on and on.”

Tom Ramos

Tom Ramos is a physicist at Lawrence Livermore National Laboratory and author of the excellent biography of Dr. Foster, Call Me Johnny, and the great 2022 book, From Berkeley to Berlin: How the Rad Lab Helped Avert Nuclear War.

In a dimly lit room the size of a small auditorium, a young man stood looking at a sea of young faces surrounding him. He was speaking to them with passion, and they listened intently, for after all, what he had to say could save their lives. The speaker spoke with an authority that belied his youth, and his words conveyed a rich Canadian accent. Johnny Foster, all of twenty-two years old, was a technical advisor to the 15th Army Air Force, stationed in Foggia, Italy. It was the height of America’s involvement in World War II and its armadas of bombers were daily pummeling factories, railroads, anything of military value, in Hitler’s Third Reich. The air raids came with a price though; casualties in the Army-Air Forces were extraordinarily high. More American airmen were dying over the skies of Europe than the Marine Corps was losing in the entire Pacific theater. Johnny was passionately determined to do everything in his power to have the young men in front of him survive the wrath of German anti-aircraft weapons.

The airmen surrounding him were crewmen of large Consolidated B24 bombers, serving on missions to strike targets in eastern Germany, as well as the Nazi's allies in Hungary and Romania. Johnny had been studying German tactics. He knew how the Germans used radar to become aware when the Americans were coming, and so he knew how German defenses were then able to intercept them and shoot them down with deadly efficiency. He was telling the aircrews how to be smart and stay alive.

Johnny had a unique trait to his character; he could place himself in the place of those airmen and that allowed him to better understand how he could help them. That talent seemed to come naturally to him. He was not only a scholar, graduating second in physics out of McGill University, he was also an athlete and a leader. Captain of the university's gymnastics team, he had been chosen to represent Canada in that sport before a shortfall in funding with the Canadian Olympic Committee canceled his dream. In 1948 he set a North American ski jumping record at an athletic competition held at Dartmouth University. At his father's behest, Johnny accepted a position to join Ernest Lawrence's Rad Lab in Berkeley, where he demonstrated his skills as being one of America's best experimental physicists.

A few years later Johnny held a PhD as he led a team of physicists to design atomic weapons for the nation. He had taken over at a time when the team had just suffered through two failed attempts to design a weapon. With the same fervor he had shown in Italy, Johnny took stock of the situation and organized his team to figure out what they had learned from their earlier failures. He would never be content to just duplicate work that had been done earlier for the sake of showing some form of success. Johnny had a very real concern and fear that the country faced a threat to its existence from a growing tide of Communism, and that the nation had to be strong if it hoped to survive. He was determined to get his team to design something new; something that would make a difference against a Soviet Union that was flexing its newly won nuclear muscle.

A year later, Johnny brought his entire team out to the Pacific atoll of Eniwetok, where the United States was conducting a series of nuclear tests. In the previous twelve months he had guided his team to design its first successful device, and now they were on the verge of testing devices that dramatically changed the way physicists had thought that they knew about such devices. Much as he had done in Italy during the World War, Johnny led a group of men to excel beyond anything they had done before. His team was on the verge of changing the landscape of the Cold War.

In another ten years, Johnny was serving the country at an even greater level. He was in the Pentagon, nominated by President Lyndon Johnson, and confirmed by the United States Senate to be the Director of Defense Research and Engineering. His was the third highest rank within the Department of Defense; he was responsible for deciding what weapon systems the Pentagon needed to invest in, to develop, and ultimately purchase. Secretary of Defense McNamara, and the President, expected him to balance the pressures being forced on him from the military services, the manufacturers of the military-industrial complex, and the politicians on Capitol Hill, and to make the decisions that gave our servicemen the best equipment possible with which to fight the country's wars. The country was in the throes of yet another war, in Viet Nam, and Johnny's inclination was to devote himself to the soldiers,

sailors, and airmen who were facing a determined and frightfully effective foe.

Throughout the decades of service that Johnny Foster gave to his country, he showed a consistent, devoted passion towards those who were actually in harm's way. This is an unusual trait, and it is this strength in his character that made him such a powerful and effective presence. He had an innovative mind, and that combined with his natural leadership skills, created a legacy of revolutionary ideas that continue to have an effect to the present day. The idea of using drones to fly over far-reaching areas to strike foes from the sky had its start in Johnny's office at the Pentagon.

Once out of the Pentagon, he continued to serve the public, now through a civilian corporation, TRW. As the country was about to experience fuel shortages triggered by the OPEC boycott, he devoted himself to addressing the energy needs of the country. He seemed to get involved with events that were important in their times, and he seemed to make an impact on them. The country owes a debt to him; he made it a better place.

Ronald Lehman

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Johnny Foster was more than a mentor; he was a wonderful friend with a million stories. How Johnny became the male model for the first neoprene wet suit was just one of them. How E. O. Lawrence himself told Johnny to stop riding his motorcycle was another. And I enjoy playing over in my mind Johnny's version of the Polaris story and what really happened at Nobska when the Chief of Naval Operations, Admiral Arleigh Burke, asked Johnny if he agreed with Edward Teller's assertion that thermonuclear weapons could be greatly reduced in size. Johnny's dramatic and clever re-enactment of this historic turning point that he experienced first-hand has the additional virtue of being funny. In Johnny's words: "Having no idea what Edward was talking about, I replied that I had no reason to disagree." Of course, as Tom Ramos's history makes clear,¹⁰ they both knew what they were

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¹⁰ See T.F. Ramos, *Call Me Johnny: A biography of John S. Foster Jr.* He designed the modern atomic bomb and directed Defense research & acquisition for two presidents. LLNL-BOOK-783447, July 26, 2019, p. 27, available at <https://www.osti.gov/servlets/purl/1576166>.

talking about. Still, when recounting how Johnny told Harold Brown back at Livermore what Edward had committed them to do, Johnny acted out Harold's silent response by making a face that looked like Edvard Munch's painting "The Scream."

It would be easy to drift off into such nostalgia, but today I want to focus on Johnny as an icon of national security. Actually, Johnny was far more important than an icon. He was an iconoclast—constantly agitating for innovation. As the Director of Defense Research and Engineering—the number three job at the Pentagon—Johnny was a prime mover in what Soviet military thinkers would label the "Revolution in Military Affairs." No one was surprised, because Johnny was one of the founders of the world's most iconoclastic laboratory.

In that spirit, I will try to follow Johnny's admonition to challenge complacency by looking back at the disruptive technologies for which Johnny was a prime mover at DoD. My hypothesis is that the steady advance in those technologies nurtured by Johnny in the Pentagon more than fifty years ago now requires us to rethink their impact today on military capabilities including the offense-defense balance and the role of air and missile defenses.

That story still begins here at the Lab. Remember, every nuclear weapon currently in the U.S. stockpile has a primary based on concepts created by Johnny and his "B Division" colleagues. For that matter, they all have secondaries based on concepts developed by Johnny's predecessor Harold Brown and Harold's "A Division" colleagues. And the radiation cases are based upon a concept from Herb York, who was the first Livermore Lab Director just before Edward Teller. And while Johnny advised Defense Secretary Mel Laird on the negotiation of the SALT I Offense Arms Limitation Agreement and the ABM Treaty, Johnny's successor as Lab Director, fellow weapons designer Mike May, was actually on the U.S. Delegation.

Roger Batzel followed Mike. Under Roger, as our current generation of offensive warheads were introduced, the Lab also played a leading role in the Strategic Defense Initiative (SDI). And our last Lab Director from that founding generation was John Nuckolls who, shortly after the laser was invented, became the godfather of Inertial Confinement Fusion. That science has now led for the first time to fusion ignition in a laboratory. As you can see, Johnny was among the foundational nuclear pioneers who set the standard for all who follow. With Johnny often the catalyst or provocateur, they fed off each other, and they worked both sides of the offense/defense equation. They were also godfathers of supercomputers, advanced simulations, high powered lasers, and many other technologies that impact even more today both offense and defense.

Well into his 102nd year, Johnny continued to advise follow-on generations that if they didn't take the risks necessary to overcome "Grand Challenges," they wouldn't be as great as the nation needs them to be. He inspired the official chain of command but, more importantly, he energized generations of innovators buried in often sticky systems. In that spirit, now is a good time to think again about the offense/defense relationship in nuclear deterrence. We are beginning to debate the "Golden Dome," which has many similarities to the Strategic Defense Initiative or "Star Wars" debate when I was in government. And for that

debate, we learned much from the first great debate over Anti-Ballistic Missile (ABM) systems that took place when Johnny was in the Pentagon from 1965 through 1973.

At that time, Johnny was pushing American military systems to increase their performance, both offensive and defensive. He established the “Foster Criteria”—the requirement that endoatmospheric ABM interceptors achieve 100 Gs of acceleration. But Johnny was also driving other technologies. Some were immediately applicable to the offense-defense nuclear balance at that time. Consider the electronically steered phased array radars and the W71 warhead that emphasized x-rays to expand the exoatmospheric missile defense kill zone while countering Penajids and reducing radar “blackout.” And on the offensive side of the equation, Johnny pushed MIRVs and research on maneuvering reentry vehicles to counter Soviet defenses. Johnny’s contributions to helping American bombers penetrate Nazi radars in World War II gave him real insight into the offense-defense competition.

Johnny recognized that technological change and the measure/countermeasure dynamic would constantly change the balance over time. If you weren’t getting better in many different ways, you were almost certainly falling behind in some important thing that matters. Thus, many other technologies that Johnny was advancing would eventually become as vital to the offense-defense equation as the missiles and interceptors. For example, the American response to Sputnik was more than the Polaris; we went into space. Indeed, on Johnny’s watch, the Defense Department went from just transiting space to staying up there with the first KH spy satellites, the DSP early warning satellites, satellites for communications and navigation, and other special space-based sensors.

And Johnny was pushing other transformative developments for military modernization—high performance computations for simulations and modeling, precision guided munitions, the network of networks, total situational awareness, integrated deterrence. Johnny oversaw the first massive introduction of integrated circuits into military systems—a process that had begun with the Minuteman II. And remember that the ARPANET—the precursor of the Internet—began in 1969. This acceleration of digital and information technology 50 years ago was the catalyst for much of the “superconvergence” of technology we see today.

Most of the deterrence debate when Johnny was in government focused narrowly on the top of the escalatory ladder—a “bolt out of the blue” World War III with cataclysmic nuclear exchanges and massive retaliation. Given that the number of deployed warheads would expand greatly as both the United States and the Soviet Union placed multiple warheads on ballistic missiles, one had to ask how the U.S. Sprint and Spartan ABM interceptors and the Moscow ABM system would deal with thousands of independently targeted reentry vehicles.

Prominent ABM opponents demanded that any defenses be leakproof against the worst case, and many enthusiastic ABM advocates accepted that as the goal. Unfortunately, that debate over the achievability of perfect defenses crowded out a broader discussion of more optimal balances of offense and defense. Much of this debate was abstract, ideological, and partisan, but the high comparative economic cost of leakproof defenses against massive missile barrages discouraged exploitation of less than perfect defenses for other scenarios.

Let me give one personal example of how easy it is for the process to “lose the bubble.” On an Air Force Gulfstream flight from a Moscow Summit to a NATO capital, Paul Nitze, whose friendship I valued greatly, asked me how SDI would deal with the problem that building additional offensive nuclear warheads might be cheaper than the defenses against them. I had been up all night and was crashing preparing talking points, so I said somewhat abruptly, “if it isn’t cost effective, we won’t do it.” Later, Paul came back to me with his yellow legal tablet on which he had written that the policy should be that we would not deploy SDI unless it was “cost effective at the margin” in preventing the missile defense system from being overwhelmed. Paul was a bit surprised that I reacted negatively. I said that “cost effective at the margin” reflected too much the “leakproof” standard, but that in many scenarios in which missile defenses could ultimately be overwhelmed, the defenses would still be valuable. I countered with a word formulation that said: “cost effective for its missions.” Paul seemed to agree, but later in testimony Paul spoke of “cost effective at the margin,” and that was the theme that caught on. This again turned the debate back to the top of the escalatory ladder and the cost of “unobtainium” rather than exploration of more optimal balances of synergistic capabilities.

Over the years, however, technological and geostrategic changes have shifted the debate toward the broader utility and greater affordability of less than perfect missile defenses with much of that utility being demonstrated at lower levels of conflict. Again, Johnny Foster played a major role. When Johnny was at the Lab, he and his colleagues had successfully reduced the size of nuclear weapons down from tons to pounds. This, of course, shaped the ABM versus MIRV debate, but it also had great implications for theater offensive weapons and for defenses against such weapons. Johnny understood that a strong deterrent at the lower end of the escalatory ladder where wars begin was as important as at the top.

Although air and missile defenses have been overshadowed by offensive systems at the top of the nuclear escalatory ladder, such defenses have become the “go to” systems with allies in violent regions around the world. Defenses offer additional options to manage escalation. Defenses have become critical to protecting vital leadership, forces, communications, infrastructure, and urban centers. Defenses have become a key tool for shaping the battle space and altering the contexts in which conflicts occur. And defenses have become almost as important as our extended deterrent for dissuading adversaries from proliferating and for offering insecure allies alternatives to their own proliferation or escalation.

What is currently true at the lower levels of conflict is increasingly true at the higher levels and also at much lower levels. Just as it is a mistake to assume defenses must be leakproof to be valuable, it is a mistake to think that deterrence is only about the ability to punish. Deterrence is more resilient when it includes the ability to deny success, to raise the risk of escalation failure, to confirm early warning, to take away the cheap and easy options, to avoid being presented with a *fait accompli*, to unite allies, to manage more than one threat at the same time, and to shape thinking in other ways to prevent conflict. In deterrence, less than perfect defenses may be significantly undervalued assets.

Some go so far as to argue that defenses should always be given moral or policy primacy over offenses, but historically, military doctrine has always looked to the offense first, and for good reason. Some armies have gone to war with only swords. It is true that I don't know of any armies that went to war with only shields. If they did, however, I am certain that they would be beating their opponents over the head with their shields or throwing their shields at the enemy like a discus. Even in the Golden Age of Fortifications culminating in the "Star Fortress" masterpieces, the brilliant engineer Vauban himself emphasized the importance of finding the right mix of offense and defense. Fortresses were an economy of force measure to support the offense. Of course, the balance would change each time new technology such as gunpowder presented either better options to breach fortified defensive positions or better options to devastate insufficiently protected troops engaged in the offense.

Getting the mix right is even more complex today because of the maturation of technologies from Johnny's generation. Truly integrated deterrence requires a more optimal use of defenses as both offense and defenses engage today's multiple, technologically empowered threats operating in all the domains such as space, cyber, EW, land, sea, air, and information. These threats blur the distinctions between strategic and nonstrategic, between regional and global, between conventional and nuclear, and between offense and defense. This is not new, but it is far more intense.

But let me give a contemporary example of how categories overlap and boundaries blur. Right now, great emphasis is being placed on defenses against theater hypersonic systems that threaten high value assets in regional conflicts. Because some of these hypersonic systems are hybrids of high speed ballistic missiles and highly maneuverable cruise missiles, defenses against them are especially demanding. But this raises the question of whether the achievement of effective defenses against these hypersonic hybrids at the lower levels of conflict will result in defensive capabilities applicable further up the escalatory ladder that could threaten the traditional offensive tools of strategic deterrence; namely ballistic missiles and cruise missiles.

Likewise, air and missile defenses are becoming more important at even lower levels on the escalatory ladder. When Secretary Carlucci and I toured the new Soviet guided missile cruiser *Slava* in 1988, we were impressed with its massive armament of cruise missiles. It was renamed the *Moskva* to be the flagship of the Russian Black Sea Fleet. The Ukrainians sunk it with upgraded R-360 "Neptune" anti-ship cruise missiles while a Ukrainian operated Turkish Bayraktar TB2 drone in the area reportedly played some role. Ukraine later used very low cost drones to destroy a large number of Russian cruise missile armed strategic heavy bombers. The search is on for low cost defenses against low cost drones down to small unit actions and even hybrid and covert operations, some of which can have a strategic impact.

Whether we like it or not, defenses are going to be playing a greater role in deterrence at all levels of conflict. And whether we like it or not, the measure/counter-measure dynamic will alter the balance between offense and defense creating uncertainties that may favor or undermine deterrence. And whether we like it or not, the success of low cost drones against tanks and even strategic nuclear bombers reminds us that cost effectiveness for the mission

matters. And whether we like it or not, we can't afford to do everything, so trades must be made. The good news is that—thanks in so many ways to Johnny—the United States has been the world leader in the enabling technologies. The bad news is that if we don't rethink our assumptions and understand better the current dynamics of the offense-defense balance we could lose that edge—especially if we fail to follow Johnny's advice to be bold.

C. Bryan Gabbard

C. Bryan Gabbard is CEO of NeuroGen Technologies, Inc., former Chair of the Global Security External Advisory Board for Sandia National Laboratories, and former Chair of the NIF Peer Review Panel at Lawrence Livermore National Laboratory.

Preface

My personal connections and collaborations with Johnny came shortly after my graduate school in the early 1970s. I had moved from Cambridge, Massachusetts, to Santa Monica, California, to work with several individuals who were then at the Rand Corporation (including Albert and Dick Latter, Art Biehl, Bob LeLevier, Ernie Martinelli, and others from Lawrence Livermore National Laboratory) with whom Johnny had a close relationship. Johnny was becoming increasingly involved with national intelligence issues but had less time to support them than he hoped. He asked Albert and Dick to recommend “new blood” to back up and cross check numerous ongoing technical and policy deliberations, particularly those ongoing within the President's Foreign Intelligence Advisory Board (PFIAB) in which Johnny was a member. Albert and Dick pointed to me, which began a lifelong friendship and collaboration with Johnny that ran from the 1970s onward.

Introduction

Thanks are due, up front, to Keith Payne, Amy Joseph, and the whole National Institute for Public Policy (NIPP) Team for initiating and shaping this important tribute to Johnny. Johnny was truly an important part of, and indeed a leader of, the “Greatest Generation,” to steal a phrase from Tom Brokaw. In this short paper, I plan to make a few remarks, both anecdotal and substantive, to supplement the excellent comments by Miriam John, Ron Lehman, and Tom Ramos, by providing a quick peek behind the Green Door into some of Johnny's less frequently discussed activities that were key in supporting the National Foreign Intelligence Program.

Over his career, Johnny made numerous intelligence community (IC) contributions of consequence. Some were at the enterprise level, others at the organizational level, and many at the technical, detailed level. As expected, many of these contributions dealt with better understanding of the then surging changes in Soviet Strategic Systems and Soviet nuclear

weapons. A few examples of each of these activities are briefly highlighted in the sections below.

Enterprise Level Contribution Examples

In the early 1970s Johnny was invited to join the PFIAB. PIFIAB had an on-again, off-again history through the presidencies of Eisenhower, Kennedy, Ford, Carter, and Reagan. During this period there was a growing concern regarding Soviet missiles, their purpose, and their accuracy. Exacerbating these issues were the growing concerns that the “official U.S. position,” as reflected by the Central Intelligence Agency’s National Intelligence Estimates (NIEs), were biased and being heavily influenced by the equities of congressional stakeholders rather than by substantive technical analyses. The PFIAB was asked to review this matter. In quick reviews, the Board disagreed with most findings of the NIEs on this subject. Johnny was instrumental in highlighting discrepancies associated with the official reporting and weak analytic evidence associated with, for example, SS-9 guidance accuracy and Soviet MIRV capabilities.

During the next several years, Johnny, with others, led a push toward having an independent review of these matters by leading technical experts not associated with the Intelligence Community (IC). The idea was rejected by several Directors of Central Intelligence (DCIs) until George H.W. Bush agreed that such an exercise would be interesting and could be helpful. Two teams were then formed to concoct a net assessment of several IC issues, each using the same identical data sets. An A-TEAM was composed of CIA professionals, and a B-TEAM was formed by outside technical experts and led by Dick Pipes of Harvard. The comparative analysis was done and briefed to the PIFIAB. The B-Team’s results were wholly endorsed by the Board in contrast to CIA analysis results.

Institutionalizing the lessons learned from this process took several more years, but the IC products, including the NIE’s, benefitted from this work, and their impact is apparent today. Although Johnny was not part of either the A-Team or the B-Team, his diligence as a forcing function for the process reflects the unique contributions that he made to all fields that he touched.

Organizational-Level Impacts and Soviet Nuclear Matters

In addition to process reforms at the enterprise-level, Johnny made specific technical contributions of consequence supporting the missions of several IC agencies and components, particularly the Weapons Intelligence, Non-Proliferation, and Arms Control Center (WINPAC), the Special Weapon Effects Group (SWEG), and the National Reconnaissance Office (NRO). Not surprisingly, many of these were related to emerging nuclear matters within the Soviet Union.

The organization within the CIA charged with evaluating and characterizing the status of Soviet nuclear weapons was WINPAC. As a member of the WINPAC Advisory Board, Johnny’s pointed questions and depth of nuclear design understanding led to improved collection

tasking and better asset utilization and indeed, better analysis and net technical assessments.

These interchanges led to an improved U.S. understanding of Soviet nuclear testing protocols and instrumentation signatures in field experiments and stimulated deeper insights into the range of fielded weapons as well as possible research devices evaluating nuclear weapon designs. This included advanced, Nth generation Soviet weapons, the so-called “neutron bombs,” sub-nano second gamma rise times and testing puzzles from Novaya Zemlya campaigns.

Johnny is well recognized for his capabilities in nuclear weapon designs and testing, but Johnny also played an important role in advancing U.S. understanding of nuclear weapon effects through the analysis of Soviet nuclear tests, particularly high-altitude nuclear tests. Johnny’s involvement in assessing the advancement of Soviet missile capabilities was nearly continuous in substantive ways throughout the 70’s and 80’s, as has been mentioned through PIFIAB and other IC venues. A natural correlate of these Soviet missile developments at the time were Soviet ABM activities and attendant capabilities growth.

Johnny’s involvement in culturing a better understanding of Soviet ABM activities sparked a series of initiatives that, somewhat unexpectedly, led to marked improvements in U.S. understanding of nuclear weapon effects, particularly the effect from high altitude nuclear detonations, as well as the Soviet ABM Program itself. Again, leveraging his links to both the Defense and Intelligence enterprises, Johnny pushed for an all-source IC/DDR&E/DTRA-sponsored look by U.S. technical experts at the Soviet High-Altitude Nuclear Test series of 1961 and 1962. The resulting SWEG was constituted in the 1960s-1970s and several technical issues spawned by SWEG continue as research areas today.

“Shouldn’t you consider the question of creating ABM equipment?” This question, posed by seven Marshals of the Soviet Union to the CPSU Central Committee in August 1953, set into motion a research and development program that led the Soviets to abrogate the limited test ban treaty with high altitude nuclear explosions (HANE) in October 1961. It even motivated commencement of the construction and deployment of a Moscow ABM system well before the results of the HANE tests were completed and fully analyzed.

During the negotiations in Geneva in 1961 on a comprehensive nuclear weapon test ban, the Soviet Union abruptly abrogated the then existent atmospheric test ban and exploded two low yield nuclear explosions, ~1-2 KT, on 21 and 27 October 1961 at altitudes of 150 km and 300 km, respectively. These were followed the next year by what the United States believed to be megaton range bursts on 22, 28 October and 1 November 1962 at altitudes of 300 km, 150 km and 50 km, respectively.

These tests involved three IRBM missiles, designated by the United States as SS-4s, launched from Kapustin Yar toward the impact area of the ABM test range created on the shores of Lake Balkash near the village of Sary Shagan in south central Asia. The lead SS-4 carried the live nuclear warhead followed by an instrumented SS-4 spaced at one or two minutes behind the first SS-4, the last SS-4 followed about ten minutes behind the first. In all five events of 1961-62, a vertical probe at an altitude of 500 km above the burst point conducted geophysical measurements.

Multiple diagnostic measurements were made including trajectories, seismic signals, very-low frequency (VLF) electromagnetic pulse (EMP) field measurements, trapped electron belt populations, and high frequency (HF) link performance and acoustics signals. The data collected by the IC provided a basis for tasking the SWEG to assess the altitudes and yields of the Soviet events of 1962. The five events of 1961-62 are referred to as "Operation Khariton" in the Russian literature in honor of Academician Yu B. Khariton, the father of the Soviet atomic bomb. Through trajectory information and the EMP timing, SWEG deduced fairly accurately the altitudes of all five events. The three events of 1962 each created artificial Van Allen belts of trapped fission decay electrons or beta rays within the earth's magnetosphere.

The SWEG estimates of the yield of the K5 shot at 60 km came from the acoustic gravity wave (AGW) amplitude measurements, which placed the yield in the megaton range. It was conjectured at the time that the purpose of the shots was to test their ABM systems in an operational environment, and that the yield of K3 and K4 was the same as that of K5, that is, in the megaton range. SWEG was correct about the purpose of the events, testing their ABM system which was already under construction around Moscow. However, the SWEG was wrong about the inferred yields of the tests of 1962.

The Soviets subsequently stated that the total yield of each of their high-altitude shots was less than one megaton. The instrumentation capsule was deployed from the lead IRBM, the missile carrying the nuclear warhead. This capsule was deployed at a range of a few hundred meters from the burst point. At this distance, a modern warhead in the megaton yield range would deposit x-ray fluences in the tens of thousands of calories per square centimeter on the surface of the capsule. This would crush the structure. In fact, the actual capsule was in free fall and was recovered on the desert floor after the detonation and taken relatively intact to Soviet laboratories for analysis. There was no mention at all of x-rays in any of the resulting analyses of the instrumentation in the capsule. The recovery of the uncrushed capsule was quite consistent with the 300 KT yield disclosed by the Russians some years later and, importantly, consistent with a *massive fragmentation warhead, with a low, cold x-ray emission*.

Johnny's nurturing of these analyses led to a marked improvement in U.S. understanding of high-altitude nuclear weapon effects that was complementary to the knowledge base developed from events such as the U.S. Hardtack and Fishbowl series of high-altitude tests in the Pacific.

The three Soviet HANE events of 1962 created artificial radiation belts of fission electrons injected into the earth's magnetic field. This is important because these electrons can seriously degrade satellite lifetimes due to accumulated electron doses in the spacecraft electronics on passage through the belts. The U.S. predictor techniques are largely empirical and are based on the ARGUS shots of 1958, and the STARFISH shot of Operation Fishbowl (1.4 MT at 400 km burst altitude). The electron injection efficiency predictions changed dramatically given the Soviet detonations were near 300 KT instead of the megaton range. The Soviet shots also took place at northern magnetic field latitudes whereas STARFISH took place in the Pacific under the magnetic equator. The electron injection efficiency was shown

to increase significantly in terms of electrons injected per KT in northern latitudes, which is central to current satellite vulnerability calculations in wartime.

Subsequently, in the 1980s, Russian scientists reported at international conferences that extensive damage occurred to the terrestrial power/communications grid in the vicinity of the test site at Sary Shagan during the 1962 tests. The responsible mechanism is the magnetic hydrodynamic (MHD) wave generated by the downward moving debris from the high-altitude event. Ongoing research continues to understand how mid-range yield nuclear detonations (hundreds of kilotons rather than megatons) can be highly effective at causing MHD damage to power grids and long-line communications.

With the current world-wide proliferation of nuclear warheads and missile technology, these technical issues are of major importance to, respectively, threats to satellites from low yield high-altitude events at northern magnetic latitudes, command and control continuity of terrestrial power/communication grids and the detection and interpretation of possible future high-altitude events by third world countries, based on acoustic gravity wave (AGW) phenomena.

These analyses led to a better understanding of offense-defense trade spaces in adversary weapon designs and engagement protocols, particularly fragmentation warhead designs. For example, a 300 KT kinetic energy warhead weighing ~2,500 lbs. with 500 lbs. of instrumentation would involve nearly 2,000 lbs. of fragmentation metal, i.e., a yield to weight ratio of 0.15 KT/lb.

Johnny's initiatives like SWEG helped to shape our understanding of the nuclear weapon *effects* field, as he has done so often in the nuclear *design* field.

Broader IC Impacts—A National Reconnaissance Office (NRO) Example

Intermittently, Johnny was a key advisor to the NRO, during a period when new technologies were being rapidly integrated into space and ground segments. This period also saw burgeoning digital technologies and network advances within the civilian sector, particularly among hobbyists interested in spaceflight. The union of these components led to selected security concerns which were raised by Johnny and others regarding the ease with which low altitude reconnaissance could be viewed with the naked eye and reveal sensitive orbital data. Since the national space reconnaissance program was then a covert operation, Johnny raised a growing concern that some of our national assets were becoming too visible, based upon sun glints during certain operational periods. This was exacerbated with technological developments that enabled global hobbyist networks (including many foreign participants) to track satellites and share ephemeris data.

Johnny was asked by the NRO Director to verify the ease with which data could be collected and used. This led to regular "Walks in the Park" by Johnny and his colleagues. These activities began to garner a growing following of curious on-lookers trying to understand what observations were being made. At this point, Johnny began giving full seminars on the U.S. Space Shuttle program, its importance, contractors, and operational capabilities. These seminars created a following and provided an effective smokescreen

obscuring the fact that the satellites of interest here had nothing to do with the space shuttle but were, in fact, highly classified low altitude imaging satellites.

Johnny's abilities to protect important, sensitive national issues with publicly acceptable overlays, was without peer. He was always a driving force in pushing the need for good science and engineering in addressing critical defense-intelligence challenges. Interestingly, even many of Johnny's "hobbies" (that Tom Ramos has mentioned) became DARPA and other programs within the military services. A good example here was his enjoyment of model airplanes and helicopters and how this interest helped shape several drone programs.

Closing Remarks

It is interesting to note in closing that Johnny always maintained a level of discomfort with broad national security matters and how technologies might help move U.S. policies forward responsibly to address challenges posed by shifts in geopolitical threats. In decades of discussions with Johnny, from the 1970s to his 100th birthday, Johnny would regularly say, "*We still do not have national security right.*" He continued to be concerned that our capabilities to "blow-up" things (people, facilities, cities, etc.) obscured our lack of ability to address real challenges to U.S. principles. He expressed concerns about how falsely we can change "isms....to ists" and believe that we have changed hearts, minds, and ideologies. It is easy to replace terrorism with terrorists, or communism with communists, because we are good at destroying the "ists." We are less good at changing the "isms," and the "isms" may be the real challenges to U.S. national security.

Johnny was the Eru Ilúvatar in a *Lord of the Rings* saga involving the nuclear labs and the national nuclear enterprise, from the Trinity to NIF. He will be missed.

Thomas Scheber

Thomas Scheber is former Vice President of the National Institute for Public Policy, Director of Strike Policy, OSD, and Director of the Military Applications Group at the Los Alamos National Laboratory.

When I joined Los Alamos National Laboratory in the late 1980s, I was unfamiliar with the name Johnny Foster. That lack of knowledge was not to last for long.

As the late industrial phase of the nuclear weapons complex gave way to shutdown, reconfiguration, and organizational confusion, Congress directed the formation of a panel of experts to recommend next steps for the nuclear weapons stockpile and nuclear complex. The Defense Authorization Act of 1999 commissioned a panel to Assess the Reliability, Safety, and Security of the United States Nuclear Stockpile. That panel was led by Dr. Johnny Foster.

My first exposure to the work of Johnny Foster was from reading the progress reports from the Foster Panel. The interim reports from the panel included recommendations that

seemed to bring order out of the confusion at the time regarding the future direction of the stockpile and nuclear infrastructure.

When I changed job locations and began working in OSD Policy, I came across the name Johnny Foster over and over again. I read a terrific summary of steps to maintain the security of the U.S. fleet of ballistic missile submarines. The program to study technical issues related to submarine detection was initiated by Johnny Foster. At that time, Dr. Foster was the Director of Defense Research and Engineering. A short time later, I came across a report on lessons learned after resuming nuclear testing following a short test moratorium. The name at the bottom of the report was again familiar, Johnny Foster. He designed products as diverse as a new kind of wet suit for diving and miniaturized nuclear weapons. Over and over, one name seemed to be associated with innovative technical issues regarding national security. I had still never met Dr. Foster but, in my mind, he had become an intellectual giant regarding science and technology for defense-related matters.

I finally got to meet Johnny about 2008 when I was working with Keith Payne at National Institute for Public Policy. Johnny would stop by to see Keith when he was in the D.C. area and would sometimes discuss nuclear policy issues or ideas for an upcoming talk that Johnny was working on. Keith knew of my background at Los Alamos and suggested to Johnny that I take a look at a couple of issues in a draft talk that Johnny was preparing. The first time that Johnny stopped by my office and asked me to take a look at his draft remarks for an upcoming talk, my first thought was, “who am I to review and comment on a draft by Johnny Foster.”

I soon learned what Dr. Foster was like as a real person—not the legend in my mind. He was humble, personable, and a true gentleman. Since Johnny was twenty some years my senior, I always treated him with deference and called him “Dr. Foster” when greeting him. Not one to stand on formality, he would then say something like, “Please, just call me Johnny.”

On complex issues, he sought the views of a variety of people and often found value in the ideas of others. During those “review” sessions we developed a professional friendship that involved many memorable discussions. Our conversations would devolve from specific topics to include a wide range of issues. He never dwelt on his past successes. The few times that I mentioned his notable accomplishments, such as initiating the SSBN Security Program, he would think for a minute and usually say something modest, such as, “Oh yes, I remember a few things about that.”

Those are my fondest memories of Johnny Foster—sitting in my office and talking about the state of affairs at the national laboratories and the world and what could be done to improve each. During my life, I have encountered only a few people who possess both the technical brilliance and the engaging personality that was exemplified by Dr. Johnny Foster!



LITERATURE REVIEW

Paul Robinson, *Russia's World Order: How Civilizationism Explains the Conflict with the West*, Cornell University Press, 2025, 168 pp.

When it comes to foreign adversaries, American leaders have a tendency to focus on what unites us rather than what divides us. In a New Year's Eve broadcast to the people of the Soviet Union in 1986, President Ronald Reagan stated that Americans and Soviets "share our common hopes for the future, our hopes for peace on Earth, our hopes for good will among all humanity, our hopes for a better world for ourselves and our children."¹ President George H.W. Bush called for "a new world order, where diverse nations are drawn together in common cause to achieve the universal aspirations of mankind—peace and security, freedom, and the rule of law."² Addressing the Russian people, President Bill Clinton stated that the United States wanted "to join with others to meet common goals; to give its people their chance to live their dreams," noting that "on many issues that matter to our people, our interests coincide." He stated, "increasingly we find that the fundamental threat to our security is not the threat that we pose to each other, but instead, threats we face in common."³ President George W. Bush declared that Russia and the United States "have common interests" and that he and Vladimir Putin "share a lot of values."⁴ President Barack Obama said, "I believe that on the fundamental issues that will shape this century, Americans and Russians share common interests that form a basis for cooperation.... and I believe that you will see that we share common ground."⁵

The emphasis on seeking common ground, while acknowledging differences, reflects a quintessential Western view that problems are not insoluble, and that good faith attempts to seek out areas of common interest will lead to mutually beneficial solutions. This includes the desire for greater understanding that will lead to better political relations, arms control agreements, and cooperative security arrangements. U.S. leaders have also believed that over time, autocratic governments will inevitably confront popular desires for greater liberalization and reform, resulting in a convergence with the West that narrows ideological differences and results in a lessened risk of conflict. This convergence, it was thought, would

¹ Ronald Reagan, "New Year's Radio Address to the People of the Soviet Union," December 31, 1986, available at <https://www.reaganlibrary.gov/archives/speech/new-years-radio-address-people-soviet-union#:~:text=That%27s%20what%20I%20would%20like,for%20ourselves%20and%20our%20children.>

² George H.W. Bush, "Address Before a Joint Session of the Congress on the State of the Union," January 29, 1991, available at <https://bush41library.tamu.edu/archives/public-papers/2656>.

³ William Jefferson Clinton, "Address to the Russian Duma," June 5, 2000, available at <https://www.americanrhetoric.com/speeches/wjclintonrussianduma.htm>.

⁴ The White House, "Press Conference by President Bush and Russian Federation President Putin," June 16, 2001, available at <https://georgewbush-whitehouse.archives.gov/news/releases/2001/06/20010618.html#:~:text=PRESIDENT%20BUSH:%20Good%20afternoon.,world%20that%20we%20do%20so.>

⁵ The White House, "Remarks By The President At The New Economic School Graduation," July 7, 2009, available at <https://obamawhitehouse.archives.gov/the-press-office/remarks-president-new-economic-school-graduation>.



lead to a global liberalism that was famously described as “the end of history.”⁶ Indeed, for decades, supposed “experts” have argued that China’s movement toward a more market-based economy would undermine the ideological dogma of the ruling Communist Party and lead to a convergence of views and behaviors between China and the West. That prediction has proven woefully wrong.

Paul Robinson’s book, *Russia’s World Order: How Civilizationism Explains the Conflict with the West*, explains why this thinking is naïve and unlikely to result in the kind of shared beliefs that will lead to greater cooperation between the United States and Russia. In short, Robinson argues that Russia’s views of “civilization” differ markedly from those of the United States, and this difference accounts for the improbability of achieving agreements that are mutually beneficial. Moreover, official Russian narratives emphasize the view that competing “civilizations” should be allowed to chart their own course, separate and distinct from Western approaches and influences. In this context, the notion of “Westernization” is to be resisted. A contemporary Russian foreign policy analyst is quoted as saying, “A new era has dawned.... The realignment of forces on the world stage is taking its course, with China and Russia, whether they like it or not, on one side and the United States and its allies on the other.”

Robinson dissects Vladimir Putin’s speeches and his repeated use of the term “civilizations” to explain Moscow’s insistence that Russia’s development path be accepted uncritically by the West. According to Robinson, “Civilizationism is more than a philosophy. It is also a powerful political tool. Russia’s leaders are using it to resist what they see as the West’s efforts to export its values and institutions to the rest of the world and to smother worldwide civilizational diversity under a bland homogeneity of universal Westernism.”

The book reviews Russian history and how civilizational theory has permeated Russian thinking over many centuries, arguing that its contemporary manifestation “places more emphasis on the differences between Russia and the West” rather than their similarities. Within this strain of thought, Western concepts of universal values and an international world order structured under universally accepted morals and norms are dismissed as examples of Western hegemony to be strenuously opposed. The traditional American emphasis on freedom and democracy as goals to be achieved throughout the international system is seen as a direct challenge to the notion of civilizationism. Consequently, Russia sees itself in a “battle against attempts by the West to preserve a unipolar world order in which it has hegemonic power.”

The book is well documented, sourcing numerous Russian thinkers, philosophers, and strategists from pre-Soviet days to the present. Robinson argues that Vladimir Putin has adopted Russian civilizational theory, noting his comment at the turn of the century that “Moscow will strive to create a multipolar world.” Years later, Putin decried the notion of a unipolar world led by the United States, declaring that “one center of power, one center of strength... has nothing in common with democracy.” And as another Russian official

⁶ Francis Fukuyaka, “The End of History?,” *The National Interest*, No. 16, Summer 1989, pp. 3-18, available at <https://pages.ucsd.edu/~bslantchev/courses/pdf/Fukuyama%20-%20End%20of%20History.pdf>.

commented, “before our eyes, the West is losing its five-hundred year old dominance.... The rules of the game are changing.”

The implications of this little understood distinction between the Russian and American notions are far reaching and touch on every aspect of U.S.-Russian relations, including the bilateral security relationship. Indeed, Russian civilizational theory helps explain why the prospects for meaningful arms control agreements that serve American security interests are improbable if not impossible.

This is, in essence, the difficulty faced by the West as it confronts a Russia determined to overturn the existing world order. Robinson concludes that Putin believes “the move toward a multipolar, multicivilizational world is unstoppable.” Clearly, the United States must factor this into any policy considerations regarding how best to deter Russia. The stakes could not be greater.

Winston Churchill once described Russia as “a riddle wrapped in a mystery inside an enigma.”⁷ For those who wish to understand Russia and the factors that influence its mistrust and suspicion of the West, Robinson’s book peels back that wrapping to expose the sinews of a people and philosophy that make mutual cooperation on weighty national security issues impractical if not impossible. It offers useful lessons for U.S. policy makers—lessons that hopefully will be heeded.

*Reviewed by David J. Trachtenberg
National Institute for Public Policy*

Matthew Fuhrmann *Influence Without Arms: The New Logic of Nuclear Deterrence* (Cambridge, UK: Cambridge University Press, 2024), 366 pp.

In *Influence Without Arms: The New Logic of Nuclear Deterrence*, Matthew Fuhrmann asks an important if academically somewhat overlooked question: can countries derive influence from a latent nuclear program? In other words, can states derive benefits from mastering technologies that would help them build a nuclear weapon without actually building it?

Fuhrmann finds that U.S. allies and adversaries can leverage latent nuclear programs to advance their national interests. For example, U.S. allies can pursue latent nuclear programs and threaten to develop nuclear weapons to induce more accommodating policies on the part of the United States (e.g. more U.S. troops on their territory in the case of allies). Spain used this tactic during the Cold War, South Korea and Poland appear to be using it today. Fuhrmann calls this “deterrence by proliferation.” Countries can also leverage latent deterrence by threatening a delayed retaliatory strike if an opponent attacks them first. This

⁷ David Owen, *Riddle, Mystery, and Enigma: Two Hundred Years of British-Russian Relations* (London, UK: Haus Publishing, 2021), reviewed by W. Mark Hamilton, “The Enigma of Russia,” Bulletin #166, International Churchill Society, April 3, 2022, available at <https://winstonchurchill.org/publications/churchill-bulletin/bulletin-166-apr-2022/the-enigma-of-russia/>.

is a situation in which a country develops all the necessary technologies short of putting together a nuclear device, but then plans on assembling and using one or more nuclear bombs in retaliation for an invasion or other serious military attack. When a country is extremely close to building a nuclear weapon, uncertainty about whether it actually possesses a nuclear weapon may deter other countries from attacking it, what Fuhrmann calls “deterrence by doubt.” Fuhrmann considers U.S. deliberations regarding attacking North Korea’s nuclear program in the 1990s an example of this dynamic.

Herein lies a conceptual difficulty—if the existence of a nuclear weapon deters another country from pursuing a course of action it would otherwise take, then the program should no longer be considered latent. How much do leaders know about another country’s nuclear program and how long have they known it before they make that information public? Archival work in the future will be required to answer the question, because public disclosures regarding a nuclear program sometimes come after the program was detected by another country’s intelligence services and therefore the program’s influence on policymakers can predate the publicizing of the existence of another country’s program.

The book distinguishes between restrained and unrestrained nuclear programs; an important factor regarding whether a country reaps the benefits of latent deterrence. A country pursuing a restrained nuclear program likely does not have dedicated research to produce a nuclear weapon, but may be pursuing technologies for a civilian nuclear program. According to the author, such a country will appear less threatening to others and less likely to cause them to adopt countermeasures. This is the “sweet spot” for a country in terms of obtaining benefits like greater foreign policy alignment with rivals, fewer crises, more U.S. troop deployments to allies, and a lower risk of nuclear armament by adversaries. An unrestrained program, the book argues, leads to less reliable deterrence of crises and conflict, increases the risk of preventive military attacks, and arms racing.

Fuhrmann uses qualitative and quantitative analysis to examine these important and intellectually interesting questions. The methodological part is competently executed, although the quantitative analysis strips the cases of the important characteristics necessary for understanding countries’ motives and goals when pursuing nuclear technologies. The case studies, including Argentina, Brazil, and Iraq, mitigate this shortcoming to some degree, and Fuhrmann’s book is a good advancement of the discussion so far.

*Reviewed by Michaela Dodge
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DOCUMENTATION

This issue's Documentation section features Prime Minister Benjamin Netanyahu's statement announcing the commencement of Operation Rising Lion. The operation was designed to reduce the Iranian threat to Israel's security. The Documentation section also provides the Introduction and Overview sections of the UK Ministry of Defence's Strategic Defence Review. The Review discusses changes to strategic environment and the best pathway for the UK defence forces to adapt to them. Lastly, the Documentation section provides excerpts from Section 20008 of a January 3, 2025, Act of Congress that provides for the enhancement of resources for nuclear forces, a commendable and overdue step in bolstering U.S. nuclear defense capabilities.

Document No. 1. Benjamin Netanyahu, "Statement by PM Netanyahu," June 13, 2025.¹

Moments ago Israel launched Operation Rising Lion, a targeted military operation to roll back the Iranian threat to Israel's very survival. This operation will continue for as many days as it takes to remove this threat. For decades the tyrants of Tehran have brazenly, openly called for Israel's destruction. They've backed up their genocidal rhetoric with a program to develop nuclear weapons. In recent years Iran has produced enough highly enriched uranium for nine atom bombs, nine.

In recent months Iran has taken steps that it has never taken before, steps to weaponize this enriched uranium. And if not stopped, Iran could produce a nuclear weapon in a very short time. It could be a year, it could be within a few months, less than a year.

This is a clear and present danger to Israel's very survival. 80 years ago the Jewish people were the victims of a holocaust perpetrated by the Nazi regime. Today the Jewish state refuses to be a victim of a nuclear holocaust perpetrated by the Iranian regime.

Now as prime minister I've made it clear time and again Israel will never allow those who call for our annihilation to develop the means to achieve that goal. Tonight Israel backs those words with action. We struck at the heart of Iran's nuclear enrichment program. We struck at the heart of Iran's nuclear weaponization program. We targeted Iran's main enrichment facility in Natanz. We targeted Iran's leading nuclear scientists working on the Iranian bomb. We also struck at the heart of Iran's ballistic missile program. Last year Iran fired 300 ballistic missiles at Israel. Each of these missiles carries a ton of explosives and threatens the lives of hundreds of people. Soon those missiles could carry a nuclear payload, threatening the lives not of hundreds, but of millions.

Iran is gearing up to produce 10,000s of those ballistic missiles within 3 years. Now just imagine, imagine 10,000 tons of TNT landing on a country the size of New Jersey. This is an intolerable threat, it too must be stopped. Iran is now working on what it calls the new plan to destroy Israel. You see the old plan failed. Iran and its proxies tried to encircle Israel with a ring of fire and to attack us with the horrible attack of October 7th. But the people of Israel, the soldiers of Israel, rose like lions to defend our country.

¹. Benjamin Netanyahu, "Statement by PM Netanyahu," *YouTube*, June 12, 2025, available at <https://youtu.be/Vsj5pw4QPls?si=SEwoq88YpmqMRxY2>.



We crushed Hamas, we devastated Hezbollah. We hit Iranian proxies in Syria and Yemen and when Iran directly attacked us twice last year we struck back inside Iran itself. Yet in defending ourselves we also defend others. We defend our Arab neighbors. They too have suffered from Iran's campaign of chaos and carnage. Our actions against Iran's proxy Hezbollah led to the establishment of a new government in Lebanon and the collapse of Assad's murderous regime in Syria. The peoples of those two countries now have a chance for a different future, a better future. So too do the brave people of Iran.

And I have a message for them. Our fight is not with you, our fight is with the brutal dictatorship that has oppressed you for 46 years. I believe that the day of your liberation is near and when that happens the great friendship between our two ancient peoples will flourish once again.

I want to assure the civilized world we will not let the world's most dangerous regime get the world's most dangerous weapons. And Iran plans to give those weapons, nuclear weapons, to its terrorist proxies. That would make the nightmare of nuclear terrorism all too real. The increasing range of Iran's ballistic missiles would bring that nuclear nightmare to the cities of Europe and eventually to America. Remember Iran calls Israel the small Satan, it calls America the great Satan. And this is why for decades it's led millions in the chants of "death to Israel" and "death to America."

Today Israel is responding to those genocidal calls with action and with a call of our own. "Long live Israel" and "long live America." Our action will help make the world a much safer place. I want to thank President Trump for his leadership in confronting Iran's nuclear weapons program. He has made clear time and again that Iran cannot have a nuclear enrichment program. Today it is clear that Iran is just buying for time. It refuses to agree to this basic requirement of peaceful nations. That is why we have no choice but to act and act now.

The hardest decision any leader has to make is to thwart a danger before it is fully materialized. Nearly a century ago facing the Nazis a generation of leaders failed to act in time. They were paralyzed by the horrors of World War I. They were determined to avoid war at all cost and they got the worst war ever. They adopted a policy of appeasement, they closed their eyes and ears to all the warning signs.

That failure to act resulted in World War II, the deadliest war in history. It claimed the lives of 60 million including 6 million Jews, a third of my people. After that war the Jewish people and the Jewish state vowed "Never again." Well "never again" is now. Today Israel has shown that we have learned the lessons of history when enemies vow to destroy you, believe them. When enemies build weapons of mass death, stop them. As the Bible teaches us, when someone comes to kill you, rise and act first. This is exactly what Israel has done today; we have risen like lions to defend ourselves.

Over 3,000 years ago, Moses gave the people of Israel a message that has stealed their resolve ever since: be strong and courageous, he said. Today our strong and courageous soldiers and people stand together to defend ourselves against those who seek our destruction. And by defending ourselves, we defend many others. And we roll back a murderous tyranny. Generations from now history will record that our generation stood its

ground, acted in time, and secured our common future. May God bless Israel. May God bless the forces of civilization everywhere. Thank you.

Document No. 2. Ministry of Defence of the United Kingdom, *Strategic Defence Review, 2025, (Introduction and Overview)*²

1. **A generational challenge demands a generational response.** For the first time since the end of the Cold War, the UK faces multiple, direct threats to its security, prosperity, and democratic values. The world itself is beset by volatility and deep uncertainty.

2. In response, the UK, with its allies—especially those in NATO—must once again be ready to deal with the most demanding of circumstances: **deterring and preventing a full-scale war by being ready to fight and win.** Until recently, such a war against another country with advanced military forces was unthinkable. It would likely be high-intensity, protracted, and costly in every way. Moving to warfighting readiness in this new era is essential.

3. With rapid advances in technology driving the greatest change in how war is fought for more than a century, **the UK must pivot to a new way of war.** It must continually harness new technology and think differently about what conventional ‘military power’ is and how to generate it. In modern warfare, simple metrics such as the number of people and platforms deployed are outdated and inadequate. It is through dynamic networks of crewed, uncrewed, and autonomous assets and data flows that lethality³ and military effect are now created, with military systems making decisions at machine-speed and acting flexibly across domains.

4. **The UK’s Armed Forces must once again be able to endure in long campaigns** through assured access to key capabilities—all underwritten by a thriving industry that is ready to scale and sustain innovation and production as required.

5. And in a decisive shift from the post-Cold War era, **a renewed emphasis on home defence and resilience is also imperative,** with ‘sub-threshold’ activities,⁴ growing access to space

² The full report is available at:

https://assets.publishing.service.gov.uk/media/683d89f181deb72cce2680a5/The_Strategic_Defence_Review_2025_-_Making_Britain_Safer_-_secure_at_home_strong_abroad.pdf.

³ Where ‘lethality’ refers to the combat power (disruptive and destructive force) of the Armed Forces.

⁴ Sub-threshold’ attacks do not always meet the legal threshold of ‘war’. They include the use of espionage, political interference, sabotage, assassination and poisoning, electoral interference, disinformation, propaganda, and Intellectual Property theft. Such attacks are often difficult to attribute to a perpetrator with certainty due to the methods used and the frequent reliance of some states on proxy actors. In this Review, we use the term ‘sub-threshold’ attack. Others may refer to ‘grey-zone attacks’ because such acts lie in the ‘grey zone’ between ‘peace’ and ‘war’, challenging the clarity of the legal distinction between the two. The term ‘hybrid warfare’ is often used interchangeably with these terms but we take this to

and cyberspace, and unrelenting advances in weapons systems all making it easier for adversaries to cause the UK harm, even at distance.

6. Where previous reviews have more narrowly addressed the Armed Forces, this Strategic Defence Review (SDR) delivers the **'root-and-branch' review of UK Defence** that was commissioned by the Prime Minister in July 2024 in response to this rapidly changing world. It outlines the deep reform needed **'to ensure the United Kingdom is both secure at home and strong abroad—now and for the years to come'**.⁵

7. Overseen by the Secretary of State for Defence, the SDR was unprecedented in being led by external Reviewers: Lord (George) Robertson; General Sir Richard Barrons; and Dr Fiona Hill. It has been conducted within the Terms of Reference set by the Government and latterly costed within an increased defence budget of 2.5% of GDP from April 2027 and 3% in the 2030s, subject to economic and fiscal conditions.⁶ The Review process, including its extensive engagement with internal and external expertise, is set out in the Appendix.

8. In this report, we set out:

- **Why UK Defence needs to change**, considering the international and security context in the period to 2040 and the current state of Defence (Chapter 2).⁷
- **What roles Defence should perform and where** in the coming years (Chapter 3).
- **How the Armed Forces should fight and how wider Defence should support that fight**, with the transformation of UK warfighting delivered by an empowered and adaptive workforce (Chapter 4).
- **Who Defence should fight alongside**: the centrality of allies and partners with which the UK can build industrial power and common capabilities, and ultimately fight and win (Chapter 5); and the importance of a renewed connection with UK society to ensure resilience and strategic depth in the event of crisis or conflict (Chapter 6).
- **The capabilities with which the Integrated Force should fight** (Chapter 7), addressing the front-line elements and foundational enabling capabilities of UK

have a more specific meaning, whereby 'kinetic' military action is used simultaneously with sub-threshold attacks to pursue a state's objectives.

⁵ Strategic Defence Review 2024-2025: Terms of reference - GOV.UK, 17 July 2024.

⁶ Strategic Defence Review 2024-2025: Terms of reference - GOV.UK, 17 July 2024; Prime Minister's Oral Statement to the House of Commons: 25 February 2025. The Prime Minister also announced the intention to recognise the contribution of the UK Intelligence Community (UKIC) to the defence of the UK, with Defence and UKIC together spending 2.6% of GDP on defence by 2027.

⁷ This Review has considered the strategic context in the period to 2040. However, the MOD's programming works on ten-year cycles. This is reflected in this report, which articulates a vision for Defence and a path to transformation by 2035.

Defence—creating a force fit for war in the 21st century through the new ten-year Defence Investment Plan.⁸

A new era of threat

9. **This is an important moment for the UK and its allies** (Chapter 2). Russia’s full-scale invasion of Ukraine in 2022 was a strategic inflection point. It irrefutably demonstrated the changing and dynamic nature of the threat, with state-on-state war returning to Europe, adversaries using nuclear rhetoric in an attempt to constrain decision-making, and the UK and its allies under daily attack beneath the threshold of war as part of intensifying international competition. The conflict has also shown the power of emerging technology to change where, how, and with what war is fought. Armed Forces that do not change at the same pace as technology quickly risk becoming obsolete.

10. Importantly, Ukraine is just one flashpoint of many amid growing global instability and a **volatility that is exemplified by the remarkable rate of change in the international landscape** since this Review was launched in 2024. Most immediately relevant at the time of writing, this includes: negotiations for a ceasefire in the Ukraine-Russia war; the possible deployment of a ‘reassurance force’ to Ukraine in the event of a ceasefire; and major questions about the future of European security that inevitably follow the United States’ change in security priorities, as its focus turns to the Indo-Pacific and the protection of its homeland.⁹ Fundamentally, the UK’s longstanding assumptions about global power balances and structures are no longer certain.

11. UK Armed Forces have begun the necessary process of change in response to this new reality. But progress has not been fast or radical enough. **The Armed Forces remain shaped by the risks and demands of the post-Cold War era**—optimised for conflicts primarily fought against non-state actors on Europe’s periphery and beyond. Although substantial and demanding, these operations also did not require ‘whole-of-society’ preparations for war, home defence, resilience, and industrial mobilisation.

A new era for UK Defence

12. In response to this strategic context, our Review articulates a new era for Defence. Building on changes already underway, **our vision is that, by 2035, UK Defence will be:**

A leading tech-enabled defence power, with an Integrated Force that deters, fights, and wins through constant innovation at wartime pace.

⁸ Which will replace the Equipment Plan.

⁹ Opening Remarks by Secretary of Defense Pete Hegseth at Ukraine Defense Contact Group, Brussels, Belgium, 12 February 2025.

Defence must be able to fulfil its fundamental role: to deter threats to the UK and its allies by being ready for war, and to provide the definitive insurance policy should deterrence fail. This should be pursued as part of a whole-of-society approach to deterrence and defence under which Defence combines its strengths with those of wider Government, industry, and society.

Roles for UK Defence

13. The starting point for this Review is the Government's 'NATO First' policy (Chapter 3). There is an unequivocal need for the UK to redouble its efforts within the Alliance and to **step up its contribution to Euro-Atlantic security** more broadly—particularly as Russian aggression across Europe grows and as the United States of America adapts its regional priorities. In a shift in approach, the Alliance should be mainstreamed in how Defence plans, thinks, and acts.

14. **'NATO First' does not mean 'NATO only'**. The UK should take a pragmatic approach to bolstering collective security in the Euro-Atlantic through stronger bilateral and minilateral partnerships.¹⁰ The Alliance itself recognises the importance of working with partners outside the region—reflecting the connection between Euro-Atlantic security and that of other regions such as the Middle East and Indo-Pacific. Defence must also be able to pursue and protect the UK's significant interests, commitments, and responsibilities outside the region, including the defence of its sovereign territory.

15. Nevertheless, the fundamental importance of meeting Alliance commitments and shaping deterrence in the Euro-Atlantic every day is reflected in **the enduring and mutually reinforcing roles that Defence must fulfil**. The three core Defence roles are:

- **Role 1:** Defend, protect, and enhance the resilience of the UK, its Overseas Territories, and Crown Dependencies.
- **Role 2:** Deter and defend in the Euro-Atlantic.
- **Role 3:** Shape the global security environment.
- The two enabling roles for Defence are to:
 - Develop a thriving, resilient defence innovation and industrial base.
 - Contribute to national cohesion and preparedness.

Transforming UK warfighting

16. To meet the threats of today and tomorrow, **Defence must fundamentally change how it fights and how it supports that fight**: rapidly increasing the Armed Forces' lethality and enhancing their ability to fight at the leading edge of technology (Chapter 4). Drawing on lessons from the war in Ukraine and enabled by organisational change under Defence

¹⁰ 'Minilateral' refers to smaller groupings of countries.

Reform, the whole of Defence (the Armed Forces and Department of State together) should be driven by **the logic of the innovation cycle**— able to find, buy, and use innovation, pulling it through from ideas to front line at speed.

17. At the heart of this transformation are three fundamental changes in approach. Defence must be:

Integrated by design. For the Armed Forces to be more lethal than the sum of their parts, they **must complete the journey from ‘joint’ to ‘integrated’**: designed and directed as one force under the authority of the Chief of the Defence Staff, and delivered according to this design by the single Services and Strategic Command. Under this new model, there is no fixed force design to be delivered by a specified date. The design and capabilities of the Integrated Force, and the way that wider Defence supports it, must continue to evolve as threats and technology do. The Integrated Force must be **capable of operating in different configurations**: as part of NATO Component Commands by design; in coalition; and as a sovereign force. To deliver a step-change in lethality, the Integrated Force must be **underpinned by a common digital foundation and shared data**. Delivery should be a top priority. A single ‘digital mission’—to deliver a digital ‘targeting web’¹¹ in 2027—should enable Defence to succeed where it has previously failed, as should the creation of an expert Digital Warfighters group that can be deployed alongside front-line personnel (Chapter 4.1).

Innovation-led. Today, much of the best innovation is found in the private sector, while the increasing prevalence of dual-use technologies¹² has widened the net of potential suppliers that can contribute to Defence outcomes. **Defence must embrace its role in seeding innovation and growth**, rapidly adopting new technology to keep the Integrated Force at the forefront of warfare. In particular, Defence should build relationships with the investors behind the innovators. External expertise should be systematically accessed through a new Defence Investors’ Advisory Group whose membership includes venture capital and private equity investors, while private finance should be crowded in under new funding models. To set itself up for success internally, Defence should reorganize existing structures to create two distinct organisations under the National Armaments Director:

- A Defence Research and Evaluation organisation,¹³ focused on enabling external early-stage research and providing a gateway to academia.
- The new UK Defence Innovation (UKDI) organisation,¹⁴ focused on harnessing commercial innovation, including dual-use technologies. UKDI will have a ringfenced annual budget of at least £400m (Chapter 4.2).

¹¹ The digital targeting web would connect ‘sensors’, ‘deciders’, and ‘effectors’. This creates choice and speed in deciding how to degrade or destroy an identified target across domains and in a contested cyber and electromagnetic domain.

¹² Technology developed for civilian use but with potential military applications.

¹³ Potentially retaining the Dstl brand.

¹⁴ Announced in March 2025. Government to turbocharge defence innovation - GOV.UK.

Industry-backed. To develop a thriving, resilient innovation and industrial base that can scale in support of the Integrated Force, **Defence must create a new partnership with industry.** Under the forthcoming Defence Industrial Strategy and the leadership of the National Armaments Director, this involves **overhauling acquisition processes** from top to bottom: engaging industry early in procurement processes on desired outcomes; ensuring that suppliers are rewarded for productivity and for taking risks; and reducing the burden on potential suppliers from startups to primes. At the heart of this partnership should be a new, segmented approach to procurement:¹⁵

- Major modular platforms (contracting within two years).
- Pace-setting spiral and modular upgrades (contracting within a year).
- Rapid commercial exploitation (contracting within three months), with at least 10% of the MOD's equipment procurement budget spent on novel technologies each year.

Exports and international capability partnerships¹⁶ should also be mainstreamed into acquisition processes from the outset, with responsibility for defence exports returned to the Ministry of Defence (MOD) and a new framework for building and sustaining government-to-government relationships. Investment decisions should consider associated costs to ensure they are genuinely affordable—for example, through-life upgrades, acquisition and support, and attendant changes to infrastructure (Chapter 4.2).

18. By more purposefully using its market power and by prioritising UK-based business, Defence should also strive to **deliver for the UK economy while delivering for the warfighter.** Defence has **significant untapped potential to be a new engine for growth** at the heart of the UK's economic strategy. Radical root-and-branch reform of defence procurement—combined with substantial investment in innovation, novel technology, advanced manufacturing, and skills—would grow the productive capacity of the UK economy. Defence should aim high, measuring success in the number and scale of defence and dual-use technology companies in the UK. Success will also see **significant improvement in Defence productivity, competitiveness, exports, and value for money,** supported by the new Defence Reform and Efficiency Plan (Chapter 4.2).¹⁷

19. **This transformation of UK Defence must ultimately be delivered by its people** (Chapter 4.3), empowered through changes in culture and 'people' policies that remove red tape and eradicate behaviour that is unacceptable in the workplace. Targeted intervention is needed to tackle Defence's workforce crisis—improving recruitment through faster, more

¹⁵ Announced by the Chancellor of the Exchequer in March 2025. Spring Statement 2025, p. 36.

¹⁶ Such as AUKUS and the Global Combat Air Programme (GCAP). Under AUKUS, Australia, the UK, and the US will develop conventionally armed, nuclear-powered submarines that are interchangeable, as well as advanced technologies such as AI, autonomous systems, cyber, hypersonic missiles, and underwater warfare. Under GCAP, Italy, Japan, and the UK will develop a sixth-generation aircraft—part of the Future Combat Air System, comprising crewed aircraft, uncrewed platforms, next-generation weapons, networks, and data-sharing.

¹⁷ Prime Minister's Oral Statement to the House of Commons: 25 February 2025.

flexible options such as military ‘gap years’, and improving retention through the MOD’s planned ‘flexible working’ initiative and prioritised investment this Parliament in accommodation that falls well short of the standards required.

20. The focus must be on maximising the effectiveness of the ‘whole force’:¹⁸

- To fulfil the roles set out in this Review, there is no scope for reducing the number of highly trained and equipped Regulars across all three Services, even as the forces move to a much greater emphasis on autonomy. Overall, we envisage an increase in the total number of Regular personnel when funding allows. This includes a small uplift in Army Regulars as a priority.
- Increasing the number of Active Reserves by 20% when funding allows (most likely in the 2030s) and reinvigorating the relationship with the Strategic Reserves.
- Reshaping the Civil Service workforce with an emphasis on performance, productivity, and skills, reducing costs by at least 10% by 2030.
- Releasing military personnel in back-office functions to front-line roles and automating 20% of HR, Finance, and Commercial functions by July 2028. This should be a minimum first step.
- Reforming training and education so that it is much more adaptive to operational lessons, ensures managed risks can be taken in military training, and creates greater capacity and flexibility through developing a single virtual environment. Civilian qualifications and education provision should be used where possible to increase efficiency and to reduce the barriers between Defence, industry, and wider society.

Strengthening deterrence through alliances and partnerships

21. The UK must bolster collective security and create strategic depth by actively investing in its relationships (Chapter 5). Finite resources mean the UK cannot be everything to everyone. It must prioritise its approach, informed by the roles outlined in Chapter 3 and using the full range of tools available to it.

22. Bilateral agreements and capability partnerships—with the United States and European NATO Allies—offer a powerful tool through which to strengthen relationships and Euro-Atlantic stability. The same is true of unilateral activity, including through the Joint Expeditionary Force, E3, and E5 formats,¹⁹ supplemented by implementation of the UK-EU Security and Defence Partnership. AUKUS and the Global Combat Air Programme must be developed as exemplars of capability collaboration and a powerful signal of the UK’s

¹⁸ Incorporating the Regular and Reserve forces, civil servants, and contractors.

¹⁹ The Joint Expeditionary Force (JEF) is UK-led and comprises nine other members: Denmark; Estonia; Finland; Iceland; Latvia; Lithuania; the Netherlands; Norway; and Sweden. The E3 is a format for diplomatic cooperation between France, Germany, and the UK, while the E5 is a format for diplomatic cooperation between France, Germany, Italy, Poland, and the UK.

ambition to bring partners from different geographic regions closer together in support of collective security. Doubling down on support to Ukraine in pursuit of a durable political settlement is critical, as is learning from its extraordinary experience in land warfare, drone, and hybrid conflict.

Home defence and resilience: a whole-of-society approach

23. A renewed focus on home defence and resilience is vital to modern deterrence, ensuring continuity in national life in a crisis (Chapter 6). Reconnecting Defence with society should be the starting point, as part of a national conversation led by the Government on defence and security. This can be achieved in part through expanding Cadet Forces by 30% by 2030 (with an ambition to reach 250,000 in the longer term) and working with the Department for Education to develop understanding of the Armed Forces among young people in schools.

24. A more substantive body of work is necessary to ensure the security and resilience of critical national infrastructure (CNI) and the essential services it delivers. The MOD should explore, with wider Government, a ‘new deal’ for the protection and defence of CNI that is rooted in partnership with private-sector and allied operators. To support this, the Royal Navy should play a new leading and coordinating role in securing undersea pipelines, cables, and maritime traffic.

25. The Government must also be able to achieve a sustainable and effective transition to war if necessary. A new Defence Readiness Bill should provide the Government with powers in reserve to mobilise Reserves and industry should crisis escalate into conflict. It should also facilitate external scrutiny of UK warfighting readiness.

The Integrated Force: a force fit for war in the 21st century

26. The essential task is to transform the Armed Forces, restore their readiness to fight, and reverse the ‘hollowing out’ of foundational capabilities without which they cannot endure in protracted, high-intensity conflict (Chapter 7).

27. The UK must continue to dedicate its independent nuclear deterrent to NATO (Chapter 7.1), adapting its alliances, industrial base, and military capabilities to ensure it can continue to deter the most extreme threats. The UK will need a full spectrum of options to manage escalation as part of NATO, delivered by its nuclear and conventional forces in combination. Defence should commence discussions with the United States and NATO on the potential benefits and feasibility of enhanced UK participation in NATO’s nuclear mission. Further investment in conventional deep precision strike and Integrated Air and Missile Defence would increase options for deterring and responding to high-impact threats.

28. Senior Ministers must drive efforts to sustain the nuclear deterrent as Defence's top priority and as a 'National Endeavour'. The programme to replace the sovereign warhead is critical and will require significant investment this Parliament. Confirming the intended numbers of SSN attack submarines would provide clarity on the required build capacity and tempo for all nuclear-powered submarines. To secure the long-term future of the nuclear deterrent, the Government should start work in this Parliament to define the requirement for the successor to the Dreadnought class submarine.

29. An immediate priority for force transformation should be a **shift towards greater use of autonomy and Artificial Intelligence within the UK's conventional forces** (Chapter 7). As in Ukraine, this would provide greater accuracy, lethality, and cheaper capabilities—changing the economics of Defence. This shift towards AI and autonomy should exploit the parallel development of a common digital foundation, a protected Defence AI Investment Fund, and an initial operating capability for a new Defence Uncrewed Systems Centre established by February 2026.

30. The Armed Forces should accelerate their transition to a 'high-low' mix of equipment—for example, through:

- The **Royal Navy's** 'Atlantic Bastion' concept for securing the North Atlantic for the UK and NATO and its plans for hybrid carrier airwings (Chapter 7.2).
- The **Army's** 'Recce-Strike' model for land fighting power, aiming to deliver a ten-fold increase in lethality.²⁰ This new model should underpin the transformation of the two divisions and Corps Headquarters committed to NATO's Strategic Reserves Corps (Chapter 7.3).
- The **RAF's** development of the Future Combat Air System—a sixth-generation, crewed jet operating with autonomous collaborative platforms (Chapter 7.4).

31. With the Integrated Force fighting as one across all five domains, **greater attention must be given to the space and cyber and electromagnetic (CyberEM) domains:**²¹

- Assured access to operate in, from, and through space underpins UK security and prosperity. The MOD should invest in the resilience of military space systems, with a focus on space control, decision advantage, and capabilities that support 'Understand' and 'Strike' functions. A reinvigorated Cabinet sub-Committee should set the UK's strategic approach to space, maximizing synergies between the UK civil space sector and clear military needs (Chapter 7.5).
- The CyberEM domain is similarly essential to securing and operating in all other domains and is fundamental to the digital targeting web. Hardening critical Defence functions to cyber-attack is crucial. Defence must move to a more proactive footing

²⁰ Measured against a conventional armoured brigade model.

²¹ Cyberspace and the electromagnetic spectrum are now treated as a single military domain (Chapter 7.6).

in this domain. A new CyberEM Command—established within Strategic Command—should emulate Space Command in ensuring domain coherence, rather than directing execution. An initial operating capability should be established by the end of 2025 (Chapter 7.6).

32. Under Defence Reform, **Strategic Command** will be responsible for delivering, at the direction of the new Military Strategic Headquarters, many of the joint enablers and specialist capabilities for the Integrated Force—from Defence Intelligence to the Integrated Global Defence Network, Defence Medical Services, and Special Forces and Special Operations Forces. **UK Special Forces**—the ‘tip of the spear’—represent a working model of the Integrated Force, leading the way in innovation of new technologies and systems across all domains. Defence must continue to enhance its Special Forces, ensuring UK sovereign choice by maintaining this strategic capability at the very highest level.

33. Where some past reviews have focused on front-line equipment at the expense of foundational capabilities, we have sought to redress this balance. We recommend a focus on:

- **Empowering Defence Intelligence** as the functional leader of all defence intelligence organisations—pursuing common priorities and standards, underpinned by a new Defence
- Intelligence charter, and, in time, fully interoperable with the UK Intelligence Community (Chapter 7.9).
- **Rebuilding Defence Medical Services**, cohering disparate defence medical resources and initiating a sprint review with the Department of Health and Social Care to ensure personnel needs can be met in peacetime and in war (Chapter 7.10).
- **Restoring the Strategic Base²² from which the Armed Forces deploy**: delivering a Defence Infrastructure Recapitalisation Plan by February 2026 to address years of underfunding and identify ways to maximise the value of the estate as a national asset (Chapter 7.11).
- **Targeted investment in joint support enablers and munitions**. Defence should maintain an ‘always on’ munitions capability, laying the industrial foundations for production to be scaled up at speed if needed. This should be complemented by the further development of novel directed energy weapons (Chapter 7).

The transformation imperative

34. **Prudent sequencing is needed to ensure the Armed Forces have what they need, when they need it**, within the resources available and to achieve the best possible return on investment. This includes being ready to accelerate efforts to transform the Armed Forces and restore readiness should conditions deteriorate further, or to mobilise UK Defence

²² The network of infrastructure (airports, seaports, warehouses, mounting centres, preparation bases), ‘movement assets’ (such as trains and shipping), and activities to transport troops and materiel.

rapidly in the event of a crisis. In this new and uncertain era, nobody should be surprised if it became necessary to transform further and faster.

35. There is no reason to delay in changing fundamentally how Defence works, however, leveraging Defence Reform—the ongoing programme of organisational and cultural change (Box 1)—as a driver for reform across the Department of State and the Armed Forces. Unlike other departments in Government, the MOD does not control the timetable for confrontation and conflict. ‘Events’ and the UK’s adversaries do. Bold and decisive action is needed. **‘Business as usual’ is not an option.**

36. We are acutely aware that words such as ‘transformation’ have been used before in defence reviews but the intention has seldom been delivered. A key factor in success in the coming years will be Defence Reform. Where the SDR states what Defence must do in the next decade and beyond, Defence Reform will ultimately determine how, and how successfully, it is delivered. To support implementation, we have identified key interventions and deadlines to further catalyse progress where in the past it has been slow and lacked accountability. The MOD will necessarily take this work forward in creating detailed implementation plans—an essential part of the department taking ownership of the Review’s findings and recommendations.

Document No. 3. 119th Session, U.S. Congress, *An Act*, January 3, 2025²³

SEC. 20008. ENHANCEMENT OF RESOURCES FOR NUCLEAR FORCES.

(a) DOD APPROPRIATIONS.—In addition to amounts otherwise available, there are appropriated to the Secretary of Defense for fiscal year 2025, out of any money in the Treasury not otherwise appropriated, to remain available until September 30, 2029—

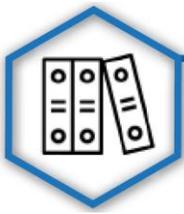
- (1) \$2,500,000,000 for risk reduction activities for the Sentinel intercontinental ballistic missile program;
- (2) \$4,500,000,000 only for expansion of production capacity of B-21 long-range bomber aircraft and the purchase of aircraft only available through the expansion of production capacity;
- (3) \$500,000,000 for improvements to the Minuteman III intercontinental ballistic missile system; intercontinental ballistic missile reentry vehicles;
- (4) \$100,000,000 for capability enhancements to intercontinental ballistic missile reentry vehicles;
- (5) \$148,000,000 for the expansion of D5 missile motor production;

²³ The full text of *An Act* is available at <https://www.govinfo.gov/content/pkg/BILLS-119hr1enr/pdf/BILLS-119hr1enr.pdf>.

- (6) \$400,000,000 to accelerate the development of Trident D5LE2 submarine-launched ballistic missiles;
- (7) \$2,000,000,000 to accelerate the development, procurement, and integration of the nuclear-armed sea-launched cruise missile;
- (8) \$62,000,000 to convert Ohio-class submarine tubes to accept additional missiles, not to be obligated before March 1, 2026;
- (9) \$168,000,000 to accelerate the production of the Survivable Airborne Operations Center program;
- (10) \$65,000,000 to accelerate the modernization of nuclear command, control, and communications;
- (11) \$210,300,000 for the increased production of MH- 139 helicopters; and
- (12) \$150,000,000 to accelerate the development, procurement, and integration of military nuclear weapons delivery programs

(b) NNSA APPROPRIATIONS.—In addition to amounts otherwise available, there are appropriated to the Administrator of the National Nuclear Security Administration for fiscal year 2025, out of any money in the Treasury not otherwise appropriated, to remain available until September 30, 2029—

- (1) \$200,000,000 to perform National Nuclear Security Administration Phase 1 studies pursuant to section 3211 of the National Nuclear Security Administration Act (50 U.S.C. 2401);
- (2) \$540,000,000 to address deferred maintenance and repair needs of the National Nuclear Security Administration pursuant to section 3211 of the National Nuclear Security Administration Act (50 U.S.C. 2401);
- (3) \$1,000,000,000 to accelerate the construction of National Nuclear Security Administration facilities pursuant to section 3211 of the National Nuclear Security Administration Act (50 U.S.C. 2401);
- (4) \$400,000,000 to accelerate the development, procurement, and integration of the warhead for the nuclear-armed sea-launched cruise missile pursuant to section 3211 of the National Nuclear Security Administration Act (50 U.S.C. 2401);
- (5) \$750,000,000 to accelerate primary capability modernization pursuant to section 3211 of the National Nuclear Security Administration Act (50 U.S.C. 2401);
- (6) \$750,000,000 to accelerate secondary capability modernization pursuant to section 3211 of the National Nuclear Security Administration Act (50 U.S.C. 2401);
- (7) \$120,000,000 to accelerate domestic uranium enrichment centrifuge deployment for defense purposes pursuant to section 3211 of the National Nuclear Security Administration Act (50 U.S.C. 2401);
- (8) \$10,000,000 for National Nuclear Security Administration evaluation of spent fuel reprocessing technology; and
- (9) \$115,000,000 for accelerating nuclear national security missions through artificial intelligence.



FROM THE ARCHIVE

The From the Archive section of this issue offers excerpts from the Executive Summary from the 1987 “Report to Congress on Stockpile Reliability, Weapon Remanufacture, and the Role of Nuclear Testing.” The report discusses the importance of nuclear testing in the context of U.S. policy, including in resolving stockpile problems and maintaining a workforce capable of making judgments regarding the expected military performance of nuclear warheads. The second document is Chapter 7 on adapting U.S. strategic forces from Donald H. Rumsfeld’s December 2002 *Annual Report to the President and the Congress*. The chapter explains the rationale behind the Bush Administration’s nuclear force reductions and its movement toward the New Triad: nuclear and non-nuclear strike capabilities; active and passive defense; and a capable research and development infrastructure for developing, building, and maintaining offensive forces and defensive systems.

Document No. 1. George H. Miller, Paul S. Brown, Carol T. Alonso, “Report to Congress on Stockpile Reliability, Weapon Remanufacture, and the Role of Nuclear Testing,” Lawrence Livermore National Laboratory, October 1987¹

EXECUTIVE SUMMARY

[...] We address their questions of “whether past warhead reliability problems demonstrate that nuclear explosive testing is needed to identify or to correct stockpile reliability, or alternatively, whether a program of stockpile inspection, non-nuclear testing, and remanufacture would be sufficient to deal with stockpile reliability problems.”

The answer to the first question is “yes.” Past experience indicates that nuclear testing is necessary to identify and correct problems in the stockpile. Although we have learned from each case, some problems have been very recent. Therefore, we believe that for the foreseeable future, continued nuclear testing will be necessary to maintain stockpile reliability.

The answer to the second question is a qualified “yes” over the short term and a definite “no” over the longer term. Over the short term, experienced scientists and engineers would probably be able to deal with stockpile reliability concerns about as well as they do now; we currently have a high level of confidence in the stockpile, but some problems do arise. The “short term” is the time it takes for the scientific judgment and expert capabilities of weapon scientists and engineers to atrophy in the absence of nuclear test experience. This time may be as short as three to five years, as we found during the Nuclear Test Moratorium of 1958-1961 (Reference 1^[2]). Measures taken to prepare for further test restrictions can slow the erosion of capability but they cannot stop it.

Before one can assess whether further nuclear test limitations are advisable, the technical and national security issues involved must be thoroughly addressed. Only then

¹ The report is available at <https://www.osti.gov/servlets/purl/6032983>.

² R. D. Woodruff, Testimony Before the Subcommittee on Arms Control and Disarmament, Armed Services Committee, U.S. House of Representatives (September 20, 1985); also, R. N. Thorn, testimony on same date.



can the risks and benefits of additional nuclear testing constraints be evaluated. In this report, we present our views on the technical issues, supported by historical and technical facts, many of which are presented for the first time in an unclassified publication.

Nuclear Testing in the Context of U.S. Policy

The debate about nuclear testing has focused mostly on the issue of stockpile reliability. The discussion should, in fact, be much broader and examine the role of nuclear testing in the context of the U.S. policy of deterrence. Current U.S. strategy is to deter nuclear and conventional war by maintaining a credible and effective retaliatory capability that can respond in a limited and proportional way to an act of aggression. Deterrence thus is a dynamic condition and, as such, must be responsive to military and technological developments.

Nuclear testing supports deterrence in four important ways. First, nuclear tests are required to maintain the proper functioning of the stockpile. Second, nuclear tests are needed to modernize the existing stockpile for enhanced safety, security, and effectiveness. The advance of Soviet technologies, most of which are nonnuclear, requires the modernization of U.S. weapon systems to ensure their survivability. [...] Third, nuclear tests are required to measure the effects of a nuclear weapon environment on U.S. weapon systems and on critical command, control, and communications systems. Finally, nuclear tests make it possible to identify future weapon concepts for U.S. decision-makers and to stay abreast of potential Soviet nuclear weapon developments, thus avoiding technological surprise. While these reasons for testing are all vitally important, in this report we focus on the issues related to stockpile reliability.

The Need for Nuclear Testing to Resolve Stockpile Problems

The reliability of U.S. nuclear weapons is currently very high because we have been able to sustain a balanced program of weapons physics tests, stockpile confidence tests, and production verification tests. At issue are the conditions for maintaining high confidence in this reliability. Experience has shown that testing is essential. One-third of all the weapon designs placed in the U.S. stockpile since 1958 have required and received post-deployment nuclear tests to resolve problems. In three-quarters of these cases, the problems were identified as a result of nuclear testing. The important point here is that in each case, the weapon was thought to be reliable and adequately tested when it entered the stockpile. Problems resulted from aging, from concerns about safety, from environmental effects, or from a later realization that our understanding of the weapon's physical behavior was incomplete.

Let us emphasize that although a number of weapons in the stockpile have required nuclear tests to evaluate or correct problems, most of the problems encountered with the stockpile have been fixed without nuclear tests to certify the changes. This has been possible only because the designers and engineers involved could make informed

judgments about the problem—judgments that drew on years of experience in actual nuclear testing. Nuclear testing, thus, has a vital role in assuring confidence in all U.S. nuclear weapons.

Some have claimed that many of the stockpile problems were the result of deploying weapons that were not “thoroughly tested.” There is no such thing as a “thoroughly tested” weapon. Budgetary limitations make it impossible to test nuclear weapon designs under all possible conditions (e.g., delivery environments, defensive threat levels, target requirements, storage histories, safety and security requirements). When a weapon is developed, we test it as thoroughly as we judge to be appropriate to define the boundaries of reliable operation. We conservatively balance factors affecting reliability against those affecting cost. However, not all of the important factors may be known or assessable ahead of time. We test to the level of performance required to meet the military characteristics (MCs) specified by the Department of Defense (DOD).

The military characteristics are prepared by the DOD to specify the requirements for each nuclear warhead. These requirements include, in order of priority, nuclear safety, size and weight, plutonium dispersal safety, operational reliability, yield, conservative use of nuclear materials, and operational simplicity. In the event that compliance with the MCs leads to a design conflict, priorities are to be observed in the order listed, with tradeoffs that allow high-priority MCs to be met while minimizing the degradation of the competing, lower-priority MCs. In 1982, the DOD established an unprioritized MC for stockpile endurance and replicability; these are stated to be desirable goals to be achieved to the extent possible while meeting the other MCs.

Claims have been made that the success with which we predict the yield of new nuclear devices in their first nuclear tests indicates the reliability and surety of weapon performance. It would, however, be misleading to judge stockpile reliability on this basis. Our success with first-time predictions is indeed high. There are reasons for this. First, the designers making the predictions either have extensive test experience themselves or their work is reviewed by senior designers with extensive experience. Second, most new designs are based on fairly conservative, previously established technology. For the first test of a variation of this technology, our designers build safe margins into the design. It is later, when the designers begin to optimize a device for its intended weapon application, to study it at environmental extremes, or to incorporate structural, safety, or security features, that margins are reduced and performance sometimes falls short of prediction.

Weapon Remanufacture and the Need for Nuclear Testing

The difficulties involved in “replica” remanufacture have been faced by all major U.S. industries—aerospace, automobile, chemical and materials, and engineering, as well as nuclear weapon design and fabrication. Experience with attempts at remanufacturing in all these industries can be summarized in three important conclusions.

First, exact replication, especially of older systems, is impossible. Material batches are never the same; some materials become unavailable; equivalent materials are never exactly

equivalent; “improved” parts often have new failure modes; different people (not those who did the initial work) are involved in the remanufacturing; vendors go out of business or stop producing some products; new health and safety regulations prohibit the use of certain materials or processes.

Second, documentation has never been sufficiently exact to ensure replication. A perfect specification has never yet been written. We have never known enough about every detail to specify everything that may be important. Individuals in the production plants learn to bridge the gaps in the specifications and to make things work. Even the most complete specifications must leave some things to the individual’s common knowledge; it would be an infinite task to attempt to specify all products, processes, and everything involved in their manufacture and use. Experts believe that it would be extremely difficult to improve documentation enough to ensure replication by inexperienced personnel.

Third, testing is the most important step in product certification; it provides the data for valid certification. A nuclear test provides our only data on the performance of the whole nuclear warhead package. Tests, even with the limitations of small numbers and possibly equivocal interpretation, are the final arbiters of the tradeoffs and judgments that have been made. They force people to ask the right questions.

Today, design physicists and engineers with extensive nuclear test experience at the relevant yield levels could undertake a weapon remanufacture with confidence that the weapon would perform about as well as the original version. However, even such a group has had difficulty predicting the behavior of some weapons recently manufactured for the stockpile—in particular the W68 Poseidon warhead and the W84 warhead for the ground-launched cruise missile. (The W68 was a remanufactured weapon.) In both cases, measured yields fell short of the predictions made by test-experienced weapon designers on the basis of production specifications. Even in retrospect and taking into account the minor changes known to exist between the development and stockpile hardware, we have not yet been able to explain the causes of these yield degradations. The nuclear tests uncovered gaps in our knowledge and revealed that important and as-yet-unidentified production details should have been specified.

The W68 and W84 are relatively recent weapons. The documentation and specifications for older weapon systems are less complete. Although documentation has improved since the MC for replicability was established in 1982, our experience with the W68 and W84 demonstrates that the specifications are still insufficiently complete to prevent subtle but apparently significant variations from taking place. Improved documentation will be helpful in remanufacturing the newer weapon systems. However, confidence in their performance would be lacking if they are placed in the stockpile without relevant nuclear testing and without certification by test-experienced physicists and engineers.

It is important to emphasize that in the manufacture of nuclear weapons, we are dealing with practical problems. Idealized proposals about what we should be able to do, without a proper experience base, are prescriptions for failure.

The Importance of Scientific Judgment and Continuity of Experience

Nuclear weapons are extremely complicated, and they operate at conditions that are virtually unique—at material velocities of millions of miles per hour, under temperatures and pressures that are hotter and denser than the center of the sun, in time scales as short as a few billionths of a second. Because of the complexity of nuclear weapons and the limited rate at which they are tested, nuclear weapon design is largely an empirical science. Thus assessments of weapon performance—whether for stockpile inspection, new design, or remanufacture—depend primarily on scientific judgment.

It takes years for designers to gain the experience on which they base their scientific judgment. This judgment must be continually cultivated by the application of theory and experiment to device design and refined with data from nuclear tests. We strive to maintain a continuous line of experienced designers, as senior designers pass on their knowledge to younger designers. This continuity of experience is of paramount importance.

We expect, in the event of very restrictive test limits, that in only a few years we would start to lose the test-experienced people. After a while, the people whose judgment has been honed by the realities of nuclear testing would no longer be available—they would have retired or moved on to other fields. We would then be faced with the prospect of asking scientists without nuclear testing experience to make judgments about the inevitable changes that will occur in remanufactured or stockpile weapons. This is a script for failure. If today, test-experienced personnel have difficulty explaining unexpected behaviors in the nuclear weapons they themselves have designed, how in the future will personnel without test experience be able to establish confidence in weapons designed by people long since gone?

Preparing for Further Nuclear Test Limitations

We are continually studying ways to prepare for further nuclear test limitations so that we can maximize our ability to meet our responsibilities for ensuring the reliability and effectiveness of U.S. nuclear weapons. A number of measures could help alleviate the impact of additional test limitations, if they are vigorously pursued before such restrictions are imposed. However, it is important to emphasize that, irrespective of any amount of preparation, further test restrictions will adversely affect confidence in the U.S. nuclear weapon stockpile. In addition, there is no way to ensure that the effect will be symmetric between the U.S. and the Soviet Union. The risk of such a loss in confidence needs to be carefully weighed against the potential political gains of new testing limitations.

Nuclear tests have played a necessary role in helping us meet our responsibilities to ensure the reliability and effectiveness of the stockpile. The need for increased nuclear testing to prepare for new test limits was most recently recognized in 1980 as part of the Augmented Test Program (ATP), planned at the request of the Office of Science and Technology Policy and in response to a memorandum from the National Security Council. The underlying purpose of the ATP was to prepare for a Comprehensive Test Ban (CTB) by

placing “early emphasis on those areas of science and technology that contribute most to reliability and confidence of the stockpile.”

President Carter approved the ATP in principle, but he did not submit it to Congress for explicit approval and funding. Although in the years since then, there has been some additional funding for nuclear testing, most of this increased funding at LLNL has been earmarked for nuclear-driven directed-energy programs for the Strategic Defense Initiative (SDI); we cannot simultaneously sustain high levels of research on both SDI and weapon physics with the current level of funding. We believe that it would be advisable to consider the equivalent of an ATP at this time. If such a test program is to be successful and avoid the fate of the 1980 ATP, it requires Congressional endorsement, and sustained support will be imperative.

Measures to prepare for more restrictive limits and to help mitigate the problems caused by more restrictive limits include nuclear tests to provide assurance about the reliability of the current stockpile, verify the production of new weapons, and improve our understanding of weapon physics. Expanded nonnuclear experimental facilities, such as expanded hydrodynamic capabilities and a High-Gain Test Facility for fusion research, and advanced computing and numerical modeling capabilities would provide valuable supplements to nuclear test data. Also helpful would be programs to investigate means of certifying nuclear components at reduced yields as well as nonnuclear projects that use some of the same skills as the current nuclear weapon programs. In addition, nuclear weapons might be designed to reduce the likelihood of material degradation with age or to permit modification with less uncertainty about their resulting performance. We are pursuing all of these measures to the extent that funding and the DOD’s military characteristics allow.

With the optimized stockpile that we presently possess, nuclear testing has played a key role in maintaining confidence in reliability. It should be mentioned here that with direction, support, and a sustained testing and production program, the stockpile could be reconfigured to be less reliant on (but not totally free from) nuclear testing to maintain reliability. Such an effort would deal only with the testing issues associated with reliability and would not address issues of future modernization. Such a decision would have a significant impact on the cost and capability of the weapon delivery systems since the reconfigured stockpile would generally consist of larger, heavier nuclear systems.

Let us emphasize, however, that in preparing for future, more restrictive test limits, these measures have only limited value. Nonnuclear and low-yield nuclear experiments can maintain some weapon skills but they cannot be used to solve weapon problems. Computer calculations have yet to (and may never) reach the stage where they can replace nuclear tests. These measures provide little guarantee that we will be able to fix future stockpile problems or address new military requirements. They can help slow the erosion of scientific expertise and judgment. They cannot stop it. [...]

Conclusion

We believe that if further nuclear test limits are determined to be desirable, then a detailed study of the feasibility and impact of reducing our reliance on underground nuclear testing is needed. Such a study should be done in the context of the overall arms control environment. The study would investigate the changes in nuclear design that might have to be made and the military capabilities that might have to be relinquished in order to develop more robust warheads. These issues must be addressed to determine what could or could not be accomplished under more restrictive test limits.

We are not ready today for significantly reduced nuclear test limits. Until we can find ways to meet our responsibilities for ensuring the reliability and effectiveness of U.S. nuclear weapons and ways to prevent the erosion of nuclear weapon expertise and judgment under restrictive nuclear test limits, it would be imprudent to commit this country to a regime of further nuclear test limitations.

Document No. 2. Donald H. Rumsfeld, *Annual Report to the President and the Congress* (Washington, D.C.: Department of Defense, 2002), pp. 83-92.³

CHAPTER 7 ADAPTING U.S. STRATEGIC FORCES

The Department of Defense has completed a comprehensive review of the U.S. nuclear posture. This chapter summarizes the conclusions of that review.

Nuclear forces continue to play a critical role in the defense of the United States, its allies and friends. They provide credible capabilities to deter a wide range of threats, including weapons of mass destruction and large-scale conventional military force. Nuclear capabilities possess unique properties that give the United States options to hold at risk classes of targets important to achieve strategic and political objectives.

The transformation of the nation's nuclear posture complements the transformation of America's conventional forces and capabilities. President Bush directed the Department of Defense to transform America's military forces to meet the challenges of the new century. In response to his direction, the Department of Defense used the Congressionally-mandated Quadrennial Defense Review to develop a new defense strategy and program for transforming U.S. conventional forces. Building on the strategic premises of the QDR report, the Nuclear Posture Review (NPR) offers a blueprint for transforming our strategic posture and signifies a major departure in our approach for managing strategic issues. Indeed, the

³ The report is available at https://history.defense.gov/Portals/70/Documents/annual_reports/2002_DoD_AR.pdf?ver=2014-06-24-153732-117.

findings of the NPR form the foundation for the Moscow Treaty signed by President Bush and Russian President Putin and awaiting ratification by the Senate.

The Nuclear Posture Review began with the recognition that the security situation at the start of the 21st century differs substantially from that of the early 1990s when the last Nuclear Posture Review was conducted. The end of the Cold War can no longer be considered a recent phenomenon. Russia is no longer an enemy and the collapse of the Soviet Union is now more than a decade past. At the same time, new dangers have emerged that are both less familiar and less predictable, including terrorists and rogue states intent on acquiring and using weapons of mass destruction. Unlike the former Soviet Union, their leaders are subject to few institutional restraints on using such weapons. Their decision-making processes are obscure and behavior at times unpredictable. Their actions increase the complexity of managing international security. In this environment, the probability of surprise and ubiquity of uncertainty are dominant strategic considerations for the U.S.

Meeting the challenges of surprise and uncertainty requires a new approach to deterrence. While nuclear forces made an indispensable contribution to deterring Warsaw Pact aggression during the Cold War, a strategic posture that relies solely on offensive nuclear weapons is insufficient to support the nation's defense policy goals. The Nuclear Posture Review concluded that deterrence should not be limited to the threat of retaliation, nor rely exclusively on nuclear forces. The U.S. will need a broader range of capabilities to assure friends and foe alike of its resolve. Nuclear forces, moreover, are unsuited to many of the contingencies for which the U.S. prepares. A mix of capabilities, offensive and defensive, nuclear, and conventional is required. Such a mix will provide additional military options that are credible to enemies, reassuring to allies, and appropriate to Americans.

Following the direction laid down for U.S. defense planning in the QDR, the Nuclear Posture Review shifts the basis for strategic forces planning from specific threats to emerging capabilities that could exploit U.S. vulnerabilities or confer advantages on adversaries.

This capabilities-based approach is the foundation for transforming the U.S. nuclear posture:

- Replace the Strategic Triad of the Cold War with a New Triad that integrates conventional and nuclear offensive strategic strike capabilities, active and passive defenses, and a responsive infrastructure to provide a more diverse portfolio of capabilities against immediate, potential and unforeseen contingencies; and
- Adopt a new approach to strategic nuclear force reductions that provides the flexibility to respond to changes in the security environment and to technological surprise.

The New Triad

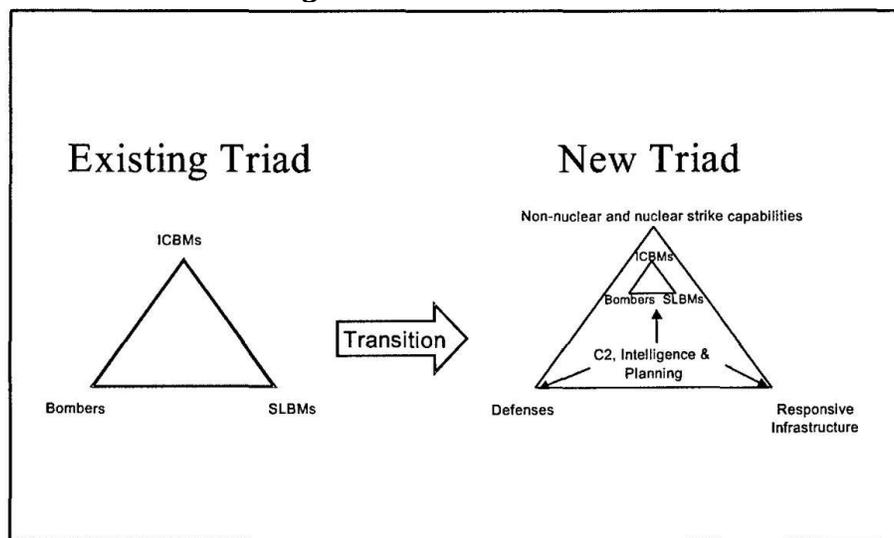
The application of a capabilities-based approach to U.S. nuclear forces has resulted in a decision to transform the existing triad of U.S. strategic nuclear forces-intercontinental

ballistic missiles (ICBMs), heavy bombers, and submarine-launched ballistic missiles (SLBMs) – into a New Triad composed of a diverse portfolio of offensive and defensive, nuclear, and conventional systems. The New Triad is designed to give the President and the Secretary of Defense a broad array of options to address a wide range of possible contingencies.

The elements of the New Triad are depicted in Figure 7.1 and summarized below:

- Strike capabilities, both non-nuclear and nuclear, and their associated command and control;
- Active and passive defenses, including the command and control for air and missile defenses; and
- Research and development (R&D) and industrial infrastructure for developing, building, and maintaining offensive forces and defensive systems.

Figure 7.1 The New Triad



The efficiency and military potential of the individual elements of the New Triad are maximized by timely and accurate intelligence, adaptive planning, and enhanced command and control. Enhancing these capabilities is critical to realizing the potential inherent in the New Triad concept.

With respect to nuclear forces, once the planned warhead reductions are completed, the New Triad will include about one-third of the operationally deployed warheads of the current strategic nuclear force. It will retain a vital role in deterring Weapons of Mass Destruction (WMD) threats, assuring allies of U.S. security commitments, holding at risk an adversary's assets and capabilities that cannot be countered through non-nuclear means, and dissuading potential adversaries from developing large-scale nuclear, biological, chemical, or conventional threats.

As other elements of the New Triad are developed and integrated, they could assume tasks now assigned exclusively to nuclear forces. Under such circumstances the required number of operationally deployed nuclear weapons might be further reduced.

Elements of the New Triad

There are six underlying elements that support the legs of the New Triad:

Strike Capabilities. Non-nuclear strike capabilities include advanced conventional weapons systems, offensive information operations, and Special Operations Forces. Deployed nuclear strike capabilities include the three legs of the existing strategic triad and theater-based, nuclear-capable dual-role aircraft. Nuclear-armed sea-launched cruise missiles, removed from ships and submarines under the 1991 Presidential Nuclear Initiative, are maintained in a reserve status.

Defenses. Active defenses include ballistic missile defense and air defense. Passive defenses include measures that reduce vulnerability through mobility, dispersal, redundancy, deception, concealment, and hardening; warn of imminent attack and support consequence management activities. This element of the New Triad comprises defenses for the U.S. homeland, forces abroad, allies, and friends.

Infrastructure. The R&D and industrial infrastructure includes the research facilities, manufacturing capacity, and skilled personnel needed to produce, sustain, and modernize the elements of the New Triad. A responsive infrastructure that can augment U.S. military capabilities in a timely manner provides strategic depth to the New Triad.

Planning. Careful planning will be critical to integrate and balance the three elements of the New Triad. Planning for the New Triad must consider multiple goals, a spectrum of adversaries and contingencies, and the many uncertainties of the security environment.

Command and Control. A reliable, survivable, and robust command control system will serve as a critical portion of the New Triad.

Intelligence. "Exquisite" intelligence-access to an adversary's secrets without his knowledge-is essential to provide insight into the intentions as well as the capabilities of opponents. Such intelligence should enable the United States to tailor its deterrent strategies to the greatest effect.

Creating the New Triad

Development and deployment of elements of the New Triad will require several initiatives.

Major Initiatives. Developing and sustaining the New Triad will require investment in the areas of: (1) advanced non-nuclear strike, (2) missile defenses, (3) command and control, and (4) intelligence. These investments will reinforce the nation's strategic deterrent capabilities and contribute significantly to the improvement of the military's operational capabilities.

Overhaul of Existing Capabilities. To meet the demands of the New Triad, an overhaul of existing capabilities is needed. This includes improving the tools used to build and

execute strike plans so that the national leadership can adapt pre-planned options, or construct new options, during highly dynamic crisis situations. In addition, the technology base and production readiness infrastructures of both DoD and the National Nuclear Security Administration must be modernized so that the United States will be able to adjust appropriately to changing situations.

Nuclear Force Reductions and System Modifications. As elements of the New Triad are deployed and the number of operationally deployed nuclear warheads is reduced, adjustments may be needed to match the capabilities of the remaining nuclear forces to new missions. The large size of the Cold War nuclear arsenal allowed planners to develop weapons optimized for specific tasks. The large number of warhead types in the arsenal served to reduce the risk that technical problems with one type of warhead would substantially reduce the capability of the force overall. For the New Triad, the reduced size of the force will require more reliable systems. In addition to the efforts needed to refurbish aging weapons in the stockpile, a need may arise to modify, upgrade or replace portions of the extant nuclear force or develop concepts for follow-on nuclear weapons systems better suited to the nation's needs. It is unlikely that a reduced version of the Cold War nuclear arsenal will be precisely the nuclear force the United States will require in 2012 and beyond.

The New Triad will take time to develop as its elements are adjusted and adapted to each other. Nuclear forces assigned to the New Triad and their command and control systems are mature, but are in need of refurbishment. Advanced non-nuclear strike capabilities are comparatively new, their operational effectiveness is still developing, and planning for their employment is still evolving. Missile defenses are beginning to emerge as systems that can have an effect on the strategic and operational calculations of potential adversaries. They are now capable of providing active defense against short- to medium-range threats. The defense and nuclear infrastructure is well established, but in many respects neither is sufficiently flexible to respond quickly to new requirements.

Sizing the Nuclear Force for Immediate, Potential and Unexpected Contingencies

In setting requirements for nuclear strike capabilities, distinctions can be made among the contingencies for which the United States must be prepared. Contingencies can be categorized as immediate, potential, or unexpected.

Immediate Contingencies involve well-recognized, current dangers. During the Cold War, Soviet threats to the United States and Western Europe represented the immediate contingency for which U.S. nuclear forces were primarily prepared. Current examples of immediate contingencies include an attack using WMD on U.S. forces or a key friend or ally in the Middle East or Asia.

Potential Contingencies are plausible, but not immediate, dangers. They are contingencies which the U.S. leadership can anticipate and about which it has received timely warning. For example, the emergence of a new, hostile military coalition against the United States or its allies in which one or more members possess WMD and the means of

delivery is a potential contingency that could have major consequences for U.S. defense planning. The re-emergence of a hostile peer competitor is another example of a potential contingency.

Unexpected Contingencies are sudden and unpredicted security challenges. They could occur in the near term or well into the future. Contemporary illustrations might include a sudden regime change by which an existing nuclear arsenal comes into the hands of a new, hostile leadership group or an adversary's surprise acquisition of WMD capabilities.

The operationally deployed forces are sized to provide the capabilities required to meet U.S. defense goals in the context of immediate and unexpected contingencies. That is, a sufficient number of forces must be available on short notice to counter known threats while preserving a small, additional margin in the event of a surprise development. The United States plans to reduce its operationally deployed nuclear forces over the next decade to 1,700 to 2,200 warheads, while maintaining the flexibility necessary to accommodate changes in the security environment that could affect U.S. nuclear requirements. This reduction will provide a credible deterrent at the lowest possible number of nuclear weapons consistent with national security requirements and alliance obligations.

The United States will also maintain an ability to augment the operationally deployed force to meet unanticipated or surprising potential contingencies. This augmentation would be accomplished by moving the required number of individual warheads from storage to an operational unit. This capability is also an important tool to assure allies and friends and dissuade potential competitors. It will allow the United States to augment its operational forces over weeks, months and years to meet any potential contingencies. Depending on the time available, the United States could also pursue diplomatic, political, and economic measures to improve conditions. Additionally, it could choose to improve other elements of the New Triad.

Adopting a New Approach to Strategic Force Reductions

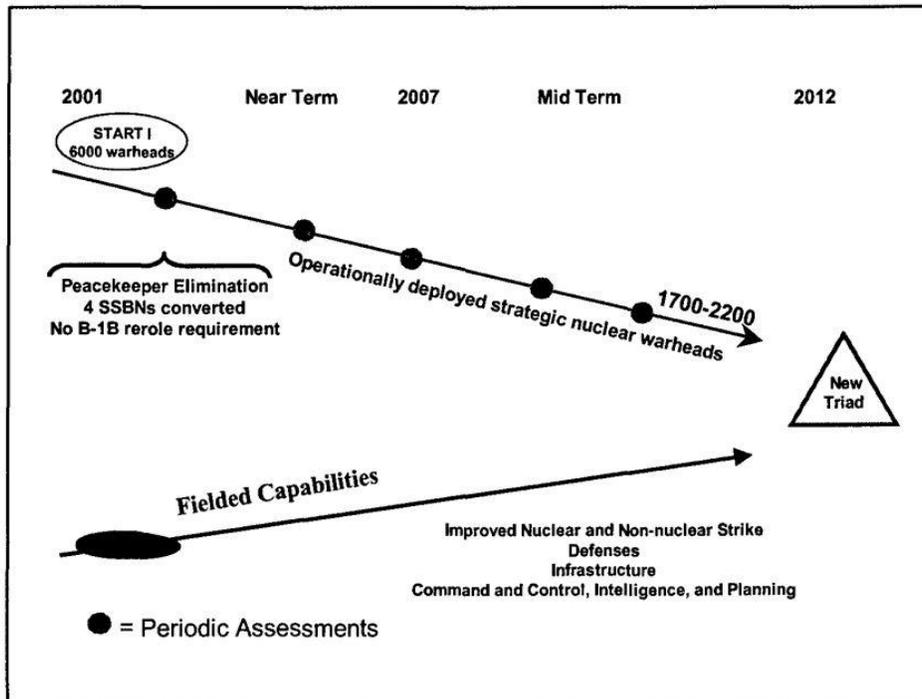
Figure 7.2 depicts the Department's approach toward reductions in strategic nuclear arms. The objective is an operationally deployed strategic nuclear force with 1700 to 2200 operationally deployed strategic nuclear warheads by 2012. Reductions are planned through a phased program beginning in FY 2002 that eliminates Peacekeeper ICBMs, removes 4 Trident SSBNs from strategic service, and downloads weapons from Trident SLBMs, Minuteman III ICBMs, and B-52H and B-2 bombers.

The precise method of achieving the reductions will be determined in the course of the periodic reviews the Department will conduct. The periodic reviews will:

- Review the progress to date in the reduction schedule;
- Evaluate existing assumptions regarding the risks facing U.S. national interests for the next one to three years and the role of nuclear forces in meeting those risks; and

- Review the progress made in the development of the New Triad and the capability of non-nuclear forces, defenses, intelligence, command and control, and the defense infrastructure to meet emerging risks.

Figure 7.2 Path for Nuclear Reductions



Note: The downward arrow illustrates a trend. U.S. reductions are unlikely to occur in a linear fashion.

As the President's announced reductions are implemented, the existing verification regime established by the first Strategic Arms Reduction Treaty (START I) that entered into force December 5, 1994 will remain in effect. The START I Treaty includes provisions that provide a useful baseline of transparency for offensive strategic forces. The U.S. will assess options for additional transparency and confidence-building options in the context of the new strategic relationship with Russia. In this regard, President Putin has announced that the Russian Federation also will reduce nuclear forces in line with its requirements. The United States will continue consultations with the Russian Federation on how to achieve increased transparency and predictability regarding reductions in offensive nuclear forces.

The U.S. Senate did not provide its advice and consent to the Comprehensive Test Ban Treaty (CTBT). The Administration does not support ratification of the CTBT but continues to support observance of the U.S. testing moratorium. The U.S. test readiness posture under a moratorium is an important aspect of the U.S. infrastructure. The Department of Defense is working with the Department of Energy to determine the appropriate test readiness standard that exercises the range of skills necessary to sustain this readiness posture and to be able to respond appropriately to unforeseen problems with the nuclear stockpile.

In sum, the U.S. strategy for its strategic forces will be transformed and adapted to meet the challenges of the decades to come. The risks associated with reductions in deployed nuclear warheads will be offset by the development and fielding of non-nuclear offensive and defensive capabilities and a revitalization of the infrastructure. The new strategy puts aside Cold War practices and planning and represents an important step in defense transformation.
