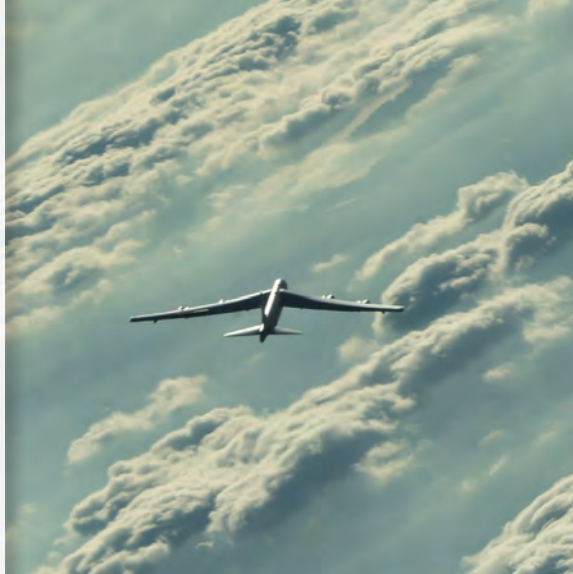


Guide to Nuclear Deterrence in the Age of Great-Power Competition



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Guide to Nuclear Deterrence in the Age of Great-Power Competition

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*This book is dedicated to the airmen of
Air Force Global Strike Command.
Your service provides peace to a grateful
nation and to the many allied nations who
depend upon the United States to provide a
credible deterrent for their own security.*

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Foreword

There is no more important time to understand nuclear deterrence operations than now. Global geopolitics and strategic threats continue to evolve, and we need to adjust our thinking about our deterrence responsibilities. Great-power competition with Russia and China, and the risks and uncertainties that come with it, will increasingly define the character of the Joint Force for years to come. This book breaks down the complicated strategic environment into easily digestible chapters to explain the critical roles strategic and nuclear deterrence play in defending our nation.

Air Force Global Strike Command forces will remain an essential component to our nation's ability to deter a range of adversaries and threats in great-power competition, even as Russia and China modernize and attempt to challenge international norms. This provides the opportunity to revisit deterrence and Global Strike forces. To do that, we answer the simple question: why does deterrence matter to each Global Strike airman?

First, functional deterrence is having the means to impose costs on an adversary to shape its calculus away from egregious behavior. Global Strike forces are an essential element of the Joint Force that can do that quickly and on a global scale.

Second, deterrence has to be credible—that is, believable—to be effective. If Global Strike airmen do not do their jobs in an exceptional manner, and do not have weapon systems that perform as advertised, this could lead

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adversaries to perceive the US as weak and miscalculate the cost of their aggressive actions. Adversaries need to know, and the US needs to be prepared to deliver a decisive response—anytime, anywhere.

Third, we need a variety of methods to communicate our intentions and our resolve. Global Strike forces provide excellent signaling options for leadership. Bombers, for example, provide a visible form of such signaling by changing their location to forward-operating areas and changing the numbers that are deployed. Additionally, missile-strike forces are always on alert and provide the bedrock to our strategic posture. Signaling is essential, not only when tensions are increasing, but also when we need to signal our intention to deescalate in a crisis.

Fourth, US Joint Forces also need the ability to manage escalation below the threshold of armed conflict, in crisis and during war. There are times, despite our best efforts, that deterrence can fail. In those times, we need to restore deterrence by punishing adversary actions in such a way that they restrain from further attacks. Our conventional Global Strike forces can be utilized to conduct such punishment below the nuclear threshold. This serves two purposes: first, it punishes the adversary for past actions, and, second, it demonstrates to other adversaries our capabilities and willingness to strike, thus deterring future potential aggressive actions.

Each Global Strike airman is a critical component to deterrence now and well into the future—to impose costs;

maintain deterrence credibility; signal; and restore deterrence. So, why does deterrence matter to each Global Strike airman? Because each Global Strike airman matters to deterrence!

THOMAS BUSSIERE
Lieutenant General, USAF
Deputy Commander
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PART 1

Deterrence and National Security

Chapter 1

Artisans and Advocates

The Importance of Strategic Deterrence Education

Curtis McGiffin

This book is about educating airmen who practice deterrence in the age of great-power competition. While a consequential read for airmen in leadership positions, this book is also intended for those airmen they lead, the deterrence *artisans*. There are some 700,000 total force airmen who engage in the profession of arms.¹ These airmen are *practitioners* of national security entrusted with the privilege of preserving and protecting the American citizenry, the Constitution, and the nation's future. To do that, airmen are asked to adopt a “service before self” and “excellence in all that we do” mentality that demands airmen take ownership of their personal and professional growth. If the Air Force is truly “powered by airmen and fueled by innovation,” then practitioners must strive to become artisans, specialists in their slice of national security work.² With over 33,000 airmen assigned to Air Force Global Strike Command (AFGSC) and thousands more from other major commands as well as the Air Force Reserve and Air National Guard, we can see that well over 5 percent of total force airmen are connected to the strategic deterrence mission. These are the artisans who must focus on this slice of national security.

Whether you are a new lieutenant in the missile field, the pilot sitting on alert, the crew chief working a swing

shift, the “defender” standing guard, or a civilian on the AFGSC staff, you are all practitioners of national security as well as artisans and advocates of strategic deterrence. General Ronald Fogleman, the fifteenth Air Force chief of staff, said about airmen and their profession, “We are not engaged in just another job; we are practitioners of the Profession of Arms. We are entrusted with the security of our nation, the protection of our citizens and the preservation of its way of life. In this capacity, we serve as guardians of America’s future.”³

The descriptors of practitioner and artisan are often conflated, but in reality, they are different. A practitioner is a person engaged in the practice of a profession or occupation whereas an artisan is a person skilled in an applied art.⁴ In other words, all airmen are practitioners in national security, but only a few are artisans in strategic deterrence; and still fewer serve as advocates, charged with the responsibility to educate others on the ends, ways, and means of deterrence. This book is intended to inform the practitioners, educate the artisans, and arm the advocates with twenty-first-century strategic deterrence knowledge and perspective as they embark in this new era of great-power competition.

The Problem

According to former Air Force Chief of Staff General David L. Goldfein, “The globe is not getting any safer, and I believe the nuclear enterprise supports all military operations and all courses of diplomacy on the planet.... We provide deterrence and then we defend the homeland.”⁵

The chief's statement is a stark recognition of twenty-first-century risk and amplifies the role and priority of strategic deterrence in this age of great-power competition.

The 2018 *National Defense Strategy* (NDS) and 2018 *Nuclear Posture Review* (NPR) have profoundly reset the military's strategic objective from combating terrorism to managing inter-state strategic competition as "the primary concern in US national security."⁶ Former Secretary of Defense James Mattis notes in the NPR, "We must look reality in the eye and see the world as it is, not as we wish it to be."⁷ The NPR also proclaims the Department of Defense's (DoD's) top priority is to maintain an effective nuclear deterrent capable of deterring both a nuclear attack against the US and its allies, as well as "preventing large-scale conventional warfare between nuclear-armed states for the foreseeable future."⁸ This significant shift in national security prioritization reminds us of Bernard Brodie's 1946 axiom from his influential book *The Absolute Weapon*, "The chief purpose of our military establishment has been to win wars. From now on its chief purpose must be to avert them."⁹

The NDS is a tacit reminder that the preponderance of our military resources was consumed with both pre- and post-9/11 irregular warfare, counter-insurgency, and counterterrorism-related activities often referred to as overseas contingency operations. Primarily in Iraq and Afghanistan, overseas contingency operations (OCO) are defined by the DoD as small- to large-scale campaign-level military operations, including support for peacekeeping operations and international disaster relief efforts.¹⁰ Over-

seas contingency operations were not meant to deter great-power competitors or adversaries. America's pivot of focus and resources to address great-power competition must also energize a corresponding focus on force education. A substantial number of field grade officers and senior non-commissioned officers have little or no experience with great-power competition thanks to decades of OCO deployments and their associated requirements.¹¹

The NDS and NPR have objectively described a twenty-first-century world of great-power competition that combines Cold War-like hostility with the hasty proliferation of novel technology, while also demanding a "flexible, tailored nuclear deterrent strategy" to properly address this dynamic situation.¹² "Thus, in this rapidly changing geopolitical environment there remains an urgent need for more deterrence education. From nuclear to cyber, the United States faces a very complex, multi-domain, multi-polar world that is characterized by a revolutionary change in technology and complicated by hybrid warfare, economic competition, and mass-disinformation."¹³ As US Strategic Command's former Commander, General Kevin Chilton (USAF, Ret.) writes:

The underlying principles and rationale for the deterrent have not gone away, but we have stopped educating, thinking, and debating, with informed underpinnings, the necessity and role of the US nuclear deterrent in today's world. Even more concerning has been the lack of informed debate on the subject. We have raised three generations of Air Force officers who may not have been exposed to the most fundamental and yet relevant arguments surrounding deterrence from the late nuclear theorists Herman Kahn and Thomas Schelling.¹⁴

Moreover, in the 2008 *DoD Nuclear Weapons Management Report*, former Secretary of Defense James Schlesinger noted that “deterrence itself is as old as human conflict” and that our nuclear deterrent must remain “sufficiently impressive and persuasive, [so that] the weapons themselves will not have to be employed in combat.”¹⁵ The report deduced a derisive level of awareness and advocacy:

[A] distressing degree of inattention to the role of nuclear weapons in deterrence among many senior DoD military and civilian leaders. Many lack the foundation of experience for understanding nuclear deterrence, its psychological content, its political nature, and its military role—which is to avoid the use of nuclear weapons. A lack of education on nuclear deterrence has contributed to this problem. This shortfall of experience and understanding will become even more acute among senior leaders in the future.¹⁶

The former Secretary of Defense James Schlesinger said in 2008 that “what has been the long-time practice during the Cold War and subsequent years of developing the theory and doctrine of deterrence has more or less disappeared [and] the doctrine of deterrence has, to a large extent, been forgotten.”¹⁷ This idea was reaffirmed in the 2014 National Defense Authorization Act (NDAA), which noted “that challenges remain in educating airmen on their role in safeguarding national security.”¹⁸ In 2016, the Air Force acknowledged the need to develop a new generation of deterrence thought leaders:

The need for military officers who have a deep understanding of nuclear policy and strategy is perhaps at an all-time high. Where the Cold War took place during a time when a bipolar international system dominated the globe, and general deterrence

was all that it took to maintain a stable balance of power, the current international system is far more complex. Adversaries of the United States are now closer in capability than at any point in history. In some areas, both the Chinese and Russians have surpassed the United States in their technical capability. Thus, it is increasingly important that the men and women of the military understand not only the technical capabilities they will employ, but the history, psychology, interests, and risk tolerance of our allies and adversaries.¹⁹

The 2014 invasion and annexation of Crimea by Russia ushered in a realization that great-power competition had returned. Airmen, especially the artisans and advocates of deterrence, must complete the mental transformation from deploying and fighting an irregular war on terror to a deliberate revival of Cold War–like strategic competition and deterrence. According to the 2014 NDAA, “Educating the warfighters who execute the daily mission of nuclear deterrence remains a critical element to ensuring the level of excellence required for the mission.”²⁰

Artisans and Advocates of Deterrence

According to former US Strategic Command Commander Admiral Richard Mies,

We have raised a whole generation of war-fighters within DOD who have received virtually no professional education in the theories of deterrence, assurance, and dissuasion, and who consequently often fail to think in war-prevention terms. Additionally, there has been until recently little, if any, programmatic advocacy within the Office of the Secretary of Defense, the Joint Staff, and the military services for the strategic nuclear enterprise.²¹

The Air Force has acknowledged the need to “develop and foster Air Force critical thinking on deterrence and assurance.”²² In order to shoulder the NDS’s and NPR’s acknowledgment that great-power competition has returned, “and with it the associated revivification of deterrence thought and strategy, the armed forces must appropriately edify the force.”²³ The need for a deterrence-informed force is immediate and focused education is the solution to overcoming the decline in nuclear deterrence expertise within the military.²⁴ However, formal education is not enough. Constrained by finite capacities, limited resources, and curtailed calendars; individual artisans and advocates must rely on self-education in order to develop as professionals. The late Jim Rohn once said, “Formal education will make you a living; self-education will make you a fortune.”²⁵

In order to effectively develop or enrich the strategic deterrence artisan, one must accept the role of “pracademic.” The artisans of deterrence are professional practitioners who effectively orchestrate strategic deterrence-related resources, operations, and/or policy across the domains on a daily basis in order to achieve the desired deterrent effect. However, the strategic deterrence artisan cannot rely solely on formal training, professional military education, or routinized experience to ensure the expertise and innovative thinking necessary for effective deterrence. Indeed, the strategic deterrence artisan must become a self-educated and self-aware pracademic, versed in theory application and tempered by substantive experience. Artisans are the “doers of deterrence” who can examine, employ, and evaluate the art and science of strategic deterrence.²⁶

While there is plenty of professional military education and professional continuing education available to airmen, self-education is the key to developing and enriching the deterrence artisan; thus, truly advancing from one level of knowledge to the next. This is a hallmark of an airmen who embraces service before self and professional excellence.

For the strategic deterrence advocate, one must harvest the expertise derived from advanced artisans steeped in years of deterrence education and experience. Because deterrence is a complex subject where it is difficult to measure success, advocacy becomes a challenge that can only be met by advanced thinkers and strategists. Advocates are cultivated “thinkers of deterrence” who can evaluate and facilitate the implementation of effective deterrence policies and strategies. Moreover, they are teachers, leaders, and planners who would inescapably be the decision-makers or advisors to the decision-makers, who must in turn articulate and champion the resourcing and innovative applications necessary to achieve any meaningful deterrence effect.²⁷

Advancing from “doer” to “thinker” should be the demand of every airmen practicing national security and strategic deterrence. One must not rely solely on experience or assigned institutional education to develop. Self-education and self-development are traits of a *bona fide* professionals and are the only bridge between profession deterrence-related educational opportunities. The compounding effect is a faster more comprehensive maturation of the artisan and a quicker transition from “doer” to “thinker.”²⁸

Deterrence: What to Study

According to former US Strategic Command Commander General John Hyten, “To effectively deter and, if necessary, respond, we must out-think, out-maneuver, out-partner, and out-innovate our adversaries. Deterrence in the twenty-first century is an active mission that requires integration of all our capabilities across all domains.”²⁹ While the principle of deterrence has existed for millennia, the theory has grown sophisticated over time. The concepts have evolved from mere threats of retaliation created by waiving Mesolithic weapons over one’s head to an interconnected web of denial and punishment, energized by alliances and complicated by multiple domains, technology, and nuanced messaging. Understanding the complexity of deterrence requires a key understanding of theory, history, culture, geography, psychology, international relations, economics, and strategic communication, as well as adversary doctrine and capabilities.³⁰ From a military perspective, “effective deterrence requires global situational awareness, rapid decision-making, effective force management, and reliable force direction.”³¹

“To study deterrence is to study the very mechanics of inter-state peace, perhaps even global peace.”³² Fundamentally, deterrence is about the following: averting existential attack on the homeland; assuring our allies and partners; and, should deterrence fail, limiting opponents’ conflict escalation via intra-war deterrence.³³ Deterrence is defined by the Department of Defense as the prevention of action by the existence of a credible threat of unacceptable counter-

action and/or belief that the cost of action outweighs the perceived benefits.³⁴ This is a good sterile “action-reaction” definition that describes the mechanics of deterrence; however, it does not capture the emotion of deterrence.

Dr. Strangelove suggests, “Deterrence is the art of producing in the mind of the enemy the fear *to* attack.”³⁵ This may well be the most useful definition. Fear is a primal emotion that does not require a political elucidation. If Thucydides’ reasons for war include fear, then perhaps the fear *to* attack equates to an absence of war.³⁶ Fear informs perception and perception informs credibility, thus the fear *to* attack is a purposeful and consequential result of an adversary’s perception of credible strategic deterrence. The fear *to* attack is a necessary transference into fear *of* or *from* attack, the retaliatory threat that accompanies deterrence by punishment. If a potential adversary perceives the United States’ capability of devastating response as credible and assured, then the fear *to* attack is realized and the deterrence effect will be achieved. The ability to orchestrate the fear-complexity of psychology and capability is what deterrence artisans and advocates must master.

To achieve effective deterrence, the Air Force, which operates two-thirds of the nation’s strategic nuclear triad, has routinized deterrence with process and procedure, often characterizing the effort as an operation while trying to satisfy its doctrinal edict that deterrence is in fact an effect.³⁷ These complexities necessarily complicate the orchestration of deterrence strategy and consequently demands a well-educated force of deterrence-educated artisans.³⁸ The study of war is necessary to achieve victory on the battle-

field and ultimately win the nation's wars, but the study of deterrence is essential to averting the need for large-scale operational warfare and winning the nation's peace.³⁹

The examination of deterrence crosses the academic spectrum at the whole-of-society level. Artisans and advocates alike must master the art of persuasion; prudently brandishing capability and consorting with allies and partners. Strategic deterrence artisans and advocates must be knowledgeable in deterrence theory (how it works), history (when and why it worked), means and force postures (what it needs to work), roles of allies and treaties (supporting its work), escalation management (making it work again after it initially fails), adversary perspectives (how they think it works), and strategic messaging (communicating its work).⁴⁰ Understanding the distinction between dissuasion, deterrence, denial, defense, and assurance, as well as being able to consider second- and third-order effects requires future leaders and those who would advise future leaders to be knowledgeable practitioners (artisans) and champions (advocates) of deterrence strategy across the diplomatic, information, military, and economic (DIME) spectrum.⁴¹

Twenty-first-century deterrence is not any more challenging than twentieth-century deterrence, but it is more complex. There are six deterrence disciplines that every artisan and advocate must study:

- 1. Concepts and theory.** Examine deterrence through a multitude of conceptual lenses, often filtered through the prism of realism and idealism. Identifying the often-conflated acts of deterrence (protecting/maintaining the status quo)

with acts of compellence (forcing action to change the status quo) can be demanding. Likewise, balancing the deeds of deterrence with the exploits of assurance is key to understanding the strategy of deterrence and the effects concerning allies. Moreover, comprehending the differences between deterrence by punishment, deterrence by denial, and deterrence by delegitimization; what these theories mean and how they should be applied for peace is a must. Counter value—counter force, launch on warning, the security dilemma, deterrence traps, stabilizing—destabilizing, rational actor model, nuclear abolition, easy deterrence vs. hard deterrence, damage limitation, countervailing, and brinkmanship are but a few examples of the comprehensive deterrence lexicon that every artisan must understand.⁴²

2. History. Artisans and advocates alike must study the history of deterrence. Some have referred to the twenty-first century's new era of great-power competition as a new Cold War.⁴³

What kept the Cold War from going hot was the fear of hydrogen bombs. That applies much less to this new cold war. The use of nuclear weapons and the era of testing them in the atmosphere keeps receding from memory, making policymakers on both sides less terrified of such weapons than their predecessors were in the 1950s and 1960s, especially since nuclear arsenals have become smaller in terms of both size and yield, as well as increasingly tactical. Moreover, in this new era of precision-guided weaponry and potentially massive cyberattacks, the scope of nonnuclear warfare has widened considerably. Great-power war is now thinkable in a way that it wasn't during the first Cold War.⁴⁴

This new era of great-power competition requires deterrence artisans and advocates to transform their view of the modern world from one unified to fight terrorism into a world of nation-state peers vying for hegemonic power that seeks to usurp America's global dominance. The first Cold War will lend many historical lessons of past great-power competition to today's practitioners, so we must not forget that we have fought this war before.

3. Technology. Artisans and advocates must grasp the impact of technology on deterrence. Technologies such as hypersonic weapons, stealthy nuclear-armed cruise missiles, and weaponized artificial intelligence have hastened the challenge of attack-time compression. Attack-time compression is the effect created by the rapid advancement of weapons technology designed to enhance speed, maneuver, or stealth, and necessarily complicates or delays detection or warning and might shorten the time to detect a strategic attack, decide how to react, and direct a response.⁴⁵ "The challenges of attack-time compression present a destabilizing risk to America's deterrence strategy. Any potential for failure in the detection or assessment of an attack, or any reduction of decision and response time, is inherently dangerous and destabilizing."⁴⁶ The ability to implement a superior detect, decide, and direct continuum is a key component of deterrence because it enhances any second-strike retaliation capability and the threat of deterrence by punishment. Conversely, the artisan's ability to exploit technology in the form of capability and capacity will also enhance deterrence. Twenty-first-century strategic weapons come in many forms and affect every domain.

Therefore, as technology evolves so must the artisan's ability to implement the concepts and strategies for deterrence.

4. Joint domains and environments.⁴⁷ Artisans must understand the multi-domainal and multi-environmental aspect of today's great-power competition-deterrence dynamic. Of the five identified domains, air, land, and maritime are perhaps the most understood. However, the convergence of outer space and cyberspace has added new complexities to deterrence as modern communications and tactical warning rely on persistent connectivity that must overcome consistent vulnerability. These five domains exist across three environments: physical, information, and human. The human environment may well be a sixth cognitive domain and highlights the psychological aspect of deterrence, since all deterrence occurs between the ears of the competitor. Deterrence is largely a product derived from fear—fear of failure (denial) or annihilation (punishment). Fear, together with biases and bounded rationality, either influence or restrict the ability to influence perception. For the artisan and advocate, influencing the adversary's perception of risk (fear) and reward is key to curbing bad behavior and achieving a successful deterrence effect. Artisans must understand the domains and how they behave within and across environments and how they might entangle the great powers.

5. Comprehend the competitor(s). Sun Tzu wrote: "If you know the enemy and know yourself, you need not fear the result of a hundred battles."⁴⁸ In order to craft the most effective deterrence strategy, artisans must understand the adversary; specifically, the decision-makers. Appreciating

your competitor's culture, history, geography, political structure, and economic infrastructure, as well as their military power, will enlighten artisans to the adversary's motives, risk tolerance, and values. Artisans must be careful not to mirror image the adversary.⁴⁹ All nation-states have their own national interests and sometimes those interests cross America's interests and can lead to conflict if deterrence fails. Whether seeking to maintain the status quo or formulating and implementing treaties the competitor has a vote.

6. Strategic communication. Finally, strategic communication is crucial to the success of deterrence. Adversaries and allies alike must comprehend our deterrence message. Artisans and advocates must recognize the value of messaging because it directly affects the human cognitive environment. If deterrence occurs between the ears of our adversaries, then effective messaging is the key enabler of the effect. Is effective messaging better or worse when it is ambiguous? Tangible strategic communications include strategic force structure (e.g., bombers and missiles), which represent the military instrument of power (capability and capacity) and strategic presence (deployed force structure) that is the display of power. Intangible strategic communications include public policy, doctrine, and strategy. In today's age of great-power competition, the power of social media must not be ignored when artisans are considering strategic deterrence communication, not only in how we communicate to competitors, but in how they are communicating to us.

The Clarion Call

A 2016 global literacy survey illustrated that

most college-age Americans have extremely limited understanding of deterrence, which is the core concept upon which the United States seeks to achieve its foreign policy goals, responds to security threats, and builds collective defensive commitments around the world. Only 9% of respondents learned about deterrence in college, and 49% could correctly select the definition of “nuclear deterrence” in a multiple-choice test. When it comes to assuring our allies, only 28% of respondents knew that the United States is bound by a treaty to protect Japan.⁵⁰

With few exceptions, institutional education does not provide the level of national security education airmen require. This places a tremendous burden on the national security practitioner to self-educate in order to become more aware and better prepared for their role in the profession of arms. The transformation from national security practitioner to deterrence artisan to deterrence advocate is necessarily deliberate and persistent. Airmen must embrace their core values as a clarion call to self-educate in their chosen profession.

Strategic deterrence is a complex enterprise focused on shaping human behavior. Like all human endeavors, deterrence “is imperfect in its creation and execution.”⁵¹ Deterrence requires learned artisans (doers of deterrence) to hone their knowledge and abilities in order to make the imperfect, more perfect. For deterrence artisans and advocates charged with the task of waging peace by preparing for war, they must realize and embrace the complexity of deterrence in order to effectively achieve deterrence.

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Chapter 2

American Nuclear Deterrence Policy

What Is It and How Is It Implemented?

Franklin C. Miller

The fundamental purpose of US nuclear weapons policy is to deter nuclear or massive conventional attack on the United States and on a select group of our treaty allies. There is a consistent bipartisan theme in this policy which began in the 1950s and continues to today. Over time, the means by which the United States has made this policy actionable have evolved because, as former Secretary of Defense Caspar Weinberger once observed, “Deterrence is dynamic, not static. In order to deter successfully our capabilities must change as the threat changes, and as our knowledge of what is necessary to deter improves.”¹

As a result, the United States moved from “massive retaliation” in the 1950s, to “flexible response” in the Kennedy administration, and adjusts the latter incrementally to accommodate changes in the threat environment, including in potential enemy leaderships and in their capabilities. But the purpose remains the same: to deter nuclear or massive conventional attack. US policy is premised on the belief, as President Ronald Reagan made clear, that a “nuclear war cannot be won and must never be fought.”²

For American deterrence policy to be successful, however, it is vital that potential adversaries recognize the truth in President Reagan’s statement. Three statements from

the late Cold War period frame this thought better than any other formulation on record. In 1980, then-Secretary of Defense Harold Brown, in a speech at the Naval War College, said:

By definition, successful deterrence means, among other things, shaping Soviet views of what a war would mean—of what risks and losses would entail. We must...convince the Soviet leadership that no war and no course of aggression by them that led to the use of nuclear weapons—on any scale of attack and at any stage in the conflict—could lead to victory, however they may define victory. Firmly convincing them of that truth is the surest restraint against their being tempted to aggression.³

Two years later, his successor as defense secretary, Caspar Weinberger, told the Senate Foreign Relations Committee:

We, for our part, are under no illusions about the consequences of a nuclear war: we believe there would be no winners in such a war. But this recognition on our part is not sufficient to ensure effective deterrence or to prevent the outbreak of war: it is essential that the Soviet leadership understands this as well. We must make sure that the Soviet leadership, in calculating the risks of aggression, recognizes that because of our retaliatory capability, there can be no circumstance where the initiation of a nuclear war at any level or of any duration would make sense. If they recognize that our forces can deny them their objectives at whatever level of conflict they contemplate, and in addition that such a conflict could lead to the destruction of those political, military, and economic assets which they value most highly, then deterrence is enhanced and the risk of war diminished. It is this outcome which we seek to achieve.⁴

One year after that, the report by the Scowcroft Commission, a bipartisan panel of senior strategists commissioned by President Reagan to examine how the proposed

MX Peacekeeper intercontinental ballistic missile (ICBM) supported US policy, put a coda on this line of thought:

Deterrence is not and cannot be a bluff. In order for deterrence to be effective we must not merely have weapons, we must be perceived to be able, and prepared, if necessary, to use them effectively against the key elements of Soviet power. Deterrence is not an abstract notion amenable to simple quantification. Still less is it a mirror of what would deter ourselves. Deterrence is the set of beliefs in the minds of the Soviet leaders, given their own values and attitudes, about our capabilities and our will. It requires us to determine, as best we can, what would deter them from considering aggression, even in a crisis—not to determine what would deter us.⁵

Brown, Weinberger, and Scowcroft all spoke to the quintessential Cold War threat: the Soviet leadership. If, however, we substitute for “Soviet” the idea of “potential enemy leaderships” in today’s world of great-power competition, the three quotes are as valid today as they were when they were first written. Convincing the Chinese and Russian leaderships that they have more to lose by going to war against the United States and its allies than they could possibly hope to gain remains the key task of national defense now and for the foreseeable future. Deterrence is the product of capability and will. This means the United States must have confidence in its deterrent and potential adversaries must have respect for it. Critical to this is the ability to communicate to potential enemy leaders that if America or its allies are attacked with nuclear weapons or major nonnuclear strategic assets, the nation has the ability, even in a worst-case scenario, to destroy what they hold most dear.

What Do Enemy Leaderships Value?

Democracies value their societies, their people, and their way of life. Generally speaking, freely elected governments and the leaders of those governments reflect, support, and sustain these values. This does not carry over to authoritarian governments. The primary goal of authoritarian leaders is to sustain themselves in power, to harness the resources of their nations to support their personal policy objectives, and to intimidate and/or blackmail their neighbors. Such, sadly, is the case with China and Russia today, where Xi Jinping overthrew decades of Communist Party history to have himself appointed “President for Life,” and in Russia, where Vladimir Putin has manipulated his country’s constitution to achieve comparable status to Xi Jinping in all but name. In both China and Russia, the most valued assets of a leader are the abilities to remain in power, to control the people, and, in event of war, to accomplish those tasks while dominating the post-war world. In simple terms, they value themselves, the leadership apparatus which carries out their policies, their military forces, their internal security forces, the ability to command and control their nation, and the industrial potential to sustain war. Accordingly, American deterrence policy “holds these assets at risk” (which is to say “targets” them) so that the Chinese and Russian leadership understand that if they attack the United States, a response will deny them of everything they hoped to retain in order to dominate the post-war world.

With respect to both China and Russia, the 2018 *Nuclear Posture Review* (NPR), the most recent and most authoritative of US policy, is unambiguous:

The United States will maintain the capability to credibly threaten intolerable damage as Chinese leaders calculate costs and benefits, such that the costs incurred as a result of Chinese nuclear employment, at any level of escalation, would vastly outweigh any benefit.⁶

The US deterrent tailored to Russia, therefore, will be capable of holding at risk, under all conditions, what Russia's leadership most values. It will pose insurmountable difficulties to any Russian strategy of aggression against the United States, its allies, or partners and ensure the credible prospect of unacceptably dire costs to the Russian leadership if it were to choose aggression.⁷

How Does the US Hold Enemy Valued Assets at Risk?

Our principal means of threatening nuclear response against enemy attack is found in the so-called triad of strategic nuclear forces: land-based ICBMs, dual-capable bombers which carry either standoff air-launched cruise missiles (ALCM) or gravity bombs, and submarine-launched ballistic missiles (SLBM) carried by US Navy strategic ballistic missile submarines (SSBN). The ICBM force and the bomber force are Air Force missions that fall under the responsibility of Air Force Global Strike Command (AFGSC).

A logical first question is “Why a triad?” The triad started life, admittedly, as the offspring of inter-service rivalries of the 1950s. During the 1960s, however, military and civilian strategists recognized that the combination of three different basing modes, each with unique strengths and different but offsetting vulnerabilities, each having separate attack azimuths, and each with complementary alert postures presented potential enemy offenses and defenses with insurmountable obstacles. It is this combination which provides for deterrent stability, because an aggressor cannot preemptively destroy the triad or prevent the retaliation it could impose. In short, the triad quickly became recognized as being invaluable, and it is why the triad’s underpinning of nuclear stability continues to guide US force planning today. Indeed, former Secretary of Defense Jim Mattis is quoted in the 2018 NPR as saying:

I have also looked at—I have questioned—the triad and I cannot solve the deterrent problem reducing it from a triad. If I want to send the most compelling message, I have been persuaded that the triad, in its framework, is the right way to go.⁸

To credibly degrade our retaliatory capability would require a substantial act of nuclear aggression, beyond China’s current capabilities and arguably challenging even for Russia. Today, an enemy planner contemplating a first strike against the United States must take account of the 450 Minuteman silos, the two strategic submarine bases, the two national command centers (Washington and Omaha), and the three nuclear bomber bases. This would obviously be a massive strike and would draw a major response—a deterring prospect for any rational opponent.

That is why such an enemy attack is most unlikely to occur. Looking at this from a different perspective, if the 450 ICBM sites did not exist, an enemy planner's job becomes vastly simpler: two SSBN bases, the weapons storage areas at Minot and Whiteman Air Force Bases, and the command centers in Washington and Omaha. A massive strike is no longer necessary and nuclear stability is weakened significantly.

What Is America's Biggest Challenge in Maintaining an Effective Deterrent?

America's strategic nuclear forces remain effective today but the clock is running out. The original strategic triad was created in the late 1950s and early 1960s. Twenty years later, that original force was modernized across the board by the Reagan administration. The Reagan triad should have been modernized by the George W. Bush administration, but the perception of a benign Russia and events in the Middle East/South Asia diverted focus from this task. Many of the force elements—the Minuteman III and its command-and-control facilities, the Ohio-class SSBNs, the AGM 86B air-launched cruise missile and the NC3 architecture that supports them—have all surpassed their intended service lives. In April 2016, then-Commander of US Strategic Command Admiral Cecil Haney issued a stark warning to the House Armed Services Committee, “If you don’t proceed with modernization the US will be out of the nuclear deterrence business within the next

decade and a half.”⁹ Another warning came from former Defense Secretary Ashton Carter in April 2017:

The Defense Department cannot further defer recapitalizing Cold-War era systems if we are to maintain a safe, secure, and effective nuclear force that will continue to deter potential adversaries that are making improvements in their air defenses and their own nuclear weapons systems. The choice is not between replacing these platforms or keeping them, but rather between replacing them and losing them altogether. The latter outcome would, unfortunately, result in lost confidence in our ability to deter. The United States cannot afford this in today’s security environment or in any reasonably foreseeable future security environment.¹⁰

The 2018 NPR called for modernizing all three legs of the American nuclear triad (basically endorsing, with a few key changes, the Obama administration’s plan to do so). That said, new US systems will not begin to be fielded before the late 2020s, which given the age of American forces, will be, as then-Commander of US Strategic Command General John Hyten said, “just in time.”¹¹

As an aside, given that Russia and China began modernizing (and in China’s case expanding) their nuclear forces in 2008–2010 and that they are now annually placing tens of new strategic nuclear missiles in the field, new SSBNs in the water, and deploying other new nuclear capabilities (including Russia’s deployment of the new Intermediate Nuclear Forces Treaty busting cruise missile), any notion that the American modernization program has spurred a new arms race is completely false. Again, to quote former Secretary Carter:

Indeed, those worried about the start of a new arms race miss the lesson of the past two decades. Despite decades of American and allied reserve—for 25 years our nations have refrained from

building anything new—many countries, including Russia, North Korea, and more, have been doing just that. And some of these nations are even building some new types of weapons. So those who suggest that the US recapitalization is a major stimulus to other powers to build more do not have the evidence of the past 25 years on their side.¹²

Because the entire triad must be modernized, the financial cost of doing so is not insubstantial. That said, critics of modernization dramatically inflate that cost, throwing around a 30-year life cycle cost to produce a sticker-shock reaction. This criticism, however, obscures two points. First, thirty-year costs always look large, regardless of the program. Second, the cost of the modernization program, even when in full swing by the 2020s, is not expected to exceed 3 to 4 percent of the defense budget (before sequester caps were lifted). Current operating costs of the existing deterrent will continue to run about 3 percent of the defense budget, leaving the total cost of protecting America and its allies from nuclear and large-scale conventional attack at 6 to 7 percent of the defense budget. This is less than 1 percent of the federal budget—not too much to pay to prevent an existential threat.

Some say that even that amount of money is a great deal to spend for weapons that are never used. But the truth is they are used every day. Xi Jinping and Vladimir Putin are well aware of American capabilities, and their every move against the United States or our allies is designed to stay below the threshold of war. They are aware of the devastation to their interests and homelands that war would bring.

The “Extended Deterrence” Mission

As was stated at the beginning of this chapter, the American nuclear deterrent covers not only our homeland but also a select number of treaty allies—the members of North Atlantic Treaty Organization (NATO), Australia, Japan, New Zealand, and South Korea. This “extended” nuclear deterrent serves to reassure allies that we are fully committed to defend them and to deter nuclear and major conventional attack against them. It also serves as an “anti-proliferant” for allies capable of developing their own nuclear weapons, convincing them that they do not, in fact, need to develop independent nuclear deterrents.

Due to different histories, geographies, and threats in the two regions, forward deployments of US nuclear weapons in Asia and Europe during the Cold War differed significantly.

In the Asia-Pacific region, American forward deployments were almost exclusively maritime and did not involve allied participation. Given this, there is no imperative currently for forward deployments of US nonstrategic nuclear weapons to this theater, although our Pacific allies very much rely on American strategic forces to help keep them safe. Over the past several years, AFGSC strategic bombers deployed to the Pacific to exercise with allied forces and to demonstrate America’s capacity and will to protect them.

In NATO Europe, while US Navy ships deployed with nuclear weapons, the predominant nuclear deployment was on land and involved allied forces through “programs of cooperation.” At the height of the Cold War, the United States had up to 7,000 nuclear weapons forward deployed

in NATO Europe; these were to be delivered by a variety of platforms including Army short-range ballistic missiles and tube artillery, surface-to-air missiles, Air Force gravity bombs and, for a brief period, ground-launched cruise missiles. The fall of the Berlin Wall, the demise of the Warsaw Pact, and the breakup of the USSR created conditions in which the United States and its NATO allies felt comfortable slashing the forward-based stockpile dramatically and restricting it exclusively to a relatively small number of gravity bombs. Those weapons remain in NATO today, and four allied nations participate in nuclear burden-sharing by maintaining nuclear-certified dual-capable aircraft (DCA), while other nations contribute to nuclear burden-sharing by supporting aspects of the DCA mission. USAF DCA forward deploy to Europe to participate in this extended deterrence mission, and USAF personnel maintain security and control of those American nuclear weapons based in Europe to support allied DCA roles. As in the Pacific, AFGSC strategic bombers have been deploying to NATO Europe frequently over the past several years to exercise with allied forces and to demonstrate US nuclear deterrent capability and reach.

While it is true that some political figures in NATO countries, citing the relaxed tensions with Russia in the early 2000s, have, from time to time, called for the removal of American nuclear weapons, no allied government adopted that view as official policy. Indeed, as the Russian government stepped up its campaign of intimidation and nuclear saber-rattling against NATO beginning about 2010, the Alliance began to emphasize the importance—

both to deterrence and to reassurance—of keeping the weapons in Europe. Importantly, American DCA, and those of allies, and the nuclear bombs they carry are also aging out and are in need of modernization. The NPR program is funding both.

Conclusion

America's nuclear weapons are not an "all purpose" deterrent. They were never intended to fill such a role. And although they may be somewhat affecting the leaders of states that sponsor terrorism, they are not useful in deterring terrorists, piracy, cross-border drug trafficking, or even low-level insurgencies. They are arguably of marginal use in deterring small-scale cyberattacks or attacks against space assets. They were not designed to do so. The United States needs strong conventional forces, strong cyber forces, and strong space forces—all backed by exquisite intelligence and command-and-control capabilities—to deter specific threats in all of these areas. In a world of renewed great-power competition, with two adversaries possessing large and varied nuclear arsenals, American nuclear weapons provide a vital backdrop to everything else the nation does in the world. To quote official policy from the 2018 NPR one more time:

US nuclear capabilities cannot prevent all conflict or provocations and should not be expected to do so. But the US triad of strategic bombers, ICBMs and SLBMs, supplemented by dual-capable aircraft (DCA), overshadows any adversary's calculations of the prospective benefits of aggression and this contributes uniquely both to deterring nuclear and nonnuclear attack and

to assuring allies and partners. The triad and DCA are essential for these purposes and will be so for the foreseeable future.¹³

Notes

1. Secretary of Defense Caspar W. Weinberger, testimony before the Foreign Relations Committee, US Senate, December 14, 1982.
2. President Ronald Reagan, State of the Union Address, January 25, 1984.
3. Secretary of Defense Harold Brown, Convocation Remarks, Naval War College, Newport RI, August 20, 1980.
4. Weinberger, testimony.
5. The Scowcroft Commission Report, *The Report of the President's Commission on Strategic Forces*, April 1983.
6. Office of the Secretary of Defense, *Nuclear Posture Review*, US Department of Defense, February 2018, 32.
7. Ibid., 30.
8. Ibid., 43.
9. Admiral Cecil Haney, USN, testimony before the Strategic Forces Subcommittee, Armed Services Committee, US House of Representatives, February 24, 2016.
10. Ashton B. Carter, "Nuclear Deterrence: Still the Bedrock of American Security," *The American Interest* 12, No. 6 (April 2017).
11. General John Hyten, USAF, remarks, Mitchell Institute Triad Conference, July 17, 2018.
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13. Office of the Secretary of Defense, *Nuclear Posture Review*, 2018, 16.

Chapter 3

Nuclear Superiority Matters

Matthew Kroenig

What kind of nuclear strategy and posture does the United States need to protect itself and its allies?¹ According to a widespread conventional wisdom in the academic community, the answer is simple: the United States needs only a second-strike capability, defined as the ability to absorb a nuclear attack and respond with a devastating nuclear counterattack. So long as the United States possesses such an assured retaliatory capability, this argument maintains, no sane adversary will attack, and deterrence will hold.

There is just one problem. The United States has never been content with a mere second-strike capability. If it were, Washington would only need a couple of hundred (maybe even just a couple of dozen) warheads on survivable platforms, such as submarines. But, for decades, the United States has possessed a more robust nuclear posture, with thousands of nuclear weapons on a variety of delivery vehicles and missile defenses. Moreover, the United States has long practiced counterforce, not countervalue nuclear targeting. In other words, in the event of a nuclear conflict, the United States plans to use its nuclear weapons not to intentionally slaughter innocent civilians, but to destroy an adversary's military targets, including nuclear missile silos, air bases, naval bases, and command and control sites.

US leaders also consistently express interest in nuclear superiority: quantitative and/or qualitative advantages over nuclear rivals. For example, in 1961, US President John F. Kennedy vowed to build a nuclear force “second to none.”² In 2010, then-US Secretary of State Hillary Clinton stated that the United States would be “stronger than anybody else in the world as we have always been with way more nuclear weapons than are needed many times over.”³ And, in 2017, US President Donald Trump declared that when it comes to nuclear weapons, the United States would be at the “top of the pack.”⁴

How do we make sense of this contradiction? Is US nuclear strategy “illogical” as some academics argue, or do scholars in the ivory tower not understand the practice of US nuclear strategy? In this case, it turns out that US national leadership knows something that the academics do not. A robust nuclear posture and nuclear superiority over rivals contributes to American national goals, including deterring nuclear and nonnuclear attack, assuring allies, and limiting damage if deterrence fails. Moreover, claims from critics that the US pursuit of nuclear superiority will result in strategic instability, arms races, nuclear proliferation, or that it is unaffordable are not supported by logic or evidence.

Currently, the United States possesses a clear nuclear superiority over at least two of its nuclear-armed rivals. North Korea is believed to possess a few dozen nuclear weapons and may or may not have the ability to deliver them to the continental United States. There is no doubt, however, that Washington retains the ability to promptly

deliver over one thousand warheads to North Korea and end the regime of Kim Jong-un.

China is estimated to possess only seventy-five or so warheads capable of reaching the continental United States, although its arsenal is expected to double in size over the coming decade. Like with North Korea, the United States retains the ability to impose much more significant costs on China, and Chinese nuclear experts fear that Washington may even be able to deny China's deterrent with a nuclear first strike on China's nuclear forces.

The nuclear balance of power with Russia is less clear. Russia is a nuclear superpower and, according to the limits of the New START Treaty, possesses quantitative strategic parity with the United States. Moreover, Russia has a large advantage in nonstrategic nuclear weapons.⁵ But the United States possesses a qualitative strategic edge, with more accurate missiles, more survivable submarines, stealthier aircraft, and more impressive nonnuclear strategic potential, including with missile defenses and prompt conventional strike. Indeed, Russian officials are also paranoid that US technological advances could in the future give Washington the ability to conduct a disarming first strike.

Washington should seek to retain valuable strategic advantages and it must avoid falling into a position of strategic inferiority relative to any rivals. As we will see below, nuclear superiority contributes to US national security objectives.

Why Nuclear Superiority Advances US Nuclear Goals

In the 2018 *Nuclear Posture Review*, the United States articulates the goals of its nuclear forces.⁶ American nuclear superiority contributes to several of these goals including: achieving objectives if deterrence fails, deterring nuclear and nonnuclear strategic attack, and assuring allies.

Achieving Objectives if Deterrence Fails

The foremost goal of US nuclear strategy is to deter nuclear attack. But if deterrence fails, the United States will not accept its “assured destruction.” Rather, it will do what it can to limit damage to itself and its allies. This can be done by seeking the de-escalation of the conflict. It can also be achieved by offensive strikes against an adversary’s nuclear forces and by using missile defenses to blunt an incoming nuclear attack. Any enemy nuclear weapon that is destroyed in a silo over there or intercepted by US missile defenses is a warhead that is not going to fall on US or allied territory.

The United States has pursued a counterforce nuclear strategy since at least the time of Secretary of Defense James Schlesinger in the 1970s. In fact, Secretary of Defense Harold Brown in the Carter administration, for example, declared that “we have always considered it important, in the event of war, to be able to attack the forces that could do damage to the United States and its allies.”⁷ And President Obama, in his nuclear employment guidance to the Department of Defense (DoD) in 2013 ordered “the United

States to maintain significant counterforce capabilities against potential adversaries.”⁸

A robust nuclear force contributes to the American ability to pursue counterforce targeting and damage limitation strategy. If Washington were content to destroy one or two enemy cities, a handful of nuclear weapons may be enough. But a larger force is required to target a wide range of adversary nuclear sites. Moreover, outside analysts estimate that it takes two offensive nuclear weapons to destroy each enemy nuclear target. What if the first strike fails? A second warhead increases the probability that the target, such as a hardened ballistic missile silo, is destroyed. The larger the size of the American nuclear force, the better able it is to cover the full range of enemy nuclear targets. Moreover, the larger the size of the US nuclear arsenal, the more enemy nuclear weapons required to conduct a counterforce strike against the United States, and the fewer enemy weapons left over to directly target Americans.

As a result, sophisticated nuclear exchange modeling demonstrates that the quantitative nuclear balance of power between states is the most important (but not the only) determinant of the war’s outcome.⁹ In other words, the larger the size of the US arsenal and the smaller the size of the adversary’s arsenal (all else being equal), the less damage that the United States and its allies would suffer in the event of a nuclear war.

Every nuclear weapon cut from the American force or added to the adversary’s force, therefore, increases the potential number of American and allied citizens that will die in the event of a nuclear war.

Deterring Nuclear and Nonnuclear Strategic Attack

Nuclear superiority also helps the United States to deter nuclear and nonnuclear attack. Nuclear deterrence has long been conceptualized as a game of nuclear chicken. Conflicts of interest among nuclear states do not go away because of nuclear weapons. Nuclear powers still disagree over many things. In these disagreements, neither country wants a nuclear war, but both countries want to achieve their objectives. Rather than back down immediately, therefore, countries often engage in nuclear brinkmanship. They use conventional military force, make nuclear threats, place nuclear weapons on alert, and take other steps to raise the risk of nuclear war in the hope that the adversary backs down first. As Robert Jervis put it, “war must be avoided, but the other side’s need to avoid war can be used for leverage.”¹⁰ As examples, think of the Cuban Missile Crisis, the Sino-Soviet Border War, the Kargil Crisis, and even the United States and North Korea trading threats of “fire and fury” in 2017.

Rather than conceptualizing deterrence as black and white (the adversary is deterred or not), it is more helpful to think in shades of grey. What is the level of risk that the adversary is willing to run? Are they willing to initiate and escalate crises against the United States? The greatest risk of nuclear war does not come from a bolt-out-of-the-blue attack, but from the risk that lower-level regional conflict escalates. By deterring lower-level challenges and escalation, the United States also deters nuclear and nonnuclear strategic attacks.

The nuclear balance of power directly contributes to these “competitions in risk taking.” Other things matter too, such as the interests at stake in the crisis. So, the nuclear balance of power is not the only thing that matters, but it is a factor. As discussed above, a robust nuclear force reduces the United States’ expected damage in the event of conflict. This bolsters the resolve of US leaders and, ultimately, enhances deterrence. If the United States is more resolved than its adversaries, then it can stand its ground in these disputes and defend US Interests. Countries in a position of nuclear inferiority will be less likely to challenge the United States and less likely to escalate crises against it. After all, in a game of chicken, we should expect the smaller car to swerve first, even if a crash is bad for both.

Systematic research has marshalled substantial evidence of how nuclear superiority contributes to deterrence. To use just one example, political scientists find that since 1945, nuclear-armed states have issued forty-nine militarized compellent threats. Guess how many of these threats were issued against countries with more nuclear weapons? How many with fewer? The answer is forty-nine to zero. Never in the history of the world, according to this analysis, has a nuclear-armed state issued a compellent threat against a country with more nuclear weapons.

Assuring Allies

American nuclear weapons are special. Most nuclear powers use their nuclear weapons to protect themselves. Washington uses them to defend the entire free world. It extends nuclear deterrence to over thirty formal treaty

allies, including the twenty-nine other members of North Atlantic Treaty Organization (NATO), Japan, South Korea, Australia, and arguably others. The United States does this for altruistic reasons, but also because it advances its own interests, keeping the peace in Europe and Asia and shoring up the global nonproliferation regime by convincing allies not to build their own nuclear arsenals.

Every day, Washington must be prepared to engage in nuclear brinkmanship on behalf of Estonia against Russia, Japan against China, South Korea against North Korea, and many more. Any given day, Washington might be called upon to play a game of nuclear chicken on behalf of any of dozens of smaller nonnuclear allies in the backyard of a formidable nuclear-armed foe. It is no wonder that, in these games of chicken, Washington prefers to drive a Hummer and not a Prius.

The maintenance of nuclear superiority over rivals contributes to the credibility of these extended nuclear deterrence guarantees. It helps assure allies that the United States can defend their interests while limiting the risk of damage to the US homeland. It assures allies that the United States can stand firm in crises involving their interests. For these reasons, vulnerable frontline allies watch US nuclear posture closely. They are often the most concerned when the United States considers softening its nuclear doctrine or cutting its nuclear forces. Few South Koreans, for example, questioned the credibility of the US nuclear umbrella when North Korea lacked nuclear weapons. As the North's ability to hold the US homeland at risk has grown, however, strategic thinkers in Seoul are increas-

ingly questioning the American commitment and are even considering building their own nuclear arsenal.

To be sure, the United States can continue to extend deterrence and assure allies even when the US homeland is vulnerable to nuclear war, as it demonstrated during the Cold War. But the job is easier the larger the margin of US superiority over rivals.

Given that the United States demands more of its nuclear forces than any other nuclear power, it makes sense that the United States requires a more robust arsenal. It does not make sense for the United States to aim for parity with Russia or China when these countries do not employ their nuclear weapons for similarly ambitious purposes with profound importance for international peace and security.

The Disadvantages of Nuclear Advantages?

Critics argue that the American pursuit of strategic superiority is not only unnecessary, it is also dangerous. They argue that it is dangerous because it results in: strategic instability, dangerous arms races, nuclear proliferation, and national insolvency.

As we will see below, however, these arguments are illogical and/or are unsupported by the empirical evidence. Many critics of US nuclear policy are insincere in their critiques. They hold a normative commitment to nuclear disarmament and eventual abolition, and they look for any argument to justify their desired goal. Others are sincere in their beliefs. All are incorrect.

Strategic Instability

Critics of US nuclear policy argue that an American nuclear advantage will undermine strategic stability and increase the risk of nuclear war. They maintain that if America's adversaries fear their nuclear weapons could be wiped out in a first strike, then they would actually have an incentive to use them early in a crisis. They call this the "use 'em or lose 'em" dilemma. By seeking to protect itself and its allies, therefore, the United States actually makes it more likely that it suffers a nuclear attack.

But, in reality, American superiority contributes to nuclear stability. The "use 'em or lose 'em" argument, is irrational. It assumes that vulnerable adversaries are so afraid of a nuclear war with the United States that they intentionally start a nuclear war with the United States. This does not make sense. It also presents a false dilemma. Never in international politics is the choice between starting a nuclear war and passively allowing one's nuclear weapons to be destroyed in a nuclear war. There are many other options, such as backing down and living to fight another day. That is the option outgunned adversaries have often selected. They have never intentionally started a nuclear war because they were afraid their nuclear weapons might be destroyed.

Dangerous Arms Races

Critics also argue that the pursuit of strategic superiority will result in dangerous arms races. America's adversaries, like Russia and China, will not allow the United States to maintain its advantage. They will seek to match or surpass

the United States. Washington will then need to build to ever higher levels in search of a temporary advantage. This process will continue, leaving the United States poorer because it spent great sums on nuclear forces and more vulnerable because the end result is better armed adversaries.

But, America's adversaries cannot arms race effectively with Washington. The United States is the world's largest and most innovative economy. Engaging it in an arms race is easier said than done. Two of America's three nuclear-armed rivals, China and North Korea, made a strategic decision not to strive for parity with the United States. Moscow tried during the Cold War only to bankrupt itself in the end. It is unlikely that these countries would be foolish enough to engage in a strategic arms race with the United States, and, if they do, they will lose. As President Trump said, "Let it be an arms race. We will outmatch them at every pass and outlast them all."¹¹

Nuclear Proliferation

Critics of US nuclear policy argue that the pursuit of American nuclear superiority will cause the spread of nuclear weapons globally. They argue that if the United States, the world's most powerful country, needs nuclear weapons for its security, then other countries will follow its lead. Moreover, critics claim, the US pursuit of superiority is inconsistent with American commitments in the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) to eventually disarm. The end result, therefore, according to these critics, is that many nonnuclear weapon states will reconsider their nonnuclear status and build nuclear weap-

ons, causing the weakening of the nonproliferation regime and widespread nuclear proliferation.

But US Nuclear Weapons Contribute to Nuclear Nonproliferation

Critics of US nuclear policy make vague arguments about how a robust US nuclear posture will weaken the NPT, but they cannot point to a single nonnuclear country that would realistically decide to build nuclear weapons unless the US disarms.¹² On the contrary, there are many countries, namely US allies, that likely would build nuclear weapons to protect themselves if they could no longer rely on the US nuclear umbrella. Indeed, US nuclear weapons have been a centerpiece of the nuclear nonproliferation regime and one of the greatest forces for nuclear nonproliferation over the past seventy-five years.

Too Expensive

Other opponents of American nuclear policy argue that it is too expensive to spend money on nuclear weapons. They argue that, rather than spending money on nuclear weapons, Washington should devote its resources to conventional weapons that it might actually use. Or, rather than building weapons, the United States should invest in roads, schools, and hospitals.

But, as former Secretary of Defense James Mattis stated, “we can afford national survival.” The United States spends about 5 percent of its defense budget on nuclear weapons. Several recent US secretaries of defense have stated that nuclear deterrence is the most important mission of the

DoD. Is 5 percent too much to spend on the most important mission of the DoD? Reasonable people can disagree, but, to most, this is a good value.

American Nuclear Superiority: The Central Pillar of the Rules-Based International Order

After the end of World War II, the United States and its like-minded allies constructed the rules-based international system that we live in today. This system generates unprecedented levels of international peace, prosperity, and freedom.

US nuclear superiority undergirds this system. A robust nuclear force deters great-power war in Europe and Asia. It also supports the nonproliferation regime and halts the spread of the world's most dangerous weapons. It is no wonder that the most peaceful, well-governed, and most democratic parts of the world today (Europe and East Asia) are also those protected by US nuclear weapons.

In an era of renewed great-power competition, American strategic superiority is as important as ever. The United States must strive to maintain a strategic edge over revisionist autocratic rivals, Russia and China; the fate of the free world and everything Washington has constructed over the past seventy-five years hangs in the balance.

Notes

1. This chapter is drawn from Matthew Kroenig, *The Logic of American Nuclear Strategy: Why Strategic Superiority Matters* (New York: Oxford University Press, 2018).
2. Cited in Kroenig, *Logic of American Nuclear Strategy*, 2.

3. Ibid.
4. Ibid.
5. Matthew Kroenig, "A Strategy for Deterring Russian Nuclear De-Escalation Strikes," Atlantic Council, Washington DC, April 2018.
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8. Ibid.
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Chapter 4

The Cost of Nuclear Deterrence

Michaela Dodge

Debates regarding how much the United States should spend on nuclear weapons are as old as the nuclear deterrent itself. While an overwhelming majority of people involved in nuclear modernization decisions during the Cold War, including members of Congress, understood the need for funding US nuclear deterrence, the consensus on the need to fund the nuclear mission got much more fragile after the fall of the Soviet Union collapsed, largely as a consequence of a diminished threat perception.

Arguments about how much the United States needs to spend on nuclear deterrence, are with increasing frequency, heard alongside arguments about *whether* the United States should fund a nuclear deterrent at all. The expectation in the early 1990s was that nuclear deterrence will lose relevance because we have reached the “end of history,” a state in which all international conflicts will be solved through diplomacy and international institutions rather than through brute force. The first post–Cold War *Nuclear Posture Review* (NPR), written in 1994, pursued a “lead but hedge” strategy, and while the United States massively decreased the number of its nuclear weapons to lead, it let its nuclear infrastructure atrophy as if forgetting about the hedge.¹ Needless to say, US nuclear modernization efforts grinding to a halt had no appreciable effect on US

adversaries and competitors who did not share American assumptions about the state of the post–Cold War world.

Today, China and Russia continue to modernize their nuclear forces, including reportedly conducting low-yield nuclear weapon experiments the United States stopped in 1992.² The US has not deployed a new nuclear warhead design since the late 1980s, stopped a large majority of its warhead design activities in the early 1990s, let its nuclear weapon complex atrophy, and took a procurement holiday from modernizing its nuclear delivery systems. As a consequence of this largely unilateral restraint (also pursued by France and the United Kingdom), it is likely that America’s adversaries are narrowing the gap in nuclear warhead technologies, if not surpassing the United States in some areas.

Lagging behind in this class of “ultimate” weapons could incur political and diplomatic penalties for the United States and its allies that are dependent on US nuclear weapons for their own security. Many American allies possess the technology to develop their own nuclear forces should they feel the United States’ assurances are no longer credible. There are some indications of increasing doubt in the minds of some allies. For example, two-thirds of South Koreans support a “domestic nuclear weapons program” according to a poll from 2013.³ To make matters more complicated, North Korea emerged as a nuclear-armed state since the end of the Cold War, increasing the complexity of interactions among nuclear-armed players and their allies. North Korea continues to invest tremendous wealth to advance its nuclear weapon and ballistic missile programs at the expense of meeting the basic population

needs—and its programs are causing significant concerns in both the United States and South Korea.

US nuclear delivery systems are on average older than the airmen and sailors who operate them. These systems are often in service decades past their original service lives. The B-61 gravity bomb and the Minuteman III intercontinental ballistic missile (ICBM) are two examples. So far, the United States has managed to extend their service lives, but further extensions are only possible assuming unacceptable risk to the crucial mission they perform.

Nuclear warhead infrastructure is often a less considered component of the nuclear enterprise. Every NPR since the end of the Cold War emphasized the importance of a flexible and resilient nuclear weapons production complex. Yet, despite public statements to the contrary, investing in infrastructure and pursuing policies that would provide for flexibility and resilience has not been a priority of successive administrations. Consequently, the nation's nuclear weapon infrastructure is underfunded and faces myriad challenges that span from an aging workforce and the inability to retain and train the next generation of scientists to the modernization of aging facilities. More than half of the National Nuclear Security Administration's (NNSA) facilities are more than 40 years old, nearly 30 percent date to the 1940s Manhattan Project, and 12 percent are considered excess or no longer needed.⁴ The NNSA reported \$2.5 billion worth of deferred maintenance as of February 2019.⁵ The NNSA is facing an ambitious warhead sustainment and modernization schedule in the coming decades and its potential inability to deliver on time could negatively impact delivery system modernization.

Why the Cost of Nuclear Deterrence Matters

The US Air Force operates two of the three legs of the nuclear triad: intercontinental ballistic missiles and bombers.⁶ David Trachtenberg, former deputy under secretary of defense for policy, testified in March 2019, saying, “A robust and modern US nuclear deterrent helps ensure the United States competes from a position of strength and can deter nuclear attack and prevent large-scale conventional warfare between nuclear-armed states for the foreseeable future.”⁷

Our nuclear weapons and infrastructure supporting them are old, which translates into commensurate maintenance bills. Even more worrisome is that the net result of trends described above is that the United States must replace all its delivery systems simultaneously and that nuclear weapon modernization will compete against other force modernization priorities in the coming decades. And because the United States “punted” nuclear weapons modernization for so long, it has very little margin to replace the systems without creating gaps in US nuclear capabilities and potentially nuclear deterrence.

Nuclear weapons modernization is “a top priority of the Department of Defense,” according to the 2018 NPR.⁸ In fact, it is so important that a majority of US nuclear force modernization efforts started under the Obama administration.⁹ In his remarks announcing his commitment to creating conditions for a nuclear-free world, President Obama stated, “As long as these weapons exist, the United States will maintain a safe, secure, and effective arsenal to

deter any adversary, and guarantee that defense to our allies.”¹⁰ Nuclear weapon modernization is an essential component for keeping nuclear weapons “safe, secure, and effective,” but it is not free.

Technically speaking, the United States is planning on modernizing only its nuclear weapon delivery systems and nuclear command, control, and communications (NC3) network supporting the nuclear mission. For now, it is not planning entirely new nuclear warheads. Even the W-93, a “new” Navy warhead announced in February 2020, will be based on “existing designs” and components that are currently in the stockpile.¹¹ US nuclear warheads are sustained through life-extension programs, meaning that rather than designing new nuclear warheads with new military characteristics, the United States tries to replicate existing warhead designs to the best of its ability and without underground nuclear weapon testing.¹²

If it is to retain today’s capabilities, the United States will have to build at least twelve Columbia-class strategic submarines to replace the current force of fourteen Ohio-class ballistic missile submarines. The ground-based strategic deterrent (GBSD) is scheduled to replace the Minuteman III ICBM beginning in 2029. The B-21 Raider will initially supplement and eventually replace the current nuclear-capable force of 46 B-52H and 20 B-2A bombers. These systems will carry long-range standoff (LRSO) nuclear cruise missiles, a follow-on to the more than 25-year-old air-launched cruise missile (ALCM). The LRSO will increase the bombers’ strike capabilities, particularly in situations in which adversaries possess advanced anti-access and

area denial systems. The forward-deployable and nuclear-capable F-35 will replace F-15Es and perhaps allied dual-capable aircraft in Europe. NC3 acquisition oversight was given to US Strategic Command in 2019.¹³

Are Nuclear Weapons Too Expensive?

Estimating nuclear weapons modernization costs is difficult because some delivery systems perform conventional and nuclear missions (B-21) or have nonnuclear variants that share much of the research and development costs (F-35). It also means that cost estimates have considerable range depending on how their authors account for multiple missions. Therefore, it is important to closely examine assumptions any cost analysis makes about dual-use categories. To make matters more complicated, nuclear weapons modernization involves long time frames, which makes initial cost estimates unreliable. Analysts often adjust their estimates over time as they learn more and refine assumptions. Lastly, nuclear warhead modernization activities are funded by the NNSA and are often lumped together with nonnuclear activities like nonproliferation or environmental clean-up. Since budget categories occasionally change year-to-year, it makes assessing their cumulative value over time even more difficult.

In the recent past, discussions about US nuclear forces costs were made particularly salient by concerns over the 2011 Budget Control Act's (BCA) impact on the Department of Defense's (DoD's) budget. The law mandated caps on discretionary spending (of which defense spending is a

part) and instituted a mechanism (sequestration) to cut discretionary spending across the board should these caps be topped. The law required the DoD to bear half of these cuts.

Perhaps the clearest budget estimate in terms of clarifying underlying assumptions up-front is the Congressional Budget Office's (CBO) *Projected Costs of U.S. Nuclear Forces*. The latest publicly available iteration of the document from January 2019 estimates the 10-year costs of nuclear forces between the DoD and the Department of Energy at \$494 billion.¹⁴ The breakdown of the costs are as follows: \$234 billion for strategic nuclear delivery systems and weapons; \$15 billion for tactical nuclear delivery systems and weapons; \$106 billion for nuclear weapons laboratories and their supporting activities; and \$77 billion for nuclear command, control, and communications. Because bombers are used both for nuclear and conventional missions, the CBO attributes 25 percent of the costs of the B-52 and the new B-21 to the nuclear mission and 75 percent to the conventional mission. The CBO's budget numbers are perhaps the most authoritative and are often used by members of Congress.

Since nuclear forces take decades to develop and deploy, some oft-cited estimates tally their costs over a 30-year time frame. The longer the time frame, the more uncertainty estimates they entail. These estimates also tend to suggest a more expensive nuclear deterrent. The BCA presented opponents of nuclear modernization an opportunity to portray it as wasteful and argue that resources spent on new nuclear forces would be better spent on other government programs.¹⁵ Similar arguments continue to be

made in today's fiscally challenging environment. However, cutting nuclear weapons modernization costs cannot cure this country's fiscal woes.

The Stimson Center 2012 report estimated costs of strategic offensive nuclear forces at \$352 billion to \$392 billion in 2013–2022. The report broadly attributes all funding having to do with nuclear weapons to the nuclear mission, which is a questionable approach given that many nuclear systems primarily perform conventional missions.¹⁶ The January 2014 report by the James Martin Center for Non-proliferation Studies estimated a 30-year cost of US nuclear forces between \$872 billion and \$1,082 billion.¹⁷ The report attributes all bomber costs to the nuclear mission and accounts for some NNSA costs.¹⁸

Another authoritative estimate of the Center for Strategic and Budgetary Assessments in 2015 used somewhat different assumptions and projected the cost of nuclear forces during 2015–2039 at \$704 billion in then-year dollars.¹⁹ The report noted that potential nuclear force cuts would not significantly contribute to meet caps mandated by the BCA. Indeed, Congress repeatedly admitted that the Pentagon's budget caps, set to expire in 2016, are unworkable and changed the BCA several times after 2011 to permit higher levels of defense spending than the BCA permitted.

Nuclear Weapons Provide a Good Value

The Trump administration's fiscal year 2021 budget request includes \$15.6 billion for the NNSA's nuclear weapon activities account and \$28.9 billion for the DoD's nuclear

weapons modernization effort and operations and maintenance.²⁰ The DoD's top five research, development, testing, and evaluation programs are the Columbia-class submarine (\$4.4 billion); NC3 modernization (\$4.2 billion); the B-21 Raider (\$2.8 billion); the GBSB (\$1.5 billion); and the Trident II missile life-extension program (\$1.2 billion).²¹

While this is a significant sum of money—which reports projecting decades into the future make them seem ever larger—US nuclear forces are not a large budget line in the DoD's budget in real or value terms. Today, nuclear forces take up about 5 percent of the Pentagon's budget, which itself has been a declining part of the federal budget.²² Even at the peak of modernization, nuclear forces will consume about 6.4 percent of the budget.²³ Nuclear force maintenance and operation takes another 2 percent or 3 percent of the budget—and is a recurring cost that will not disappear.

In other words, it is important to keep nuclear force costs in perspective. Long-term estimates tend to give an impression that nuclear forces are unaffordable and that opportunity costs of funding them are too high. But they are misleading—and not only because of the uncertainty involved in long-term estimates in general. Consider that when any major defense program is costed-out over a long enough time frame, its total cost will seem significant. This is true of airplanes, tanks, personnel, and even office equipment.

Moreover, over the period between 2004 and 2019, the government paid out \$1.2 trillion in improper payments (waste, fraud, and abuse).²⁴ Should the government conduct its financial business in a similar fashion to responsible

Americans, the amount saved would more than cover the cost of nuclear force modernization over the next 30 years.

The American response to the Wuhan flu and massive government spending the crisis facilitated—more than \$6 trillion in various capital infusions—are likely to impinge on defense spending in the years ahead.²⁵ For some, the crisis is an opportunity to continue to call for reductions in US nuclear forces. But a closer look at the numbers tells a familiar story; the United States cannot balance its budget on the back of nuclear weapons modernization—and the DoD, more generally. For example, as the Hudson Institute analyst Tim Morrison points out, “Cancelling the GBSD entirely this year would amount to .002% of the defense budget for fiscal year 2021 and .0003% of projected federal spending and .0002% of spending to date on the pandemic.”²⁶ Most important is the benefit Americans receive from the nuclear deterrent, which is foundational to the peace the nation has enjoyed for seven decades. In the words of former Secretary of Defense James Mattis, “America can afford survival.”²⁷

Conclusion

As operators and maintainers of two legs of the strategic triad and American tactical dual-capable aircraft, airmen have a special duty to understand the context in which the nuclear force is funded so that they can make logical and persuasive arguments for continued support to these forces. The nuclear force is in need of recapitalization and it is up to airmen to explain not only how deterrence works,

which is covered in other chapters, but why American taxpayers are served well by their investment in nuclear modernization. This is not only an obligation for the corporate Air Force as its leadership explains the service's needs to Congress, but the American people have a right to know how their taxes are spent and for what purpose.

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Chapter 5

The Legislative Process

How Congress Funds Deterrence

Brooke Mitchell

The bottom line is this: in an era of mounting fiscal challenges and competing demands, we must actively seek ways to free up time, money, and manpower to invest back into our top priorities.

—Mark Esper

Secretary of Defense, United States of America

The United States Congress is tasked with establishing funding priorities and passing legislation. “No money shall be drawn from the treasury but in consequence of appropriations made by law; and a regular statement and account of the receipts and expenditures of all public money shall be published from time to time.”¹ While the service of airmen is apolitical, the responsibility to understand the foundational role of Congress and the flow of money to the deterrence mission is critical.² It is a misnomer to dismiss the importance of how the funding process for the mission is conducted, providing an excuse or misinformed judgment, in confusing partisanship with process.

The procedural aspects of policy’s democratic integrity are an apolitical process that is Constitutionally mandated and steeped in checks and balances. Interpretation of policy and participation in politics cause partisanship to come into play and is out-of-scope for this chapter and sworn duty of the

United States military.³ All uniformed military, both enlisted and officer rank, take an oath to serve and defend the United States Constitution. The fiduciary components of duty are mission-critical and should be respected, acknowledged, and recognized as an extension of service responsibilities.

This chapter provides a generalized overview of the legislative process in order to assist airmen in evaluating, assessing, and understanding the congressional appropriation and authorization process that ultimately funds strategic deterrence specifically within the National Defense Authorization Act (NDAA). This process is traced through its origins in the president's budget, and then through congressional appropriation and authorization processes. The legislative branch may appear abstract and irrelevant to the job duties of airmen, but in actuality the legislative branch touches every part of strategic deterrence. Awareness of where the federal budgeting process is within its annual spending cycle is a practical example of how airmen may better serve their unit in evaluation and identification of both short-term and long-term funding priorities.

The Budget Process

The President proposes, the Congress disposes.

—Will Rogers, circa 1920s

President's Budget

The president is responsible for submitting a federal budget to Congress annually. The Office of Management and Budget (OMB) exists to assist the president in meeting policy, budget, management, and regulatory objectives in

the preparation of the budget.⁴ The president's budget is due to Congress on the first Monday of February.

The president's budget is a comprehensive document that includes funding requests from every federal department and agency.⁵ It is a strategic planning document and is frequently used as a political messaging document.⁶ The president's budget contains line-by-line information for all of the programs in the federal government. Congressional budgeters use these numbers as a starting point for producing the resulting twelve spending bills.

"The president's budget contains detailed information on a number of subjects, since it describes explicit policy recommendations. The budget contains past, present, and proposed spending information for every program, including budget authority, outlays, offsetting receipts, unobligated balances, and more."⁷ The budget is not presented as a bill, and, thereby, is never voted on; however, the president's budget does provide proposed legislative language for Congress.

While the "power of the purse" lies with Congress, due to the Budget and Accounting Act of 1921 the President is required by law to submit a budget before Congress. Included in the budget are estimates on spending, revenue, information on the performance of the economy and legislative and policy recommendations. However, the President's budget is only a request to Congress and a proposal for consideration. While this budget does not offer any binding language, it is still regarded as a powerful directive for the executive branch to offer national policy.⁸

Legislative Branch

The United States Congress is comprised of two chambers: the House of Representatives and the Senate. In the House of Representatives, each state elects a varied number of representatives based on the population of that state to total 435 voting members.⁹ In the Senate, there are 100 senators, two elected from each state. Whichever political party is represented with the largest number of elected members holds the majority within both the House and the Senate.

The role of the legislative branch includes creating and passing federal law, declaring war, and passing the federal budget. Accomplishing these tasks take place through congressional committees, which are assigned specific governmental functions for oversight and spending. These committees include Agriculture, Armed Services, Foreign Affairs, Intelligence, Judiciary, and Ways and Means. The Senate is responsible for confirming political appointees such as the secretary of defense and secretary of the Air Force, as well as military promotions.¹⁰

The majority party in each chamber of Congress holds the most seats on each committee. A chairman is selected from the majority party to oversee the committee. The minority party is led by a ranking member and is the most senior member of a congressional committee and subcommittee.

“A Congressional Budget Resolution is a blueprint that guides fiscal decision-making in the Congress.”¹¹ A budget resolution is passed by the House and the Senate and is not presented to the president for signature; therefore, it is not

a law. A budget resolution establishes the “top-line levels for the budget by setting targets for revenues and upper limits for subsequent spending bills (with exception to Social Security) over a specific period or budget window” and sets the terms of the budget debate by defining Congress’ goals for “federal spending, revenues, deficits and debt, and allocates budgetary resources among the major functions of government.”¹² Through the process known as reconciliation, budget resolutions also provide for changes made to mandatory programs.

The United States federal budget is divided into three broad categories: mandatory or direct spending, discretionary spending, and interest on debt.¹³ Mandatory spending is spending for entitlement programs, such as Social Security, Medicare, and Medicaid. Mandatory spending is ongoing and is not subject to the same oversight rigor as discretionary spending. In comparison, discretionary spending is expended through the appropriations process and funds for these programs are provided under annual review.¹⁴ Funding for defense, education, and transportation are examples of discretionary spending.

Appropriations

Appropriations consists of three types of bills: regular appropriations, continuing resolutions, and supplemental appropriations.¹⁵ Regular appropriations provide funding for the majority of federal programs to ensure the government continues to operate. Continuing resolutions provide funding for shorter periods of time. The 1974 Congressional Budgeting Act outlines the standard appropriations pro-

cess and establishes April 15 as the deadline for submitting its budget resolution and October 1 as the deadline for passing its twelve appropriations bills.¹⁶ “Congress has managed to pass all its required appropriations measures on time only four times: in fiscal 1977 (the first full fiscal year under the current system), 1989, 1995 and 1997.”¹⁷

In absence of a continuing resolution, the government shuts down and many functions cease. The Department of Defense (DoD) funding is a regular appropriation unless funding has not been passed by the expiration of the current budget. This may necessitate a continuing resolution to fund the DoD until the NDAA is passed. Supplemental appropriations bills provide additional funding for specific items that arise outside the budget cycle. For example, “the DoD has regularly requested large appropriations to supplement its base-budget funding. Most of that non-base funding has been designated for overseas contingency operations (OCO) that began after 9/11.”¹⁸

Federal spending is broken into mandatory and discretionary spending. Mandatory spending like Medicare, Medicaid, Social Security, and other entitlement programs is not part of the regular appropriations process and is generally governed by statutory criteria.¹⁹ Discretionary spending, which includes all or some of each federal department or agency’s budget, must pass through the annual appropriations process. This includes both the House and Senate Committee on Appropriations and the specific focus of the committee assignment, which have oversight for a specific federal department. “House and Senate appropriations committees divide the discretionary

spending portion of the budget resolution among twelve subcommittees.”²⁰ Defense, for example, has its own appropriation committee dedicated to overseeing funding for the military, the Intelligence Community, and other national defense organizations. A second example is Energy and Water, an appropriations subcommittee that holds jurisdiction over the Department of Energy.

It is a massive undertaking for the House and Senate Appropriations Committees to produce their annual spending bills. With each committee broken into a differing number of subcommittees, members establish their funding priorities and submit these priorities through their respective subcommittees to their committee. As part of this process, members meet with constituents and other groups who lobby for support and funding. Additionally, members hold hearings where leaders from the various departments testify before congressional subcommittees and committees in response to their assigned funding priorities that ensure ability to achieve the federal program’s purpose.

In reference to defense appropriations, the secretary of defense, Joint Chiefs of Staff, and/or combatant commanders, including heads of major commands such as Air Force Global Strike Command, are regularly called to speak before the Senate or House Armed Service Committees regarding budget requests. Title 5, US Code, Section 7102 and Title 10, US Code, Section 1034 grant United States Air Force personnel with the legal right to petition and furnish information to or communicate with Congress.²¹ These hearings often take place in open session which allow the

public and members of the press to attend. Closed sessions are held when testimony contains classified information.

Simultaneously, interest groups and constituents submit requests to members seeking funding for their cause or organization. Members then submit a comprehensive list of requests to the House Committee on Appropriations. Committee staff begin the review of thousands of budgeting requests that are narrowed down to form the committee's funding bill. During this time period, review and markup take place. The House Committee on Appropriations votes on its spending bill. If it passes, the bill is then sent to the House of Representative's floor for a vote. Once the bill passes in the House it is then ready to be sent to the Senate, where a similar process takes place. It is worth noting that the Constitution specifically mandates that all spending bills originate in the House of Representatives because it is the "House closest to the people."²²

Authorizations

The role of "authorizers" is to create, extend, or make changes to statutes and specific programs, and specify the amount of money that "appropriators" may spend on a specific program. Specifically, the House and Senate Armed Services Committees, through the NDAA, establish funding and policy for the DoD. "Article 1, Section 8 of the Constitution states that Congress shall have the power to 'raise and support Armies' and 'to provide and maintain a Navy.' In addition, Congress must provide for the state militias when they are called to federal service."²³

Within the House Armed Services Committee (HASC) there are six subcommittees, and the Strategic Forces Subcommittee specifically focuses on the nuclear enterprise:

The Subcommittee on Strategic Forces has jurisdiction over Department of Defense and Department of Energy policy related to strategic deterrence, strategic stability, nuclear weapons, strategic and nuclear arms control, nonproliferation, nuclear safety, missile defense, and space; Department of Defense programs and accounts related to nuclear weapons, strategic missiles, nuclear command and control systems, Department of Defense intelligence space, space systems and services of the military departments, and intermediate and long-range missile defense systems; and Department of Energy national security programs and accounts.²⁴

Each subcommittee submits its own bill (called a “mark”) to the full committee. At this stage, the bill must pass with a majority vote before submission into the next phase of review.

Once passed through the House, the Senate Armed Services Committee (SASC) receives the bill. The SASC is comprised of seven subcommittees. The SASC reviews and marks up the bill within the individual subcommittee and then presents the bill to the full committee for a vote. The SASC conducts much of its markup process in a closed session, whereas the HASC markup occurs in an open session.

“Both versions of each bill go to a conference committee to merge the two. Both chambers vote on the same version of each bill.”²⁵ This is the last phase of the legislative process for the bill. Once the spending bill has undergone this extensive process it is presented to the president as the last step. The president will either veto the bill or sign the bill, where at this point it becomes law. “If Congress cannot

agree on the twelve separate appropriations bills, it can pass an Omnibus bill that includes multiple funding areas. If the President signs that, the budget becomes law and goes into effect.”²⁶

Committee Review and Markup: Debates that Fund Deterrence

Committee review and markup is a highly politicized environment where issues are contested and analyzed with detail and scrutiny on funding that best serves national security from legislators’ perspective.

The fiscal year (FY) 2020 NDAA is 1,794 pages and was signed into law on December 20, 2019, following a contentious review process between the HASC and the SASC.²⁷ Typically, the bill is passed through Congress and signed into law by the president by September 30 of each year. The FY 2020 NDAA contained many issues, specific to the nuclear enterprise, that were heavily debated during the review and markup process. Examples worth highlighting here include:

Partisan seams appeared during the House Armed Services Committee’s lengthy debate over whether to deploy a new low-yield nuclear warhead on submarines, putting members’ deeply held disagreements about nuclear policy on display. The discussion came during the full committee’s markup of the 2020 defense policy bill June 12.

The House Armed Services strategic forces subcommittee’s mark of the 2020 defense policy bill seeks to withhold funds that would allow the Pentagon to deploy the W76-2, a low-yield warhead that proponents argue is needed to counter nuclear-

armed adversaries. The 2018 Nuclear Posture Review recommended that warhead, which is seen as an option for shorter-range, tactical nuclear strikes from ballistic missiles on submarines, as well as a new sea-launched cruise missile.²⁸

In addition, Democrat priorities established through the HASC Strategic Forces Subcommittee in the FY 2020 NDAA include cutting \$103 million from the ground-based strategic deterrent, repealing convention requirements for the long-range standoff weapon (LSRO), and increasing funding for nuclear command, control, and communications (NC3).²⁹

As a single example, among thousands of debated issues, to highlight the markup process note the following excerpt from the FY 2020 Joint Explanatory Statement of the Committee of Conference:

Briefing on long-range standoff weapon and sea-launched cruise missile (sec. 1669). The Senate bill contained a provision (sec. 1665) that would require the Under Secretary of Defense for Acquisition and Sustainment, in consultation with the Administrator for Nuclear Security, to provide a briefing to the Committees on Armed Services of the Senate and the House of Representatives on opportunities to increase commonality between the long-range standoff weapon (LRSO) and the nuclear sea-launched cruise missile (SLCM-N), and to leverage technology developed for LRSO in the development of the SLCM-N.³⁰

The House amendment contained no similar provision.

The House recedes with a clarifying amendment. Extension of prohibition on availability of funds for mobile variant of ground-based strategic deterrent missile (sec. 1670). The House amendment contained a provision (sec. 1645) that would extend until 2030 the prohibition contained in the National Defense

Authorization Act for Fiscal Year 2017 (Public Law 114–328) on availability of funds for development of a mobile variant of the ground-based strategic deterrent program.

The Senate bill contained no similar provision. The Senate recedes with an amendment that would extend the prohibition through 2024.³¹

These excerpts represent contentious areas that were resolved through lengthy debate. The FY 2021 HASC and SASC committee review and markup have faced no such contentions and are projected to fund all ground-based strategic deterrent (GBSD) and Minuteman III (MMIII) related budget marks.

Conclusion

As noted by Major General Steven L. Basham, former director of Air Force legislative affairs, “We are not only the Air Force liaison to Congress, but we are also liaisons for Congress to the rest of the Air Force.”³² It is within the spirit of this exchange and role that congressional offices send delegations to the various Air Force bases to learn, observe, and champion for causes specific to unique missions. Observations, inputs, and analysis reported through the channels of the military to Congress best inform the congressional process; however, advocacy for resources that enable airmen to practice strategic deterrence originate within a unit. Diligently evaluating priorities in both the external and internal operating environment create a pipeline of knowledge to specific pieces of the bigger puzzle; thereby, better identifying long-term funding priorities.

Among an airman's many obligations, add to the job the need to both evaluate and understand the congressional appropriation and authorization process that ultimately funds strategic deterrence. It is Congress' role that keeps the nuclear enterprise in business.

For airmen, understanding this comprehensive process aids senior leadership in effectively conveying to legislators, when called upon, the mission of Air Force Global Strike Command in establishing funding priorities for the nuclear enterprise. The resources provided by Congress support the operations and maintenance dollars needed to equip security forces, sustain the parts needed by maintainers, and provide the fuel required by bombers. While the United States' Congress may not directly execute the everyday mission, the dollars they appropriate and authorize allow for mission continuity.

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Chapter 6

Nuclear Crisis Stability

Cold War Legacies and New Era Challenges

Peter Huessy

Nuclear crisis stability is a state of international affairs where the United States has successfully prevented an adversary from threatening or using nuclear weapons in a crisis or conventional conflict. For the 75 years of the nuclear age, the United States successfully kept nuclear weapons from being used, despite some close calls over Berlin and Cuba. Fears of the use of nuclear weapons receded after the Cold War. Adding to that benign environment was the subsequent 85 percent reduction in Russian deployed nuclear warheads, which began with the 1991 Strategic Arms Reduction Treaty (START).¹

Unfortunately, the threat of nuclear weapons use is increasing, making crisis stability an emerging concern for American policymakers. Taking for granted that nuclear weapons will not be used is an unwise action.

As the 2018 *Nuclear Posture Review* (NPR) explains, global threat conditions have worsened markedly since the most recent 2010 NPR, including increasingly explicit nuclear threats from potential adversaries. The United States now faces a more diverse and advanced nuclear-threat environment than ever before, with considerable dynamism in potential adversaries' development and deployment programs for nuclear weapons and delivery systems.²

The NPR focuses on deterring Russia and China, making strategic deterrence especially important—protecting the Baltic states and Taiwan.³ While a nuclear-armed attack on the American heartland may be less likely than at the height of the Cold War, the NPR warns regional nuclear threats are growing.

How the Air Force Promotes Stability

To meet this challenge, the US Air Force (USAF) is sustaining its legacy nuclear forces. The service is also acquiring the new ground-based strategic deterrent (GBSD) and B-21 strategic bomber. Where possible the United States may also explore deploying regional missile defenses. Without these upgrades, the strategic nuclear deterrent could easily “rust to obsolescence.”⁴ As a result, the nation’s deterrent might lose credibility, potentially putting the United States out of the nuclear business.⁵ If that occurs, adversaries may not fear the American deterrent, nuclear or conventional—with crises or conflicts escalating to nuclear use.

The USAF mission is to ensure potential adversaries not miscalculate the consequences of their possible nuclear first use, or misunderstand that there are no possible benefits from nonnuclear aggression or limited nuclear escalation.⁶ As the 2018 NPR explained, correcting any such adversary misperceptions is now critical to maintaining strategic stability in Europe and Asia.

To achieve this goal, the NPR emphasizes three realities across the emerging range of threats and contexts. First, adversaries must know the United States is able to identify

them and hold them accountable for acts of aggression, including any new forms of aggression. Second, the United States will defeat nonnuclear strategic attacks such as electromagnetic pulse (EMP) and cyber. Third, any nuclear escalation will fail to achieve its objectives and will instead result in unacceptable consequences.⁷

History and Early Stability Concerns

Concerns over strategic stability are not new for the United States. Two crises early in the Kennedy administration almost led to nuclear war. In 1961, Soviet General Secretary Nikita Khrushchev threatened to attack American conventional forces in Germany unless they were removed from Berlin. Newly released archival material has President Kennedy telling Khrushchev an attack on American forces would risk nuclear retaliation.⁸ Apparently, Khrushchev thought better of attacking forces in Berlin and built the Berlin Wall instead.⁹

The following year, Khrushchev again tried to bully the United States and placed nuclear-armed missiles in Cuba. President Kennedy announced the discovery of the missiles on the same day as he also announced the first Minuteman missiles going on alert in Montana, North Dakota, and Wyoming. As the president would later remark, “Minuteman was my ace in the hole.”¹⁰ This convinced Khrushchev to stand down and remove the nuclear-armed missiles from Cuba.

Subsequently, the United States and the Soviet Union created an “arms control” framework to better manage

their nuclear arsenals. The objective was to ensure crises such as Berlin and Cuba did not escalate into nuclear war.

Although the Strategic Arms Limitation Talks (SALT) was concluded in 1972, it only marginally regulated the growth in Soviet warheads. With the increase in Soviet nuclear arms bolstered by the new multiple warhead (MIRV) technology, deployed Soviet warheads rose dramatically. Consequently, the USAF decided better survivability of both its bombers and intercontinental ballistic missiles (ICBMs) was needed. During the 1970s the USAF examined over fifty alternative mobile basing modes for the new MX land-based missile. A decade later, the USAF explored alternative bomber deployment strategies, fearing a surprise Soviet submarine strike.

The 1972 SALT agreement between President Richard Nixon and General Secretary Leonid Brezhnev took three years to negotiate, and the joint deal accommodated a massive¹¹ Soviet nuclear modernization. By 1974, Moscow's deployed nuclear arsenal was projected to reach 12,000 strategic weapons within the next decade.

The origin of the SALT I treaty stemmed from Soviet concerns over potential deployment of American missile defenses,¹² which were announced by Secretary of Defense Robert McNamara in 1967. Although the United States' objective was ostensibly to counter the Chinese nuclear threat, the Soviets suspected otherwise fearing a backdoor attempt to change the strategic balance. Following the 1968 election¹³ General Secretary Brezhnev called President Nixon and demanded that arms control talks begin.

SALT I, as noted, managed a fivefold increase in deployed Soviet strategic nuclear warheads, especially high-yield, multiple-warhead, first-strike missiles. At the same time, a companion anti-ballistic missile (ABM) treaty was approved by the US Senate, eliminating most missile defenses for the USSR and USA.¹⁴

Even with the new agreements on nuclear arms and defense, strategic stability did not necessarily improve. Despite *détente*, the Soviet empire expanded considerably by some eighteen nations. In the view of Moscow, the “correlation of forces”¹⁵ moved decidedly in the Soviet’s favor. Soviet expansion was punctuated by the end of the decade with the 1978 Soviet invasion of Afghanistan and the 1979 revolution in Iran.

As the new Reagan administration examined the strategic landscape, the SALT II treaty was withdrawn from consideration by the Senate and much of the country’s strategic modernization plans were in disarray. Arms control was seen by many as an alternative to strategic nuclear modernization or at least a good excuse to curtail it. Instead of building more nuclear weapons, arms control enthusiasts argued we could simply avoid such costly expenses. Paul Warnke, Carter’s head of the Arms Control and Disarmament Agency (ACDA), argued the United States and the Soviets were like “apes on a treadmill.”¹⁶ Each nuclear power projected the worst intentions onto the other, with such worse-case analysis justifying buying more and more nuclear weapons.

The United States could not just jump off the treadmill and stop modernizing. Strategic stability was needed and

that in turn required a deterrent and that in turn required building nuclear-armed bombers, submarines, and missiles. As Secretary of Defense Harold Brown once quipped, “We build, they build. We stop. They build.”

Nonetheless, because of the perceived contradiction between pursuing arms control and strategic modernization simultaneously, the United States did both badly. Including not funding significant parts of the proposed nuclear modernization put forward by Presidents Nixon, Ford, and Carter—and signing off on SALT II, which endorsed a huge increase in Soviet nuclear weaponry.

The Reagan Solution

President Reagan campaigned heavily on his concern about the strategic “window of vulnerability” he saw develop between the United States and USSR. Naturally, strategic stability concerns were important. Soviet deployments of heavy multiple-warhead nuclear missiles were growing rapidly. The 1979 SALT II treaty,¹⁷ while putting some limits on overall numbers of bombers and missiles, sanctioned the continued growth of Soviet weapons.

On top of the strategic disparity the United States faced with the Soviets, Moscow deployed over a thousand SS-20 nuclear-armed medium-range missiles in Eastern Europe and Soviet Asia. Although North Atlantic Treaty Organization (NATO) promised to counter this Soviet deployment, no such missiles were deployed. And to make matters worse, the overall state of the US military was so bad it was repeatedly called a “hollow Army.”

The Reagan administration, facing these combined challenges, adopted as an alternative a multi-pronged strategy.¹⁸ It included significantly increasing the defense budget, and instituting an across-the-board strategic nuclear modernization. It rejected the Soviet offer of a freeze on all nuclear weapons. Instead, the administration proposed to deploy the ground-launched cruise missile (GLCM) and Pershing II missiles in Europe and Asia—to counter Soviet SS-20s.¹⁹

In an effort to seize the arms control high ground, the administration simultaneously proposed two major initiatives. Reagan offered Moscow a “zero-zero option,” which was a ban on all intermediate-range ballistic missiles.²⁰ The president also proposed to radically reduce the nuclear arsenals of both superpowers.

Reagan’s four-part strategy was supported by Congress. Instead of choosing between new weapons or arms control, Reagan said both were needed. Instead of buying more weapons to increase arms, Reagan proposed to smartly modernize the smaller force reached from anticipated arms control reductions.

In a novel switch from strategic orthodoxy, Reagan pushed for missile defenses. As Robert McFarlane explained, the promise of missile defenses led the Soviets to accept radical reductions in nuclear weapons.²¹ A year later, Reagan formally proposed the Strategic Defense Initiative (SDI). The objective of SDI was to build missile defenses to further complicate Soviet attack plans.²²

As a result, the correlation of forces moved decidedly in the direction of the United States. Reagan moved to a position of “peace through strength.” Most importantly, the

large throw-weight, multiple-warhead Soviet missiles, seen as highly destabilizing first-strike weapons, were reduced.²³

A decade earlier, Secretary of Defense Melvin Laird warned Congress that the Soviets were developing the capability for a preemptive strike against the United States, saying, “and of that there is no doubt.”²⁴ Nearly two decades later, Reagan’s vision of eliminating the Soviet threat was coming to fruition. The 1991 START Treaty reduced nuclear weapons fifty percent and was signed by President George H. W. Bush and General Secretary Mikhail Gorbachev. In January 1993, less than two years later, START II was signed by President Bush and President Boris Yeltsin, cutting strategic nuclear forces by an additional sixty percent.²⁵

Mindful of Laird’s warning, American negotiators included in START II a critically important measure to improve strategic stability. The treaty, while reducing deployed strategic weapons to 3,500, banned all multiple-warhead land-based missiles. Such missiles were the lynchpin of Soviet plans during the Cold War to launch a disarming attack on the United States. Not surprising, former Soviet Premier Gorbachev hinted at Russian opposition to Start II. Gorbachev, reflecting Duma thinking, argued a ban on multiple warhead missiles would effectively bankrupt Russia.²⁶

Unfortunately, the Russian Duma followed Gorbachev’s advice and in April 2000 ratified START II but added a “poison pill” provision.²⁷ All US missile defense work had to stay in the laboratory, a provision effectively banning all US missile defenses. The Duma provision was consistent

with former-Secretary of Defense Les Aspin's decision in 1993 to kill most of the strategic defense initiative (SDI).²⁸ The decision was inconsistent with the congressionally passed Missile Defense Act (1999), which mandated the United States deploy missile defenses against "limited" rogue state threats like North Korea.

Gorbachev's view was not without merits. Banning multiple-warhead ICBMs makes it more expensive to field large numbers of ICBMs. Alternatively, placing a greater percentage of alert forces at sea is even more costly—giving credence to the cost concerns of the Russians.

However, such a force structure is also markedly more stabilizing. To preemptively attack the United States the Russians would use a high percent of such a deployed force—to have sufficient warheads available to cover all US nuclear assets. This would require, absent multiple warhead ICBMs, more submarines at sea from which to launch an attack.

Sending submarines to sea is seen by American satellites, thus giving the United States warning time to put its own forces, including submarines and bombers, on higher alert. American forces would then be more survivable. Strategic stability would be strengthened as a Russian attack would be likely. This in turn makes any Russian plans to decapitate American nuclear forces highly improbable—strengthening stability.²⁹

Russian support for START II was no mistake. President Boris Yeltsin signed the agreement. He spoke at the United Nations and endorsed START II and the ban on multiple-warhead land-based missiles.³⁰ He also endorsed building

a parallel worldwide missile defense system—a global protection against limited strikes (GPALS).³¹

Yeltsin obviously did not seek to maintain a Soviet-era first-strike arsenal. But, in 2000, the Duma and President Putin rejected that idea of combining stabilizing missile defenses and START II compliant forces. The US Senate did not agree to such a missile defense constraint and thus the previously signed START II treaty did not go into effect.

While the START II ban on multiple-warhead land-based missiles was lost, arms control progress resumed. President George W. Bush proposed the Strategic Offensive Reduction Treaty (SORT) and signed the agreement with Russia in June 2003. It went into effect in 2003 and began the process of reducing nuclear forces to a maximum of 2,200 operationally deployed nuclear warheads while avoiding a ban on missile defenses.³² In fact, SORT achieved a seventy percent reduction in deployed strategic nuclear weapons. It was accompanied by the US withdrawal from the 1972 ABM Treaty.

Subsequently, in 2003–2004 the United States began building an initial missile defense system in California and Alaska, which now includes 44 interceptors with plans to expand to 66.³³ The United States will also deploy an underlayer of Navy Aegis Ashore standard missile interceptors to further protect the continental United States. Additionally, space-based sensors are planned to enhance missile threat detection.

In 2010, the Obama administration successfully negotiated another nuclear arms control deal with Russia. With New START ratified by the US Senate, nuclear warheads were reduced another thirty percent to a notional 1,550

operationally deployed strategic nuclear weapons. Each of the 60 allowed strategic bombers counted as one warhead, despite carrying more than one weapon.³⁴

Future Considerations

From over 2,500 delivery vehicles to no more than 700, and from 12,000 operationally deployed strategic nuclear warheads to approximately 1,550, the nuclear landscape is markedly changed since the 1972 SALT agreement. Deployed strategic nuclear warheads were ninety percent below their Cold War levels. Congress supports a combination of nuclear modernization and arms control—rather than an either/or approach.

On the surface, the news appears positive for USAF nuclear modernization. However, a number of serious challenges must still be navigated to maintain strategic stability.

First, with New START set to expire in 2021, a five-year extension is yet to be signed.³⁵ There are serious concerns about the utility of New START. For example, while the START I verification measures were quite effective, under New START there is no portal monitoring, telemetry rules are weak, and accountable warhead loadings are absent. Second, China is problematic because of its growing arsenal and complete lack of transparency on its nuclear forces.

Third, the failed ban on MIRV land-based missiles heightens the uncertainty over the size of the Russian deployed and breakout force. Fourth, it may be that arms control has reached a certain limit where further reduc-

tions are not wise. Proposals to reduce one-third to 1,000 warheads, for example, often are accompanied by a requirement that the ICBM force be taken down to fit a US force structure into an arbitrary warhead limit.³⁶

Fifth, global zero advocates often neglect to consider strategic stability requirements.³⁷ Without ICBMs, for example, the United States would have at most ten nuclear targets (three bomber and two submarine bases and four submarines at sea). Compared to the 500+ assets the United States has today, such a minimum force certainly might tempt an adversary to plan a disarming attack. This is especially true if a breakthrough occurs on submarine detection. Sixth, if further arms control is incompatible with maintaining both credible deterrence and stability, how does the United States continue to combine arms control and modernization to make sure support continues for the latter?

Seventh, the United States has always maintained a prudent hedge or reserve of warheads in case the strategic environment deteriorates. But if the United States reduces platforms too far, at a certain point the United States might lose the ability to adequately build back up if necessary. For example, US land-based missiles are all deployed with one warhead and can be deployed with three. But to do so requires four years. A modest hedge, yes, a sudden breakout potential to match the Russians, no.

Finally, the Russian adoption of a doctrine of “escalate to win,” is of growing concern to the United States and its allies.³⁸ Here, the Russian leadership openly discusses the use of limited numbers of nuclear weapons in a crisis or early in a conventional conflict. The intent is to force the

United States to capitulate in a crisis where vital interests are not at stake.

Keith Payne explains that the United States has not yet developed a robust strategy for dealing with “escalate to win.”³⁹ Adding effective missile defenses to a strong nuclear deterrent might be especially stabilizing if the United States encounters limited nuclear weapons use. Such defenses are hardly a challenge to Russia’s inventory of 1,550 operationally deployed strategic nuclear weapons. China’s arsenal is expected to grow to 600–800 weapons, which would also be safe from American missile defenses.⁴⁰

Ironically, such a strategy for missile defense would serve the very strategic purpose envisioned by President Reagan some thirty-seven years ago. The ambitions of adversaries cannot, in the words of Bill Keller, remain “unfettered” but must be challenged by effective defenses and a robust deterrent.⁴¹

Furthermore, Keith Payne emphasizes that whatever benefits flow from arms control, such deals cannot change the great-power competition between the United States and its allies on the one hand and Russia and China on the other.⁴² Thus, given the view of Russia and China that the United States is a strategic enemy, it is probably not wise to assume more “arms control” will improve strategic stability.

Strategic stability remains an important watchword from which to judge the adequacy of the United States strategic approach and the nation’s nuclear deterrent. During the nuclear era, stability has rested on three components: credible nuclear modernization, robust missile defenses, and verifiable arms control. If successfully implemented, the

American-led global order may continue to dominate the international system, even as Russia and China seek to turn the system to one that is authoritarian. The shape of the future will be up to the United States and its leaders.⁴³

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Chapter 7

Deterrence and Disarmament

Pulling Back the Curtain

Keith B. Payne

Should the United States seek the maintenance of nuclear deterrence or nuclear disarmament as the policy priority? Both cannot be the US priority simultaneously because they entail contradictory and incompatible goals. Why not? Because deterrence policies posit the great value of nuclear weapons to prevent war while the disarmament agenda seeks to “stigmatize” nuclear weapons and establish global norms and laws prohibiting them. Nuclear deterrence and disarmament present incompatible policy directions; one must be subordinate to the other.

Enthusiasm for nuclear disarmament increased with the end of the Cold War and the expectation that nuclear weapons and deterrence were of declining relevance to US security. The 2010 *Nuclear Posture Review*, “for the first time,” placed “atop the U.S. nuclear agenda” nonproliferation and “our effort to move toward a world free of nuclear weapons.”¹ More recently, however, US policy identifies deterrence as “the highest U.S. nuclear policy and strategy priority.”²

The basis for conflicting answers to the question of whether deterrence or disarmament should be the policy

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priority follows from two very different political philosophies, realism and idealism. Yet, the idealist and realist roots of arguments for disarmament and deterrence are rarely part of any discussion. This is unfortunate because understanding the philosophic roots of deterrence and disarmament arguments is essential to any serious understanding of them.

Realism and Idealism: Conflicting Worldviews, Conflicting Priorities

The famous twentieth-century historian E. H. Carr identified the fundamental differences between realists and idealists (“Utopians” in Carr’s terms): “The two methods of approach—the [idealist] inclination to ignore what was and what is in contemplation of *what should be*, and the [realist] inclination to deduce what should be from *what was and what is*—determine opposite attitudes towards every political problem.”³

For the realist, interstate conflicts of interest and the potential for aggression are constants inherent in an anarchic, “self-help” international system.⁴ Cooperation cannot be assumed, and no international authority exists with the power and will to reliably prevent aggression. Consequently, the pursuit of national position and power for self-preservation, potentially including nuclear weapons, is a reasonable and prudent national priority.

In contrast, idealists emphasize the inherent dangers of an anarchic international system and focus on its transformation to a more cooperative order that facilitates and

enforces the peaceful resolution of interstate conflicts. This new order would replace the anarchy of the existing international system and the need to prioritize power and position with a more peaceful and cooperative system, now potentially including nuclear disarmament. Past efforts to so change the international system include the League of Nations following World War I and the United Nations following World War II.

In short, realists see states as compelled to prioritize national power and position given the unavoidable potential for conflict and aggression in the anarchic international system. Idealists seek an international order that allows states to pursue cooperative goals—such as global nuclear disarmament—rather than the jealous pursuit of national power.

The Idealist Agenda for Nuclear Disarmament

Idealism often underlies the nuclear disarmament narrative. It essentially contends that the existing international system of independent and often conflicting states *can be transformed* via concerted, cooperative international efforts to such a degree that individual states ultimately will no longer feel compelled to, or need to, maintain independent nuclear arsenals. The felt need to maintain nuclear weapons can be relieved by cooperative global security mechanisms and anti-nuclear norms and laws to eliminate nuclear weapons. This transformation is feasible because it

is in each state's enlightened self-interest given the global threat posed by the existence of nuclear weapons.

The nuclear disarmament narrative contends that disarmament is a matter of existential importance because individual state deployment of nuclear arsenals poses an extreme and immediate risk to all humanity.⁵ Consequently, the pursuit of complete nuclear disarmament should be the US policy priority and, indeed, the priority goal of all states in the international system.⁶

Proposals for nuclear disarmament implicitly or explicitly posit the transformation of the international system to achieve the goal of nuclear disarmament.⁷ This disarmament narrative, in common with idealist thought in general, emphasizes the transformative power of reason, enlightened self-interest, and the instruments of collective security or "cooperative security," international institutions, laws, and norms. These have the potential to transform the international system and enable nuclear disarmament. The rudiments of these mechanisms and corresponding transition purportedly already are visible in the rise of international institutions, the decline in interstate wars and combat deaths over decades, the workings of the United Nations, multilateral arms control agreements, and the spread of democratic governments.⁸

The risk posed by the existence of nuclear arsenals is unprecedented and establishes the dynamic necessary for the equally unprecedented need for interstate cooperation—required for nuclear disarmament. Because of the unprecedented severity of the nuclear threat to all countries, the transformation of the international system needed for

nuclear disarmament should be feasible via informed leaders with “strategic foresight and political courage.... No law of nature stands in the way.”⁹ This transformation can reduce or eliminate the felt security requirement of individual states to retain nuclear weapons and enable the common good of eliminating the risks to all peoples posed by the existence of nuclear weapons.

The catalyst for this needed transformation is wider recognition of the potential for a global nuclear catastrophe. When leaders understand the severity of the common threat posed by the existence of nuclear weapons, they should be willing to engage in nuclear disarmament in their own enlightened self-interest. The common threat posed by the existence of nuclear weapons can overcome their felt need to sustain them and inspire the unprecedented interstate cooperation needed to transform the system and realize nuclear disarmament.¹⁰

Correspondingly, frequently expressed goals of the nuclear disarmament narrative include: (1) the global promotion of recognition of the inherent risks to all posed by the existence of nuclear weapons, and the consequent need for transforming international relations to enable their elimination; and (2) organizing political pressure on national leaders to move in this direction. There are many examples of this argument in action—most recently, including organized public pressure on behalf of the UN-based Treaty on the Prohibition of Nuclear Weapons.¹¹

Disarmament Opposition to Deterrence

The nuclear disarmament narrative often refers to nuclear deterrence as an impediment to disarmament because it suggests a positive, important value for nuclear weapons rather than stigmatizing them and establishing a global norm against them. Consequently, the argument *for* nuclear disarmament often includes criticism of nuclear deterrence as a dangerous, unreliable, and accident-prone security strategy. For example:

- “Nuclear deterrence comes with tremendous risks and costs. The arguments in favor of deterrence, if sometimes true, are not likely to be true in every case. What happens when it fails? The growing risk of a catastrophic nuclear war outweighs the uncertain benefits of deterrence for the United States.”¹²
- “Nuclear deterrence is the heart of the nuclear believers’ case; it’s their indispensable idea, and without it, they have nothing. Nuclear deterrence is indefensible because 1) we don’t understand it, 2) it has failed in the past, and 3) it will inevitably fail in the future.”¹³
- “They made us false promises. That by making the consequences of using these weapons so unthinkable it would make any conflict unpalatable. That it would keep us free from war. But far from preventing war, these weapons brought us to the brink multiple times throughout the Cold War. And in this century, these weapons continue to escalate us towards war and conflict.”¹⁴
- “Nuclear deterrence does not provide physical protection against nuclear weapons—it provides only a false

sense of security and the possibility of retaliation and vengeance. Reliance on nuclear deterrence opens the door to omnicide.”¹⁵

Nuclear deterrence policies and weapons are a severe problem. The transformation of the international system and disarmament are the answer.

Realist Thought and Nuclear Policy

As noted, realist thought is based on the proposition that the international system is an anarchic, “self-help” system because cooperation cannot be assumed and there is no overarching authority with sufficient power to regulate interstate behavior reliably and predictably. In this anarchic international system, aggression and conflict are an ever-present reality.

Because individual states ultimately also are “on their own” with regard to their national security, each state has an overarching interest in its power position relative to any other state that is, or might become, a security threat. As noted realist scholar Kenneth Waltz has observed: “States coexist in a condition of anarchy. Self help is the principle of action in an anarchic order, and the most important way in which states must help themselves is by providing for their own security.”¹⁶

In response to the inherent insecurity of the international system state leaders generally will, to the extent feasible, seek power to meet the threats they perceive or anticipate. Political leaders must seek the tools of power essential for national survival as their priority goal, sub-

ordinating, if necessary, other possible goals, including adherence to international norms or legal codes.¹⁷

Realism provides this logical explanation for why states often place national power and security ahead of other goals, including nuclear disarmament. Realists refer to much of history to illustrate this point: When necessary, national leaders typically have subordinated international norms and laws to meet the national security demands of the hour.

Realism: Why Not Nuclear Disarmament?

The realist challenge confronting the nuclear disarmament agenda are its conclusions that: (1) states facing security threats, particularly including nuclear threats, cannot reasonably be expected to disarm without the *prior* cooperative transformation of the anarchic interstate system to one that is reliably cooperative and secure; and (2) the cooperative transformation of the anarchic international system that could enable nuclear disarmament is implausible, if not impossible, in any anticipated time frame. In an anarchic, self-help system states will *not* willingly part with those capabilities they consider *essential* to their security, potentially including nuclear weapons, because, “Nuclear weapons are considered the ultimate deterrent for good reason: Adversaries are unlikely to threaten the existence of a nuclear-armed state.”¹⁸

Nuclear disarmament could ultimately be *a consequence* of the cooperative transformation of the international sys-

tem, *but disarmament cannot precede that transformation*. Initiatives that place *policy priority* on the US pursuit of nuclear disarmament over sustaining nuclear deterrence capabilities may be misguided and possibly dangerous because the underlying timely international transformation necessary for general nuclear disarmament *simply is not plausible*.

For the realist, nuclear weapons *are a symptom* of the enduring realities of the international system: conflicting interests, a continuing security dilemma, and the enduring possibility of interstate war. If these cannot be eliminated, the prudent expectation must be that a state's survival could, ultimately, be dependent on its own power. Such an expectation reasonably precludes a general willingness to forfeit necessary power in advance of the establishment of a new more cooperative and reliably peaceful international political order.¹⁹ In the absence of such a new order, at least some states will continue to seek nuclear weapons for their security, and as a consequence, others will see a need to do so as well.

Realists doubt the idealist's claim that the common fear of nuclear weapons will provide the dynamic needed for unprecedented global change any more than past developments in military technology. Different national leaderships predictably will perceive and respond differently to the lethality of nuclear weapons. It may inspire the "peace wish" of some, but not others: "One can equate fear with world peace only if the peace wish exists in all states and is uniformly expressed in their policies."²⁰ And, as John Mearsheimer concludes, "It is unlikely that all the great

powers will simultaneously undergo an epiphany”²¹ and “there is little reason to think that change is in the offing.”²²

In the absence of an existing high level of international trust and cooperation, national leaders should not be expected to accept the risk of ceding their critical tools of power to a weak central authority such as today’s United Nations. And as John Mearsheimer notes, “states can never be certain about other states’ intentions.... There is little room for trust among states.”²³ If they were to disarm prior to that central authority, reliably providing collective security, what then would provide for their protection if opponents did not simultaneously relinquish their tools of power? The realist asks: “Where would such a guarantee come from, and why would it be credible?”²⁴ States cannot prudently disarm simply trusting that others will cooperatively do likewise or that a trusted central authority will one day emerge capable of protecting them and enforcing norms.

For realists, the anarchic character of the international system precludes disarmament, and given the system’s inherent lack of international trust and cooperation, the creation of such an international authority appears nowhere in sight.²⁵ Consequently, nuclear disarmament is not a plausible alternative to nuclear deterrence—whatever may be the weaknesses of nuclear deterrence.

Realism: Why Nuclear Deterrence?

Given the absence of the reliable international trust and cooperation needed to transform the war-prone interna-

tional system, realists ask the question, “how can we perpetuate peace without [first] solving the problem of war?” Nuclear deterrence is an important part of their answer.²⁶

The realist’s rationale for this answer is clear: “[Nuclear weapons] make the cost of war seem frighteningly high and thus discourage states from starting any wars that might lead to the use of such weapons. Nuclear weapons have helped maintain peace between the great powers and have not led their few other possessors to military adventures.... Wars become less likely as the costs of war rise in relation to possible gain.”²⁷ Nuclear deterrence can preclude a would-be aggressor’s expectation of gain and prevent war. And, if conflict occurs, the presence of nuclear weapons can limit its likely escalation.²⁸

Indeed, Waltz contends that the disarmament narrative’s emphasis on the destructive consequences of nuclear war “has obscured the important benefits [nuclear weapons] promise to states trying to coexist in a self-help world,”²⁹ and that nuclear disarmament, in addition to being “fanciful,” would “deny the peaceful benefits of nuclear weapons to those [states] who need them.”³⁰

Realists see this value in nuclear deterrence from historical evidence.³¹ For example, the late, distinguished deterrence theorist and academic, Bernard Brodie, observes that the “strategic nuclear forces of each of the superpowers do inhibit the other from any kind of warlike action against it. This was proved abundantly during the Cuban missile crisis.”³² Brodie concludes that “nuclear weapons do act critically to deter war between major powers, and not nuclear wars alone but any wars. That is really a very great

gain. We should no doubt be hesitant about relinquishing it even if we could.”³³

Thomas Schelling, one of the twentieth century’s most renowned deterrence theorists and a Nobel Laureate, expressed his preference—in contrast to what he called “the ‘ban the bomb’ orientation”—that nuclear deterrence be viewed “as something to be enhanced, not dismantled.”³⁴ Schelling judged a “nuclear world” in which deterrence operates to be safer than a nuclear-disarmed world in which, past history demonstrates, the possibility of war is a constant.³⁵

Conflicting Philosophies, Conflicting Conclusions

The contending arguments for and against disarmament and deterrence reflect the differences separating idealism and realism. Idealists see the continuing national accumulation of power, particularly including nuclear power, as the greatest security threat confronting all humankind. Reason and the global threat of nuclear weapons can compel leaders and peoples toward the unprecedented transformation of the international system and nuclear disarmament for the great benefit of all humanity.

In contrast, realists contend that the transformation of the international system needed to enable nuclear disarmament is not now plausible—as is illustrated by millennia of historical experience. And, in the context of continuing international anarchy, nuclear deterrence serves the critical purpose of preventing war. Secretary of Defense Ashton

Carter for the Obama Administration emphasized publicly in 2016: “America’s nuclear deterrence is the bedrock of our security and the Defense Department’s highest priority mission.” He added that “[w]e all, of course, would wish to live in a world without nuclear weapons.... [U]nfortunately, given what we see in today’s security environment, it’s also likely that our children and their children will probably have to live in a world where nuclear weapons exist.”³⁶

These fundamentally conflicting realist and idealist perspectives drive contrary conclusions about the wisdom and feasibility of nuclear disarmament and the relative value of nuclear deterrence.

Realists Backing Nuclear Disarmament

It must be noted that for a relatively brief period amid widespread, optimistic post–Cold War expectations of a “New World Order,” some prominent realists adopted the nuclear disarmament agenda.³⁷ This realist support for nuclear zero was based not on the expectation of a new cooperative world order, but on the popular view that in the post–Cold War era, nuclear weapons were increasingly irrelevant to US national security: (1) the collapse of the Soviet Union and relatively benign relations with Russia and China immediately following the Cold War had largely eliminated any serious interstate nuclear threats for the West; (2) nuclear terrorism was now the serious potential nuclear threat, and counterproliferation measures—*not* nuclear deterrence—were key to addressing that threat; and (3) US conventional force superiority around the globe

allowed the United States to meet its priority security needs *without the need for nuclear weapons*.³⁸

This apparent realist evolution in favor of nuclear disarmament, however, arose and subsided relatively quickly as great-power relations in the post-Cold War era moved in hostile directions and both Russia and China emphasized new nuclear capabilities rather than follow the US lead toward “nuclear zero.” Neither Russia nor China embraced the Western post-Cold War nuclear disarmament campaign. Indeed, President Vladimir Putin reportedly viewed the US proposal for nuclear zero “as just another US trick to weaken his country.”³⁹ The American conventional force advantages that gave some US realists the freedom to endorse nuclear disarmament had precisely the opposite effect on other powers. As Yale professor Paul Bracken observed, “Nuclear abolition—as seen from Moscow, Beijing, Pyongyang—looked like a way to make the world safe for U.S. conventional strong-arm tactics.”⁴⁰ This does not necessarily reflect malevolence on their part. Such concerns are the natural consequence of the mistrust inherent in the anarchic international system—mistrust that precludes cooperative disarmament.

Conclusion

Proponents of nuclear disarmament often contend that the elimination of nuclear weapons is an immediate imperative for human survival and thus they seek via consensus the transition to a cooperative international system that

enforces peace and enables disarmament—as idealists envisage. They also tend to dismiss nuclear deterrence policies as an ill-fated and foolish justification for nuclear weapons that undermines their efforts to “stigmatize” nuclear weapons and establish a powerful global norm against them. Consequently, proponents of nuclear disarmament elevate global transformation and disarmament as policy priorities over deterrence.

In contrast, realists generally are skeptical of the prospects for the timely transformation of the “self-help” international system needed for nuclear disarmament. Thus, they tend to prioritize sustaining nuclear deterrence capabilities because, in the continuing context of an anarchic and nuclear-armed threat environment, they may be needed to deter wars. For these realists, nuclear deterrence compels leaders to “draw back from the brink” and enforces a cautious if grudging peace.⁴¹

Realists and idealists envisage contrary routes to preventing nuclear war—nuclear deterrence vs. nuclear disarmament, respectively. Each doubts the other’s solution. The nuclear disarmament agenda typically rests on the idealist’s expectation of a fundamentally transformed international order. The continuing need to prioritize deterrence generally follows from the realist’s expectation that such a profound transformation is implausible in any predictable time frame. For those who seek to comprehend the competing deterrence and disarmament arguments, these differing philosophic roots must be understood—the curtain must be pulled back.

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Chapter 8

The NNSA Contribution to the Nuclear Mission

Frank G. Klotz

Nuclear weapons are the most powerful and destructive weapons in America's military arsenal. They also play a central role in US defense strategy. As the Air Force Chief of Staff General C. Q. Brown, writes, "A safe, secure, reliable, and effective nuclear triad is essential to deterring threats against the US homeland and underpins every other military operation around the world."¹

Most Americans might, therefore, be surprised to learn that a civilian agency, and not the US military, has the principal responsibility for designing, developing, producing, maintaining, and dismantling US nuclear weapons. True, the Air Force and the Navy organize, train, and equip the bombers, submarines, and missiles designed to deliver nuclear warheads to their designated targets. But "cradle to grave" responsibility for the actual warheads associated with those delivery systems rests with the National Nuclear Security Administration (NNSA).

Since the NNSA plays an important role in maintaining the US nuclear weapons stockpile, Air Force nuclear professionals need to be aware of how the NNSA is organized and carries out its work. They also need to understand the relationship between the NNSA and the Department of Defense (DoD) in providing for US nuclear deterrent forces, and the tension that occasionally results from the

division of responsibilities. Finally, it is worth knowing how Air Force professionals are likely to interact with the NNSA during the course of their military careers. This chapter addresses each of these topics in turn.

The Establishment of the NNSA

Civilian control over the American nuclear weapons stockpile has been a fact of life for almost 75 years. During World War II, the US Army was in charge of developing and producing the first atomic bombs as part of the Manhattan Project.² However, in 1946, the Atomic Energy Act transferred the Manhattan Project's assets and responsibilities to the newly created Atomic Energy Commission (AEC)—an independent civilian agency outside the DoD.³ In 1975, the AEC was disbanded, and its programs for nuclear weapons were vested in the Energy Research and Development Agency, which two years later became the US Department of Energy (DOE), a brand-new cabinet agency.⁴

As the United States drew down its US military forces following the end of the Cold War, some members of Congress expressed growing concern that the DOE was not paying sufficient attention to the nuclear weapons enterprise. To remedy this perceived problem, Congress included a provision within the Fiscal Year 2000 National Defense Authorization Act to establish the NNSA as a “separately organized agency” within the DOE, with responsibility for enhancing national security “through the military application of nuclear science.”⁵ The NNSA was formally activated

on March 1, 2000, with retired Air Force General John A. Gordon as its first administrator.⁶

The NNSA has several specific missions assigned to it by law. First and foremost, it is tasked to “maintain and enhance the safety, reliability, and performance of the United States nuclear weapons stockpile, including the ability to design, produce, and test.”⁷ Based on its unique expertise and capabilities in this endeavor, the NNSA also addresses many other nuclear-related challenges, including working with US and international partners to reduce the potential threats posed by nuclear proliferation and nuclear terrorism. The NNSA is also responsible for providing the US Navy with safe and militarily effective nuclear propulsion plants for its submarines and aircraft carriers. Finally, in an often-overlooked provision of the NNSA Act, it is also charged with supporting US leadership in science and technology.⁸

All of these activities are vitally important to US national security. However, since the NNSA’s mission of maintaining the nuclear weapons stockpile is the one that airmen are most likely to encounter in performing their duties, this chapter will concentrate only on that.

The Organization of the NNSA

The NNSA can best be described as a hybrid, government/contractor organization. Nearly 42,700 people work for the NNSA. Of these, only 2,170 (or 5 percent) are actually federal government employees. These “feds” are responsible for performing inherently governmental functions, such

as program and project management, as well as contract oversight. They work primarily at the NNSA's headquarters facilities and at the NNSA's several field locations. (See Figure 8.1.)⁹

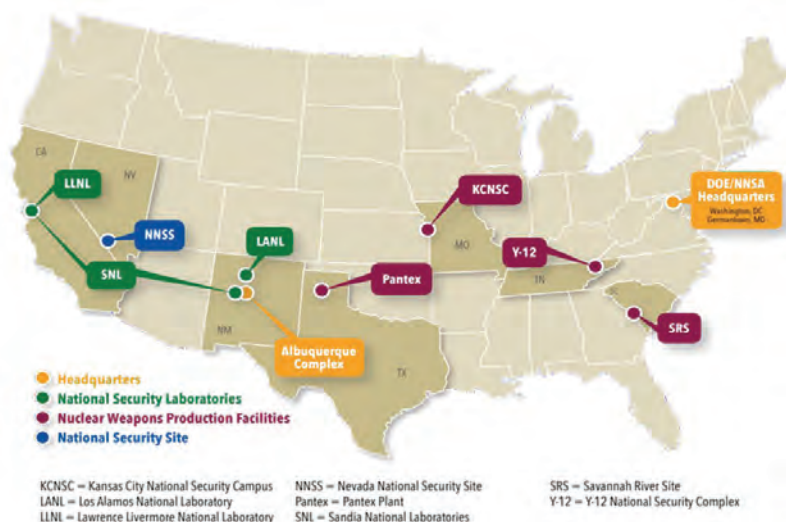


Figure 8.1. NNSA Laboratories, Production Facilities, and Sites¹⁰

The bulk of the scientific and technical work performed by the NNSA is actually carried out in specialized facilities located across the country. These include three national security laboratories, four production facilities, and a national security site, formally known as the Nevada Test Site. These sites are owned by the federal government, but they are actually run by different commercial corporations who compete for contracts to manage and operate them on behalf of the NNSA. The 40,000 or so scientists, engineers, technicians, and specialists who work at the NNSA's field locations are mostly employees of these commercial corporations, not the federal government.

The NNSA thus has a very different organizational structure, business model, and culture than found in the military. Its operations and the vast majority of its employees are not subject to a single, hierarchical chain of command. Even though it must follow NNSA directives and contractual requirements, each NNSA site has its own history, its own missions, and its own procedures for governance, personnel, and administration. Air Force members should be mindful of these differences in working with the NNSA and its people. Yet even though the NNSA is a civilian agency, its employees are highly skilled professionals who fully understand the importance of the nuclear deterrence mission and perform their duties with the same commitment to excellence, integrity, and service as their Air Force counterparts.

The US Nuclear Weapons Stockpile

As noted above, the primary role of the NNSA is to maintain a safe, secure, reliable, and effective nuclear weapons stockpile. The size and composition of that stockpile has changed dramatically since the days of the Cold War. At one point, it consisted of 31,255 warheads, ranging from weapons designed for use on the battlefield or at sea to weapons deployed on intercontinental-range bombers and ballistic missiles. (See Figure 8.2.) As the military's inventory of nuclear delivery systems expanded and grew, and as weapon designs became more sophisticated, the nation's nuclear laboratories and production facilities continuously designed, produced, and added new weapon types to the mix or replaced existing ones.¹¹

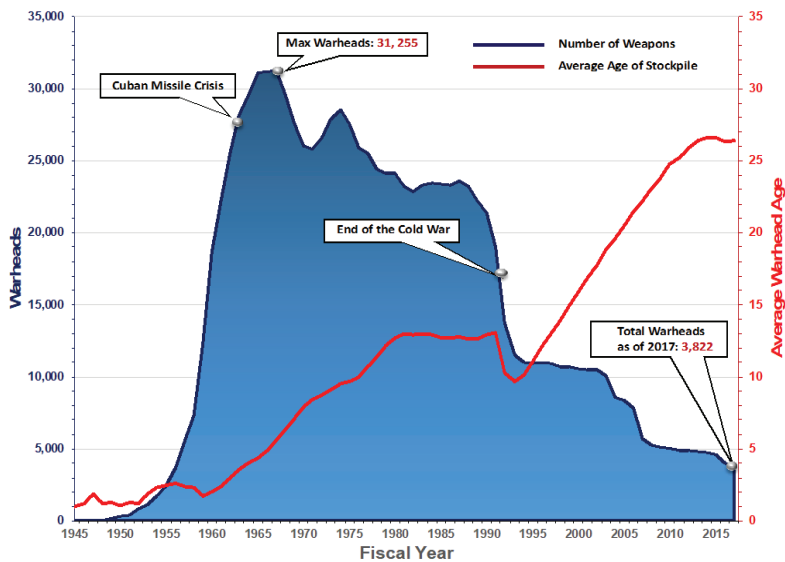


Figure 8.2. Size and Age of the US Nuclear Weapons Stockpile, 1945–2017*¹²

*Active and inactive warheads. Several thousand additional warheads are retired and awaiting dismantlement.

The US nuclear weapons stockpile looks very different today. By 2017, only 3,822 weapons remained in the active and inactive US inventory, which consists of nine different types of warheads. (See Figure 8.3.) The original versions of each of these weapons were initially fielded before the end of the Cold War. Since then, successive administrations chose not to deploy new weapon types. In fact, the 2010 *Nuclear Posture Review* (NPR) explicitly stated that the United States, as a matter of policy, “will not develop new nuclear warheads.” It further stipulated that programs to extend the life of existing weapons “will use only nuclear components based on previously tested designs, and will not support new military missions or provide for new military capabilities.”¹³ The subsequent 2018 NPR does not

speak directly to this particular issue, though it does note that the United States should maintain the capability to “design, develop and produce nuclear weapons with new or different military applications *if required in the future*.”¹⁴

Warheads—Strategic Ballistic Missile Platforms					
Type ^a	Description	Delivery System	Laboratories	Mission	Military
W78	Reentry vehicle warhead	Minuteman III intercontinental ballistic missile	LANL/SNL	Surface to surface	Air Force
W87	Reentry vehicle warhead	Minuteman III intercontinental ballistic missile	LLNL/SNL	Surface to surface	Air Force
W76-0/1/2	Reentry body warhead	Trident II D5 submarine-launched ballistic missile	LANL/SNL	Underwater to surface	Navy
W88	Reentry body warhead	Trident II D5 submarine-launched ballistic missile	LANL/SNL	Underwater to surface	Navy
Bombs—Aircraft Platforms					
B61-3/4	Non-strategic bomb	F-15, F-16, certified NATO aircraft	LANL/SNL	Air to surface	Air Force/Select NATO forces
B61-7	Strategic bomb	B-52 and B-2 bombers	LANL/SNL	Air to surface	Air Force
B61-11	Strategic bomb	B-2 bomber	LANL/SNL	Air to surface	Air Force
B83-1	Strategic bomb	B-52 and B-2 bombers	LLNL/SNL	Air to surface	Air Force
Warheads—Cruise Missile Platforms					
W80-1	Air-launched cruise missile strategic weapons	B-52 bomber	LLNL/SNL	Air to surface	Air Force

LANL = Los Alamos National Laboratory NATO = North Atlantic Treaty Organization
 LLNL = Lawrence Livermore National Laboratory SNL = Sandia National Laboratories
^a The suffix associated with each warhead or bomb type (e.g., “-0/1” for the W76) represents the modification associated with the respective weapon.

Figure 8.3. Current US Nuclear Weapons and Associated Delivery Systems¹⁵

Moreover, the United States has not conducted a full-scale, explosive nuclear weapon test since 1992. Prior to then, it carried out 1,054 nuclear tests, starting with the first atomic bomb test in July 1945 at the Trinity site in New Mexico.¹⁶ However, in October 1992, President George H. W. Bush signed into law a moratorium on nuclear testing which every president since then has observed.¹⁷ Under this moratorium, the US adheres to the “zero-yield standard,” which prohibits “all nuclear explosions that produce a self-sustaining, supercritical chain reaction of any kind.”¹⁸

Therefore, a key challenge for the NNSA is to maintain a stockpile of aging nuclear weapons that (1) have not been routinely replaced with new weapon types and (2) cannot be tested as full-up rounds. Despite these constraints, the secretary of energy and the secretary of defense have, for the past 23 years, been able to jointly certify to the president that the nuclear weapons stockpile remains safe, secure, reliable, and effective.¹⁹ This remarkable achievement is made possible by the NNSA's Stockpile Stewardship Program.

The Stockpile Stewardship Program (SSP)

Congress first established the SSP in 1993 following the start of the test moratorium and in anticipation of an international comprehensive nuclear test ban treaty being negotiated.²⁰ In subsequent years, the United States committed substantial resources to building the experimental and computing capabilities required to assess the status of each weapon in the stockpile and to take appropriate measures to ensure they remain effective.²¹ Today, the SSP entails a wide variety of complex activities that are far too numerous to list in this short chapter; but, a few illustrative examples can provide a sense of the critical role cutting-edge science and engineering plays in this process.

- Every year, a representative number of deployed nuclear weapons are returned to the NNSA from the field, disassembled, and their components subjected to rigorous inspection and tested using highly specialized diagnostic equipment.²²

- Some of these disassembled weapons are re-configured as joint test assemblies (JTAs), in which the nuclear components in the weapon are removed and replaced with surrogate parts. These instrumented JTAs are then incorporated into Air Force and Navy flight tests of their nuclear delivery systems (such as the *Glory Trip* series of Minuteman III operational test launches) to provide data to NNSA experts on weapon performance in a flight environment.²³
- The Z pulsed power machine (at Sandia), the National Ignition Facility (at Lawrence Livermore), and Omega (at the University of Rochester in New York) each use different experimental techniques to explore the performance of nuclear weapon materials under temperatures and densities similar to those that occur at the center of the sun or in a nuclear explosion.²⁴
- Subcritical experiments, conducted underground at the Nevada National Security Site, use chemical high explosives to apply high pressures to plutonium (or other materials). The configuration and quantities of plutonium ensure that a self-sustaining nuclear chain reaction, or criticality, cannot occur, thus complying with the nuclear test moratorium. High-speed diagnostic instruments gather data on how the nuclear material behaves under these conditions.²⁵

The results from these (and many other) types of tests and experiments, together with archived data from the US nuclear explosive tests conducted before the 1992 moratorium, are analyzed using advanced modeling and simula-

tion tools run on high-performance computing platforms.²⁶ Since its very beginning, the US nuclear weapons program has been a major driver in the development of computers to perform complex, time-consuming calculations. Today, some of the fastest supercomputers in the world are found at NNSA and DOE national laboratories.²⁷ In addition to understanding the effects of aging during a weapon's entire life cycle, advanced modeling and simulation techniques are also employed to assess the impact of using new materials or different configurations for various components when refurbishing an existing weapon.

These, as well as a wealth of other activities, are an integral part of the NNSA's annual assessment process. Every year, the directors of the three NNSA national security laboratories and the commander of US Strategic Command provide a written assessment of the state of each warhead and bomb type in the nuclear weapons stockpile.²⁸ This assessment, in turn, serves as the basis for a certification by the secretary of energy and the secretary of defense to the president that the nuclear weapons stockpile remains safe, secure, and effective without the use of nuclear explosive testing.

Maintenance and Refurbishment

Like aircraft and missiles, nuclear weapons also require different types and levels of maintenance to ensure their continued safety, security, and effectiveness. Some components in a nuclear weapon—including gas transfer systems, power sources, and neutron generators—are called

limited life components (LLC) because they require replacement at predictable, pre-planned intervals.²⁹ Certain LLC replacements can be performed by Air Force munitions maintenance personnel at the unit level. However, in most cases, weapons must be returned to NNSA facilities, just as aircraft and missiles must be shipped to a depot for more extensive inspections, repairs, and modifications.

The movement of nuclear weapons and other components between military bases and NNSA facilities for this work is carried out by the NNSA's Office of Secure Transportation (OST). This elite, highly trained unit transports its unique cargo in specially modified secure tractor-trailers escorted by armed federal agents. The individuals who work in OST are all US government (as opposed to contractor) employees, many of whom have prior military or law enforcement experience.³⁰

From time to time, the surveillance process may indicate that other components in addition to LLCs need to be refurbished or replaced to address aging-related issues. Likewise, some components may be redesigned to enhance performance, maintainability, safety, or security. Finally, more extensive replacement and updating of components may take place in order to prolong the overall service life of a weapon type. The NNSA refers to these undertakings as either modifications, alterations (ALTs), or life-extension programs (LEPs), depending upon their scope, complexity, and cost. An LEP, for example, can cost several billion dollars. As of 2020, the NNSA had one modification, one ALT, and two LEPs in progress. (See Table 8.1.)

Table 8.1. NNSA Warhead Activities³¹

<i>Warhead Activity</i>	<i>Current Status</i>	<i>FPU</i>
W76-1 LEP SLBM warhead	Completed	FY 2008
W76-2 Modification Program SLBM warhead	Completed	FY 2019
W88 Alt 370 with CHE Refresh SLBM warhead	Phase 6.4 (Production Engineering)	FY 2021
B61-12 LEP (3/4/7/10) Tactical/strategic bomb	Phase 6.4 (Production Engineering)	FY 2022
W80-4 LEP Cruise missile warhead	Phase 6.3 (Development Engineering)	FY 2025
W87-1 Modification Program (formerly W78 Replacement Warhead) ICBM Warhead	Phase 6.2 (Feasibility and Design Options)	FY 2030

Alt = alteration
LEP = life-extension program

CHE = conventional high explosive
FPU = first production unit

Assembly and Dismantlement

The nuclear and nonnuclear components that make up a nuclear weapon are either produced within the NNSA’s production facilities or procured by the NNSA from commercial vendors that must meet strict quality and security standards. Final assembly of all these components into a completed weapon takes place at the NNSA’s Pantex Plant, located near Amarillo, Texas. As weapons are retired from the stockpile, they may be returned to Pantex for disassembly. Some of their components and materials may be recovered and recycled for possible re-use in current or future systems.³²

The Future of Stockpile Stewardship

The SSP has thus pushed the limits of modern science and engineering. Today, nuclear explosive testing has been replaced by an annual assessment process that rigorously examines each weapon type in detail. Many of the NNSA's scientists and engineers claim to now have a greater understanding of how nuclear weapons actually perform than they did during the nuclear testing era.³³ As one former Los Alamos lab director has testified, the science-based approach has provided insights on managing the nuclear weapons stockpile that were “unimaginable two or three decades ago.”³⁴

But as the nuclear weapons stockpile continues to age and the threat environment continues to evolve, it is incumbent upon the NNSA, in the words of the 2018 NPR, to “maintain and enhance the computational, experimental, and testing capabilities needed to annually assess nuclear weapons.”³⁵

The NNSA has important programs to meet this objective. For example, it has launched an effort to deliver a leading-edge radiographic and neutron diagnostic system by 2025 that will improve the fidelity of data collected in subcritical experiments conducted at the U1a Complex in Nevada.³⁶

The NNSA is also partnering with the DOE Office of Science to field the nation's first exascale computing platforms, which will dramatically improve the NNSA's ability to model and simulate nuclear weapon performance. The NNSA's goal is to have its first exascale system up and running at the Lawrence Livermore National Laboratory by 2023.³⁷

In a related vein, the NNSA is also taking long overdue steps to modernize its antiquated production facilities, many of which were originally constructed during the early days of the Cold War. A new uranium processing facility is already under construction in Oak Ridge, Tennessee, and scheduled to begin operation in 2025.³⁸ The NNSA also recently put forth a plan to restore the nation's ability to manufacture plutonium pits, an essential component of all nuclear weapons, at the Los Alamos National Laboratory and in new facilities at the DOE's Savannah River Site in South Carolina.³⁹

These are all complex, challenging, and expensive projects, but they are absolutely essential to the NNSA's ability to meet its national security responsibilities now and in an uncertain future.

DoD-NNSA Coordination and Cooperation

Even though the NNSA is a separately organized agency within the DOE, it does not manage the nuclear weapons stockpile in a vacuum. Nuclear warheads are ultimately intended for deployment on Air Force and Navy delivery systems and must meet military requirements. Therefore, the DoD and the NNSA closely coordinate on their respective activities to sustain and modernize US nuclear deterrent forces.

At the highest level, this process is carried out by the Nuclear Weapons Council (NWC). The NWC was originally created by congressional mandate in 1986.⁴⁰ According to its charter, the council "endorses military requirements, approves trade-offs, and ensures alignment between DoD

delivery systems and NNSA weapons.”⁴¹ Congress has also tasked the NWC to prepare various policy documents and reports to the president, including the annual Nuclear Weapons Stockpile Memorandum.⁴²

Today, five senior DoD officials and the NNSA Administrator serve as voting members of the NWC. Thus, the NWC’s composition is heavily weighted in favor of the DoD. Other senior leaders from several different departments and agencies, including the secretary and chief of staff of the Air Force, often attend NWC meetings as non-voting advisors. By law, the NWC must meet every three months, but it generally convenes more frequently. Additionally, its Standing and Safety Committee and a more informal Action Officers Group also meet regularly to address, and in many cases, resolve issues before they are reviewed by the NWC.⁴³

Regular coordination between the military and the NNSA also occurs at many different levels below that of the NWC. For example, Air Force wing munitions personnel routinely deal with NNSA technicians in addressing maintenance issues, especially those that can be resolved at the unit level. They also work with the Office of Secure Transportation in scheduling incoming and outgoing shipments, and in transferring custody of nuclear weapons between the NNSA and the unit. Air Force members who participate in Minuteman III and air-launched cruise missile operational test launches interact with NNSA technical experts in configuring the test assets and addressing any technical issues that arise. Air Force nuclear professionals assigned to the Air Force Nuclear Weapons Center at Kirt-

land AFB also deal with NNSA counterparts on an almost daily basis, especially through the joint DoD-NNSA Program Officers Groups (POGs) that have been established for every weapon type.

In all of these activities, coordination between the NNSA and the DoD has been remarkably effective in managing the nuclear weapons enterprise. That said, some tension can arise between the two institutions as a result of differences in their respective missions, size, institutional processes, and culture. The NNSA's mission—designing, developing, and producing nuclear weapons—is largely a scientific and engineering undertaking. It has been that way ever since the Manhattan Project. Then and now, nuclear science, like rocket science, is hard work and it takes time to get it right.

The military services tend to view the NNSA as a “supplier,” and to focus on the end product or output of the NNSA's work. They understandably worry about how the NNSA's schedule and progress in completing alterations and LEPs will affect Air Force and Navy delivery systems at the operational level. The military services do not always appreciate the complex scientific and engineering challenges that must be overcome in maintaining nuclear weapons for the long haul. As a result, they often question the need to spend resources on developing leading-edge experimental and computing capabilities, wondering instead why those same resources cannot be applied directly to weapons production.

Given these differences in perspective, some members of Congress have, from time to time, proposed measures

to give the Pentagon more control over the NNSA and its budget, or even to transfer the NNSA to the Department of Defense.⁴⁴ The pros and cons of doing so are complicated and beyond the scope of this chapter. Suffice it to say, there are powerful political forces in favor of preserving the 75-year-old tradition of civilian agency control over America's nuclear weapons program, as well as keeping the NNSA in the DOE and ensuring that the department has full authority to carry out its legally assigned responsibilities in the nuclear enterprise. So, it is a reasonably safe bet that the mission and organization of the NNSA described in this chapter are likely to remain essentially the same as they are today for the foreseeable future.

For this reason, Air Force nuclear professionals should do all they can throughout their careers to promote cooperation in dealing with their counterparts in the NNSA. Rather than dwelling on the differences between the military services and the NNSA, it is best to understand and respect the unique and indispensable contributions they each make to national security. Airmen can justifiably take great pride in how they organize, train, and equip the aircraft and missiles that make up the nation's nuclear deterrent forces. NNSA employees likewise deserve enormous credit for the extraordinary work they do to design, produce, and maintain the nuclear warheads that go on those delivery systems. Though they may contribute in different ways, the Air Force and the NNSA are both on the same team—the team that ensures that America's nuclear deterrent forces remain safe, secure, reliable, and effective, both now and in the future.

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Chapter 9

Nuclear Weapons Physics

Lee Hobbs

The workings and effects of nuclear weapons are an often-overlooked contributing factor to nuclear deterrence operations (NDO). This may be the result of sparse use of these weapons through history¹ or possibly the three decades that passed since the last full-scale test.² It also could be the result of fear caused by the complicated technical nature of nuclear devices. Whatever the reason, the fact remains that if it were not for the unique physical effects of nuclear weapons there would be no need for; nuclear command, control, and communications (NC3); or nuclear strategy and policy. If the airmen that develop and operate supporting systems do so without considering the physical capabilities and technical requirements of the weapons themselves, the systems run great risk of not being a credible deterrent to the nation's adversaries. For instance, an airman charged to acquire, operate, or maintain an NC3 system that is not aware of the electromagnetic pulse effect from a nuclear weapon likely will not protect against this effect during operations. It is important that the warfighter understand the basics of the workings, technical requirements, and physical effects of nuclear weapons to execute assigned NDO missions.

History and Background

The history of the early development of nuclear weapons illustrates how understanding emerging scientific discoveries is vital to national security. To understand the lessons this history provides to modern nuclear deterrence operations a basic understanding of the atom is helpful. Complex collections of tiny atoms make up the material of our world. These tiny atoms are composed of a smaller nucleus containing even smaller neutrons and protons. Still smaller electrons exist about the nucleus to complete the atom. Figure 9.1 depicts a conceptual visual depiction of an atom. The green spheres represent the neutrons, the red spheres represent the protons, and the surrounding blue spheres are the electrons. The discoveries of energy-releasing reactions on this scale are what led to the development of nuclear weapons.

Shortly before the beginning of World War II in Nazi Germany, Otto Hahn discovered that the nucleus of the

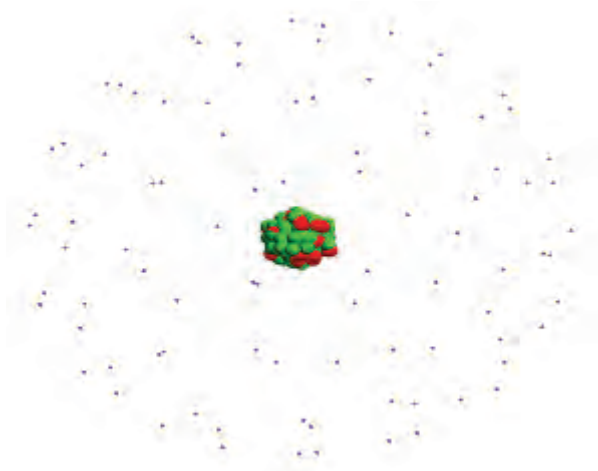


Figure 9.1. Conceptual Atomic Structure

atom could split, or fission, into lighter atoms. He also determined that this fission process released large amounts of energy.³ Soon after, in the United States, Hans Bethe, who emigrated from Germany soon after the Nazis took power in Germany, determined pathways to fusion. This is the process where the nuclei of two atoms combine to form heavier atoms and release large amounts of energy. Realizing the exceptional potential that the energy released from the nucleus had for wartime use, Albert Einstein wrote President Roosevelt a letter to express his concerns. The letter urged the United States government to support nuclear energy research, secure access to uranium, and warned of German ambitions in the same area. President Roosevelt responded by establishing a research committee and then established the Manhattan Project tasked to develop a nuclear bomb. The project was successful, and the first human-engineered nuclear explosion occurred at the Trinity test site, south of Albuquerque in the remote New Mexico desert. The United States shortly thereafter used the nuclear weapons against Japan—leading to the end of the war in the Pacific within a week.⁴

The United States developed, tested, and employed nuclear weapons within seven years of the scientific discovery of fission. Six years later the United States incorporated significant fusion reactions into the design of nuclear weapons and achieved the first thermonuclear explosion.⁵ This is an amazing accomplishment when compared to modern weapon acquisition programs. Current acquisition programs, of much less significant technical innovation, can take decades to make incremental improvements

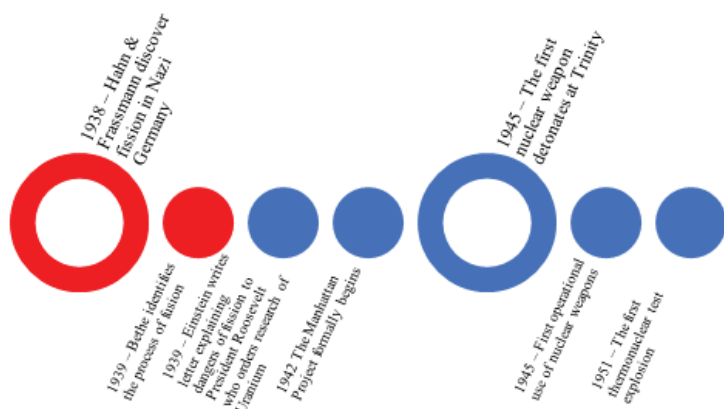


Figure 9.2. Timeline of Early Nuclear Weapon Development

to designs that are based on long established discoveries of natural laws.⁶ This feat also highlights how important a technically informed national leadership and military are to success in war and deterrence.

Nuclear Reactions

Fission

Nuclear fission is a process where the nucleus of an atom splits and forms two or more lighter nuclei. Fission of heavy elements causes changes in the nuclear structure and releases a large amount of energy. To put this energy release in perspective, the fission of about a pound of material would equal the explosive energy of about 8,000 tons of trinitrotoluene (TNT).⁷ Fission occurs in many materials. The materials of current interest are particularly useful forms, or isotopes, of uranium and plutonium used in the US stockpile of nuclear weapons. Fission also occurs in multiple ways, but the method of most interest is by the

introduction of a neutron to a nucleus. Figure 9.3 illustrates the concept of neutron-induced fission. The neutron on the far left of the figure collides with a uranium nucleus. The nucleus becomes unstable and then separates to form two lighter nuclei called fission fragments and, in this case, two neutrons.

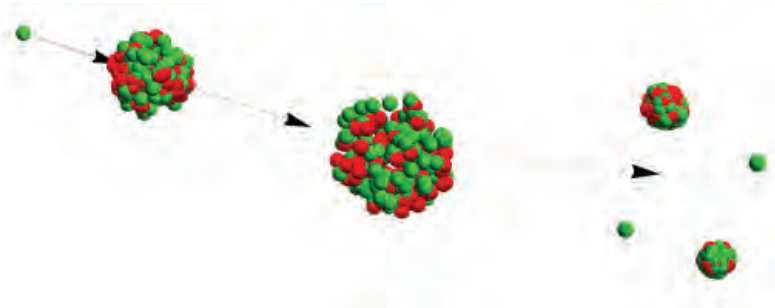


Figure 9.3. Neutron-Induced Fission

The fission fragments and the neutrons carry most of the energy released. The neutrons produced in this fission are now available to cause other fissions. A smart arrangement of uranium or plutonium will cause a fission chain reaction and, if done right, a nuclear explosion suitable for use as a weapon.

Fusion

Nuclear fusion is a reaction where the nuclei of multiple elements fuse to become a heavier element. The fusing of light elements releases large amounts of energy. Special forms of hydrogen are typical fusion fuels of interest in nuclear weapons. The energy released by these fuels is much greater by weight than the fission discussed in the

previous section. For perspective, the fusion of about a pound of the hydrogen isotope deuterium would release the same energy as about 26,000 tons of TNT.⁸ Figure 9.4 depicts the fusion of a deuterium nucleus and a tritium nucleus. The fusion results in the formation of a helium nucleus and a neutron that carry the energy released.

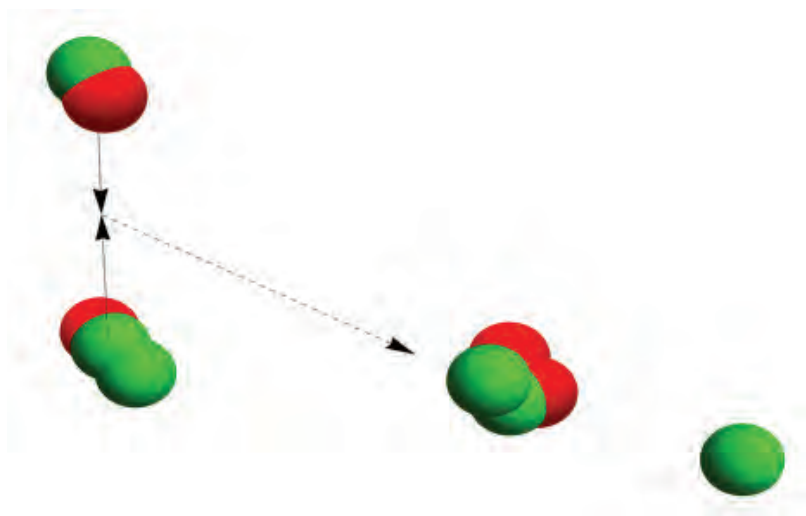


Figure 9.4. Nuclear Fusion

The protons in the nucleus are a significant barrier to a successful fusion reaction. The protons carry a positive charge that repels them from each other until they are significantly close enough for nuclear binding forces to overcome this repulsion. This charge repulsion is not an issue in the fission process described earlier because the neutron does not have a charge and can travel unimpeded to the nucleus. Even though the energy release of fusion is much larger by weight than that of fission, overcoming the natural repulsion of the nuclei makes it a much more difficult reaction to take advantage of to produce energy.

Functionality of Nuclear Weapons

To take advantage of natural nuclear reactions and produce a weapon requires some engineering. Figure 9.3 shows a neutron causing fission in uranium and that this fission produces more neutrons. In order to achieve a fission chain reaction engineers must arrange the fuel in a way that ensures enough of the neutrons produced in fission cause multiple other fission events before leaking out of the system or being lost by absorption without causing a fission. There are typically two methods of achieving this result.

Gun-Type Weapons

A way to achieve a fission chain reaction is by making the core of nuclear fuel significantly large. If the core is large, fission-produced neutrons will cause more fission resulting in a chain reaction. If the core is too small leakage or absorption will consume too many neutrons and a chain reaction will not occur. This is the principal concept of a gun-type nuclear weapon design.⁹ Figure 9.5 shows a notional gun-type nuclear weapon. The picture on the left shows a container and a two-piece separated core. In this configuration the two pieces are not large enough to sustain a chain reaction. The large surface area of the hemispheres allows too much leakage and the weapon is in a relatively safe configuration. However, bringing the two

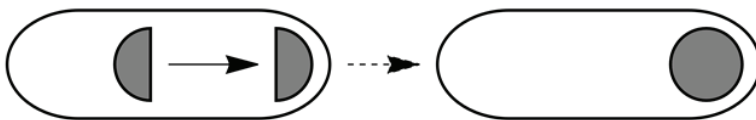


Figure 9.5. Gun-Type Nuclear Weapon

hemispheres together as depicted in the picture on the right eliminates a large portion of the surface area. If done right, this reduction in surface area and increase in mass will result in a super-critical mass of nuclear fuel and a nuclear explosion.

Implosion-Type Weapons

Another engineering method used to create a fission chain reaction is to implode the nuclear fuel and bring the nuclei of the fuel closer together. If the nuclei of the fuel are too far apart, the neutrons produced by fission have an exceptionally good chance of escaping without hitting a nucleus and causing fission. However, if the fuel becomes sufficiently dense to improve the chance of interaction of the neutron and nucleus a chain reaction will result. Figure 9.6 depicts a notional implosion-type nuclear weapon. In the graphic on the right, the nuclear fuel is of a low density. Because of this low density the nuclei of the fuel are not close enough to each other to allow enough fission neutrons to cause additional fissions. In this configuration the weapon is relatively safe. The picture on the right depicts a compressed core where the nuclei of the fuel are close enough together to sustain a chain reaction and cause a

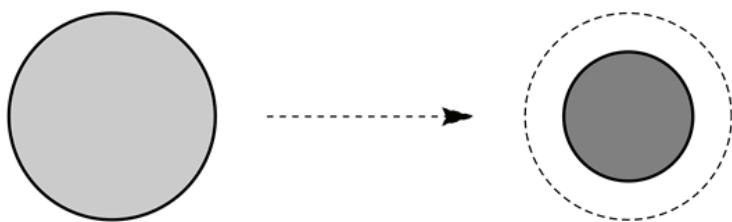


Figure 9.6. Implosion-Type Nuclear Weapon

nuclear explosion. Carefully arranged conventional explosives are a means to achieve the needed implosion to form a super-critical mass of nuclear fuel and an explosion.¹⁰

The Fusion Reaction in Weapons

A previous section described the fusion reaction and established the significant energy released by nuclear fusion. However, it also noted that the reaction is more difficult to achieve than fission due to the repelling forces of protons in the nucleus. It turns out that the energy released by the fission chain reaction in a nuclear weapon is more than adequate to overcome this difficulty. Thermonuclear weapons use the fission chain reaction to provide the needed temperatures and pressures required to obtain fusion reactions. Some fusion reactions, like the one presented in Figure 9.4, have the bonus of producing a neutron. This neutron will likely cause additional fission reactions that increase the overall yield and efficiency of the weapon. “Boosted” weapons incorporate this advantage in their design.¹¹

Military Application and Effects

Nuclear explosives have potential to be millions of times more energetic than the largest conventional explosions.¹² The mechanisms that produce a nuclear explosion are quite different from those that produce a conventional explosion. In the conventional case, the heat, expansion, and chemical changes of the explosive material itself is responsible for the effects. In the nuclear case, the fuel

itself does expand, but the primary source of energy for most of the effects are the production of X-rays. Refer to Figure 9.1 and notice the electrons in position around the nucleus forming the atom. The nuclear reactions that cause the explosion release enough energy to remove all the electrons from the atomic structure in the fuel and surrounding materials. As electrons interact with nuclei either passing by, rejoining, or rearranging themselves in the atomic structure, they emit X-rays.

Additionally, the nuclear reactions themselves emit nuclear radiation that is absent from conventional explosions. These differences produce unique effects from nuclear weapons not found in conventional weapons. Since most members of the military are familiar with the effects of conventional explosives, the following sections compare these effects to those of nuclear weapons.

Thermal Effects

Nuclear reactions produce much higher temperatures than conventional explosives. As a result, nuclear weapons emit a comparatively large portion of energy in the form of X-rays that interact with the atmosphere and produce the light and heat of thermal radiation. This emission can cause skin burns and fires to targets at great distances from the explosion. This effect can also cause temporary or permanent blindness and is of particular concern for aircrews.¹³ For space detonations these X-rays will not have sufficient atmosphere to interact with and the X-rays themselves will travel great distances and can deposit their energy into targets directly causing heating and damage.

Blast

Blast and shock are the most similar nuclear effects to conventional explosives. However, the formation of the blast wave is different depending on the type of explosion. In conventional explosions the explosive fuel itself expands and is largely responsible for the blast. In nuclear explosions it is the interaction of X-rays with the atmosphere that heats and expands the air causing a blast wave. For nuclear explosions, the blast wave lasts much longer than one from a conventional explosion. This longer duration causes a wider spread and more severe damage to structures. The human body is also sensitive to duration of the wave and a blast from a nuclear weapon is likely to cause more serious injury and death.¹⁴

Nuclear Radiation

Significant nuclear radiation is an effect that is absent from a conventional explosion. However, a nuclear explosion produces immediate and lethal nuclear radiation as the nuclear reactions occur during detonation. Additionally, the substances that remain following a nuclear explosion can be radioactive and harmful for a longer time.¹⁵

Electromagnetic Pulse (EMP)

Conventional high explosives can produce an EMP. Nuclear explosions of all types can also produce an EMP. However, the most significant EMP is generated by a nuclear explosion occurring at an altitude near space.¹⁶ In this case the prompt radiation from fission interacts with atoms in the upper atmosphere and releases electrons from

their atomic structure. Given the speed of nuclear reactions this release of electrons occurs nearly simultaneously. Since electrons carry a charge these free electrons turn collectively in the earth's magnetic field and generate a potentially damaging electric field that propagates toward the surface of the earth.¹⁷ Although the EMP is not directly harmful to humans, it may damage critical electronic equipment required for defense and life sustainment.

The unique effects of nuclear weapons are an effective deterrent to great-power conflict. A professional military would benefit from understanding and protecting itself against these effects. Being competent and prepared is a likely deterrent to the use of nuclear weapons. Attacking a military that is expert in nuclear operations and protected against their effects would likely not achieve an acceptable outcome for the attacker.

STEM, Nuclear Weapons, and National Security

The United States requires exceptional science, technology, engineering and mathematics (STEM) knowledge to make our nuclear weapons stockpile reliable, efficient, and effective. This knowledge leads to unique requirements in manufacturing and material procurement that make the deterrent credible. As a critical contributor to national security, airmen should maintain a current and professional understanding of the basic physical requirements, capabilities, and limitations of their weapons. This includes nuclear weapons. Such an understanding will assist air-

men in making realistic plans and quality decisions while conducting operations in support of deterrence operations.

For airmen charged with developing and acquiring supporting systems, this knowledge will help make sure the systems are appropriate for the mission as well as survivable when fielded. The professional airmen, especially those in leadership, should also maintain an appreciation and awareness of emerging technologies. It was this understanding by American leaders in WWII that led to the rapid development and employment of nuclear weapons. It will likely be another natural discovery, developed by exceptional engineers and scientists, that changes the strategic situation again. Airmen should continually learn and improve to make certain that any change benefits the security of the United States.

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PART 2

America's Adversaries

Chapter 10

Russian Nuclear Strategy and Forces

Mark B. Schneider

Russian nuclear strategy is fundamentally different from ours. It evolved from Soviet strategy, which makes it dangerous. From the early Cold War to the Cuban Missile Crisis, the US maintained a massive nuclear advantage. The US and the Soviet Union drew the opposite conclusions from the brush with nuclear war during the crisis. The US deemphasized nuclear weapons in its strategy, gradually reduced its tactical nuclear weapons, greatly reduced its bomber force, and limited nuclear modernization. Alternatively, the Soviet Union greatly increased its nuclear capability.

After the Cold War, parts of the Warsaw Pact war plan were made public. The plan involved the large-scale first use of nuclear weapons to facilitate an invasion of North Atlantic Treaty Organization (NATO) Europe.¹ The Soviet version of limited nuclear war included initial destruction of “Hamburg, Dusseldorf, Cologne, Frankfurt, Stuttgart, Munich and the West German capital of Bonn. NATO headquarters in Brussels would be annihilated, as would the Belgian port of Antwerp. The Dutch capital and port of Amsterdam would also be destroyed. Denmark would suffer two nuclear strikes.”² As Lieutenant General William Oden, former director of the Defense Intelligence Agency (DIA), pointed out, our assessment of Soviet nuclear weapons policy was “wildly misplaced” and the “Czech war plan [part of the Warsaw Pact war plan] shows that they decided to use

them [nuclear weapons] like big artillery, to support and speed up a traditional ground invasion of NATO territory.”³

Soviet nuclear weapons numbers peaked in the late 1980s at 45,000, about “17,000 warheads above estimates from the US intelligence community (IC) at the time.”⁴ At that time, the US had about 23,000 nuclear weapons, fewer than we had in 1962.⁵ Had nuclear deterrence failed, we would have been hit by a large Soviet surprise nuclear strike in Europe and faced many more nuclear weapons than we believed the Soviets had.

Since the end of the Cold War, we have reduced our nuclear stockpile 85 percent⁶ and the US delivery systems are over 20 years older than they were when US modernization ended in 1997. As the 2018 *Nuclear Posture Review* (NPR) points out, Russia has extensively modernized and is now expanding its strategic and nonstrategic nuclear forces.⁷

The Growing Russian Nuclear Stockpile

In 2020, Hans M. Kristensen and Matt Korda of the Federation of American Scientists wrote that the number of deployed US strategic and nonstrategic nuclear weapons was 1,980.⁸ Their estimate for Russia was 4,306.⁹ This may be low because of the small number of nonstrategic nuclear weapons included in the number. In December 2017, Bill Gertz reported,

Russia is aggressively building up its nuclear forces and is expected to deploy a total force of 8,000 warheads by 2026...according to Pentagon officials. The 8,000 warheads will include both large strategic warheads and thousands of new low-yield

and very low-yield warheads to circumvent arms treaty limits and support Moscow's new doctrine of using nuclear arms early in any conflict.¹⁰

In August 2019, then-Deputy Assistant Secretary of Defense for Nuclear Matters Rear Admiral (ret.) Peter Fanta stated, "The Russians are going to 8,000 plus warheads."¹¹ Thus, we potentially face a four to one Russian advantage before there is any serious modernization of US strategic nuclear forces. The 2018 NPR report did not mandate a US numerical increase. The Russians now claim, perhaps with a 10 percent exaggeration, modernization of 87 percent of its legacy Soviet strategic nuclear force.¹²

Russian Nuclear Doctrine and the First Use of Nuclear Weapons

While the Soviets hid their nuclear first-use strategy, the Russians openly state that they reserve the right to do so, not only in a response to biological or chemical attack, but in response to a conventional attack.¹³ In 1999, Colonel General Vladimir Yakovlev, then-commander of Russia's Strategic Missile Force, stated, "Russia, for objective reasons, is forced to lower the threshold for using nuclear weapons, extend the nuclear deterrent to smaller-scale conflicts and openly warn potential opponents about this."¹⁴ Russia believes it can introduce nuclear weapons into a conventional war without taking nuclear fire in return and this will result in a Russian victory; this is what they call "de-escalation" of a war.¹⁵ While not officially announced until 2003,¹⁶ the essence of the de-escalation

strategy was stated in 1999 by Nikolai Mikhailov, then-first deputy defense minister:

This strategy boils down to the threat of using nuclear weapons against any aggressor at a scale ensuring unacceptable damage to such aggressor. The amount of damage should be such as not to provoke the aggressor into escalating the use of nuclear weapons without a justified reason. In other words, the point at issue is a limited use of strategic nuclear forces adequate to the threat.¹⁷

The danger of Russian nuclear “de-escalation” of a conventional war was recognized by the Obama administration in 2015 when then-Deputy Secretary of Defense Bob Work and then-Vice Chairman of the Joint Chiefs of Staff Admiral James Winnefeld testified that “Russian military doctrine includes what some have called an ‘escalate to de-escalate’ strategy—a strategy that purportedly seeks to de-escalate a conventional conflict through coercive threats, including limited nuclear use.”¹⁸ In 2016, Assistant Secretary of Defense Robert Scher told Congress that “Russia’s purported doctrine of nuclear escalation to de-escalate a conventional conflict amounts to a reckless gamble for which the odds are incalculable and the outcome could prove catastrophic.”¹⁹ Further, the 2018 NPR concluded that “Moscow threatens and exercises limited nuclear first use, suggesting a mistaken expectation that coercive nuclear threats or limited first use could paralyze the United States and NATO and thereby end a conflict on terms favorable to Russia. Some in the United States refer to this as Russia’s ‘escalate to de-escalate’ doctrine. ‘De-escalation’ in this sense follows from Moscow’s mistaken assumption of Western capitulation on terms favorable to Moscow.”²⁰

Since 2007, Russia has employed overt nuclear targeting threats. These threats have been made by most Russian senior leaders, including President Putin.²¹ Russia backed this threat with provocative bomber flights.²² Most recently, these threats involved targeting missile defense sites in Europe and US missile sites with mythical weapons supposedly ranging between 500 to 5,500 kilometers.²³

In 2009, the Russian Defense Ministry announced its new nuclear first-use doctrine would be classified;²⁴ thus, Russia's current public affairs formulation regarding nuclear weapons first use (a threat to Russia's existence), initially released in 2010, is not its real doctrine. In September 2014, General of the Army (ret.) Yuriy Baluyevskiy, who developed the 2010 revision of Russia's military doctrine when he was deputy secretary of the Russian National Security Council, stated that the "conditions for pre-emptive nuclear strikes...is contained in classified policy documents."²⁵

In December 2009, then-Commander of the Strategic Missile Force Lieutenant General Andrey Shvaychenko, declared,

In a conventional war, they [the intercontinental ballistic missile (ICBM) force] ensure that the opponent is forced to cease hostilities, on advantageous conditions for Russia, by means of single or multiple preventive strikes against the aggressors' most important facilities. In a nuclear war, they ensure the destruction of facilities of the opponent's military and economic potential by means of an initial massive nuclear missile strike and subsequent multiple and single nuclear missile strikes.²⁶

In June 2020, President Putin signed a decree on nuclear deterrence which was made public. It confirmed many of

the most alarming Russian press reports about what the Russian nuclear first use threshold really was. It states:

The conditions determining the possibility of the use of nuclear weapons by the Russian Federation are:

- a) the receipt of reliable information about the launch of ballistic missiles attacking the territory of the Russian Federation and (or) its allies;
- b) the use by the adversary of nuclear weapons or other types of weapons of mass destruction across the territories of the Russian Federation and (or) its allies;
- c) the enemy's influence on critical state or military facilities of the Russian Federation, the failure of which will lead to the disruption of the response of nuclear forces;
- d) aggression against the Russian Federation with the use of conventional weapons, when the very existence of the state is threatened.²⁷

Motivating Russia to reconsider its belief that nuclear first use results in their victory is important to the success of deterrence. The military can help achieve this by planning US nuclear exercises realistically, and as an exercise in message sending, as Russia long has done.

Russian Nuclear Exercises

Russian simulation of nuclear first use in its theater war exercises is commonplace. Indeed, in 2014, Russian expatriate Nikolai Sokov reported that “all large-scale military exercises that Russia conducted beginning in 2000 featured simulations of limited nuclear strikes.”²⁸ In 2016, the annual report of NATO's Secretary General indicated that Russia “simulated nuclear attacks on NATO Allies (e.g., ZAPAD)

and on partners (e.g., March 7 2013 simulated attacks on Sweden).”²⁹ In 2017, then-DIA Director Lieutenant General Vincent Stewart said Russia is “the only country that I know of that has this concept of escalate to terminate or escalate to deescalate but they do have that built into their operational concept, we’ve seen them exercise that idea and it’s really kind of a dangerous idea.”³⁰

The publicity given to nuclear exercises in Russia is part of Russian efforts to use nuclear threats to achieve their political objectives. President Putin personally presides over the large Russian nuclear exercises which involve live (unarmed) launches of strategic and nonstrategic nuclear missiles and usually ends in a “massive” Russian nuclear strike.³¹

Our exercises can also be a way of sending messages. It is noteworthy that in February 2020, US Strategic Command announced it had conducted a coordinated test of the ability of all legs of the nuclear Triad to function, which, for the first time since the Cold War, involved live missile launches in an exercise.³² Russian state-run *RT* reported that America was “nuking Russia in response to its own nuclear strike against a ‘NATO ally.’”³³ Whether this is true or not, we need Russia to believe this will happen if they use nuclear weapons first in such a scenario.

Russian Development of New Types of Nuclear Weapons

Russia does not practice “stockpile stewardship” in the US sense of the term. In January 2005, then-Russian Defense Minister Sergei Ivanov declared, “New types of nuclear

weapons are already emerging in Russia.”³⁴ This reportedly includes the development and deployment of new high- and low-yield nuclear weapons (including sub-kiloton weapons on strategic missiles), the modernization of Soviet-legacy weapons, and the development of advanced low collateral damage designs.³⁵ These weapons not only reduce collateral damage but in some cases are more militarily effective. The low-yield weapons are intended for the first limited nuclear strikes, and the high-yield weapons are for deterring a US nuclear response (or, if necessary, to execute a massive nuclear strike). The Poseidon (previously called Status-6) nuclear-powered drone submarine reportedly carries a 100-megaton nuclear warhead.³⁶

Nuclear testing is required to develop new types of nuclear weapons. There are extensive reports, including official Russian statements going back over 20 years, of Russian low-yield nuclear testing.³⁷ In April 2020, the US Department of State issued a report that stated, “The United States finds that Russia has conducted nuclear weapons experiments that have created nuclear yield and are not consistent with the U.S. ‘zero-yield’ standard.”³⁸ There is also the possibility that Russia, without detection, has conducted higher yield nuclear tests.³⁹

Russian Strategic Nuclear Modernization

According to Russian Defense Minister General of the Army Sergei Shoigu, Russia will “continue a massive program of nuclear rearmament, deploying modern ICBMs on land and sea, [and] modernizing the strategic bomber

force.”⁴⁰ In April 2020, a US Department of Defense report said that “Russia is developing, testing, and fielding new traditional types of delivery systems like road-mobile and silo-based ICBMs, ballistic missile submarines and missiles, bomber aircraft, and cruise missiles, along with never-before-seen nuclear weapon capabilities, such as hypersonic glide vehicles, nuclear-powered cruise missiles, and nuclear-powered unmanned underwater vehicles.”⁴¹ Russia has announced over 20 new or modernized strategic delivery systems, about half of which are already operational.⁴² For each leg of their triad, Russia is developing multiple systems.⁴³ Russia is close to completing its deployment of new SS-27 ICBMs in both mobile and silo basing.⁴⁴ In December 2019, Colonel General Sergei Karakayev, commander of Russia’s Strategic Missile Force, stated that 76 percent of Russia’s ICBM force had been modernized⁴⁵ and that 100 percent would be by 2024.⁴⁶ (By comparison, US ICBM modernization begins in 2029,⁴⁷ despite the fact the US Minuteman ICBM is much older than any Soviet legacy ICBM.) While the Russians rarely meet their projected dates, almost all known Russian modernization programs will likely be complete by the time ours begins.

In December 2019, Russia announced that the Avangard hypersonic boost glide vehicle was operational⁴⁸ and that it was going to deploy 20 regiments of its new Sarmat heavy ICBM by 2027.⁴⁹ This equates to 120 to 200 deployed missiles.⁵⁰ Deputy Minister of Defense Yuri Borisov said it can deliver payloads (throw-weight) of up to 10 metric tons.⁵¹ According to the Russian ministry of defense, the “Sarmat will be able to carry up to 20 warheads of small, medium,

high power classes.”⁵² The Sarmat also reportedly can carry three to five of the large Avangard vehicles.⁵³ Russia says the Sarmat can attack the US over the South Pole,⁵⁴ apparently to exploit limitations in US early warning radar coverage. It will be much better at warfighting than survivability, and will be Russia’s main counterforce weapon.⁵⁵

Russia has modernized its legacy Delta-IV SSBNs with improved Sineva and Liner missiles, carrying more warheads.⁵⁶ In late 2019, the previous program of eight new “fourth generation” Borei ballistic missile submarines was increased to ten by the addition of two improved (quieter) 955A submarines carrying 16 missiles each.⁵⁷ The new Bulava-30 SLBM was declared to be a six-warhead missile under the original START Treaty, although there are reports it may eventually carry ten. In 2019, state-run *TASS* reported that Russia may develop and deploy two Borei-K strategic cruise missile submarines after 2027,⁵⁸ which would circumvent the current New START Treaty limits on deployed strategic nuclear weapons. The Russians are also developing the Husky “fifth generation” strategic submarine, reportedly capable of carrying ballistic missiles, cruise missiles, and Tsirkon hypersonic missiles.⁵⁹ We do not know how many they plan to build. It will reportedly be available in the same time frame as the US Columbia-class SSBN.⁶⁰

Russia has extensively modernized its legacy nuclear bombers, arming them with new nuclear or dual-capability (nuclear and conventional) long-range cruise missiles with improved accuracy, and, more recently, moved toward dual-capable hypersonic missiles.⁶¹ These include the reportedly dual-capable Kh-555 cruise missile (an adaptation of the

Cold War nuclear Kh-55/AS-15 still in service), the new stealthy nuclear-armed 5,000-km-range Kh-102, and the new, more accurate, stealthy, 4,500-km-range Kh-101. According to President Putin, the Russian Defense Ministry, and Russian state media, the Kh-101 is dual-capable (nuclear and conventional).⁶² Russia reportedly made its legacy supersonic short-range Kh-25/AS-16 missiles dual-capable and retains nuclear gravity bombs.⁶³ The Tu-22M3 bomber reportedly carries the 1,000-km range nuclear-capable near hypersonic Kh-32.⁶⁴

Russia reportedly is making major upgrades to the electronic systems and engines of its strategic bombers—the Tu-160, the Tu-95, and the Tu-22M3. In 2015, Russia announced a program to develop and deploy at least 50 improved Tu-160M2 bombers (new engines with 10 percent better performance resulting in a 1,000-km-range increase, new avionics, new electronic warfare equipment, new weapons, an active phased array radar and a modestly reduced radar cross section).⁶⁵ Today, the subsonic Tu-95 Bear H heavy bomber is essentially a strategic cruise missile carrier. The two versions of the Tu-95MS/MSM can carry either six, 14, or 16 Kh-55, Kh-555, Kh-101, or Kh-102 cruise missiles.⁶⁶

In 2009, Russia announced the development of the subsonic stealth cruise missile carrying the Pak-DA heavy bomber.⁶⁷ It is rumored to be powered by “a radically new type of engine.”⁶⁸ In 2019, Deputy Defense Minister Aleksey Krivoruchko said that the bomber will be operational in 2027.⁶⁹ In January 2020, *Izvestia* reported that three prototypes are under contract, that flight testing of the bomber

will begin in 2023, and “mass production” (in actuality, low-rate production) will begin in 2027.⁷⁰ Reportedly, the Pak-DA can carry “30 tonnes of nuclear weaponry.”⁷¹ The Pak-DA is likely to carry the same cruise missiles as the other Russian bombers, but the whole purpose of giving an aircraft stealth capability is to penetrate air defenses and launch direct attacks or limited-range missile attacks. Thus, it is reasonable to expect that the Pak-DA will also carry gravity bombs and short-range attack missiles, while the Russian state media has only reported it will carry hypersonic missiles.⁷² The Russians have been silent on the number of Pak-DAs they plan to build.

Russian Hypersonic Missiles

Characterizing Russian hypersonic missiles as strategic or nonstrategic is somewhat arbitrary, since the same missile will often be carried by a variety of platforms. Russia has operational hypersonic missiles and programs underway for more types.⁷³ Hypersonic missiles are defined as missiles with a velocity of Mach 5 (five times the speed of sound) or above. While almost all ballistic missiles have hypersonic speed, hypersonic missiles will be defined here as maneuvering hypersonic “aeroballistic” missiles, hypersonic boost glide vehicles, and powered hypersonic cruise missiles. These missiles are hard to intercept and can have a time-on-target advantage compared to ordinary ballistic missiles. The officially announced Russian programs include the Avangard, the Tsirkon-powered hypersonic missile, the Iskander “aeroballistic” missile, the Kinzhal

“aeroballistic” missile, and a smaller version of the Kinzhal for the Su-57.⁷⁴ They are reportedly all nuclear-armed or dual-capable.⁷⁵ Russia is reportedly developing the KH-MT with a “ram-jet powered hypersonic design apparently intended for internal carriage [on the Tu-95MSM bomber].”⁷⁶

Russia does not need hypersonic missiles against the small-scale US homeland missile defense, and they know this, despite their incessant propaganda attacks.⁷⁷ Hypersonic missiles are much more important in the theater attack role against heavily defended targets and warships which have advanced air and missile defenses. In 2019, Russia spoke at the highest level about using nuclear hypersonic missiles against the US National Command Authority.⁷⁸ It is incumbent on the US military to convince the Russian leadership that this is not a credible theory of victory in a nuclear war.

Russian Nonstrategic (Tactical) Nuclear Weapons

The Russian nonstrategic nuclear arsenal is ten times larger than our own—hundreds vs. thousands—according to the Obama administration.⁷⁹ The 2018 NPR credited Russia with 2,000 (and increasing) nonstrategic nuclear weapons.⁸⁰ Russian sources often report many more. Russia claims it has reduced its tactical nuclear weapons inventory by 75 percent from its massive, late-Cold War levels.⁸¹ The bad news is that this would still leave them with 5,000 or more tactical nuclear warheads, a number *Pravda.ru* reported in 2014.⁸² Dr. Philip Kerber, president of the

Potomac Foundation, has stated that “roughly half of Russia’s 5,000 tactical nuclear weapons have been modernized with new sub-kiloton nuclear warheads for air-defense, torpedoes and cruise missiles.”⁸³

A 2017 DIA report, *Russia Military Power*, says Russia’s tactical nuclear delivery systems include “air-to-surface missiles, short-range ballistic missiles, gravity bombs, and depth charges for medium-range bombers, tactical bombers, and naval aviation, as well as anti-ship, anti-submarine, and anti-aircraft missiles, and torpedoes for surface ships and submarines. There may also be warheads remaining for surface-to-air and other aerospace defense missile systems.”⁸⁴ The 2018 NPR report added close-range ballistic missiles (CRBMs) to the list and Russia is reported to have nuclear artillery.⁸⁵ The Russians have now added nuclear-capable hypersonic missiles to their arsenal.⁸⁶

The enormous Russian advantage in nonstrategic nuclear weapons creates major deterrence problems. While the addition of the low-yield Trident warhead substantially increases our deterrent capability, most of the low-yield weapons in our arsenal will be air-delivered.⁸⁷ While the Russians, as noted above, speak only about limited initial nuclear strikes and then massive nuclear strikes, there could very easily be something else in the middle. Airmen should give thought about how we handle this eventuality if it happens. The reality is that we will run out of low-yield warheads first and the Russians can launch types of attacks we cannot match. James R. Howe has looked at the possibility of what Russia might do against us with large numbers of precision

low-yield and low collateral damage weapons.⁸⁸ This would be a good starting point for future analysis.

Conclusion

Putin's Russia is obsessed with regaining the international position of the Soviet Union. It seeks imperial domination over its neighbors. It does not have the economic capability to do so, but because of its large military capability, it can play the role of the bully of Europe. Russia cannot prevail in a long war, but does have the ability to threaten conventional aggression against its neighbors backed by its nuclear potential. Its nuclear use threshold is probably significantly lower than its public declaratory policy. It may have more nuclear weapons than the rest of the world combined. Its nuclear modernization is far more extensive than that of the US, Britain, and France. It focuses on the capability to use nuclear weapons in limited war and to deter a US or NATO response. We need to convince them this will not work.

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Chapter 11

China's Nuclear Challenge

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Deterring a Chinese nuclear or nonnuclear attack, or prevailing in a conflict with China that may be characterized by nuclear signaling or actual nuclear weapon use, is likely an increasing preoccupation for the United States Air Force (USAF). Since the 1989 Tiananmen Square Massacre, the last significant existential threat to the dictatorship of the Chinese Communist Party (CCP), the Party has directed the development of full-spectrum military capabilities to achieve strategic dominance in East Asia and globally. The CCP's People's Liberation Army (PLA) is quickly acquiring global power-projection capabilities. Its nuclear weapons are at the core of the PLA's ability to ensure the power position of the CCP. Understanding the ongoing evolution of the PLA's nuclear force is crucial for the USAF to better position itself to defend the United States.

However, the People's Republic of China (PRC) does not make easy the task of understanding their nuclear strategy/doctrine, nuclear order of battle, or their future nuclear weapons modernization plans. The CCP and the PLA reject the Western consensus that military transparency, especially regarding nuclear weapons, contributes to stability. To be sure, there is a great deal published in PRC government white papers, books, journal articles, and the large cohort of Chinese academics and professionals. But reflecting historic Chinese strategies of deception and the CCP dictator-

ship's efforts to control most forms of information, the CCP/PLA's objective is to control foreign understanding of their military posture, not to expand that understanding.

This results in challenges. Chinese sources, to include commercially available imagery of PLA nuclear weapons units, government statements, published literature, and even academic-government interactions, do not produce sufficient understanding. There is no PLA official listing of its nuclear order of battle despite foreign-expert attempts to assemble one. There is a government boilerplate response regarding nuclear strategy or doctrine, but this is undermined by occasional Chinese statements and, more recently, by force posture trends. Since its first publication in 1999, the US Department of Defense's annual *China Military Power Reports* provides the definitive public assessments of China's military and nuclear power.

Controversy

China's lack of nuclear transparency causes considerable debate outside China regarding its nuclear posture and trends. In 2000, a report by the Council on Foreign Relations predicted that the PLA seeking nuclear parity with the United States was "unlikely."¹ Yet, a short twenty years later, such a PLA goal is no longer inconceivable. This illustrates China's success in concealing its long-term plans, justifying its refusal to engage in transparency. For those seeking to defend the United States and its allies from China's nuclear threat, analysis of what the PLA is

doing is just as important as what PLA and CCP leaders say and what they publish.

Background

Mao Zedong's early desire for nuclear weapons was not shaped by military requirements,² but political. He saw them as essential for preserving the position of the Party, deterring a US nuclear threat, and expanding China's global prestige and influence. Though, in 1946, he famously dismissed the American nuclear threat as a "paper tiger," Mao was obsessed with possessing nuclear weapons,³ entering the Korean War in 1950 in part because Soviet leader Josef Stalin promised to transfer a modern military industrial complex, to include help building nuclear weapons, missiles, bombers, and submarines.

Nikita Khrushchev's refusal to transfer a prototype bomb contributed to the Sino-Soviet split of 1960. However, on October 16, 1964, China tested a 22-kiloton enriched uranium implosion device. China's fourth nuclear test on October 27, 1966, was a miniaturized 12-kiloton device delivered by the 800-kilometer (km)-range Dong Feng-2 (East Wind, DF-2, US designator CSS-1) liquid-fuel missile. Its first thermonuclear bomb (3.3 megatons) was dropped from a Xian Aircraft Corporation (XAC) H-6 bomber on June 17, 1967.

Under the leadership of the Massachusetts Institute of Technology-educated Qian Xuesen,⁴ in 1964 China rationalized its missile development program to focus on a series of liquid-fuel missiles: the 1,050-km-range DF-2 tar-

geted against Japan; the 2,650-km-range DF-3 (CSS-2) targeted against the Philippines; the 5,500-km-range DF-4 (CSS-3) targeted against Guam; and the 12,000-plus-km-range DF-5 (CSS-4) targeted against the United States.

While it is likely that control of Chinese nuclear weapons was and remains with the Central Military Commission of the CCP, controlled by the chairman of the CCP, to better organize its nuclear missile forces and perform training and maintenance, the Second Artillery Corp (SAC) was created on July 1, 1966. Though crucially important to the CPP, the SAC did not have the same rank as the other services of the PLA. It did oversee the building of a series of “bases” that controlled subordinate missile-launching “brigades,” with units for training, maintenance, and storage of nuclear weapons.

From the 1970s to the 1990s, Chinese nuclear strategy is described roughly as one of “minimum deterrence,” or the maintenance of a small number of nuclear missiles to assure retaliation against enemy cities.⁵ On October 16, 1964, “From the first day it gained nuclear weapons,”⁶ China enunciated its No First Use (NFU) of nuclear weapons policy. The 1995 white paper also stressed that China’s “nuclear arsenal has been very limited.”⁷

Starting in the mid-1980s, but gathering pace in the 1990s, the PLA’s nuclear posture and strategy started evolving. Solid fuel medium-range missiles, like the 1,770-km-range DF-21 emerged, and tactical missiles like the 600-km-range DF-15 short-range ballistic missile (SRBM) emerged to meet export demand. By the 1990s, the beginning of a substantial buildup of short- and medium-range ballistic missiles, spe-

cifically to pressure Taiwan, were developed. The introduction of the PRC's first solid-fuel and road-mobile intercontinental ballistic missile (ICBM), the DF-31, was important.

Following the 1989 Tiananmen Square Massacre, the CCP elevated the national priority for military-technical power building to preserve the CCP dictatorship by eventually exceeding the broad strategic power of the United States. This purpose was specifically kept hidden. Deng Xiaoping, China's post-Mao leader, suggested that China should "hide its strength, bide its time."

Since becoming secretary general in 2012, Xi Jinping shelved Deng's counsel, making clear the CCP's hostility to liberal democracy.⁸ Xi's Belt and Road Initiative of global infrastructure now involves 138 countries, and is tied to building global military influence.⁹ On October 26, 2017, Xi announced that he had "set a midterm goal for the Chinese military—to turn itself into a modernized power by 2035—as well as a long-term one—to become a top-tier military by 2050."¹⁰ The CCP may be seeking such a force, along with a world-class nuclear force, to fulfill an ambitious agenda that may include: the conquering Taiwan, replacing US leadership in Asia, and emerging as the dominant military power.

Xi Jinping took a major step toward creating a "world class" military in late 2015, when the PLA began a series of far-reaching reforms and restructuring, for the main goal of building increasing "joint force" strategies and capabilities. The PLA's previous seven military regions were consolidated into five new theater commands that unified control over all forces therein. The SAC was also elevated to a full

service and renamed the People's Liberation Army Rocket Force (PLARF).¹¹

Land-Based Nuclear Challenge

While the PLA does not make any formal disclosures about the order of battle of the PLARF, open-source analysts examining commercial satellite imagery, PLA media reports, and state television reports have attempted to do so.¹² One estimate noted that the PLARF is comprised of six or seven “bases,” six of which control six or seven “brigades” that house, maintain, and launch one or more types of missiles.¹³ A seventh base serves as a central location for nuclear warhead storage, while individual bases may have their own warhead storage units.¹⁴ Missile numbers in a brigade depend on the type of missile; a silo-based DF-5 might have six missiles while a mobile DF-31A may have up to 18 missiles.¹⁵ Determining true numbers, however, is complicated by the PLARF's adding some number of reloads to intermediate-, medium-, and short-range ballistic missile units and cruise missile units.

Today, the PLARF has the most diverse missile arsenal in the world. It can target strategic or intercontinental-range targets with nuclear-armed ballistic missiles, and theater-range targets with nuclear and nonnuclear armed ballistic and cruise missiles, while beginning to introduce maneuverable hypersonic glide vehicle (HGV) warheads on strategic and theater-range missiles. The PLA is credited with having 300–400 nuclear warheads, but the breadth of the PLA's missile building indicates that it could increase

this number rapidly, perhaps exceeding the 1,000 warheads called for by the editor of China's hardline *Global Times*.¹⁶ However, China has for a long period resisted calls that it join arms control negotiations with the United States and Russia, claiming it has far fewer nuclear weapons than both. The reality is that China may reject such negotiations as they would limit the CCP's ability to achieve its regional and global strategic goals.

Today the PLARF maintains silo-based, liquid-fueled, single-warhead DF-5A and three-warhead DF-5B ICBMs and has tested the 10-warhead DF-5C.¹⁷ It introduced the solid-fuel, road-mobile, single warhead DF-31 in 1999 and the larger DF-31A by 2005. These may now be in the process of being succeeded by the road-mobile, single warhead with decoys, DF-31AG. In 2019, 18 of the larger 6–10 warhead DF-41s were revealed in the CCP anniversary parade. This means there may be up to two units of this ICBM deployed. There are also reports of a rail-mobile version of the DF-41,¹⁸ a larger solid-fuel and silo-based “DF-45,” and an HGV-armed ICBM.¹⁹

According to US estimates, China has over 2,000 theater ballistic and cruise missiles.²⁰ In the 1990s the PLA had over 1,000 600-km-range DF-15 and 600–700-km-range DF-11A short-range ballistic missiles. These may be declining in number, but China developed second-generation SRBMs.

The PLARF may have up to 450 medium-range ballistic missiles and 160 intermediate-range ballistic missiles.²¹ The 1,500–2,000-km-range DF-21 comes in a nuclear-tipped DF-21A version, as well as the terminally guided DF-21C and the anti-ship ballistic missile (ASBM) DF-

21D. The DF-16 also has a terminally guided DF-16B version. When revealed in a 2015 military parade, the 4,000-km-range DF-26 was also said to have an ASBM variant, sometimes called the DF-26B. In 2019 the PLA revealed the DF-17, armed with a maneuverable HGV, which helps extend its range to about 2,000 km.

The US also estimates that the PLARF may have up to 540 subsonic-speed, but very accurate, ground-launched cruise missiles.²² These include the 1,500-km-range DF-10s, the 2,000-km-range DF-10A, and new supersonic DF-100s.

The PLA is also developing missile defenses, though it is not clear whether strategic and theater-range missile defenses will be controlled by the new Strategic Support Force or the PLARF. Russia may be providing strategic missile defense technology, while Russia and China have held command-post-level missile defense exercises. Such missile “defense” cooperation should raise concerns that Russia and China may be considering missile “offense” cooperation.²³

Naval Nuclear Challenge

Reflecting Mao Zedong’s desire to match the capabilities of the US and Russia, in the mid-1960s he ordered the development of a Chinese nuclear-powered ballistic missile submarine (SSBN), that did not start construction until 1978, with the 8,000-ton Type 092 “Xia” being commissioned by the People’s Liberation Army Navy (PLAN) in 1987. It carried twelve 1,770-km nuclear-armed Julang-1 (Big Wave, JL-1) solid-fueled submarine-launched ballistic missiles (SLBMs). However, developmental challenges

including high underwater radiated noise, prevented it from achieving regular deterrence patrols.

Development of the larger second-generation Type 094 Jin class also began in the late 1960s, very likely influencing Chinese planners to focus on Hainan Island, offering the most assured access to deepwater launch points to cover the United States, necessitating control of the South China Sea to create protected “bastions.”²⁴ With some Russian assistance in developing the new larger hull,²⁵ the first 11,000-ton Type 094 was launched in 2004 and commissioned in 2007. There are now six Type 094s in PLAN service, four having been modified to Type 094B standards with improved sonar and torpedoes.²⁶ While the first two are likely armed with twelve 8,000–9,000-km-range JL-2 SLBMs, there are also informal Chinese reports of a possible JL-2B armed with multiple warheads.²⁷

In late 2019, at least one Type 094 was reported to have launched a third-generation multiple-warhead-capable JL-3 SLBM.²⁸ A key question is whether the four Type-094Bs will be upgraded with the JL-3, which reportedly may carry up to six warheads out to 12,000 km.²⁹ The JL-3 is also expected to arm the PLAN’s third-generation Type 096 SSBN, expected to emerge in the mid-2020s. Likely derived from the Type 095 attack submarine, the Type 096 is expected to incorporate new Chinese advances in submarine quieting and nuclear propulsion. Commercial satellite imagery from early 2020 indicates that a recent expansion of nuclear submarine production facilities in Huludao will facilitate Type 095 and Type 096 production.³⁰

A potential production run of six Type 096 SSBNs could allow PLAN SLBM warhead numbers to exceed 700.

Looking forward to the 2030s it cannot be discounted that the PLA may seek to counter American and Russian Navy SSBNs. To advance its maritime dominance in East Asia, the PLA is developing its “Underwater Great Wall” of supercomputer-enhanced sea-bed sonar sensors networked with future unmanned underwater vehicles (UUVs) to more rapidly find and prosecute enemy submarines. The PLAN may be developing a new nuclear-enhanced air independent propulsion (AIP) system³¹ that would enable much less expensive, thus more manned submarines or long-range UUVs to follow American and Russian SSBNs.

Aerial Nuclear Challenge

The PLA's first nuclear delivery platform was the Russian Tupolev Tu-16 Badger medium bomber—now the Hongzhaji-6 (Bomber-6 or H-6). It was used to drop nine nuclear bombs in tests but by the 1970s was assigned to nonnuclear and nuclear-strike missions. In the early 1990s the PLA tried to purchase the Tupolev Tu-22M3 *Backfire* supersonic medium bomber, but was unsuccessful.³² Then again in the mid-2000s, the Russian government of Vladimir Putin sought to sell China the Tu-22M3, but by then the PLA had decided on an indigenous program to radically upgrade the H-6 bomber.³³

Emerging in Chinese internet images in early 2007, the H-6K's most notable upgrade was the incorporation of Russian 12,000-kilogram-thrust Soloviev D-30KP turbo-

fans, replacing 9,500-kilogram WP-8 turbojets, increasing the estimated radius to about 3,500 km. It also featured a redesigned “solid” nose with a radar and infrared targeting system, and six wing pylons to carry long-range cruise missiles or precision/non-precision bombs. It is usually seen armed with the 1,500-km-range nuclear/nonnuclear CJ-10, a derivative of the land-based DH-10, the 2,000-km-range KD-20 land attack cruise missiles (LACM), and the 400-km-range YJ-12 supersonic anti-ship missile.

In 2019 the PLA Naval Air Force began receiving the naval H-6J version of the H-6K, which would usually carry the YJ-12 but likely can also carry nuclear/nonnuclear LACMs. Also in 2019 the People’s Liberation Army Air Force (PLAAF) began receiving the H-6N, an H-6K modified with an aerial refueling probe and fuselage “notch” to accommodate a new air-launched ballistic missile, that could be modified for nuclear strike, anti-ship, or anti-satellite missions. By 2020 the PLA produced over 100 of the H-6K/J/N variants in at least five units.

For most of the last decade Chinese sources have been revealing some data and speculating about a next-generation bomber for the PLAAF, called the H-20 bomber. Expected to enter service by the mid-2020s—about the same time as the American B-21 and the Russian “Pak-DA.” Like these two, the PLAAF bomber is also expected to be a refuelable, subsonic speed, stealthy flying-wing platform.³⁴ In 2011 Noshir Gawadia, who worked on early stages of the Northrop Grumman B-2 stealth bomber, was convicted of espionage for selling stealth technology to China³⁵ that may have aided the development of the H-20. Some informal

Chinese sources indicate the H-20 may weigh about the same as the B-2 but feature a longer fuselage area.

It is clear the PLA has the ambition to develop large aerial refueling aircraft necessary to support the aerial leg of a strategic triad and aerial power projection. Since the early 1990s it developed the H-6 bomber into the H-6U refueler, which can only carry about 10 tons of fuel out to about 2,000 km. About 24 H-6U and three Russian/Ukrainian Il-78 Midas refuelers can support the H-6N bomber force. The 60-ton cargo-capable Y-20 heavy transport is also being developed into the Y-20U refueler.³⁶ It is likely that the C-929 widebody airliner under development with Russia, should it be successful, may also be developed into a more capable refueler.

Conclusion

For airmen, understanding Chinese capabilities and ambitions can strengthen deterrence and contribute to victory in the event of conflict. China, under CCP leader Xi Jinping, is building a world-class military to include a peer nuclear capability. China targets democracies like Taiwan for conquest and is signaling its hostility to all democracies. Understanding China's broad challenge means taking the time to seek out a range of sources. The Chinese venerate their ancient strategists like Sun Tzu who taught "to win without fighting is the acme of skill." For Chinese strategists, victory begins with the superior assessment of the enemies' weakness to formulate the best combination of political, economic, and military pressures.

This feeds China's historic aversion to military transparency, meaning airmen must dig harder and challenge dubious assumptions to better deter or defeat Chinese aggression.

Notes

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Chapter 12

The Challenge from the Islamic Republic of Iran

Matthew Kroenig

The 2018 *National Defense Strategy* states that the return of great-power competition with China and Russia is the foremost threat to US national security and economic well-being. After these great powers, the Islamic Republic of Iran may pose the next most significant security threat to the United States and its allies. Like Moscow in Europe and Beijing in the Indo-Pacific, Tehran poses a revisionist autocratic challenge to US and allied leadership in the Middle East. To protect American and allied interests, the United States must prevent Iran from building nuclear weapons, deter Iranian nonnuclear strategic attacks, assure allies and partners in the region, and counter Iran's malign influence.

History and Background

The United States and Iran enjoyed friendly relations while Shah Reza Pahlavi-ruled Tehran from 1941 until the 1979 Iranian Revolution. But following the Revolution, the countries' relations underwent a seismic shift. The Islamic Republic was founded on resistance to the United States and the West and is dedicated to promoting its revolutionary model abroad.

Relations deteriorated quickly after the Revolution, with Iran taking hostage 52 Americans from the US Embassy in

Tehran and holding them for 444 days.¹ In the 1980s, Iran founded the terrorist organization Hezbollah to threaten US security partner Israel, and in 1983, an Iranian-backed terror attack on the US marine barracks in Lebanon killed over 200 American military personnel.² In response to Iran's mining of the Persian Gulf during the Iran-Iraq War, the US Navy fought its largest battle since World War II in 1988, sinking or damaging half of Iran's surface fleet.³ During the wars in Iraq and Afghanistan, Iranian-backed proxies killed over 600 US troops.⁴ In 2012, US Attorney General Eric Holder announced that Iran was thwarted in a terror plot to bomb a popular Washington, DC, restaurant.⁵ From 2003 to 2015, the United States and other leading global powers confronted Iran over its nuclear program but the deal that was reached in 2015, the Joint Comprehensive Plan of Action (JCPOA), did not succeed in completely eliminating the threats posed by Iran or in shifting relations in a more cooperative direction.

Today, Tehran sees itself as the leading state in the Middle East and a global power. America's security partners in the Middle East, including Israel, Jordan, Egypt, and the Gulf States, see Iran as their principal security threat. Moreover, as a revisionist autocratic power, Tehran has developed growing security ties with Washington's great-power rivals, Russia and China.

Iran does not possess a fearsome conventional military. Rather, many of its major military platforms date to the time of the Shah, and Iran's military has long been constrained by an international arms embargo. Instead, Teh-

ran has invested in asymmetric capabilities at the highest and lowest ends of the conflict spectrum.

The most significant Iranian threat comes from its nuclear and missile program. Iran does not currently possess nuclear weapons. It signed the Treaty on the Nonproliferation of Nuclear Weapons (NPT) as a nonnuclear weapons state, but it has repeatedly violated its obligations under the agreement. It operates two uranium enrichment facilities for the production of nuclear fuel.⁶ It is estimated that if Iran attempted to “break out” and build nuclear weapons, it could have enough weapons-grade uranium for its first bomb within three to four months.⁷ The International Atomic Energy Agency (IAEA) caught Iran engaging in activities relevant to designing a nuclear warhead, and it is estimated that Tehran already has the ability to construct a basic nuclear explosive device.⁸

Moreover, Iran possesses the most sophisticated ballistic missile program in the Middle East. These missiles can range US bases, forces, and allies in the Middle East and Southern Europe. Tehran is also working on longer-range missiles, including an intercontinental ballistic missile (ICBM) capable of reaching the continental United States.⁹ Currently, these missiles are armed with conventional warheads, but, in the future, they could serve as nuclear delivery systems. It is also believed that Iran may possess chemical and biological weapons.

The US State Department has named Iran the world’s leading state sponsor of terror. Iran provides funding and arms to Hamas, Hezbollah, and the Palestinian Islamic Jihad terrorist organizations. It also manages a network of

proxies, including the Houthis in Yemen and Shia militias in Afghanistan, Iraq, and Syria.¹⁰ Iran employs these terror and proxy groups to attack the interests of the United States and its security partners, destabilize the Middle East, and extend Iranian political influence. Due to these terror and proxy groups, Iran exerts a significant malign influence in Iraq, Lebanon, Syria, and Yemen.¹¹

Additionally, Iran possesses the irregular Iranian Revolutionary Guard Corps Navy. This force includes many fast attack crafts used to attack and harass commercial shipping and US naval vessels in the Persian Gulf.¹²

Iran's Relevance to Airmen and the US Air Force Mission

Iran poses a serious threat to the United States and its allies and is relevant to airmen and the US Air Force mission for a variety of reasons. The US Air Force works to deter Iranian nuclear breakout, deter Iranian nonnuclear strategic attacks, assure allies and partners, and counter Iran's malign influence.

Deter Iranian Nuclear Breakout

As a last resort, the US Air Force might be called upon to conduct airstrikes against Iran's nuclear facilities to degrade and destroy the program before Iran can build nuclear weapons. Moreover, the existence of a credible military option contributes to US diplomatic efforts by deterring Iran from dashing to a nuclear weapons capability and buying time and space for negotiations.

A nuclear-armed Iran would pose a grave threat to US and allied interests. A nuclear-armed Iran could lead to the further proliferation of nuclear weapons as: other countries in the region develop nuclear weapons in response; Iran exports sensitive nuclear material to states or terrorist groups; and the NPT is weakened. Additionally, a nuclear-armed Iran could be emboldened to engage in more aggressive coercive diplomacy in the region and to step up its support for terror and proxy groups. Finally, a nuclear-armed Iran could result in nuclear war. While Iran's leaders are not suicidal, a nuclear-armed Iran would almost certainly find itself in high-stakes crises with other nuclear-armed states, including Israel and the United States. In such crises, there is always a danger of uncontrolled escalation. Once Iran has an ICBM capability, such a crisis could even result in a nuclear attack against the American homeland.

Several consecutive presidents, including Barack Obama and Donald Trump, declared that a nuclear-armed Iran is "unacceptable" and all options are on the table to stop it.¹³ The United States retains the ability to destroy Iran's nuclear program, including Iran's deeply buried and hardened uranium-enrichment facilities. Such a strike could set back Iran's nuclear program from several years to indefinitely.

While such a strike would almost certainly result in serious consequences, including Iranian retaliation, the assessment reflected in the statements from President Obama and Trump is that these consequences would be less severe than living with a nuclear-armed Iran for decades to come.

Deter Nonnuclear Strategic Attack

Iran is one of only four countries mentioned by name in the 2018 *Nuclear Posture Review*.¹⁴ While Iran does not possess nuclear weapons, it does retain the ability to conduct nonnuclear strategic attacks on the United States or its allies. Nonnuclear strategic attacks are defined as attacks conducted with nonnuclear weapons that could have strategic effects, similar to nuclear weapons use.

For example, Tehran could conduct salvos of ballistic missile attacks on US bases, forces, or allied population centers in the Middle East. Such missiles could be armed with conventional, or possibly chemical or biological, warheads. Iran could also sponsor a major terror attack against the United States or its allies. It could attack or harass ships in the Persian Gulf and even attempt to close the Strait of Hormuz, a narrow passageway through which much of the world's oil flows, in an attempt to crash the global economy.¹⁵ Tehran also has a sophisticated and growing cyber program that could be used to conduct attacks against critical infrastructure or other sensitive targets in the United States or allied countries.

The United States deters such attacks by making it clear to Iran's leaders that any such attacks would be met with an overwhelming response, the costs of which would exceed any benefits Iran's leaders sought to gain. Washington leaves the nuclear option on the table to deter, and if necessary, respond to nonnuclear strategic attacks.

Assure US Allies and Partners

The United States counters Iranian threats, in part, to assure its allies and partners. While Washington possesses no formal treaty allies in the Middle East, it does have many close security partners in the region, including Bahrain, Egypt, Israel, Jordan, Kuwait, Qatar, Saudi Arabia, and the United Arab Emirates.¹⁶ Most of these states view Iran as their foremost security threat. The United States seeks to assure these countries because it advances US security interests. Without the US security umbrella in the region, some of these countries may take steps that are contrary to American interests, including building independent nuclear arsenals or becoming embroiled in regional wars with Iran that could threaten regional stability and the global economy.¹⁷

The United States assures these countries in various ways, including through high-level statements; a regional force presence and activities; and helping these countries defend themselves through arms sales, the provision of intelligence, surveillance, reconnaissance, and the deployment of missile defense capabilities.

Counter Iran's Malign Influence

The United States also seeks to counter Iran's malign influence in the region and around the globe. This mission is often conducted through other parts of the US government (such as sanctions by the Department of the Treasury) or indirectly through local security partners. Occasionally, the Air Force is called upon to counter Iran's malign influence through direct action, such as the air-

strikes against Shia militiamen in Iraq and Syria in December 2019 and the drone strike against Iranian General Qasem Soleimani in January 2020.¹⁸

Criticisms of US Policy toward Iran

American policy toward Iran is among the most politically charged and polarizing in national security policy. There are significant differences of opinion between the United States and its European allies, and on different sides of the political aisle in Washington. This section will consider some of the most common criticisms of current US-Iran policy and provide responses to them.

The Middle East Is No Longer a Strategic Priority

In this era of great-power competition, some national security analysts argue that the Middle East is no longer a strategic priority. The United States should extract itself from the “endless wars” in the region and shift resources to Europe, and especially the Indo-Pacific, to deal with the more significant great-power challenges posed by Russia and China.

But the United States remains a global superpower with global interests. It can and should devote significant attention to the Middle East, even as it counters Russia in Europe and China in the Indo-Pacific. Moreover, the China and Russia challenges are global, and a US presence and strategic partnerships in the Middle East also help to counter Moscow and Beijing’s influence in the region.

The US Can Live with a Nuclear-Armed Iran

Some argue that the United States can live with a nuclear-armed Iran. While they would prefer that Iran not acquire nuclear weapons, they aver that, if such a scenario came to pass, the US could deter Iran just like it deterred the Soviet Union during the Cold War. Moreover, they contend that the options the United States has for stopping Iran, such as cyberattacks, sanctions, and especially military strikes, are provocative and more dangerous than the threat Washington is attempting to stop.

But a nuclear-armed Iran would pose a grave threat to international peace and security, including possible nuclear war.¹⁹ Unlike the Soviet Union, the United States has viable options to stop Iran's program at acceptable costs. While there are risks to these options, they pale in comparison to the threat of living with a nuclear Iran for decades to come.

America Should Not Threaten a Nuclear Response to a Nonnuclear Attack

The United States leaves the nuclear option on the table for responding to Iranian nonnuclear strategic attacks, but some believe that this is a mistake. They argue that this lowers the threshold for nuclear use and that the United States can respond to any challenge Iran poses through conventional means alone. Moreover, they claim that actually following through on this threat in the event of an Iranian nonnuclear attack would unleash needless and catastrophic suffering and undermine the nuclear taboo against nuclear use.

But the United States has never had a “no first use” policy and has always kept the option of nuclear first use on the table. During the Cold War, for example, Washington deterred a massive Soviet conventional invasion of Europe with threats of nuclear retaliation.²⁰ This does not mean that nuclear weapons are the guaranteed or likely response. But, leaving the nuclear option on the table might contribute to deterrence. And there is little if anything to be gained by assuring Iran’s leaders that they can get away with such an attack without worrying about possible nuclear retaliation.

America’s “Allies” in the Middle East Are Worse than Iran

Some critics argue that the United States is choosing the wrong side in the Middle East. Iran is a country with a storied civilization, and its population is young and pro-Western. Meanwhile, America’s security partners in the region are problematic. For example, critics decry the human rights abuses committed by the Gulf States.²¹

To be sure, the story of Iran since the Revolution is a modern tragedy. It is a country with wonderful people and a rich culture, but the clerical regime in Tehran has oppressed its population and set the country on a collision course with the rest of the world. It would be ideal if there were a more representative government in Tehran, but the United States must deal with the Iranian government as it is, not as it might wish it to be.

Moreover, if the United States were only willing to work with consolidated democracies in the region, it would have few if any friends there other than Israel. Despite the flaws

of US regional security partners, these countries work closely with Washington to help advance America's goals in the region. The same cannot be said of the Islamic Republic of Iran, which was founded on resistance to the United States. Iran is building a nuclear weapons capability despite its NPT commitments. It possesses an expanding ballistic missile program in defiance of multiple UN Security Council resolutions. It is the world's leading state sponsor of terror and has directly sponsored attacks that have killed hundreds of Americans. US security partners in the region are not engaging in such egregious actions that threaten regional security and American interests.

The United States, Not Iran, Is the Problem

Some pin the blame for the intense rivalry between these two countries on the United States. They argue that Washington continues to hold a grudge since the days of the Revolution and the hostage crisis. While much of the rest of the world, including America's European allies, built more constructive relations with Tehran, the United States refuses to see Iran as anything other than an enemy.²² Moreover, these critics contend, the JCPOA solved this problem, but then the United States withdrew from the agreement.

Despite these claims, the United States has, in fact, shown a remarkable willingness to forget the past and forge new partnerships with former rivals. Germany and Japan, for example, went from being bitter enemies during World War II to formal treaty allies just a few years later. Washington is concerned about Iran's behavior. If Tehran were to

abandon its nuclear and missile program and cease its support for terror, US-Iran relations could greatly improve.

The JCPOA was controversial in the United States. At the time of its adoption in 2015, there was bipartisan opposition in the US Congress with every Republican and some Democrats against the deal. Every Republican presidential candidate in the 2016 race vowed to pull out of the deal.²³ The deal did not cover the full range of Iranian threats, including its ballistic missile program and support for terrorism. And even the limits on Iran's nuclear program expired over time due to "sunset clauses."²⁴ Reasonable people can debate the merits of the deal, but the duly elected president of the United States has decided that the deal does not advance American interests.²⁵

Why Is the Role Airmen Play Important to National Security?

Since 1945, the United States and its allies led the construction and defense of a rules-based international system that has greatly contributed to US and global peace, prosperity, and freedom. The United States military and its network of allies and partners are the bedrock of that system ensuring the security of important geopolitical regions, especially Europe, Asia, and the Middle East.

Currently, the Islamic Republic of Iran poses the greatest threat to peace and stability in the Middle East. If the United States does not act to counter these threats, no other state has the power or the attractiveness to organize a coalition of states to stop it. Working with its regional

security partners, however, Washington can successfully neutralize the Iranian threat and continue to advance American and allied security objectives.

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Chapter 13

North Korea's Nuclear Strategy and Forces

Trusted Shield and Treasured Sword

Bruce Klingner

North Korea's nuclear, missile, and conventional forces are a formidable threat to the United States and its allies in northeast Asia. Pyongyang's history of provocation and intimidation is a consistent indicator of the regime's intent to achieve its political objectives through the threat or execution of force.

Since assuming power, Kim Jong-un accelerated nuclear and missile testing and oversaw an expansive diversification of North Korea's arsenal. New weapons overcame the shortcomings of their predecessors and now pose a far greater threat to allied forces, including missile defense systems.

North Korea's nuclear doctrine drove development of new weapons and, in turn, evolved as new capabilities were realized. Pyongyang's continuing development of nuclear and missile programs beyond the necessary requirements for deterrence suggests the regime strives for a true war-fighting strategy.

The increasing viability of North Korea's ability to target the continental United States with nuclear weapons has reinforced growing South Korean and Japanese fears of abandonment and decoupling of the alliances. They increasingly question whether the US would be "willing to

trade San Francisco for Seoul,” raising doubts of the strength of the US extended deterrence guarantee.

US nuclear and missile defense capabilities, as well as the perceived will to use them, are critical to the defense of the American homeland, as well as allies overseas. While political will is the purview of policymakers, they are ultimately reliant on the US Air Force and its airmen to deter, defend, and defeat the North Korean nuclear threat.

Nuclear Doctrine Evolved as Capabilities Improved

As late as January 2003, North Korea still claimed that it had “no intention of developing nuclear weapons.... Nuclear activities will be limited to the production of electricity only.”¹ But, only five months later, Pyongyang finally publicly acknowledged that it possessed nuclear weapons. The regime declared that it would build up a “nuclear deterrence force [that was] not aimed to threaten or blackmail others.”² This set the tone for years of regime statements that its nuclear weapons were for self-defense as a deterrent against US nuclear or conventional attack.

In 2012, North Korea revised its constitution to enshrine itself as a nuclear weapons state.³ Kim Jong-un established the Strategic Rocket Command (later renamed the Strategic Force) as an independent military force equal to the ground, air, navy, and air defense force that reported directly to him and the military general staff.⁴

In 2013, North Korea codified the role of its nuclear forces during a meeting of the Central Committee of the

Korea Workers' Party where it adopted the Law on Consolidating the Status of a Self-Defensive Nuclear Weapons State. North Korea defined its use of nuclear weapons:

- “They serve the purpose of deterring and repelling the aggression and attack of the enemy against the DPRK⁵ and dealing deadly retaliatory blows at the strongholds of aggression”;
- “The DPRK shall take practical steps to bolster up the nuclear deterrence and nuclear retaliatory strike power both in quality and quantity”;
- “The DPRK shall neither use nukes against the non-nuclear states nor threaten them with those weapons unless they join a hostile nuclear weapons state in its invasion and attack on the DPRK”; and
- “The nuclear weapons of the DPRK can be used only by a final order of the Supreme Commander of the Korean People's Army to repel invasion or attack from a hostile nuclear weapons state and make retaliatory strikes.”⁶

The policy reflected an assured retaliation strategy of “deterrence by punishment” whereby nuclear weapons would deter allied attacks, including preemptive ones, by threatening a strong nuclear reprisal to inflict unacceptable losses on the United States. There was no distinction made between military and civilian targets.

North Korea's Preemption Threats

As Pyongyang's nuclear and missile prowess increased, so did its threats of a nuclear preemptive attack. Even prior to admitting it had nuclear weapons, North Korean offi-

cials had warned since 1994 that “we will not give you time to collect troops around Korea to attack us.... [I]f it is clear you are going to attack, then we will attack.”⁷

In 2016, the Ministry of Foreign Affairs stated, “A decisive preemptive attack is the only way for the DPRK to beat back the sudden surprise attack of the U.S.... It is a quite natural exercise of the right to self-defense.”⁸ The National Defense Commission warned that North Korea could conduct a “preemptive and offensive nuclear strike” if it believed the US was about to conduct a decapitation strike or military operations to “bring down its social system.”⁹

Improving Nuclear Capabilities

Enable New Strategy

Pyongyang is producing a new generation of advanced mobile missiles of all ranges that are more accurate; mobile and solid-fueled that are more survivable and difficult to target; and with a greater ability to evade allied missile defenses.

As its nuclear arsenal improved, the regime adopted an asymmetric escalation strategy in which Pyongyang could viably threaten a preemptive first-strike attack with tactical nuclear weapons to deter or defeat a conventional attack by superior US or South Korean forces.¹⁰ The regime would keep its nuclear intercontinental ballistic missiles (ICBM) that threatened the US homeland in reserve to maintain strategic deterrence.

North Korean Nuclear and Missile Capabilities

Pyongyang's evolving nuclear and missile forces increasingly provide the regime with the ability to conduct a surprise preemptive first-strike, retaliatory second-strike, and battlefield counter-force attacks. Pyongyang has:

- Produced 30–60 warheads,¹¹ can create fissile material for 7–12 warheads per year,¹² and successfully tested a hydrogen (thermonuclear) weapon at least 10 times as powerful as the Hiroshima and Nagasaki bombs;
- Expanded and refined manufacturing facilities for fissile material, nuclear weapons, missiles, mobile missile launchers, and reentry vehicles;¹³
- Created a new generation of more advanced, accurate, and survivable missiles for all ranges that escalates the nuclear threat against South Korea, Japan, US bases in Okinawa and Guam, and the continental United States;
- Developed mobile land-based and sea-based missile systems that are harder to detect and target;
- Produced several different solid-fueled missiles that reduce the time necessary for launch, thereby constraining warning time for the US and its allies; and
- Practiced missile launches under wartime conditions by firing multiple missiles from numerous locations throughout the country, simulated nuclear airburst attacks over South Korea and Japan, and conducted salvo launches of several missiles simultaneously.

Pyongyang has an extensive and diversified missile force to attack targets in South Korea, Japan, US bases in the Pacific, and the continental United States.

South Korean Ports and Airfields

To prevent the US from augmenting forces in South Korea during a conflict, North Korea would use nuclear weapons on South Korean ports and airfields. In 2016, Kim Jong-un oversaw several successful surface-to-surface (SCUD) and Hwasong-7 (No Dong) mobile missile launching exercises that simulated preemptive nuclear air-burst strikes against South Korean ports and airfields to be used by the US military.¹⁴

South Korean Leadership and Military Targets

Pyongyang vowed to initiate a preemptive nuclear attack against the South Korean leadership, including the presidential Blue House, if the regime perceived even a “slight sign” of US or South Korean preparations for a decapitation strike on the North Korean leadership.¹⁵

North Korea warned that it could turn South Korea into a “sea of flames” with its long-range artillery force and “reduce all bases and strongholds of the US and South Korean warmongers...into ashes.”¹⁶ The regime has deployed SCUD missiles, Pukguksong-2 (KN-15), and Hwasong-7 (No Dong) medium-range missiles. North Korea achieved breakthrough successes with several short-range missile systems in development that emphasized survivability, accuracy, and ability to defeat allied missile defenses.

Defeating Ballistic Missile Defenses (BMD)

North Korea is developing several systems and tactics that would be more effective in degrading or defeating allied missile defenses. Pyongyang has launched missiles to a higher altitude and shorter range which could allow a warhead to arrive at a steeper angle of attack and faster speed which could exceed BMD interception capabilities.

The KN-18 and KN-21 SCUD variants have maneuverable reentry vehicles and the KN-23 has a flight profile that showed evasive characteristics instead of a typical ballistic parabola. The KN-23 was flown at depressed trajectories, potentially between the upper reach of Patriot missiles and below the minimum intercept altitude for Terminal High Altitude Area Defense (THAAD), with a final pull-up maneuver that provides a steep terminal descent.¹⁷ The KN-23 could also be used in a first strike against leadership, hardened command and control, or high-value military targets.

North Korea demonstrated the ability to fire several missiles at once which could enable salvo attacks by less accurate SCUD missiles to overwhelm BMD systems.¹⁸

SLBM Threat

North Korea has successfully tested the Pukguksong-1 (KN-11) and Pukguksong-3 (KN-26) submarine-launched ballistic missiles (SLBM) which could target South Korea and Japan, potentially with a nuclear warhead.

South Korea does not currently have defenses against SLBMs. The THAAD BMD system radar is limited to a

120-degree view that is directed toward North Korea, precluding it from protecting against SLBMs arriving from either the East or West Seas.¹⁹ The SM-2 missile currently deployed on South Korean destroyers only provides protection against anti-ship missiles.

Establishing North Korean Area Denial

Pyongyang could use theater nuclear strikes against US bases in Japan and Guam to prevent the flow of forces and logistics to the peninsula that are planned in the time phased force deployment data (TPFDD) plan. Pyongyang has repeatedly threatened US bases throughout the Pacific, often citing Guam.²⁰ The regime has developed the Hwasong-10 (Musudan) and Hwasong-12 (KN-17) intermediate-range missiles to hit US bases on Okinawa and Guam.

Threatening the US Mainland

Pyongyang has threatened to “reduce the US mainland to ashes and darkness.”²¹ Kim was photographed in front of a map labelled “US Mainland Strike Plan,” with missile trajectories aimed at Washington, DC, Indo-Pacific Command in Hawaii, San Diego (a principal homeport of the Pacific Fleet), and Air Force Global Strike Command at Barksdale Air Force Base in Louisiana.²²

In 2017, North Korea conducted three successful tests of the Hwasong-14 (KN-20) and Hwasong-15 (KN-22) ICBMs to replace the earlier, less capable KN-08 and KN-14 ICBMs. General Terrence O’Shaughnessy, commander of North American Aerospace Defense Command (NORAD),

testified that North Korea demonstrated the capability to threaten the US homeland with thermonuclear-armed ICBMs capable of ranging most, or all, of North America.²³ US Forces Korea assessed that the Hwasong-15 ICBM has a range of 8,000 miles and is capable of reaching anywhere on the US mainland.²⁴

New War Plan

After assuming power, Kim Jong-un directed the North Korean military to develop a new strategy to invade and occupy Seoul within three days and all of South Korea within seven days. North Korea had studied US operations in Afghanistan and Iraq and concluded it must prevail quickly before US reinforcements arrived. This would necessitate early use of nuclear weapons.²⁵

The Korean People's Army General Staff declared that "the first combined task units stationed in the eastern, central, and western sectors of the front will [carry] out the preemptive retaliatory strike at the enemy groups with 'an ultra-precision blitzkrieg strike of the Korean style.'"²⁶ North Korea has warned that "any military conflict on the Korean Peninsula is bound to lead to an all-out [nuclear] war, an ultra-harsh war of reaction targeting the entire US mainland."²⁷

Future Capabilities Open Dangerous Doors

North Korea's continually advancing proficiencies suggest additional and more worrisome evolutions in its nuclear doctrine. Pyongyang may be on the path to developing

capabilities that go beyond deterrence to a viable offensive warfighting strategy.

In a few years, North Korea could have 100–200 nuclear warheads, dozens of mobile ICBMs, and hundreds of improved, survivable short-, medium-, and intermediate-range missiles, as well as submarine-launched missiles. North Korea possessing a more formidable military threat would put allied forces at greater risk, augment the danger to the continental United States, and degrade military responses to North Korean actions.

Greater nuclear capabilities could undermine the effectiveness of existing war plans. For example, rather than fully implementing all phases of OPLAN 5015 after a North Korean attack, the allies may strive only for returning to the *status quo ante* rather than fully liberating North Korea.

North Korea's ability to target American cities with thermo-nuclear weapons could inhibit US responses or exacerbate growing allied concerns about the viability of the US extended deterrence guarantee. South Korea and Japan have already questioned US willingness to risk its cities for theirs.

The defense of the continental US is currently provided by 44 ground-based interceptors in Alaska and California. Several interceptors would likely be fired at each incoming North Korean missile since the current North Korean ICBM arsenal is small. However, continued North Korean ICBM production could overwhelm US missile defenses.

A more survivable North Korea nuclear force could create first-strike uncertainty for the United States of not being able to get all of Pyongyang's North Korea's nuclear

weapons. Coupled with the risk of numerous American cities attacked by hydrogen bombs, Washington might be perceived as being hesitant to respond to North Korean actions. As the fictional nuclear strategist Dr. Strangelove opined, “Deterrence is the art of producing in the mind of the enemy, the fear to attack.”

If North Korea believes the US is unwilling to risk catastrophic civilian losses, the regime could feel emboldened to act more belligerently in pursuing its strategic objectives. A former North Korean official testified before Congress in 1997 that “Kim Jong-il believes that if North Korea creates more than 20,000 American casualties in the region, the US will roll back and that North Korea will win the war.”²⁸

Pyongyang may even conclude that nuclear weapons provide the ability to fulfill its oft-stated goal of reunifying the Korean Peninsula on regime terms. Kim Jong-un declared that North Korea “should not allow the national split to persist any longer but reunify the country in our generation without fail.”²⁹ The regime has repeatedly pledged to achieve the “final victory in a great war for national reunification.”³⁰

Deterrence and Diplomacy: Two Sides of the Same Coin

The arms control community argues that deterrence maintains the nuclear problem but does not solve it. They suggest that there is a need for the US to engage with North

Korea to reach a diplomatic resolution to the long-standing nuclear problem.

The international community, including the United States, has repeatedly attempted to do so, having concluded eight denuclearization agreements with North Korea. All failed due to Pyongyang's cheating or leaving obligations unfulfilled. During these and subsequent negotiations, Washington offered economic benefits, developmental assistance, humanitarian assistance, diplomatic recognition, declarations of non-hostility, turning a blind eye to violations, not enforcing US laws, and reducing allied defenses.

Despite these concessions, North Korea still has an insatiable list of security, diplomatic, and economic demands. These include the conclusion of allied military exercises, withdrawal of all US troops from South Korea, abrogation of the US–South Korea defense treaty, ending the US extended deterrence guaranty, signing a peace treaty to end the Korean War, a security guarantee, non-criticism of the regime, and removal of all US and United Nations (UN) sanctions.

Currently, North Korea rejects all working-level diplomats as well as summit meetings with the United States. It is impossible to negotiate with a nation that will not pick up the phone. Until Pyongyang is willing to comply with 11 UN resolutions that require it to abandon its nuclear and missile programs, the US must maintain a comprehensive strategy of diplomacy, upholding UN resolutions, US law, and deterrence. Washington and its allies must keep their eyes open, their shields up, and their swords sharp.

Airmen must remain ever vigilant to maintain the decades long deterrence that has kept the peace on the Korean Peninsula. As George Orwell reportedly opined, “People sleep peacefully in their beds at night only because rough men stand ready to do violence on their behalf.”

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Chapter 14

Reflections on Russian Nuclear Strategy

Stephen Blank

Newly opened arms control negotiations reconfirm the centrality of nuclear issues in the Russo-American and Sino-Russo-American relationships.¹ Therefore, the failure to understand Russian nuclear strategy benefits neither arms control nor US interests, which, despite the perfervid calls of many arms control commentators, are not necessarily identical.² Russian nuclear strategy is inherently evolutionary and must be understood based on doctrine, official statements, exercises, and procurement. Soviet/Russian nuclear strategy and behavior derive from a cognitive universe wholly unlike that of American strategic thinking.³ Identical words often mean entirely different things to Russians and Americans; much Russian rhetoric is politicized and deliberately deceptive, and invariably follows state requirements. Consequently, neither doctrine nor official statements are invariably authoritative, nor do they always mean what we think they do. Indeed, war plans, evidence from procurements, and exercises often contradict doctrinal and/or other statements.

Aspects of Russian Thinking

Russian strategy and policy originate in the presupposition of conflict.⁴ Since 2004–2005, Russia has believed itself to be in a new Cold War with a militarily superior

West, mitigated only by nuclear deterrence.⁵ This allegedly decadent West nonetheless possesses superior military power, denies Russia its rightful imperial prerogatives, and aims to undermine its state system through the promotion of democracy and support for foreign revolutions, e.g., Ukraine or the Arab Spring. Small or local wars emerging from these or analogous crises possess an inherent escalatory potential right up to nuclear war.⁶ Hence, Russia, even when acting offensively, is merely defending its vital interests regardless of the facts. Therefore, state necessity supersedes objective truth.⁷ In this theory, Russia, as a seemingly “distinct civilization,” is spiritually unique if not superior and ordained by history and destiny to an imperial or quasi-imperial role in Eurasia.⁸ Meanwhile, Russian representatives reject the sovereignty and/or territorial integrity of any state east of Germany.⁹ Instead, Russia aims to overturn the post-Cold War settlement and return to the Cold War or Yalta where the United States acknowledged Russia as its global co-equal in status.¹⁰ Nuclear weapons are essential for every tactic in that strategy.

Therefore, nuclear weapons, particularly tactical nuclear weapons (TNW), compensate for conventional weakness and justify Russia’s obsession with global equality with the United States. Indeed, Moscow’s newly published nuclear policy guidelines state that the main purpose of nuclear weapons is to deter conventional and/or nuclear attacks on Russia, its allies, or even its conventional capabilities. Thus, nuclear weapons deterred Western replies to the invasions of Georgia and Ukraine or other operations in Moscow’s self-proclaimed “sphere of influence.”¹¹ Indeed, the guide-

lines clarify the fact that nuclear strategy entails imposing escalation control across the entire spectrum of a crisis, thereby opening the way for Russia's "cross-domain strategy of coercion."¹² This point confirms that only Russia's strategy is escalation control and dominance throughout all stages of a crisis.¹³ That strategy simultaneously utilizes nuclear and conventional weapons, information and cyber warfare, economics, diplomacy, and active measures, globally.¹⁴ Russian leaders clearly understand that, "[a]t least from the military perspective, it is well understood that conflict prevention depends on a credible capability for conflict *control*" (emphasis in original).¹⁵

Soviet Strategy

Warsaw Pact strategy originally coincided with Nikita Khrushchev's nuclear saber-rattling. The Warsaw Pact embraced "nuclear romanticism": It imagined massive pre-emptive strikes on Western targets in Europe allegedly provoked by North Atlantic Treaty Organization (NATO)—leading to a massive nuclear exchange unless somehow its forces won quickly.¹⁶ Nuclear and conventional inferiority drove this strategy until that condition was overcome by the late-1960s.

Moscow's enormous military buildup from the 1960s to 1990 allegedly fostered a strategy prioritizing a massive conventional advance to destroy NATO nuclear bases and reach the Channel in a week.¹⁷ Moscow also concurrently built an enormous nuclear arsenal, which it certainly would have employed in that war. From the 1970s to the 1980s, Western technological superiority and response to

Russian strategy supposedly forced Moscow to renounce offensive options for defensive ones in Europe.¹⁸ President Brezhnev even stated a no-first-use policy, supposedly harmonizing declaratory policy with war plans.¹⁹ Yet, the Warsaw Pact's 1979 secret offensive plan postulated an alleged NATO nuclear attack upon Warsaw to unleash a preemptive nuclear war in Europe to destroy every major German city, Brussels, much of Denmark, Holland, and Northern Italy.²⁰ Thus, high-level documents and statements often contradicted actual war plans.²¹ Clearly, Soviet nuclear thinking was dangerously incoherent, and we have evidence that Russian thinking also is incoherent.²²

Current Policy

Current policy reflects Moscow's abiding and self-induced paranoia. Furthermore, it also reflects Russia's institutionalized bias toward assuming a worst-case scenario. President Putin even conceded that if the military labels something a threat, then it is one.²³ Therefore, NATO's 1999 Kosovo operation triggered an ongoing nuclear and conventional buildup. The key military threats are NATO forces, bases, and missile defenses moving closer to Russia.²⁴ Although Russian and Western experts know that missile defenses cannot neutralize Russia's nuclear capability, Russia insists upon the opposite conclusion.²⁵ This misguided threat assessment justifies new nuclear weapons, which supposedly can evade those defenses.²⁶

Russia has launched over 20 nuclear programs for short-, intermediate-, and long-range missiles tailored to every

conceivable contingency. These programs include counterforce, countervalue, and weapons that can evade missile defenses.²⁷ Moreover, every new missile system is a dual-capable one.²⁸ Admittedly, Putin stated that nuclear weapons will be used only in a launch-under-attack mode, once an attack is absolutely and reliably confirmed, not preemptively.²⁹ But Russian analysts themselves remain skeptical and define policy as launch-under-warning.³⁰ Moreover, the new guidelines state that Russia will use nuclear weapons in numerous contingencies beyond those threatening the state's stability and warning of incoming attacks.³¹ Thus, the guidelines go well beyond the 2014 doctrine restricting nuclear use to cases of weapons of mass destruction (WMD) attacks on Russia or its allies and/or threats to the state's survival. Moreover, since Russia configures its military in a state of "defensive preemption," launch-under-warning is probably not the real policy.³²

Moreover, the guidelines, exercises, procurement, and dual-capable missile deployments on icebreakers and forward-deployed naval vessels, overflights, and submarine probes—as well as doctrinal statements like the 2017 naval doctrine and statements by Russian military officers based on exercises—contradict these assertions of defensiveness.³³ Annual major exercises like Zapad (West) or Vostok (East) "typically have a nuclear component designed to simulate Russia's planning for intra-war deterrence—escalation management via use of non-strategic nuclear weapons."³⁴ Nuclear weapons remain the priority procurement and new nuclear weapons that can evade missile defenses are entering service.³⁵ Likewise, Russia broke the Intermediate-Range

Nuclear Forces (INF) Treaty by deploying multiple regiments of the SSC-8 (Novator missile). When Washington withdrew from the treaty, Moscow already had new intermediate-range ballistic missiles ready for production.³⁶

Since 1999, Russia has also modernized its TNW, low-yield weapons, testing at low yields in violation of the Comprehensive Test Ban Treaty (CTBT), using short-range nuclear weapons that threaten NATO in war games, and violating the Chemical Weapons Convention as in Syria and the Skripal Affair in Great Britain.³⁷ Russia also probably violated the Biological Warfare Conventions.³⁸ Consequently, if we consider the number of weapons and warheads (since many of these weapons have multiple warheads) plus Russia's ongoing production capabilities—even with a new START Treaty—Moscow will retain about 8,000 nuclear warheads, as Pentagon officials and independent US analysts estimate.³⁹ Therefore, there is good reason to expect either preemption with TNW or low-yield nuclear weapons and an aggressive, offensive posture, as indicated in the new guidelines.⁴⁰

Russia's nuclear stockpile is steadily growing. Whether on land, sea, or air, it is receiving new capabilities, greater accuracy, lower yields, and longer ranges. Russia's over 20 short, intermediate, and long-range nuclear programs underway, including the 9M729 (Novator or SSC-8) missile, which violates the INF treaty, also comprise anti-ship, anti-submarine, unmanned underwater vehicle missile, torpedo, and depth charges. Russia also has some 2,000 TNW not covered by any treaty. Neither they nor their delivery systems are transparent, and most new systems

cannot distinguish between conventional and nuclear-missile capabilities. Finally, Russia is also developing new warhead designs for strategic systems, e.g., new high-yield and earth-penetrating warheads to attack hardened military targets like US, allied, and Chinese command-and-control facilities. All these are made possible by violating the CTBT zero-yield standard.⁴¹

The size and scope of Russia's nuclear arsenal, procurements, exercises, doctrinal statements, and behaviors all but preclude a no-first-use or launch-under-attack strategy. Moreover, Russia's record belies confidence in these assertions of its intentions, whether by foreign experts or Russian leaders.⁴² Despite contentions that the new guidelines are defensively oriented, this is not the case.⁴³ Moreover, if Deputy Foreign Minister Sergei Rybakov is right, that nothing has happened to change nuclear doctrine as strategy in several years, then the offensive precepts encoded in the guidelines are not new but long-established.

Russia's strategy is not to escalate in order to de-escalate.⁴⁴ Rather, Russia's nuclear strategy is compellence, i.e., compelling adversaries to allow Russia to win quick victories and a *fiat accomplis*, because of its readiness to threaten nuclear use that deters their response.⁴⁵ This is a strategy of escalation control throughout all phases of any crisis. If we substitute Russia for the United States in the statement below, this becomes clear.

When the United States had nuclear superiority and a clear capability for escalation dominance, conflict termination could be achieved by implied threats on the part of the United States to escalate the conflict to the nuclear level. With the advent of nu-

clear parity, however, conflict termination rests not on escalation, but on de-escalation. It is a process aimed at bringing any conflict to an end on terms favorable to the United States, while at the same time preventing escalation to higher and more dangerous levels of warfare.⁴⁶

Indeed, the new guidelines openly say that Moscow's use of nuclear weapons or the threat thereof aims to close down a conflict on terms favorable to Russia.⁴⁷

As Dima Adamsky observes, "The nuclear component is an inseparable part of Russian operational art that cannot be analyzed as a stand-alone issue." It abets Russian conventional threats and aggression by deterring the counteraction of adversaries to that aggression.⁴⁸ As Colin Gray stated, Moscow speaks as if it can achieve nuclear victory. Not surprisingly, Gray concluded that Russia seeks escalation dominance.

The New Guidelines

The new guidelines are anything but defensive. They aim to persuade Washington to negotiate arms control. They broaden the conditions for nuclear use far beyond threats to the stability of the state, as stated in the 2014 doctrine.⁴⁹ Furthermore, under Russian law, any Ukrainian effort to regain its territory risks nuclear escalation.⁵⁰ The threats meriting nuclear deterrence and operations now include: those of WMD and their potential delivery systems; "the adversary's" (US and NATO) deployment of missile defenses in space or neighboring countries; and conventional terrestrial or maritime deployments that could threaten Russia. They also include conventional and nuclear buildups in

waters and territories adjacent to Russia; development of shorter-range ballistic and cruise missiles; high-precision-nonuclear and hypersonic weapons; UAVs and directed-energy weapons; uncontrolled nuclear proliferation, including delivery means, technology, and manufacture of their equipment; and deployment of such on territories of non-nuclear states.⁵¹ Actions that could trigger a nuclear launch comprise WMD attacks on Russia and its allies; the launch of ballistic missiles potentially carrying WMD targeting Russia or its allies even if it is a single launch; conventional attacks threatening Russian statehood; and adversaries' coercion of critically important state and military installations that could negate a responsive Russian launch of nuclear forces (probably a decapitation or other attacks on C2).⁵²

The guidelines thus express Russia's belief that any European or NATO efforts to defend against its threats are illegitimate and therefore a threat to Russia. Shunning a defensive posture, Russia insists on restoring the fundamental Cold War paradigm of mutual assured destruction and hostility and shackling Washington to its paranoia and empire-building. Consequently, for all their dynamism and evolutionary nature, the new guidelines represent an offensive, not a defensive, policy, and also a very traditional Russian innovation—a Potemkin village.

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Chapter 15

Russo-Chinese Military Cooperation

The Nuclear Agenda

Stephen Blank

Russia and China are *de facto* allies against the United States and its power, interests, allies, and values. This article, however, focuses exclusively on nuclear issues. Although those issues do not comprise the entire alliance, this cooperation poses serious threats to American policy, power, interests, allies, and values. This alliance functions globally, through worldwide diplomatic, military, and economic cooperation.¹ Although many scholars refuse to call this relationship an alliance, Sino-Russian interaction does meet academic criteria for one.² Moreover, officials here and abroad increasingly see it as an anti-Western alliance.³ This alliance represents the culmination to date of a generation-long evolution of Sino-Russian relations, whose origins in the 1990s already entailed the checking of American power, liberalism, and policy.⁴ Russia has overtly pursued an alliance with China since at least 2014, if not earlier.⁵ Indeed, in 2018, President Vladimir Putin proclaimed that theirs was a multi-dimensional alliance relationship.⁶

While not a *de jure* alliance with binding clauses like those of pre-World War I alliances, North Atlantic Treaty Organization (NATO), or US alliances with Asian states and Australia, it is an alliance like those of the tsars.⁷ This format meets both governments' desires, because they

both remember the unfortunate Sino-Soviet alliance that ended acrimoniously in the 1960s and almost led to war between them. Therefore, no formal alliance documents are needed here, given their visibly growing intimacy.⁸ Russian officials also freely employ the term “alliance.”⁹ In October 2014, Putin told Chinese Premier Li Keqiang that Russia and China were “natural partners and natural allies,” and his remarks speak for themselves.¹⁰ Today, prominent Western observers like Graham Allison similarly assert:

What has emerged is what a former senior Russian national security official described to me as a functional military alliance. Russian and Chinese General Staffs now have candid, detailed discussions about the threat US nuclear modernization and missile defenses pose to each of their strategic deterrents. It therefore stands to reason that these militaries also conduct equally probing discussions concerning conventional warfare and Korean issues.¹¹

Indeed, an extensive infrastructure of bilateral consultation and exchange has developed over the past generation.¹² American missile defenses supposedly threaten both states because both Russian and Chinese officials know that the combination of those missile defenses and US aerospace capabilities could take out their command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) or nuclear first-strike capabilities. They evidently share anxiety about what would then happen to their second-strike capabilities, suggesting that they lack confidence about these capabilities. This apprehension has apparently driven both countries’ ongoing nuclear buildup.¹³ Thus, it is the combined conventional superior-

ity of the United States (and its allies) and its nuclear capabilities that deter them. There is good reason to believe that absent such deterrence, Russia and China may actually have a first-strike move in mind in wartime, notwithstanding China's no-first-use policy claims.¹⁴

Leading officials in both countries anticipate a deepening military alliance.¹⁵ Indeed, President Xi Jinping told Russian Defense Minister Sergei Shoigu that not only can both militaries deal with "common security threats," but they also should increase cooperation and unswervingly deepen their strategic coordination.¹⁶ Thus, the evidence for the existence of an informal alliance is strong and arguably growing stronger.¹⁷

A 2018 joint Russo-Chinese expert dialogue argued that the parties have attained a level of interaction exceeding a strategic partnership and surpassing an alliance. Both sides retain full freedom in relations with third countries "except in circumstances where such relations might violate certain obligations of the existing partnership."¹⁸ Meanwhile, the intensiveness and level of trust, depth, and effectiveness of the bilateral relationship render Sino-Russian ties supposedly superior to an alliance.¹⁹ Furthermore, this partnership allegedly can act "as an independent geopolitical power and deter political adversaries." Finally, both parties have successfully adapted their cooperation "to resolve any global or regional task," while preserving their swift decision-making, tactical flexibility, and strategic stability.²⁰ Since this relationship, whatever its true nature, aims to preserve flexibility of maneuver for big sides, signs of that flexibility do not negate the reality of an alliance.

The institutional means for forging cooperation are well established:

The scale of cooperation between Russia and China is reflected in the extensive infrastructure of dialogue between the two states. Regular contacts are maintained at nearly all levels of central Authority. Political dialogue takes place within an extensive framework for bilateral consultations, including meetings of heads of state held several times a year (at least once a year on a bilateral basis, and also during several multilateral meetings); meetings of prime ministers and foreign ministers; consultations on strategic stability (at the level of deputy foreign ministers); consultations on military cooperation (at the level of defense ministers); and consultations on security issues (between national security advisors since 2005).²¹

These ties have grown subsequently with regular ministerial exchanges and summits so that since 2013, Putin and Xi Jinping have met 22 times. And, as Foreign Minister Sergei Lavrov stated:

As regards international issues, we feel—and our Chinese friends share this view—that our cooperation and coordination in the international arena are one of the most important stabilizing factors in the world system. We regularly coordinate our approaches to various conflicts, whether it is in the Middle East, North Africa, or the Korean peninsula. We have regular and frank and confidential consultations.²²

First, this alliance's strongest manifestation is its bilateral military relationship. Russian commentators have long believed that this dynamic relationship evolved into an alliance some time ago.²³ Vasily Kashin, Senior Research Fellow at the Russian Academy of Sciences Institute of the Far East, claims that the 2001 Russo-Chinese treaty

enshrined, at the very least, bilateral strategic military-political coordination. Specifically,

Chapter 9 of the treaty stipulated that “in case there emerges a situation which, by [the] opinion of one of the Participants, can create threats to the peace, violate the peace, or affect the interests of the security of the Participant, and also in case when there is a threat of aggression against one of the Participants, the Participants immediately contact each other and start consultations in order to remove the emerging threat.”²⁴

Kashin further notes that “[w]hile the treaty did not create any obligations for mutual defense, it clearly required both sides to consider some sort of joint action in the case of a threat from a third party.”²⁵

Yuri Ushakov, Putin’s foreign policy advisor, similarly observed, “Strategic interaction with China is one of the top priorities of our foreign policy. The relations have reached quite a high level and to some degree serve as an example of how two major states can and should build an inter-state dialogue.”²⁶

Chinese sources tell the same story. China’s 2017 white paper on Asia-Pacific security cooperation declared, “Russia was a priority in its diplomacy.”²⁷ Later that year China’s ambassador to Russia, Li Hui, stated that the

comprehensive strategic partnership of coordination between China and Russia occupies a special position in the major-country diplomacy with Chinese characteristics and is an important manifestation of practicing Xi Jinping Thought on Socialism with Chinese Characteristics for a new era.²⁸

More recently, China’s new 2019 Defense White Paper openly extolled bilateral military ties with Russia:

The military relationship between China and Russia continues to develop at a high level, enriching the China-Russia comprehensive strategic partnership of coordination for a new era and playing a significant role in maintaining global strategic stability. The Chinese and Russian militaries have continued the sound development of exchange mechanisms at all levels, expanded cooperation in high-level exchanges, military training, equipment, technology and counter-terrorism, and realized positive interaction and coordination on international and multilateral occasions.²⁹

Second, in this alliance, China is the rider and Russia the horse.³⁰ Russian dependence on Chinese material and political support continues to grow. Virtually every observer admits that China has the upper hand, while Russia falls further into dependence on China. Indeed, after President Trump's invitation, Russia said it could not participate in the G-7 without China.³¹

Third, and even more dangerously, Russia tenaciously deploys this relationship to prove it is a great power and force America to pay attention to it. Thus, for Russia, "the very sense in Moscow that they may have a Chinese option provides them with a kind of encouragement to be tougher, bolder, and more optimistic about their ability to survive without a meaningful cooperation with the United States."³² Consequently, Russia does not fear China but relies on Chinese support for its belligerent posture vis-à-vis the United States and its allies. Indeed, Deputy Foreign Minister Sergei Rybakov recently reiterated that Russia does not see China as a threat—a statement issued specifically in conjunction with the newly begun Russo-American negotiations over strategic nuclear weapons.³³ Therefore, Rus-

sia's aggressive global policies are, at least in part, an effort to prove to China that it is "Bundnisfähig" (worthy of alliance)—i.e., a true great power that is ready to challenge Washington aggressively, strategically, and ideologically.³⁴ Scholars and experts have long recognized that a Sino-Russian alliance profoundly threatens American interests, values, and allies.³⁵

Fourth, this alliance is still evolving. The July 23, 2019, aerial confrontation between Russian and Chinese airplanes on the one hand and Japanese and Republic of Korea (ROK) air forces on the other—Russia and China overflew both countries, and the ROK fighters took warning shots at the Russian planes—highlights a potentially dangerous escalation of tensions in Northeast Asia and the Russo-Chinese military alliance.³⁶ Another indication of this alliance was that Moscow simultaneously presented a Gulf security plan that China had previously approved.³⁷ Therefore, this essay firmly argues that an alliance has evolved since the 1990s and especially since the Russian invasion of Ukraine in 2014.³⁸

This "dogfight" over Japanese and South Korean air space reflected a recent bilateral agreement providing for joint air patrols over Northeast Asia, including South Korea's air defense identification zone (ADIZ) and enhanced bilateral cooperation.³⁹ Coupled with the Chinese white paper's declaration, the United States can expect more joint exercises, air patrols, Russian arms sales, and escalatory probes, and further military-political strategic coordination, beyond just Northeast Asia. Moreover, the political foundation for such coordination already existed.

When China and Russia introduced their double freeze proposal for Korea (freezing the Democratic People's Republic of Korea [DPRK] nuclear missile tests and US-ROK exercises) in 2017 announcing their strengthened coordination on Korea, this was the first joint official statement in ten years.⁴⁰

Therefore, the hallmarks of this alliance's dynamic are reversals of past Russian policies to China's benefit, support for China on Asian regional issues, and Russia's asymmetrical and growing dependence upon Chinese economic, political, and military support. Despite difficulties in economic issues and particularly in Central Asia, the evidence for all three hallmarks even in these domains is quite strong.⁴¹ Indeed, by 2009, economic weakness forced Moscow to reverse past policy and admit China into its plans for developing Russia's Far East.⁴² Already by 2012 analysts noticed China's ability to impose its agenda on Russia and gain disproportionate benefits from Russia while avoiding any lasting commitment to Russia's calls for an alliance.⁴³ This is even truer today. China now holds significant equities in Russian Arctic and energy projects. Apart from the aforementioned examples of coordination, Moscow has also backtracked on its 2013 insistence to take part in any future arms control negotiations because China still refuses to do so. As Rybakov said in 2013,

We cannot endlessly negotiate with the United States the reduction and limitation of nuclear arms while some other countries are strengthening their nuclear and missile capabilities.... Making nuclear disarmament a multilateral process is becoming a necessity.⁴⁴

However, Russia cannot insist upon Chinese participation despite the Chinese nuclear threat to Russia. Thus, Rybakov now reiterates the official view that Chinese nuclear weapons do not threaten Russia even though several independent analysts argue to the contrary.⁴⁵

Basis of the Alliance

This alliance derives from long-held and evolving geopolitically and ideologically congruent anti-American perspectives. While not a binding wartime alliance like NATO or pre-World War I alliances, today's concept of alliances is much more elastic and therefore suits both sides. Admittedly these are contentious claims, since most analysts deny that an alliance is occurring or sustainable.⁴⁶ Kashin recently wrote that both sides may avoid the term "alliance," but the relationship already far exceeds "neighborliness" or even a "strategic partnership," even though China's lasting gains in Asia are arguably at Moscow's, not Washington's, expense. That was most obvious in Central Asia.⁴⁷ Therefore, we must understand what this alliance means. As Russian Foreign Minister Lavrov stated in 2014:

If we talk about alliances, not in the old sense of the word, not in the sense of tough bloc discipline when NATO was against the Warsaw Pact and everyone knew that this part of the negotiating table would raise their hands and this part would vote against it. Today such baculine discipline looks humiliating to states that preach democracy, pluralism of thought, and so on.... Other types of alliances—flexible network alliances—are much more in demand today.⁴⁸

To be sure, the arguments against this relationship being an alliance invariably contend that neither government wants to be bound by permanent alliances that tie them down, that they have diverging outlooks on major issues of international affairs, and that, ultimately, Russia will bridle at Chinese encroachments on Russia's great-power pretensions. Nevertheless, that has not happened yet. Indeed, both sides have carefully avoided that predicament while advancing together.⁴⁹ Furthermore, all alliances have their points of friction until they break up due to changes in world politics and power relationships.

The Nature of the Alliance

The evidence for an alliance, albeit of a unique type, is overwhelming and growing. Thus, Russian officials freely call their relationship an alliance. In October 2014, Putin told Chinese Premier Li Keqiang that Russia and China were "natural partners and natural allies."⁵⁰ In 2014 Lavrov stated, "We can now even talk about the emerging technology alliance between the two countries."⁵¹ Lavrov then observed that "Russia's tandem with Beijing is a crucial factor for ensuring international stability and at least some balance in international affairs."⁵² He and Putin have subsequently and frequently repeated this idea. Graham Allison, as stated above, and Alexander Korolev further stressed the military element in this alliance.⁵³ More recently Deputy Foreign Minister Igor Morgulov remarked that an "energy alliance" exists between Russia and China.⁵⁴

Given both governments' penchant for deception strategies, they have employed ever-more convoluted euphemisms to disguise the true nature of the relationship. First it was a comprehensive strategic partnership.⁵⁵ In 2016 Putin defined that term as follows:

As we had never reached this level of relations before, our experts have had trouble defining today's general state of our common affairs. It turns out that to say we have strategic cooperation is not enough anymore. This is why we have started talking about a comprehensive partnership and strategic collaboration. "Comprehensive" means that we work virtually on all major avenues; "strategic" means that we attach enormous intergovernmental importance to this work.⁵⁶

In November 2018, Putin called the relationship a "privileged strategic partnership."⁵⁷ Likewise, we have noted what Lavrov called the bilateral coordination and collaboration in foreign policy.⁵⁸

Finally, Chinese Defense Minister General Wei Fenghe told the 2018 Moscow International Security Conference that he came to show the world the high level of bilateral cooperation and support between the two countries and that they share a "common position on important international problems at international venues as well."⁵⁹ Therefore, it is hard to distinguish between a privileged and a comprehensive partnership. Moreover, this alliance comprises military, political, and economic dimensions. Military cooperation is deepening and expanding, as seen in Korea and in recent official bilateral exchanges.⁶⁰ Such statements and ensuing behavior strengthen the evidence of an expanding, albeit informal, alliance.⁶¹

Analysts should not be bewitched by theories and formulas concerning alliances but rather observe states' actual behavior. History abounds with informal alliances and strategic understandings that allowed their members great latitude. Indeed, Alexander Korolev has rigorously analyzed the conditions for alliance formation in 2018 and found that most if not all had been or were about to be achieved here.⁶² Moreover, as their position on Korea, exercises, and cooperation discussed below shows, both sides conform to alliance dynamics. So, whatever this relationship's true nature is, it preserves both sides' flexibility of maneuver while maximizing opportunities for coordinated action. Therefore, manifestations of that flexibility do not negate the reality of an alliance.

Nuclear Cooperation

Bilateral nuclear cooperation is long-standing and appears in exercises, arms sales, inter-military discussions, and in science and technology—most notably regarding space. While the Sino-Russian rapprochement began in the 1990s and was already anti-American in its political thrust, for both parties the nuclear aspect only being in 1999.⁶³ The United States announced then that it would cooperate with Japan and South Korea to develop a theater missile defense program, something that could be interpreted in both Moscow and Beijing as an effort to threaten their nuclear deterrents and force them into an arms race that Russia could not then afford. Both governments viewed this decision in conjunction with the Kosovo operation as telling

them that the United States would not abide by UN procedures and that it threatened them, particularly as a theater missile defense (TMD) or national missile defense program in Japan threatened China's second strike and might even be extended to Taiwan. Therefore, China had to augment its nuclear capabilities. Moreover, both sides began to discuss strategic issues on a regular basis and arrived at a consensus that the Anti-Ballistic Missile (ABM) Treaty must be preserved and oppose the deployment of non-strategic ballistic missiles in the Asia-Pacific region. Although the impact of 9/11 led Russia to draw closer to the United States rather than to China, by 2004 that rapprochement was, for all intents and purposes, over.

Since 2004, overall military-political-economic cooperation and collaboration have steadily increased. Bilateral cooperation on civilian space projects, which nevertheless could have military implications, began and continue.⁶⁴ By 2016 the two states were discussing joint exploration of outer space, Mars, and even the moon.⁶⁵ The bilateral Peace Mission 2007 exercise with China, ostensibly a counter-terrorist exercise, simulated use of a nuclear weapon by the adversary forces.⁶⁶ Subsequently, the quantity and substance of bilateral discussions and coordination have discernibly expanded.⁶⁷ Thus, a bilateral 2017 report stated that, although Moscow's strategic nuclear forces are outside the range of the US Terminal High Altitude Air Defense (THAAD) missiles placed in Japan and South Korea at their request, China and Russia viewed this deployment as signifying a "changing strategic balance of power in this region"—a clear threat to China, and implicitly to Russia—

not just North Korea.⁶⁸ Other reports speak of growing bilateral cooperation on nuclear weapon strategies. Rybakov stated in 2019 that the two sides would focus on coordinating issues of nuclear strategy as they did previously regarding strategic stability.⁶⁹ The two governments are also reportedly working together on “an alternate internet,” in effect, a system of root servers operating independently of those controlled by the United States.⁷⁰

In this context both governments have also participated in two simulated joint missile defense exercises, one in China and the other in Russia in 2016–2017. Some experts believe that the development by both states of hypersonic weapons is a response to regional TMD and ballistic missile defense (BMD) deployments by Washington, Tokyo, and Seoul.⁷¹ This move toward naval, combined arms, and missile defense exercises after 2012 demonstrates a greater realism in the choice of contingencies, sophistication, quality of weapons being used, interoperability, and capability in undertaking ever more serious missions. For example, the 2016 missile defense exercise in Moscow, like the subsequent one in 2017, involved “defending territory against accidental and provocative ballistic and cruise missile strikes and increasing interoperability. It led to “a new level of trust” and to sharing information in sensitive areas like missile launches, warning systems, and BMD.⁷² Here, too, as in bilateral coordination and training of Chinese students, we see an ascending curve and one moving up the ladder of military contingencies, weaponry, and striving for interoperability and joint command and control.

Likewise, the 2017 Russo-Chinese aerospace simulation of a joint response to a ballistic missile attack clearly intended against the United States indicated “a new level of trust” between these governments by sharing highly sensitive information as missile launch warning systems and BMD that “indicates something beyond simple cooperation.”⁷³ These exercises also included joint air and missile defense to make a similar impression on the US Air Force. Therefore, they suggest an alliance, because in such exercises both sides must put their cards on the table and display their C4ISR.

Similarly, there is evidence that Russia’s Vostok-2018 exercise, which also involved Chinese forces, originally reflected apprehension about a US strike on North Korea that could easily oblige them to respond.⁷⁴ As Vasily Kashin notes, this exercise took the form of a computer simulation, in which both sides constructed a joint air/missile defense area using long-range SAM systems like the Chinese HQ-9 and the Russian S-300/400.⁷⁵ Likewise, there is reason to believe that the Sino-Russian military exercises of 2017–2018 were conceived and implemented with the idea of joint action against a US-led invasion of North Korea.⁷⁶ Substantial evidence from Sino-Russian naval exercises in the Sea of Japan in 2017 tends to confirm their intention to prevent US Navy forces concentrated near Korea from attaining total dominance in the theater.⁷⁷ These exercises also included joint air and missile defense exercises to make a similar impression on the US Air Force. Certainly, Russian conventional arms sales to China visibly aim to thwart US operations in the Western Pacific.⁷⁸

Moreover, Russia is building an early warning missile defense system for China that also goes beyond simple cooperation.⁷⁹ That electronic warfare (EW) system aims to reduce the threat of a “strategic surprise” on the United States or other attack on China. It also opens the door to China’s deployment of ballistic missile defenses and an integrated anti-satellite network of capabilities.⁸⁰ China can then also launch its nuclear missiles before incoming warheads can strike them.⁸¹ In other words, “This could prompt Beijing to respond to a larger US nuclear force, as urged by the 2018 US *Nuclear Posture Review*, by increasing the alert level of Chinese nuclear forces or even shifting their posture to launch-under-attack.”⁸² Moreover, since China can evidently use this EW system for conventional deterrence, it could possibly detect incoming US conventional missiles before they reach their targets.⁸³ While that outcome might strengthen strategic stability between China and the United States, this cooperation “cements a growing de facto military alliance between the countries.”⁸⁴

Arms sales also constitute a fundamental element in the alliance. Indeed, as a result of these exercises, including “Aerospace Security-2016,” Russia may now sell China the nuclear-capable Kalibr’ cruise missile for use on Russian-made Kilo-class diesel-electric submarines even as Russia continues the ongoing combined arms buildup of its Far Eastern Military District and overall military buildup.⁸⁵ China has also stated its desire to buy the nuclear-capable SU-57 fifth-generation stealth fighter.⁸⁶

Other arms sales raise the danger of Sino-American confrontations, which could begin as conventional con-

flicts but then rapidly escalate. China's naval strategy is moving from a sea-denial strategy against the United States and Japan to a strategy aiming beyond the first and second island-chain strategy in which China can project power beyond the Sea of Japan.⁸⁷ The former sea-denial strategy entails denying the use of the Yellow and East China Seas to foreign offensive-strike platforms. Russia's continuing military transfers to China are vital to upgrading China's capability for realizing this strategy.⁸⁸ As one recent analysis of Moscow's naval transfers to China observes:

The kinds of weapons that Russia was providing were geared much more toward fighting a maritime conflict with the West than a future land campaign against Russia. In fact, Moscow hoped that the buildup of China's maritime forces might intensify the growing competition between China and the United States in the Western Pacific, leaving the two strategically focused more on each other and away from Russia.⁸⁹

In the naval sphere alone, Russian help has been critical in improving Chinese ship design and cruise, ballistic anti-ship, and anti-air missiles; the ability to detect and track moving ships and airplanes at sea and strike them from a distance; and the naval air defense umbrella to prevent both US and Japanese fleets from operating in the Western Pacific.⁹⁰ Cooperation is increasing due to the intensification of Sino-Russian relations and Russian economic distress. Russia is reportedly developing a naval version of the S-400 air defense that will be sold to China, doubling the effective range of Chinese naval-based air defenses.⁹¹ The S-400 will cover the Senkaku Islands and increase the pressures on American and Japanese air capabilities given hardened Chinese air defenses and soft US air bases.

The 400-kilometer-range system allows China to strike any aerial target on the island of Taiwan, in addition to reaching air targets as far as Calcutta, Hanoi, and Seoul. The Yellow Sea and China's new Air Defense Identification Zone (ADIZ) in the East China Sea and all of North Korea will also be protected. Acquiring the S-400 strikes a major blow against Taiwan's defense and gives China uncontested air superiority over all of Taiwan's territory and into Japanese waters.⁹² When these improved capabilities are taken in tandem with Chinese statements, exercises, and fleet deployments, we see that these capabilities have materially facilitated and are continuing to facilitate the ever-increasing use and bolder deployments of the PLAN and PLAAF to threaten Japan. The YJ-12 and YJ-18 cruise missiles derived from Russian sources also represent a qualitative leap forward in Chinese cruise missile projection capabilities even without the added capabilities of the Lada-class submarine.⁹³ Finally, Russia has also agreed to sell China a consignment of IL-76 transport aircraft from Ulyanovsk, bringing the volume of annual arms sales to China back to the level of \$2 billion per annum, which we saw a decade or so ago.⁹⁴

Due to these sales and recent exercises, Russo-Chinese maritime collaboration has grown considerably. The trajectory of recent maritime exercises suggests that the partnership has exceeded the original template of military cooperation. The naval drills are significant not only for the size of the contingents involved, but also for the quality of interaction, which now seems as structured as the US Navy's many drills with its Asian-Pacific partners.

The symbolism of growing Sino-Russian maritime synergy is both notionally relevant and functionally instructive. The military exercises help bolster the Sino-Russian strategic relationship, while reinforcing deterrence against perceived adversaries. By conducting the interactions in spaces dominated by America and its allies, Russia and China seek to defy the US-led maritime order. The maritime exercises have provided a framework by which Russia and China can develop their individual and collective defensive capabilities. Intensive combat-oriented operations also serve to signal a shift in the strategic balance of Asia. While the United States is still the dominant power in the Asia-Pacific, growing Chinese and Russian nautical interaction heralds the beginning of a multipolar or possibly bipolar maritime order in Asia.⁹⁵ Finally, Russian elites may hope that sales to China like that of the SU-35 Fighter will lead to further sales of the same systems in other parts of Asia, such as Southeast Asia.⁹⁶

Other instances of alliance behavior pertain to nuclear issues in Asia. While Russia claims it sought to persuade China to join negotiations with Washington on a new arms control treaty—and it has been invited to those new talks—Russia neither expects China to join them nor was disappointed when China refused that offer.⁹⁷ Apart from Rybakov's aforementioned statements, both Moscow and Beijing recently warned that if the United States deploys more intermediate-range ballistic missiles in and around South Korea against North Korea, Russia will take that as a threat to itself and China and deploy its own retaliatory, albeit likely asymmetric, capabilities against US and allied

Asian targets.⁹⁸ The aforementioned joint 2017 report already highlighted shared threat assessments regarding THAAD deployments as signifying a “changing strategic balance of power in this region” and a clear threat to China—implicitly to Russia, not just North Korea.⁹⁹ In addition, the deployment of the THAAD missile defense system against DPRK threats—although this system does not threaten Russia’s strategic nuclear forces—has led Russian officials to claim that US policies, e.g., projected space defenses, pose a threat to China.¹⁰⁰

Finally, the striking resemblance of some of North Korea’s recently tested ballistic missiles to Russia’s nuclear-capable Iskander missile suggests that Russia’s government or members thereof are proliferating missile technology to North Korea.¹⁰¹ Certainly, both governments openly flout the UN sanctions against North Korea.¹⁰² Likewise, both governments have repeatedly stated their views on North Korea. Thus, in October 2018

deputy foreign ministers of Russia, China, and North Korea—Igor Morgulov of Russia, Kong Xuanyou of China, and Choe Son Hui of North Korea—gathered for the first time in Moscow to discuss easing sanctions on North Korea. Summarizing the meetings, Morgulov stated in a *TASS* interview that “measures” should reflect “reciprocity, and parallel, synchronous and gradual steps” and emphasized that the situation on the Korean Peninsula would be settled in “accordance with the Russian-Chinese roadmap.”¹⁰³

Similarly, Russia and China submitted a joint draft resolution to the UN in December 2019 concerning North Korea. Reportedly, the

draft resolution is set to propose relief for North Korea from sanctions imposed by previous Security Council resolutions, including those on Pyongyang's exports of seafood, statues, and textiles. The draft resolution would also loosen restrictions on North Korean laborers overseas and support exemptions for inter-Korean projects.¹⁰⁴

This resolution simultaneously highlights the Russo-Chinese alliance, or unity of position, on Korea:

Last October, (2019) at a meeting between the second-highest-level foreign ministry officials from Moscow, Beijing, and Pyongyang, the three sides arrived at a trilateral determination that international sanctions against North Korea should be "adjusted." China's foreign affairs vice-minister, Kong Xuanyou, Russia's deputy foreign minister, Igor Morgulov and North Korea's foreign vice-minister, Choe Son Hui, participated in the discussions then.¹⁰⁵

Clearly the three governments have united on this course of action, as Kim Jong-un's ever-more- threatening statements to end the negotiations with the United States and intensify missile and satellite tests signal Sino-Russian unity with North Korea and a looming crisis there.¹⁰⁶ At the same time, there has been virtual radio silence from Beijing and Moscow about North Korea's latest provocations against South Korea and the United States, suggesting their support for this behavior.

This is not surprising. The identity of Sino-Russian policies on Korea is often proclaimed by both sides. But what that means is that neither Russia nor China is ready to encourage an irreversible North Korean commitment to denuclearization. Indeed, they probably do not believe it is possible or, more importantly, desirable.¹⁰⁷ Certainly their

bilateral and ever-more-overt violation of UN sanctions on North Korea for which they had both voted allows North Korea to continue developing conventional and nuclear weapons.¹⁰⁸

Furthermore, that military cooperation continues to grow as of 2020. Both Moscow and Beijing warned that if the United States, as it evidently intends to do, deploys more weapons that were banned under the now-defunct Intermediate-Range Nuclear Forces Treaty in and around South Korea against North Korea, Russia will consider it a threat to itself and China and deploy its own retaliatory, albeit likely asymmetric, capabilities against the United States and allied targets in Asia.¹⁰⁹ And, of course, China has made similar remonstrances to Washington.¹¹⁰ All that option would do is enhance tensions and generate a real multilateral arms race in Northeast Asia that would frighten Tokyo and Seoul more than Pyongyang. That is certainly not in US interests. Neither is it a foregone conclusion that Seoul or Tokyo will accept the idea of deploying such weapons on their soil.¹¹¹ Indeed, Japan decided against hosting the Aegis Ashore missile defense complex, allegedly on environmental and cost grounds.¹¹² Whatever the real reasons behind this decision, and despite whatever solution Washington and Tokyo reach in response, Moscow and Beijing will undoubtedly regard this as a victory and continue to believe that Japan is susceptible to their pressure. Therefore, they will both exert more pressure—indeed, China has already begun to do so—and we can expect Russia and China to build more conventional, if not nuclear, missiles that can target Japan and South Korea.¹¹³

The deep bilateral institutional cooperation also appears regarding civilian and military space capabilities. China has used Russian launch vehicles for its satellites, and it also has obtained the right to station part of its Beidou satellite network in Russia. The two countries are collaborating on a joint exploration of Mars, and scientific and technological institutes have established long-term flourishing connections. Military officials are working together from both directions and are known to be launching Chinese satellites with military applications; there is also long-standing Sino-Russian cooperation on their Global Navigation Satellite Systems.¹¹⁴

Conclusion

The evidence presented here demonstrates the growing threats to American interests and allies, particularly, though not exclusively, in Asia, from this alliance. This alliance is visibly growing each day and could expand. For example, if Russian early warning and anti-submarine warfare (ASW) controls relax, the Pentagon has already warned that Chinese ballistic missile submarines might hide in the Arctic Ocean to fire missiles at the United States from there.¹¹⁵ This could occur only through Russian support, and at least one writer has already argued for joint military activity in the Arctic.¹¹⁶ Given North Korea's apparent resumption of nuclear weapon and missile building, it is also quite conceivable that Russian and Chinese nuclear weapons will figure in another Korean crisis, which is now likely, given the breakdown of negotiations with

Pyongyang.¹¹⁷ Those considerations come on top of the spiraling animosity between Washington and Beijing.

Furthermore, the recent examples of China's aggressive actions in the South China Sea against Japan and India all show that Russia cannot restrain it, and Russia's inability to act in turn shows that China probably will not restrain Russian aggressiveness.¹¹⁸ Certainly, Russia refused to mediate the Indo-Chinese clashes, and, on the South China Sea, it increasingly leans to China.¹¹⁹ China's forthcoming agreement with Iran may also signify covert support for Iran's nuclear and missile programs as well.¹²⁰ The signs of strife in any or all of these places could escalate into genuine military conflicts, which might start out as conventional but in many cases will possess significant risks of escalating to nuclear threats.

These trends demonstrate the necessity of nuclear modernization in a coherent, multi-dimensional strategy that simultaneously reinvigorates our alliances against this alliance and nuclear threats. These trends also mandate diplomatic efforts, for example, as suggested by this author with regard to Korea, to defuse that nuclear threat and create a new equilibrium in Asia that reduces Russia's incentive to follow China on Korea and other Asian issues.¹²¹ This alliance already creates numerous problems for the United States, not just nuclear ones. But since virtually all observers of this alliance regard Russia as increasingly dependent upon China, the situation easily could become even more dangerous. That dependency already manifests itself in increasingly aggressive series of Russian probes designed to prove to China and itself that it is a great global power ready to confront America. Therefore, Moscow believes that it deserves

China's support in this alliance. Indeed, Vladimir Putin has come to terms with China's rising position, having said that "the main struggle, which is now underway, is that for global leadership and we are not going to contest China on this."¹²²

The United States now believes China to be undergoing a "crash nuclear buildup" and that its nuclear capability will double during this decade.¹²³ As arms control talks are now beginning, China must be there, and accords must be based on rigorous, credible verification provisions encompassing all the participants. Therefore, the United States should not rush to resume treaty talks solely with Russia who has amply demonstrated infidelity to its own agreements. Doing that means negotiating with ourselves alone. In arms control as in life, the sound of one hand clapping is not enough.

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PART 3

The Service Contribution to Deterrence

Chapter 16

US Air Force Bombers

The Most Versatile Leg of America's Nuclear Triad

Mark Gunzinger

The ability to launch retaliatory strikes in response to nuclear aggression is the foundation of America's nuclear deterrence strategy. Since the 1960s, a triad of intercontinental ballistic missiles (ICBM), ballistic missile submarines carrying submarine-launched ballistic missiles (SLBM), and nuclear-capable bomber aircraft underpinned this strategy. Today, the United States Air Force's (USAF) B-52H and B-2 bombers are the most flexible leg of the triad and are highly survivable once they are generated and ready to sortie from their airbases within minutes. Beginning in the mid-2020s, the next-generation B-21 "Raider" stealth bomber will join the inventory, eventually replacing the Air Force's B-2s and conventional-only B-1B bombers.

Air Force B-52Hs have been operational since the early 1960s and will remain in the force until at least 2040. Originally designed as high-altitude bombers capable of delivering nuclear gravity bombs over intercontinental ranges, B-52s modified to carry conventional weapons played a critical role during the Vietnam conflict and in every major air campaign since. For instance, B-52s flew an average of 50 sorties per day and "delivered 40 percent of all the weapons dropped by coalition forces" during Operation Desert Storm against Iraq in 1991.¹

While B-52Hs can deliver a variety of short-range weapons such as Joint Direct Attack Munitions against targets in permissive threat environments, they are not stealth aircraft and must launch long-range standoff weapons against targets located in contested areas covered by modern integrated air defense systems (IADS). A single “BUFF,” as B-52s are nicknamed, can carry up to twenty 2,000-pound-class Joint Air-to-Surface Standoff Missiles (JASSM) that are designed to penetrate contested areas, and an extended range JASSM-ER will allow them to strike from standoff distances of 500 nautical miles or more. B-52Hs are stationed at Minot AFB, North Dakota, and at Barksdale AFB, Louisiana.

At this time, B-52Hs are the only USAF bombers that can carry nuclear-capable air-launched cruise missiles (ALCM). The Air Force began developing the AGM-86B ALCM in the 1970s to improve the B-52’s ability to strike targets defended by Soviet-era surface-to-air missiles and other threats. First fielded in 1982, with a projected service life of ten years, AGM-86B ALCMs are subsonic, long-range weapons. A B-52H can carry up to 20 ALCMs armed with W80-1 warheads. Beginning in the late 2020s, the Air Force will replace its ALCMs with the long-range standoff (LRSO) weapon. The LRSO will carry a W80-4 nuclear warhead and have the ability to penetrate advanced IADS, operate in GPS-denied environments, and hold high-value targets at risk from significant standoff ranges. LRSOs will ensure B-52Hs remain a viable part of the triad well into the future.²

The USAF's B-2 stealth bombers joined the force beginning in the early 1990s. B-2s have flying wing designs that decrease their radar and infrared signatures, reducing the probability they will be detected by enemy air defenses. The B-2's design, radar-absorbent materials, onboard sensors to detect threats, secure connectivity, and ability to fuse information from multiple sources give it the ability to penetrate contested areas. B-2s can deliver large payloads of conventional and nuclear weapons on targets with precision in all weather conditions, and they are certified to carry B61-7/11 and B83 nuclear gravity bombs. Although these weapons will be retired in the mid-2020s, a life-extension program will replace current B61 variants with the B61 Mod 12 that will have new and refurbished components as well as a tail kit to improve its accuracy.

B-2s will soon be joined by next-generation stealth B-21s capable of penetrating future threat environments. Beginning in the mid-2020s, the Air Force intends to procure at least 100 B-21 aircraft that will be capable of carrying conventional weapons, the LRSO, and B61-12 gravity bombs.³

Why Is the Bomber Force Relevant Today?

America's global interests are now being threatened like never before. China and Russia pose security challenges that the United States has not confronted since the Cold War—some potentially existential in nature. At the same time, rogue states like North Korea and Iran have ballistic missiles and aspire to develop the ability to deliver nuclear

warheads over long ranges, and non-state actors continue to plot attacks against the US and its allies.

The concurrency of these threats has stretched America's military resources thin. With vital interests on the line, the Department of Defense (DoD) will modernize the forces and capabilities that are most critical to executing the 2018 *National Defense Strategy*. Weapon systems like USAF bombers that are capable of attacking targets with conventional or nuclear weapons over global ranges are a top priority. Long-range strike bombers, when paired with an effective campaign strategy aimed at vital targets, are one of the most effective tools available to America's commanders. Unlike most elements of the joint force, bombers with large payloads of conventional weapons can respond within hours to strike targets located inside contested areas. This early firepower will be essential to achieving time-sensitive objectives for theater commanders—a realistic scenario could require them to rapidly halt Chinese or Russian aggression against an American ally.

The USAF's nuclear-capable bombers also complement other legs of the triad. B-2s and B-52Hs can generate to alert status within a matter of hours, disperse to multiple airfields to reduce their vulnerability to nuclear strikes, or deploy overseas to reassure allies and demonstrate resolve in a crisis. Unlike SLBMs and ICBMs, bombers can be launched and recalled without employing their nuclear weapons, giving US national command authorities another means to signal resolve. Bomber crews can modify their mission profiles, change targets in flight as directed, and determine if their weapons should be withheld. Bombers

can also regenerate after a sortie to prepare for follow-on missions or to reestablish deterrence after an attack. Penetrating bombers are the only triad leg capable of locating and attacking highly mobile or relocatable targets such as ICBM transporter erector *launchers*. This is a key reason the Air Force chose to procure the B-21.

The Debate over the Air-Breathing Leg of the Triad

After three decades of cuts and delayed modernization, the B-21 program will create a future bomber force that is appropriately sized and has the right mix of penetrating and standoff strike capabilities needed by US combatant commanders. Although there is strong national support for the B-21, a few critics continue to question the need for it. Factors contributing to the DoD's decision to procure the B-21 generally fall into two categories. First, the USAF's bomber force is too small to meet the demands of the national defense strategy, and, second, there is a need for a next-generation bomber that can penetrate future contested operational environments.

The Air Force's total inventory of 76 B-52Hs, 62 B-1Bs, and 20 B-2s is the oldest and smallest bomber fleet the service has ever operated.⁴ Since the Cold War, the bomber force declined from about 400 aircraft to 158 total tails primarily due to the DoD's desire to generate savings and its belief that a smaller bomber force would suffice for limited conventional conflicts with rogue states such as Iran and North Korea. Both rationales were behind the DoD's 1997

decision to cap the B-2 program at 21 aircraft instead of buying all 132 B-2s required by the Air Force.⁵

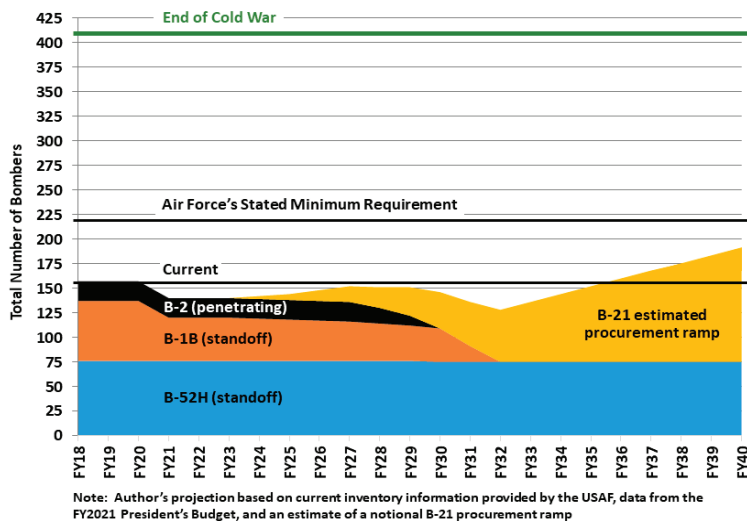


Figure 16.1. Projection of the USAF'S Bomber Inventory

The long ranges, large payloads, and multi-mission capabilities of bombers are exactly the kind of attributes theater commanders need to deter aggression. However, multiple studies have concluded the current bomber force cannot generate enough conventional strike sorties for a *single* major conflict with a peer adversary plus sustain nuclear deterrence simultaneously, and thus recommended the Air Force grow the inventory as quickly as possible.⁶ Furthermore, B-52Hs and B-1Bs designed to penetrate Cold War-era Soviet air defenses are not capable of operating in areas defended by advanced IADS, and the stealth B-2 force is far too small. In short, a larger and more balanced mix of penetrating and standoff bombers is needed. Recent Air Force Chief of Staff General David Goldfein

said the future force that wins will have “a combination of that which works from inside and that which works from outside.... [A] balance [of long-range penetrating and stand-off strike forces].”⁷ General Goldfein also testified, “Our assessment—and that’s been backed up by independent assessments—that a moderate risk force is 220 bombers of which 145 would be B-21s.”⁸ Finally, the DoD’s 2018 *Nuclear Posture Review* determined that delays in procuring B-21s would “reduce the ability of our strategic forces to penetrate adversary air defenses, limit the diversity of our response options, and compromise our ability to send the visible deterrence and assurance signals for which strategic bombers are particularly well suited.”⁹

The need for aircraft with next-generation stealth such as the B-21 is another recurring issue. Stealth skeptics typically point to advances in computing power, the increased accuracy of radars that operate in low-frequency bands, and other air defense improvements that could erode America’s stealth asymmetric advantage.¹⁰ Those who believe stealth is not worth the investment often fail to consider that the DoD development of next-generation stealth technologies continues to outpace advances in defensive systems.¹¹ This is a key reason the DoD decided to acquire the B-21. Aircraft stealth is the result of a multi-pronged approach that includes minimizing aircraft signatures in multiple bands of the electromagnetic spectrum (low observability) and at all aspects.¹² B-21s will have next-generation radar absorbent materials, increased processing power to fuse information from onboard sensors and external sources, and low probability of intercept/low probability of detection

datalinks that will maximize opportunities to collaborate with other weapon systems. All-aspect low observability in multiple frequency bands combined with these other capabilities will enable B-21s to penetrate adversary defenses well into the future.

Another critical point for Airmen to stress is that stealth does *not* make aircraft invisible to enemy sensors—it denies an enemy information required to launch a successful intercept. Many who view stealth as a waning advantage fail to understand this. Given that information dominance is increasingly critical to success in modern warfare, the need for stealth will actually grow in importance, not diminish.

Critics have also questioned the need to replace the ALCM, arguing the LRSO will be a redundant or even a destabilizing capability.¹³ Although there are many reasons for why the LRSO is needed, the DoD most frequently cites concerns over the ALCM's future viability, its reduced survivability in modern threat environments, and implications to US nuclear deterrence as a whole if it is not fielded.

The AGM-86B ALCM is the only air-launched nuclear cruise missile in the US military's inventory.¹⁴ Although it was designed in the mid-1970s to have a planned service life of ten years, life-extension programs will keep ALCMs in the inventory until approximately 2030. Similar to other USAF nuclear weapon systems, there is a limit to how long ALCMs can be sustained. Former USSTRATCOM Commander General John Hyten testified to Congress that ALCMs have “sustainability and viability issues from age related material failures, advancing adversary capabilities and diminishing manufacturing sources. Parts and mate-

rials designed for a 10-year service life are now 35 years old, and are obsolete,” and the ALCM’s service-life-extension programs “cannot keep pace with the rate of discovery of deficiencies.”¹⁵ Moreover, required testing will reduce the number of operationally available ALCMs below the required level by the year 2030.¹⁶

Concern over the ALCM’s ability to penetrate increasingly lethal Soviet air defenses caused the Air Force to initiate a program to replace its ALCMs shortly after they became operational. The resulting AGM-129 advanced cruise missile (ACM) had stealth coatings, forward-swept wings, and other design features to improve its ability to penetrate contested areas. For budgetary and other reasons, the DoD terminated ACM production early, did not replace its ALCMs, and eventually retired its ACMs. If the ALCM is not replaced by the LRSO, its inability to penetrate would deprive the air-breathing leg of the triad of a means of conducting standoff nuclear strikes. In effect, this would eliminate B-52Hs as a viable part of the triad, since these non-stealth aircraft must use standoff weapons to strike into contested areas.¹⁷

Critics assert cruise missiles are destabilizing capabilities that increase the chance of a nuclear exchange since enemies cannot determine if they carry a conventional or nuclear warhead. The truth is that bombers with nuclear cruise missiles may be the *most* stabilizing element of the triad. As the 2008 Schlesinger Commission concluded, “If this stand-off capability is allowed to disappear, then the ability to signal strategic capability through the generation and dispersal of B-52s will be compromised.”¹⁸ The DoD has

fielded multiple cruise missile variants in the past without Russian and Chinese objections, and China and Russia have done the same without concern they could be destabilizing.¹⁹

The USAF Bomber Force: Critical to National Security

Air Force bombers provide options to US combatant commanders that are unmatched by other conventional or nuclear-capable forces. A right-sized force of dual-capable B-52Hs and B-21s will be able to deter nuclear threats to the homeland and simultaneously conduct large-scale conventional strike operations during a major conflict with a peer adversary. No other leg of the triad will have this multi-mission capability, which is a key reason that the DoD supports growing the bomber force to at least 220 total aircraft by buying B-21s. USAF nuclear-capable bombers offer options to signal America's resolve in ways that cannot be matched by other triad capabilities, and they can recover after strikes to help reestablish deterrence or prepare for follow-on operations.

The Air Force's ability to provide these capabilities will diminish if much-needed modernization programs are prematurely ended or delayed, as they have been in the past. Without next-generation B-21s, the bomber force will lack the capacity needed to execute the national defense strategy and will lose its ability to conduct long-range penetrating strikes into contested environments. This would greatly simplify an enemy's air and missile defense challenge. The LRSO is also needed to ensure

B-52Hs remain a viable part of the triad capable of holding at risk targets located in contested areas. According to former Vice Chairman of the Joint Chiefs of Staff General Paul Selva (Ret.), LRSO will complicate an enemy's air defense challenge by "presenting many more small and low-observable penetrators than a single bomber with gravity weapons can present on its own. In combination with a penetrating bomber, LRSO will significantly reduce a potential adversary's ability to achieve sanctuary within his borders."²⁰

Conclusion

The USAF's bomber force is the most flexible leg of the nuclear triad. Maintaining a force correctly sized and with the right mix of standoff and penetrating aircraft and weapons for future threat environments will require continued investment in the B-21, LRSO, and other planned modernization programs. Cuts to these programs for budgetary or other reasons would erode the effectiveness of these critical capabilities and create strategic opportunities for America's great-power competitors.

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Chapter 17

The Role of Intercontinental Ballistic Missiles in National Security

Peter Huessy

The United States maintains a triad of nuclear deterrent forces, including submarines, strategic bombers, and land-based intercontinental ballistic missiles (ICBM). The current ICBM force includes 400 three-stage missiles, each with one warhead. These Minuteman III (MM III) missiles range over 5,000 miles, and are in 400 widely spaced silos in five states (Colorado, Montana, Nebraska, North Dakota, and Wyoming), along with associated 45 launch control centers.¹ When combined, the deployed area is larger than the states of Connecticut, Delaware, Massachusetts, New Jersey, and Rhode Island.

The United States faces a key issue: should the United States build a replacement—the ground-based strategic deterrent (GBSD)—for our MM III ICBMs. MM III was deployed in 1970 and has undergone three subsequent service-life extensions. The force is viable through 2030 but then faces technological impediments to operate. As a result, it will not meet its deterrent requirements.²

Both the Obama and Trump administrations endorsed the new GBSD and a full modernization of the ICBM force. The current ICBM plan achieves initial operating capability in 2029 and completes the 400 planned GBSD missile deployments by 2036.³

This chapter explores the current congressional debate whether to proceed with a new, replacement ICBM and concludes with an assessment of the ICBM role in overall US security. Three important questions are addressed: (1) Is the ICBM force survivable and thus available to deter? (2) Is the force affordable? and (3) Does the force contribute to strategic stability and arms control prospects? The assessment concludes with an overview of the relative importance of the nuclear role of the US Air Force (USAF).

The Current ICBM Debate in Historical Perspective

Whether or not the United States maintains the land-based leg of the triad will have a very significant impact on the USAF nuclear deterrence mission. Such a decision could negatively affect the strategic balance with Russia and China,⁴ the two nuclear powers we currently are most concerned with. And a failure to modernize MMIII might also be perceived by our enemies as a lack of commitment to deterrence. Consequently, such enemies might be more prone to risk using conventional or nuclear force against the United States to achieve their strategic goals.

It is true, the USAF 400 ICBM silos are in known fixed positions. And our adversaries might strike the ICBM silos in a crisis or anticipated conflict.⁵ Critics assume that since the US ICBMs could be destroyed in their silos prior to the United States being able to launch them, then resultant instability is too risky.⁶ Consequently, critics suggest elimi-

nating the US land-based ICBMs and then hopefully the Russian temptation to strike first would largely go away.⁷

Now this understandable concern over American ICBM survivability is not new. It first arose in the late 1970s when the Soviet Union was building thousands of more accurate and very large-yield ICBM nuclear warheads.⁸ Using a small percent of its nuclear forces, American military planners feared the Soviets could wipe out all the American 1,050 land-based Minuteman II and III ICBMs.⁹ Such a Soviet strike could simultaneously eliminate the most accurate and prompt missile forces in the US arsenal—our ICBMs—but at the time same leave the Soviets with a huge advantage in its remaining nuclear forces.

With such an imbalance, the Soviets might coerce the United States into standing down in a crisis or conflict. This “window of vulnerability,” as it was described,¹⁰ was part of an overall perceived Soviet military advantage that also included the Soviets’ conventional forces and military proxies worldwide. Soviet leaders at the time believed the overall “correlation of forces,” including Moscow’s growing nuclear forces, markedly favored the Soviet Union.¹¹

To meet the Soviet threat, the United States assumed a modernized ICBM force needed to be survivable. But during the 1970s, when the new MX ICBM received initial research funding, the Defense Department could not find an acceptable or affordable survivable basing mode. Dozens of options were seriously explored.¹²

The Scowcroft Commission

Thus, in the early Reagan administration, the USAF faced the same dilemma. After four previous administrations could not agree on a basing solution, the USAF still needed the MX missile in a survival mode.¹³ Fortunately, despite two years of often fractious debate, the Reagan administration proposed a compromise solution. In January 1983, in a deal with Congress, the Scowcroft Commission was created.¹⁴

The commission's April 1983 report proposed not to make the MX survivable from Soviet attack all by itself. Instead the United States would build two new ICBMs, both the ten-warhead MX and a new, companion, single-warhead, mobile ICBM, dubbed the "Midgetman."¹⁵

Senator Malcom Wallop, (R-WY), a key MX supporter, said Scowcroft got it right. "You cannot make an elephant (MX) a rabbit ("Midgetman") and you cannot make a rabbit (Midgetman) an elephant (MX)."¹⁶ Simply put, the very large, ten-warhead heavy MX behemoth could not practically be made mobile and, conversely, the small, light-weight single warhead ICBM on a mobile launcher could not carry ten warheads. But, said the Commission report, the two ICBMs deployed together within an overall triad would do the deterrent job. The MX with many warheads would counter similar Soviet heavy missiles and the mobile Midgetman would survive an enemy attack.¹⁷

Congress approved the Scowcroft compromise. The United States did deploy the MX missile, and follow-on US strategy included the requirement for the future deploy-

ment of a new single-warhead small ICBM. Equally valuable, said Scowcroft, was the modernized Ohio-class submarines and B1 and B2 strategic bombers. All elements together were capable of surviving a Soviet attack and making our Triad “survivable.”¹⁸

Scowcroft also endorsed arms control and the goal to reduce Soviet and American strategic forces, particularly large Soviet ICBMs. And Scowcroft supported missile defenses, a new element Reagan proposed in his March 1983 speech on the Strategic Defense Initiative (SDI). Theoretically, effective missile defenses made the use of any nuclear force against the United States less likely. When combined with a more survivable Triad and potential arms control reductions, our deterrent would be highly secure.

Many did not think the Reagan plan of modernized nuclear forces, arms control, and missile defenses would improve the strategic balance and strengthen deterrence.¹⁹ As an alternative, a freeze on all US nuclear modernization was put forward.²⁰ Although US modernization was in its infancy, the Soviet forces were fully modernized.²¹ But the United States beat back the Soviet supported freeze,²² modernized its nuclear forces, secured through arms control major reductions in nuclear weapons, and significantly reduced heavy Soviet-era missiles.²³

Current ICBM Debate

Now, some four decades later, the United States is again having a variation of this old debate. Opponents of ICBMs want to eliminate the ICBM force altogether²⁴ and reduce

nuclear forces to zero, rather than a nuclear freeze.²⁵ The Soviet Union is gone. US- and Russian-deployed strategic nuclear weapons are down ninety percent from Cold War levels. Yet the perception remains that our ICBMs are still highly vulnerable to attack, and as such should be eliminated, even unilaterally.²⁶ Given such vulnerability, the missiles are not of any value—and with a price tag for the GBSD of at least \$65 billion over the next few decades not worth the investment.

Cost

The total acquisition cost for the new ICBM force is estimated at between \$65 billion and \$85 billion depending on certain assumptions about labor costs, inflation, and ongoing operations and maintenance. The cost looks large but it is spread over multiple decades. For example, annual total research and acquisition costs for the new missile vary, but range from \$3.2 billion–\$4.2 billion annually. That is only 1.6 percent of the current USAF budget, one-half of 1 percent of the defense budget, or \$1 out of every \$1,200 spent annually in the federal budget.²⁷

One useful cost-benefit analysis is the relative cost per “warhead on alert” available for day-to-day deterrence. In this case, ICBMs are cheaper than any other leg of the nuclear force. Total modernization and operational costs for ICBMs are likewise less expensive than other elements of the nuclear triad. And due to new modular designs built into the GBSD force, future operational costs may reasonably turn out to be less.²⁸

Survivability

Although not mobile as envisioned by the Scowcroft Commission, the Minuteman missiles today and GBSD tomorrow are still survivable.²⁹ Properly assessing the current survivability of our ICBMs depends not on the Russian warhead threat at the height of the Cold War but the much lower deployed warheads today. Precisely the original objective of the Strategic Arms Reduction Treaty (START) initiated the arms control process in the first place.

The idea that the Russians would launch an attack on the 400 Minuteman missiles and 48 launch control centers assumes that Russian leaders dismiss the certain retaliatory strike from American nuclear-armed bombers and submarines.

As the USAF chief of staff recently explained, no nuclear adversary of the United States, including the Russians, could confidentially plan to take out *all 400 ICBM land-based missiles* spread out over five states. Said the chief, such a nuclear strike is too complicated and difficult to carry out and not a credible option for any adversary of the United States to pursue.³⁰ One frequent ICBM critic, Matt Korda of the Federation of American Scientists, recently concurred, acknowledging the chances of Russia conducting an all-out attack on the US land-based missiles are “basically zero.”³¹

Now, to be clear, the likelihood of a large-scale Russian nuclear attack on the US homeland may indeed be low, but all Russian nuclear threats have not gone away. Particularly worrisome is what General John Hyten, the vice chairman of the Joint Chiefs of Staff, described as an “esca-

late to win” Russian strategy.³² Here Russia threatens a limited nuclear strike against US forces in Asia or Europe. In this case, a “limited” regional use of nuclear weapons envisioned by Russian President Putin leaves the US ICBM force fully available for deterrence.³³

Finally, is the US ICBM force consistent with projected arms control? Historically, from 1972 to 1987, strategic nuclear arms control consisted of the US-Soviet Strategic Arms Limitations Talks (SALT) I and II agreements that governed mutually agreed upon build-ups. Deployed strategic nuclear forces of both superpowers grew over this period from 2,500 to roughly 12,000 warheads.

President Reagan replaced traditional arms-control-sanctioned year-by-year increases in nuclear weapons with major reductions.³⁴ But in order to maintain deterrence, the United States simultaneously modernized the proposed smaller nuclear force.³⁵ Added into the mix was a planned missile defense designed to help blunt and thus help deter nuclear missile threats.³⁶

Reagan’s push for missile defense, nuclear modernization, and major warhead reductions was successful, as under the 1991 START I, 2002 Moscow, and 2010 New Start agreements overall deployed US and Russian strategic nuclear forces were reduced by nearly 90 percent.

For ICBMs, the 1,050 land-based MMII and MMIII missiles the United States maintained were reduced to the current 400. Instead of carrying three warheads, each Minuteman III (and the GBSD missile) would carry only one warhead, making the missiles a highly unattractive target, while still allowing the United States to maintain an ICBM

force capable of credible, accurate, and punishing strikes against our adversaries.

A possible future arms deal could try and duplicate the START II treaty ban on multiple warheads on land-based missiles which President Bush and President Yeltsin signed in January 1993. Consistent with the deal, the United States did download all its ICBMs to only one warhead. However, Russia's Duma refused to ratify START II without a parallel ban on US missile defenses, a deal Congress and the Clinton administration would not approve. So very decidedly, the Minuteman force, and certainly the follow-on GBSD force, are compatible with arms control and improving strategic stability.

Is There Urgency for the United States to Modernize Its ICBMs?

Is the United States, as many critics contend, engendering some kind of "arms race" if we go forward with our own nuclear modernization effort?³⁷

Three facts say no. First, given the relative levels of Russian versus United States modernization, the assertion that the US nuclear modernization effort is "opening the door to an expensive arms race" needs to be re-examined.³⁸

Second, the United States has to proceed with all due haste to modernize its nuclear forces, which is based on the increasing age of our forces. Admiral Richard of Strategic Command warned in February 2020 that if the United States failed to modernize the aging forces in a timely manner the United States would soon be out of the nuclear business.³⁹ Fifteen years ago, nuclear expert Clark Murdock

of the Center for Strategic and International Studies similarly warned that US nuclear platforms, if not replaced in a timely manner, would “rust to obsolescence.”⁴⁰

Third, current rapid Russian modernization worries US security planners, particularly the built-in growth potential of Russia’s modern nuclear forces,⁴¹ a factor that makes our own timely force modernization so critical.

This third point requires greater explanation. Official Russian strategic nuclear-deployed forces number 1,550, as the 2010 New Start treaty allows. But credible estimates are that Russia’s current allowed force structure allows a buildup to over 3,200 and as many as 4,400 nuclear warheads.⁴² Russia is building additional new nuclear forces that Moscow asserts are not even covered by the 2010 treaty.⁴³ These Russian forces may reach 400 new warheads by the middle of the current decade.⁴⁴

Russian officials have also announced that eighty-seven percent of Russia’s New Start Treaty–allowed nuclear force is modernized. By comparison, no US bombers, submarines, or land-based missiles are modernized and in the field.⁴⁵ It remains uncertain the extent to which the US “hedge” stockpile is available for deployment if needed.⁴⁶ Given the current imbalance in the relative pace of US and Russian modernization, a stop to US nuclear modernization sends a signal to the Russians we are no longer serious about the deterrence business.

Airmen and US National Security

Since 1945 there have not been large-scale conventional wars between and among the world's strongest military powers. The 75-year period of relative peace is unprecedented in most of human history. The USAF airmen who have maintained and operated our nuclear deterrent, especially our land-based ICBM and strategic bomber force, have helped keep the peace year after year.

However, in appreciation of the USAF role in keeping the peace, our airmen should understand some critics of our nuclear forces do not fully buy into the idea that our nuclear umbrella has protected our allies in Europe and Asia kept the peace. As some analysts have argued, international "agreements," not the US nuclear umbrella, have kept the peace.⁴⁷

No doubt, international agreements, including arms control, have reduced the chances for conflict. But the US nuclear deterrent was for most of the Cold War and is today designed, in part, to prevent the Soviets and now the Russians from invading Europe, stop the Democratic People's Republic of Korea (DPRK) from invading the Republic of Korea, and prevent China from going to war against Taiwan.

But for each of these possible conflicts, there were and are no agreements where the feared aggressors pledged not to use force. And even if there were such agreements, would it be prudent to rely on such "deals" for our security and consequently stand down our deterrent?

So, the USAF airmen in their nuclear role are preserving the peace. They prevent major war between the world's

nuclear-armed superpowers. As the former head of Strategic Command Admiral Richard Mies laid out in a 2017 essay on the US nuclear deterrent, the number of casualties from military conflict has dropped ninety-eight percent since the dawn of the nuclear age.⁴⁸

The Role of the USAF's Deterrence Capability

With ICBMs playing an important role in keeping the peace for over six decades, helping end the Cold War, airmen and missileers long aided in the expansion of peace and prosperity. The end of the Soviet empire and the Cold War led to the liberation of nearly one billion people.

Average per capita income of the people in the free world increased \$7,800 in the 30 years since the end of the Cold War, but only grew by \$3,100 in the 30 years prior to the end of the Cold War.⁴⁹ According to Freedom House, the number of people now living in complete or relative freedom reached 130 nations compared to 80 at the height of the Cold War, bringing additional billions of people into the ranks of free people around the globe.⁵⁰

However, despite these positive developments, the need for the nuclear deterrent remains. Both China and Russia are growing threats, warns former Secretary of Defense James Mattis, as are their allies in the DPRK, Syria, and Iran.⁵¹ Former Director of Central Intelligence R. James Woolsey put it well at his Senate confirmation hearing, explaining that while the Soviet bear may be gone, “[w]e

live now in a jungle filled with a bewildering variety of poisonous snakes.⁵²

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Chapter 18

Understanding Nuclear Command, Control, and Communications

Adam Lowther and Shane Grosso

Perhaps the least understood and appreciated part of the nation's nuclear deterrent is the nuclear command, control, and communications (NC3) system. What is rightly called the nuclear triad's fourth leg consists of an Air Force component composed of more than sixty subsystems that were formally designated the AN/USQ-225 weapon system by the US Air Force in 2016.¹

The NC3 system is defined in doctrine as the “collection of activities, processes, and procedures performed by appropriate commanders and support personnel who, through the chain of command, allow for decisions to be made based on relevant information, and allow those decisions to be communicated to forces for execution.”² According to the *Nuclear Matters Handbook* (2020), “NC3 performs five critical functions: detection, warning, and attack characterization; nuclear planning; decision-making conferencing; receiving presidential orders; and enabling the management and direction of forces.”³

The nation's nuclear command, control, and communications system is not, however, a stand-alone system, but part of the larger National Military Command System (NMCS) which provides senior leaders assured access to the information they need to assess a given situation, develop a course of action, and execute across the range of

military operations. It is worth making a distinction between nuclear command and control (NC2) and NC3. As *Air Force Instruction 13-550: Air Force Nuclear Command, Control, and Communications (NC3)* clearly delineates, NC2 is the “exercise of authority and direction by the President to command and control United States (US) military nuclear weapons.”⁴ This is done through the Nuclear Command and Control System (NCCS), which is part of the larger NMCS. NC3, on the other hand, is the means by which these mission essential functions are executed.

The Air Force’s AN/USQ-225 is comprised of radios, terminals, and messaging and conferencing systems, which are all tied together in a complex network that ultimately allows the president to reach airmen flying bombers or underground in intercontinental ballistic missile (ICBM) launch control centers. These subsystems link to communications satellites, ground-based terminals, and Department of Defense (DoD) information networks.⁵ What is most important for airmen to remember about the AN/USQ-225 weapon system is that without it the president would not be able to detect an adversary nuclear weapons launch, decide how to respond, and direct American forces—detect, decide, direct.⁶

According to a 2019 report from David Deptula, William LaPlante, and Robert Haddick, the NC3 system must: detect a surprise attack; assess and characterize an attack; transmit an analysis of events to the president; accurately describe the status of US nuclear forces to the president; support the president’s decision-making conference; and transmit the president’s orders through the chain of com-

mand to military forces operating nuclear weapons systems and support systems.⁷ This is no small task.

The role played by airmen in acquiring, maintaining, and operating the NC3 system is vital to the nation's security for one important reason. Without the ability to detect, decide, and direct, the American nuclear deterrent would not be credible and could lead a nuclear-armed adversary to believe that an attack against the United States might be successful. Deptula, LaPlante, and Haddick also write that all of this must be done under the direst circumstances.

Nuclear command, control, and communications did not, however, start out as the complex network of systems that currently exists. Rather, its origins are much more humble and show just how important a role NC3 has come to play as technology forced the United States to respond to Soviet developments in delivery systems.

The History of Nuclear Command, Control, and Communications

On July 25, 1945, General Thomas T. Handy, acting chief of staff of the US Army, issued a written order to General Carl Spaatz authorizing the 509th composite group to “deliver its first special bomb as soon as weather will permit visual bombing about 3 August 1945.”⁸ At the time, nothing more complicated was needed. Somewhat surprisingly, it was not until President Harry Truman issues NSC-30 in 1948 that presidential authority to employ nuclear weapons was codified.⁹

However, it was only after the Soviet Union detonated its first nuclear weapon in 1949 that the United States required an NC3 system that detected Russian bombers heading toward the United States and provided the president with maximum warning time.¹⁰ President Truman also needed a way to command and control Strategic Air Command's (SAC) bomber force. Thus, in response to developments in the Soviet Union, the United States began developing the NC3 system.

The Pinetree Line (1951–1991) was the first early warning radar, jointly run by the US Air Force and the Royal Canadian Air Force, which consisted of more than 30 radar stations that spread across the North American continent from the 53rd parallel in the west to the 50th parallel in the east.¹¹ With a range of 200 nautical miles, this early terrestrial radar network was a marvel of technology.

Looking for greater accuracy and range, the United States and Canada fielded the Mid-Canada Line (1956–1965) and the Distant Early Warning (DEW) Line (1957–1994), which did just that. In its effort to increase the range at which a Soviet bomber were detected, the US Air Force led the way in developing radar technology—much of which is used in civil aviation.¹² Terrestrial radars were just the start.

In 1957 the North American Aerospace Defense Command (NORAD) was created and it moved into its home in Cheyenne Mountain in 1963.¹³ The US Air Force's Semi-Automatic Ground Environment (SAGE—1958–1983) was originally conceived to address inadequacies in: high-speed interception of Soviet bombers, low-altitude radar cover, air traffic handling and tracking, and data processing and

display. In essence, SAGE integrated radars and Air Defense Command aircraft through the most advanced computer networks in the world—all in an effort to stop a Soviet nuclear attack. What is perhaps most interesting about SAGE is that it was more expensive than the Manhattan Project and the development of nuclear weapons.¹⁴

When the Soviet Union fielded its first operational strategic ICBM unit in 1959, the United States realized it would soon face a major-attack time-compression challenge where time available to stop a Soviet nuclear attack would decline from a few hours to 30 minutes or less. The development and fielding of the ICBM led to the next major leap in NC3 technology and operations.¹⁵

The 1960s saw the US Air Force field the Missile Defense Alarm System (MiDAS, 1960–1966) and the Ballistic Missile Early Warning System (BMEWS, 1964). These radars were specifically designed to detect intercontinental ballistic missiles launched from the Soviet Union. And with submarine-launched ballistic missiles (SLBM) joining the Soviet arsenal in 1959, the United States needed an effective ballistic missile warning system more than ever because SLBMs cut warning times to as little as 15 minutes.¹⁶

Operation Chrome Dome, placing bombers on 15-minute alert, the Single Integrated Operational Plan (SIOP, 1962), the Worldwide Military Command and Control System (WWMCCS, 1962), Looking Glass (1961), and the Emergency Rocket Communication System (1963–1991) were all responses to the Soviet ICBM threat. With the uncertainty of detecting a Soviet ballistic missile attack, Presi-

dent Dwight D. Eisenhower and then-President John F. Kennedy sought ways to ensure the United States could command and control nuclear forces in the event of an unexpected Soviet attack.¹⁷

As nuclear weapon delivery vehicles increased numerically in diversity of delivery systems and locations in the 1950s and 1960s, the need for a larger and more complex NC3 architecture also grew. With the defense support program (DSP) satellite constellation coming online in 1970, the Air Force finally had a space-based early warning system that could detect ballistic missile launches and nuclear detonations—using infrared sensors.¹⁸ With DSP, the president had the ability to verify a Soviet missile launch with a space-based system and then verify that launch with a terrestrial radar—dual verification. The 1970s would also see the addition of new and more powerful radars like Cobra Dane, perimeter acquisition radar attack characterization system (PARCS), and precision acquisition vehicle entry phased array warning system (PAVE PAWS)—all of which improved range and accuracy.

The 1980s also saw an expansion of the DSP satellite constellation, additional PAVE PAWS sites, and the sea-based Cobra Judy radar. Improved communications systems like the Strategic Automated Command and Control System (SACCS) were also fielded to replacing aging systems that government studies suggested were vulnerable.¹⁹ However, with the fall of the Berlin Wall in 1989 and the ultimate collapse of the Soviet Union in 1991, the impetus to modernize the NC3 system declined greatly. The Military Strategic and Tactical Relay (MILSTAR) satellite con-

stellation was placed on orbit between 1994 and 2003—providing satellite communications for nuclear command and control. The WWMCCS was also replaced in 1996 by the Global Command and Control System (GCCS), but the large technology-advancing investments in NC3 of the previous decades largely ceased.²⁰

In 2011, the first of twelve space-based infrared system (SBIRS) satellites was launched, arguably marking the only major NC3 advancement since the turn of the century.²¹ With an average life expectancy of 10 years, many of the satellites that support the nation's NC3 are well beyond their time. The same is true for many of the other sub-systems that are part of the AN/USQ-225 weapon system.

The Current NC3 System and the Air Force Mission

Today's NC3 system, both the Air Force AN/USQ-225 and Navy systems, are largely dated and in need of modernization. Jeffrey Larsen captured these challenges well when he wrote,

Given the increasing number of potential threats, the challenge to American space-based assets, the rise in cyber security challenges, increased vulnerability to network attack in newer NC3 systems, and the requirement to meet the NC3 needs of an entirely new triad of nuclear forces, it is entirely possible that the NC3 system of the 2030s will be very different from today.²²

This point was made in the 2018 *Nuclear Posture Review*, which listed these areas as needing attention from the services.

The current NC3 system also faces challenges from a number of technologies that are only now becoming a reality. For example, hypersonic glide vehicles, which the Russians and Chinese will soon field in significant numbers, are difficult to track and can reach the United States in as little as six minutes.²³ It is also possible to launch low observable cruise missiles from Russian airspace which are not continuously tracked prior to striking American targets.²⁴ Anti-satellite weapons are a major threat to the very satellites that are pivotal to integrated tactical warning and attack assessment (ITWAA). Conceivably, an adversary may soon have the ability to unexpectedly attack the United States' nuclear command, control, and communications architecture using conventional capabilities alone.²⁵ How the United States would respond to such an event is uncertain.

With the stand-up of the Air Force NC3 Center in 2017, the service clearly demonstrated its commitment to addressing these challenges.²⁶ In 2018, Secretary of Defense James Mattis, appointed the commander of US Strategic Command to be the NC3 enterprise lead. This led to the stand-up of the command's NC3 Enterprise Center (NEC), which was given the task of designing a blueprint for NC3 modernization and coordinating the approximately \$77 billion that the Congressional Budget Office estimates it will cost for operations and modernization over the next decade.²⁷ In its effort to build common requirements across the services, the NEC will play a coordinating role between the services and other stakeholders that allows STRATCOM to deconflict issues that may arise.

The NC3 Modernization Debate

While airmen are rightfully careful to avoid the partisan political fights of the Washington, DC, beltway, it is, however, important to understand the central aspects of the debate surrounding NC3. It is also important to keep in mind that the political winds will shift over time, which makes it important for airmen to stay abreast of the continuing debate. Three broad areas play a central role in current discussions: need, cost, and design.

Need

The larger debate over nuclear modernization is covered in detail elsewhere, which leaves a much more focused discussion here. NC3 modernization is perhaps one of the few areas where both the arms control community and the DoD hold a similar view—albeit for differing reasons. According to Jessica Sleight of Global Zero, “Cyberwarfare, anti-satellite warfare, and other advancements in adversarial capabilities threaten to undermine current US systems that rely on satellites and communication networks to direct nuclear forces during conflict.” She goes on to add, “Strengthening these systems are critical to ensuring the survivability of the president, their legal successors, national command centers and communication links.”²⁸ Such a sentiment is supported in the 2018 *Nuclear Posture Review* and public statements by former STRATCOM Commander General John Hyten.²⁹

However, the arms control community primarily supports NC3 modernization because they fear that an adversary

may hack into the US NC3 networks and either cause an accidental launch or a miscalculation through the insertion of false information, for example. For the Air Force and the DoD, the reliability of the network and its ability to operate under adverse conditions is of primary concern—with security always a concern. Where the Air Force must necessarily think about the ability to fight and win a nuclear conflict, the arms control community is focused on the deterrence effect of the NC3 system.

Cost

Over the next decade, the Congressional Budget Office estimates the DoD and Department of Energy will spend \$494 billion on nuclear force, including modernization, with approximately \$77 billion dedicated to NC3. This is approximately \$50 billion per year for nuclear forces (operations and modernization), with NC3 costing about \$7.7 billion per year.³⁰ Any discussion of costs that run into the billions of dollars is certainly significant, but the return on investment is significant.

As discussed in *Defending the Arsenal*, nuclear forces provide the nation with the ultimate insurance policy. It is one that guarantees the freedom from attack by an adversary, which gives Americans the opportunity to focus more of their time and resources on those items that increase living standards. That insurance policy costs the average American taxpayer about \$150 per year.³¹ The cost of NC3 is approximately \$30 of that \$150. What often goes overlooked about this analogy is that nuclear forces and the deterrent they provide really are an insurance policy that,

in deterring great-power war and mitigating conventional conflict, allows the United States and those allies who fall under the American nuclear umbrella to reallocate financial resources and human capital away from the military and toward endeavors that improve standards of living.

Design

Perhaps the most divisive and challenging aspect of the NC3 modernization debate revolves around the future design of the system. There is significant disagreement as to whether modernization should take analog systems and replace them with digital networked systems or whether the DoD should build a system that integrates artificial intelligence and other leading-edge technologies and greater autonomy into the more than sixty subsystems that comprise the NC3 system.³² As both sides of this debate rightly point out, replacing analog systems with digital systems—that rely on cyber networks—introduces vulnerability as an adversary would likely seek to hack those networks for espionage and/or attack purposes.³³

Among the most important areas of contention is in the mix of artificial intelligence and its ability to create system autonomy.³⁴ On the one hand, there is some reticence to incorporate autonomous artificial intelligence into the NC3 system because of a fear that human control could be lost and an inadvertent launch occur if a system was hacked, for example.³⁵ For those who see less danger in automation and artificial intelligence, the opportunity exists to speed the command and control process as emerging threats like low observable cruise missiles and hyper-

sonic glide vehicles shrink the detect, decide, and direct cycle that the president must operate within.³⁶ Both approaches have their strengths and weaknesses.

Whatever course STRATCOM and the services take, it is certain that the decision will receive careful consideration. With so many variables to consider, any decision will necessarily weigh competing priorities to make the soundest decision.

The Impact of NC3 on National Security

As suggested at the beginning of this discussion, NC3 is perhaps the least appreciated component of the nation's nuclear forces. Without it, America's nuclear bombers, ICBMs, and SLBMs would be useless. Bombers would never leave the ground, ICBMs would never leave their silos, and SLBMs would never leave their submarines if the president's ability to command and control nuclear forces were disrupted. This is certainly a point worth remembering.

For the thousands of airmen who operate and maintain elements of the AN/USQ-225 weapon system, the importance of that work to national security is incontrovertible. If the nation's adversaries were to ever believe that the United States lacked the ability to command and control nuclear forces, not only would this serve to create instability, but it could give an adversary the encouragement it needs to make a fateful decision—one that would prove disastrous. This can never happen.

Airmen should have little doubt of the importance NC3 plays and their vital role in its success. It is certainly no overstatement to say the nation depends on it.

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Chapter 19

The Strategic Ballistic Missile Submarine in National Security

Richard W. Mies

Survivability, adaptability, and responsiveness have long been hallmarks of the American strategic ballistic missile submarine (SSBN) force. When the Soviets launched Sputnik in October 1957, and the United States was alarmed by an apparent missile gap, the submarine force was called upon to accelerate development of a ballistic missile submarine. Many people believed ballistic missiles were too large and dangerous for submarines—and that a submerged ballistic missile submarine was something from Jules Verne’s science fiction. But a handful of visionary, innovative people thought otherwise. A little more than three years later, the USS *George Washington* (SSBN-598) went to sea on its first strategic deterrent patrol—the first of almost 4,200 SSBN patrols to date.¹

That achievement was remarkable; the USS *George Washington* was completed five years ahead of schedule and incorporated into a single weapon system. Many of the great scientific developments which have revolutionized warfare—long-range ballistic missiles with inertial guidance and nuclear warheads—are deployed on high-endurance submarines with nuclear propulsion and atmosphere regeneration and control. Between 1959 and 1967—a mere seven and half years—the United States commissioned 41 SSBNs and 24 attack submarines—an interesting

comparison to today's construction rates and a remarkable statement about what Americans can achieve when they set their minds to it.²

Each of the early submarines was designed to carry 16 submarine-launched ballistic missiles (SLBMs). The first ten submarines (598 and 606 classes) carried three generations of the first SLBM—the Polaris A1 through A3. The remaining 31 SSBNs (616, 627, and 640 classes), originally configured to carry the Polaris missile, were backfit early in their service lives to carry a larger and longer-range Poseidon C3 missile. Because of the range limitations of those early missiles, the submarines were based overseas in Holy Loch, Scotland, and Rota, Spain, in the Atlantic region and Guam in the Pacific in order to be in closer range of their potential targets.³

Starting in 1978, twelve 616- and 640-class submarines were backfit to carry the even larger and longer range Trident I (C4) SLBM. That transition along with the commissioning of the USS *Ohio* (SSBN 726), the first Trident SSBN, in 1981 enabled the submarine force to base the SSBNs out of the United States while still maintaining a two-ocean presence—in Kings Bay, Georgia, in the Atlantic and Bangor, Washington, in the Pacific. The newer Ohio-class submarines were designed to carry 24 SLBMs. In turn, the Poseidon submarines were retired as Trident (Ohio-class) submarines began service. Ten years after the last Poseidon submarine retirements, the original four Trident C4 submarines were decommissioned as SSBNs and converted to guided-missile submarines (SSGN) while the remaining fourteen Ohio-class SSBNs were either com-

missioned or backfit to carry the even larger and longer range Trident D5 SLBMs.⁴

Today, the reentry subsystem of each Trident D5 missile is designed to carry a classified number of one of three thermonuclear warhead designs: the W76-1, the W76-2, a low-yield variant of the W76, and the W88. Each warhead is specifically designed for unique categories of targets.⁵

Since the revolutionary achievement of the USS *George Washington*, for the past six decades without fanfare and recognition, similar to their intercontinental ballistic missile (ICBM) and bomber counterparts in the nuclear triad, US ballistic missile submarines have patrolled the oceans in silent vigil, undetected and secure, ready to strike, deterring adversaries, and reassuring allies.

While it is impossible to prove a negative, because of the nation's triad of strategic forces, the greatest event in recent history is plausibly something that never happened—World War III. Nuclear weapons, particularly the SSBN Force, helped keep the Cold War cold. As Colin Powell said on the occasion of the completion of the strategic submarine force's 3,000th patrol by USS *Tennessee* (SSBN-734):

[T]he Cold War was won especially by...America's Blue and Gold crews manning America's nuclear-powered ballistic missile submarine fleet.... [N]o one has done more to prevent conflict, no one has made a greater sacrifice for the cause of Peace, than... America's proud missile submarine family. You stand tall among all our heroes of the Cold War.⁶

Strategic Deterrence in the Twenty-First Century

Today, the Cold War has been over for three decades; but in its wake the United States finds itself in a world of more diverse, asymmetric threats—a world of great-power competition with the reemergence of long-term, strategic competition by revisionist powers and rogue regimes.

As detailed in other chapters of this book, the predictable, monolithic world we once faced has now been replaced by a multi-polar world of greater uncertainty—uncertainty in the capitol of China and Russia, the deserts and mountains of Iran, and the bunkers of North Korea. The continued and rapid advance of technology compounds this geopolitical uncertainty and creates even more avenues for great power competition. As the 2018 *National Defense Strategy* recognizes:

Today, we are emerging from a period of strategic atrophy, aware that our competitive military advantage has been eroding. We are facing increased global disorder, characterized by decline in the long-standing rules-based international order—creating a security environment more complex and volatile than any we have experienced in recent memory. Inter-state strategic competition, not terrorism, is now the primary concern in U.S. national security.⁷

Regrettably, America is late in recognizing the return of great-power competition. Unlike the United States, since the end of the Cold War, Russia and China have modernized their nuclear forces while adding many new types of nuclear capabilities to their arsenals, increased the salience of nuclear forces in their strategies and plans, and engaged

in increasingly aggressive behavior, including in both the space and cyber domains. At the same time, North Korea continues its pursuit of nuclear weapons with which to threaten the United States and regional allies, Japan and South Korea, while Iran continues to engage in malign behavior through ballistic missile development and suspect nuclear weapon activities.

In contrast, the United States has made only modest improvements in its nuclear forces while pursuing a policy of reducing its reliance on nuclear weapons. Only in the past few years has the United States begun its modernization of the nuclear triad while adapting its national security strategy to address the emergence of great-power competition.

Strategic Deterrence in the Twenty-First-Century *National Security Strategy*

America's 2017 *National Security Strategy* recognizes the critical role of US nuclear forces: "They are the foundation of our strategy to preserve peace and stability by deterring aggression against the United States, our allies, and our partners."⁸

Achieving peace through strength is a cornerstone of US national strategy and remains the highest defense priority. Strategic nuclear forces serve as the most visible and important element of American commitment to this principle. The principal roles of US nuclear forces in support of national security, defense, and military strategies are:

- Deter major military attacks on the United States and its allies, especially attacks involving weapons of mass destruction;
- Assure US allies and partners;
- Achieve US objectives if deterrence fails; and
- Hedge against an uncertain future.⁹

The primary purpose of American strategic deterrence strategy is to influence potential adversaries' intentions far more than their capabilities through two interrelated means—the power to hurt and the power to deny. These powers are most successful when held in reserve and their non-use, their potential, exploited through diplomacy.¹⁰ The greatest utility of nuclear weapons is in their non-use—in the diplomacy derived from the threat of their use. In that sense, nuclear weapons are used every day. The most successful threats are the ones that never have to be carried out. And because nuclear weapons are primarily designed for war avoidance, nuclear deterrence ultimately depends on the threat of retaliation—not on US capability to strike first, but on the assurance that the United States always has the capability to strike second.

Because of this, the United States has adopted a long-standing targeting doctrine of flexible response—a doctrine designed to hold at risk potential adversaries' military forces, war-supporting industries, command and control capabilities, and military and national civilian leadership, while minimizing to the maximum extent possible collateral damage to population and civilian infrastructure. It is a doctrine designed to provide the President

the widest range of options using the minimum level of force intended to achieve national objectives while denying adversarial ones.

The Triad in Twenty-First-Century Strategic Deterrence

To deter a broad range of threats, the 2018 *National Defense Strategy* requires a robust triad of strategic forces enabled by effective and assured command and control. The 2018 *Nuclear Posture Review* reaffirmed the wisdom of preserving a complementary and mutually reinforcing strategic triad of land-based ICBMs, strategic bombers, and nuclear submarines armed with ballistic missiles. Each leg of the US triad contributes unique attributes that enhance deterrence and reduce risk, such that the whole is greater than the sum of the parts.¹¹

ICBMs provide a prompt response, the potential to launch under attack, and a hardened, geographically dispersed target base. Additionally, single-warhead ICBMs are considered stabilizing and “inherently survivable” since they are less attractive as targets than multiple-warhead ICBMs because the ratio of weapons required to destroy them is greater than one. Additionally, without a robust ICBM force an adversary could attack the United States’ two submarine bases and three bomber bases using a very small number of weapons while destroying a significant percentage of US strategic forces.¹²

Strategic bombers with their tanker support provide great flexibility in force posturing, signaling intentions,

route planning, and recallability. Their ability to forward deploy and to be recalled after launch provides a highly visible signal to adversaries and allies of US intent. Their ability to operate over large distances and across many vectors complicates adversary defenses.

SSBNs are the most survivable leg of the triad, providing the United States with a powerful, assured, retaliatory capability against any adversary. Designed for stealth and continuous at-sea presence, one SSBN alone carries more firepower than all of the weapons employed in WWII. Additionally, SSBNs possess the mobility to adapt missile over-flight to their targets to avoid mischaracterization by other nations. Because of their survivability, Ohio ballistic missile submarines have historically carried the majority of the strategic warheads and are projected to carry approximately 70 percent of US accountable deployed strategic weapons in existing and future arms control environments.¹³

As an enterprise, the US triad comprises a robust deterrent capability that complicates a potential adversary's offensive and defensive planning and a synergistic force that provides protection against the failure of a single leg.

And the glue that holds it all together is an often ignored but critically important element of the strategic triad—nuclear command, control, and communication capabilities (NC3). The *Nuclear Posture Review* also reaffirmed the vital importance of NC3 and called for its modernization. Today's NC3 system remains effective providing assured command and control of US nuclear forces. Modernization to the next generation of command and control will

sustain reliable, resilient, and effective command and control in the most stressing nuclear and cyber environments.¹⁴

The SSBN Force's Strategic Posture

With the end of the Cold War, the United States has dramatically changed the US triad's strategic force posture. Multiple stringent procedural and technical safeguards remain in place to guard against accidental or unauthorized launch and to ensure the highest levels of nuclear weapon safety, security, reliability, and command and control. In peacetime, no US strategic weapons are aligned to potential adversary targets. Although ICBM missiles are spun up, they are targeted on broad ocean areas. Missiles aboard at-sea SSBNs are not spun up, and when they are spun up for exercises, they are aligned to broad ocean-area targets similar to ICBMs. Since bombers have not been on peacetime alert since 1991, they do not have any nuclear targets assigned. Additionally, the policy of the US is not to rely upon "launch on warning." The United States trigger is built so it can always wait.¹⁵

American strategic forces, particularly strategic submarines, are postured to provide an assured second-strike capability to inflict unacceptable damage to a potential adversary. Submarines at sea are stabilizing; in contrast, submarines in port are more vulnerable and could offer an extremely lucrative target in time of crisis. Thus, in any foreseeable arms control scenario, the United States must preserve a large enough SSBN force to enable two-ocean

operations, with sufficient at-sea assets to ensure a retaliatory force capable of deterring any adversary in a crisis.

SSBNs, while positioned at sea for survivability, patrol under more relaxed and flexible conditions of alertness than during the Cold War. To ensure a credible deterrent, a significant percentage of the SSBN force is always at sea. Each SSBN has two crews—Blue and Gold crews. A typical patrol lasts greater than 70 days. For absolute security, SSBNs at sea are given freedom to operate anywhere in very large patrol areas without any sonar or communication emissions such that only the crew knows where the submarine is positioned at any time. A minimum number of these at-sea SSBNs are always on alert. They are in range of their potential targets and maintain constant communications connectivity, missile system readiness, and navigational accuracy while remaining completely undetected. This enables them to respond within minutes to National Command Authority (NCA) direction, if required. The remaining at-sea SSBNs are in a form of modified alert where they maintain periodic communications connectivity but are not necessarily in range of their potential targets.

At the end of a patrol, the SSBN normally returns to its homeport for a refit period conducted by both crews lasting approximately 35 days. At the end of the refit period a crew exchange takes place and the oncoming crew takes the SSBN on patrol while the off-going crew begins a period of leave followed by an in-port training regime to prepare them for their next patrol. This two-crew routine enables each SSBN to be at sea in a survivable posture for greater than 68 percent of its operational life. Additionally,

in-port SSBNs, while vulnerable, are postured to go to sea in times of crisis.

The SSBN Contribution: Survivable Deterrence

The SSBN force provides a formidable array of capabilities to the nation.¹⁶ The SSBN and SLBM possess several specific characteristics that make them an indispensable part of the US triad:

Survivability

SSBNs' inherent stealth and the manner in which they operate means at-sea SSBNs are the most survivable leg of the triad. This survivability reinforces deterrence by ensuring an adversary cannot have confidence that a surprise attack can defeat the US ability to provide a devastating response. It underpins the assured response aspect of US deterrence strategy.

Reliability

To date there have been nearly 4,200 SSBN patrols, which account for approximately 155,000 man-years spent on patrol; at the same time the TRIDENT II (D5) missile has established an unprecedented record of successful test flights. This high level of reliability reinforces the credibility of American deterrence by demonstrating that US weapon systems will work if called upon.

Responsiveness

Because of its survivability, the TRIDENT weapon system can be effective under any strategic scenario. SSBNs provide a sufficiently prompt response to meet any required mission, but their response can also be delayed as desired. Because SSBNs cannot be preempted, they are inherently stabilizing. There is no need to “use them or lose them.” Response is assured, thus providing a highly credible deterrent.

Adaptability

SSBNs have a unique ability to move undetected to any launch point. This mobility provides the United States with the option of holding at risk virtually any spot on the Earth while avoiding overflight concerns. SLBMs can be readily retargeted, providing additional flexibility. This adaptability complicates adversary ability to defend against a nuclear response, further reinforcing deterrence.

Endurance

SSBNs have sustained an operational tempo in excess of 68 percent since the first TRIDENT patrol by the USS *Ohio*. SSBNs operate at sea with no external support for long periods of time. They are truly limited only by the food that they can carry. Endurance reinforces deterrence by enabling assured response under most conceivable conditions.

Readiness

The SSBN force trains and operates the same way it expects to fight—in the ocean depths and under condi-

tions as close to actual contingencies as possible. The SSBN force has demonstrated the ability to operate under unusual and extremely difficult circumstances. During a series of strategic continuity of operations exercises, these ships have obtained patrol support under a variety of stressed scenarios, in places far from their dedicated bases at Bangor and Kings Bay. Some of these exercises included remote site replenishments, refits, and crew exchanges, an open-ocean torpedo reload from an anchored tender, at sea replenishment by helicopter, and port ingress/egress security exercises. This level of readiness provides the flexibility needed to sustain US deterrent strategy.

Connectivity

SSBNs are supported by a reliable, robust, and survivable communications network. Numerous communication resources, including the Navy E-6B Airborne National Command Post (ABNCP), the E-4B National Airborne Operations Center (NAOC), TACAMO aircraft, and satellite and shore-based transmitters are tasked with SSBN support. These assets utilize multiple independent paths across the full frequency spectrum from very low frequency (VLF) to extremely high frequency (EHF) to ensure reliable, redundant connectivity from the NCA to the SSBN force. Long-term actual SSBN connectivity of greater than 99.99 percent has been demonstrated, and no alert Ohio-class SSBN has ever missed an exercise launch order or retargeting message. The strategic connectivity system is robust, reliable, and functional in all postulated scenarios. If the NCA releases a message, it will get to the

strategic submarine force thereby reinforcing the credibility of US deterrence strategy.

Cost-Effectiveness

Today, approximately 70 percent of the nation's accountable deployed strategic arsenal is carried by Trident submarines using less than 1.5 percent of naval personnel and at a cost of less than 40 percent of the nation's strategic force budget. The SSBN is a sustainable, efficient and effective use of US resources to sustain US deterrent strategy, further reinforcing deterrence credibility.

The Future SSBN Force

Starting late in the next decade, the Ohio-class SSBNs will begin to retire at the rate of one boat per year after more than 42 years of service—the longest submarine life in American history. The successor to the Ohio class, the Columbia class, is being designed to last into the 2080s. Of specific concern to the US Navy's strategic deterrent, the key challenge to transition successfully to Columbia is to hedge against emergent programmatic or operational problems since there is no margin in the transition schedule.¹⁷

The Columbia-class submarine builds upon Ohio's legacy of stealthy and reliable operation. It will incorporate electric drive rather than steam driven propulsion, carry 16 Trident II (D5) missiles, and is designed with a vast array of advanced sensors, communications capability, and defensive weapons to ensure its survivability. It is being designed for a service life of 42 years and its open-

architecture, modular design provides the flexibility to enable Columbia to outpace any threat over its service life.

As the SSBN evolves, so too will the Trident II D5 SLBM it carries. A second Trident II D5 life extension, D5LE2, is in planning now. The D5LE2 will build upon the highly reliable D5 missile design through modernization of legacy and out-of-production components, while sustaining and improving overall system performance by harnessing technology advancements. This will ensure the Trident II weapon system is flexible, capable, and credible throughout the service life of the Columbia-class SSBN.

Conclusion

The nation's strategic forces stand as America's "ultimate insurance policy"—a cost-effective force which is the underpinning of the *National Security Strategy*. As the most survivable leg of the strategic triad, US SSBNs played a critical, if not the pivotal, role in winning the Cold War and they play a critical role in maintaining stability and security in today's profoundly changing world. That role is the ability to both reassure American allies and convince potential aggressors to choose peace rather than war, restraint rather than escalation, and conflict termination rather than continuation.

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Chapter 20

Missile Defense in US Deterrence Strategy

Ian Williams

During the latter half of the twentieth century, missile defense was among the most contentious issues in US national security, with many viewing active defenses as technologically unfeasible or an impediment to strategic stability. Yet these attitudes have shifted dramatically. The twenty-first century has seen a growing consensus in the United States and among US allies on the value of missile defense in strengthening both nuclear and conventional deterrence.

Driving this shift in thinking around missile defense is the extent of missile proliferation among US adversaries. Foes like North Korea, for example, are gaining the capability to strike the United States homeland with nuclear ballistic missiles. Iran has made missiles a central pillar of its power-projection capabilities. China and Russia are furthermore using regional ballistic and cruise missiles to hold forward-deployed US forces at considerable risk, testing the strength of US alliances and resolve. Russia and China have also begun fielding new types of hypersonic glide vehicles that can challenge early warning and other underpinnings of crisis stability.

The growth of missile defense in US military posture has led to greater responsibilities for the military. Like the nuclear triad, missile defense is a multi-service enterprise. Yet the missile defense mission demands a level of inter-service integration that surpasses that required of nuclear

strike forces. The ground-based midcourse defense (GMD) system defending the US homeland, for example, requires personnel and equipment from the Army, Air Force (USAF), Navy, and National Guard to function. The Air Force relies on Army Patriot units to defend forward-based squadrons from missile attacks. Those Army air defenders, in turn, may depend on USAF aircraft for broader aerial situational awareness.

While the missile defense enterprise still receives its share of criticism, the demand for missile defense capabilities around the world remains high and will likely remain so for the foreseeable future.

Missile Defense and Deterrence: A Historical Overview

United States officials have traditionally viewed missile defense in the context of nuclear deterrence. This connection has led the United States to embrace missile defense at some points in history and eschew it at other times. The faith that US strategists placed in the stabilizing effect of mutually assured destruction resulted in severe limitations on defenses until the end of the twentieth century. Since then, missile defense has evolved into a core capability within US strategy dealing with emerging threats from rogue states like North Korea and Iran and plays an increasingly important role in deterring regional threats from Russia and China.

The first major ballistic missile defense system the United States pursued was Sentinel, announced by Defense

Secretary Robert McNamara in 1967. McNamara scaled the Sentinel architecture to defend the continental United States against a Chinese intercontinental ballistic missile (ICBM) attack, with residual capability against a more limited accidental or unauthorized attack from the Soviet Union. Sentinel was to consist of 17 sites across the United States, with many centered on major urban areas.¹ These sites would house nuclear-tipped LIM-49 Spartan and Sprint missiles, designed to detonate close enough to neutralize incoming reentry vehicles.²

Congressional opponents to Sentinel were numerous, led by Senator Edward Kennedy, who, in a letter to McNamara's successor, Melvin Laird, questioned whether Sentinel would work as advertised, among other concerns.³ Other senators argued that the Chinese missile threat was too immature to justify defenses and that the system would exacerbate the arms race with the Soviets.⁴ By 1969, the Nixon administration began scaling back Sentinel to one focused on protecting US Minuteman ICBMs from a Soviet nuclear attack.⁵ Particularly concerning to the administration was the Soviet Union's development of the high-payload SS-9, an early version of the SS-1/8 "Satan" missile still in service today.⁶ This more limited Sentinel architecture became known as Safeguard.

As Safeguard underwent development, the Nixon administration began to engage in arms control talks with the Soviet Union to restrict active missile defense deployments. In 1972, President Nixon and Premier Leonid Brezhnev signed the Anti-Ballistic Missile (ABM) Treaty. The ABM Treaty severely limited active defenses, in effect codifying

mutual vulnerability to nuclear attack and retaliation in the interest of arms race and crisis stability.

The ABM Treaty did permit minimal missile defense deployments in constrained configurations. Under these restrictions, the United States deployed a modified version of the Safeguard at one site on Grand Forks Air Force Base in North Dakota to defend US ICBMs against a preemptive counterforce attack. By the time the Army activated the site in 1975, however, Congress had entirely defunded Safeguard, and the site shut down in February 1976.

Concerns about the vulnerability of US ICBMs did not go away with the scrapping of Safeguard. In 1983, President Reagan articulated his vision of a missile defense system that could make nuclear weapons “impotent and obsolete.”⁷ Reagan’s lofty rhetoric created an enduring sense that the goal of US missile defense was to create an impenetrable shield around the United States. In reality, the goals of the Strategic Defense Initiative (SDI) were more limited and practical. System architects scaled SDI’s Phase 1 to be able to stop around 40 percent of incoming Soviet missiles.⁸ This defense sought not to negate the Soviet Union’s nuclear deterrent, but rather to enhance deterrence by complicating Soviet targeting of US nuclear forces.

Yet the SDI architecture failed to make it out of the development stage and the United States remained compliant with the ABM Treaty. After the Soviet collapse in 1992, SDI evolved into the Global Protection Against Limited Strikes (GPALS) program. Unlike SDI, GPALS focused less on nuclear deterrence and more on limiting damage from accidental or unauthorized use of nuclear weapons

(the kind of attack one cannot reliably deter through retaliatory threats). Like SDI, though, GPALS would fail to garner enough support and funding to become a reality.

While SDI and GPALS failed to field any defenses, their associated research and development work sparked a period of technological advances that helped prove the operational feasibility of missile defense. For example, the United States conducted the first hit-to-kill intercept of a ballistic missile in 1984 using the 550-pound Homing Overlay Experiment kill vehicle. Just eleven years later, in 1995, the Ballistic Missile Defense Organization test flew the Lightweight Exoatmospheric Projectile (LEAP), weighing a mere 8 pounds. LEAP would evolve into the kill vehicle used in today's Standard Missile-3.⁹

As the Cold War faded, new threats began to emerge that reinvigorated US interest in missile defense. Iraq's use of Scud missiles in the 1991 Gulf War against Israel nearly fractured the delicate coalition of Arab states. This experience demonstrated that even conventionally armed missiles could have profound strategic effects. The United States began investing in regional missile defense systems, including optimizing the Patriot system for ballistic missile defense (BMD) and the development of the Navy area and theater-wide systems, which would later become Aegis BMD.

By the early 1990s, it became apparent that North Korea was pursuing a nuclear weapons program. In July 1998, the Rumsfeld Commission, an independent commission set up by Congress to assess global missile threats, issued its final report. The commission concluded that North Korea could test a 10,000-kilometer-range rocket within

six months of choosing to do so.¹⁰ One month later, North Korea test-fired a two-stage missile over Japan, which seemed to confirm the commission's assessments.

In 2000, President Bill Clinton connected these threats with the need for a national missile defense system, declaring "such a system...could give us an extra dimension of insurance in a world where proliferation has complicated the task of preserving the peace."¹¹ President George W. Bush went further and withdrew the United States from the ABM Treaty in 2002 and began pursuing a layered missile defense system capable of intercepting ballistic missiles in all phases of flight. This program laid the foundations of the Ballistic Missile Defense System (BMDS) that the United States fields today. This layered system comprises four main intercept systems: The GMD System, Aegis BMD, the Terminal High Altitude Area Defense (THAAD) system, and Patriot, as well as a network of sensors and command and control infrastructure.

Guiding the development of the BMDS has been the principle of "limited defense." Under this policy, the United States has not sought to defend against attacks of any scale. Instead, the US homeland missile defense is scaled to defend against rogue states like North Korea. The *Missile Defense Review* (MDR) does note, however, that "it would be used to defend, to the extent feasible, against a ballistic missile attack upon the US homeland from any source."¹² Even a small number of Russian or Chinese ICBMs, however, would significantly strain GMD's limited 44-interceptor magazine.

The Contemporary Threat Environment

As of 2020, more than 30 countries possess ballistic missile capabilities, and a growing number now boast air-breathing projectiles like cruise missiles and drones. The accuracy and lethality of these weapons are also improving, fueled by the commercial availability of technologies like satellite navigation, overhead imagery, and drone avionics. The real-world effects of this proliferation were on full display in September 2019 during Iran's precision unmanned aerial vehicle strike on the Saudi Aramco facility at Abqaiq. In short, the advantages the United States once enjoyed in precision strike are diminishing.

In this threat environment, missile defense plays an increasingly important role in deterrence below the nuclear threshold. As adversary missile capabilities become more lethal and precise, the more vulnerable forward-deployed US forces have become to a first strike. Forward-deployed US forces play two vital functions in keeping the peace. First, they make it difficult for an adversary to attack a US ally without triggering US involvement, sometimes referred to as a "tripwire." Secondly, forward-deployed US forces would prove critical early in a conflict, preventing the enemy from achieving a *fait accompli* long enough for reinforcements to arrive. It is this second, "fight tonight" mission that the spread of advanced missiles most places at risk.

An adversary might, for example, use ballistic and cruise missiles in complex attacks against command, control, and communication hubs, disrupting airbase operations and attacking troop formations. Such an attack could provide

an enemy with a window of advantage where it can achieve its objectives. Moreover, an adversary could employ missiles against logistical hubs, such as air and seaports of debarkation, to impede the insertion of additional forces. These kinds of area-denial operations could create conditions for an enemy *fait accompli*.

These concerns are shaping the direction of missile defense policies and programs. The proliferation of cruise missiles and drones, for example, is creating demand for integrated air and missile defense (IAMD) system architectures that can seamlessly tackle both air and space breathing threats. The need for short-range air defense to protect maneuver forces from low-flying threats is also on the rise.

The United States has also begun to pursue new kinds of defenses to counter hypersonic weaponry, such as boost-glide vehicles. Such an architecture requires new types of interceptors and space-based sensors. If fully developed, the United States will likely prioritize these defenses for forward-based forces to decrease their vulnerability. Should US adversaries begin significant deployment of long-range hypersonic glide vehicles that threaten the continental United States, the Pentagon may again consider active defenses to protect US ICBM fields and other sensitive elements of the US nuclear force.

Like homeland defenses, regional air and missile defenses are limited. America's adversaries can field many more strike assets than the United States can field interceptors. However, the purpose of regional defenses is not to intercept everything the enemy can launch, but complicate

adversary planning enough to deter it from aggression. Should deterrence fail, defenses are there to buy enough time for offensive forces to deploy and end the conflict.¹³

USAF Role in Missile Defense

With the American embrace of missile defense has come an expanding set of missile defense–related missions for the military. Since SDI, the United States has approached missile defense development as a joint force endeavor, managed by an independent Department of Defense (DoD) organization staffed by a mix of soldiers, sailors, airmen, and civilians. In the Reagan administration, this was the Strategic Defense Initiative Organization (SDIO), which became the Ballistic Missile Defense Organization (BMDO) in 1993. Today's incarnation of this entity is the Missile Defense Agency (MDA).

Defense Secretary Donald Rumsfeld established MDA in 2002 to prioritize and accelerate the development and fielding of missile defenses. Unlike the BMDO, Secretary Rumsfeld endowed MDA with special authorities, including an alternative acquisition oversight process outside DoD 5000 procedures.¹⁴ Airmen have, and continue, to play an essential role in the development and leadership of the US missile defense programs at MDA. For example, the USAF has brought critical experience in the development and acquisition of launch vehicles and space operations. The USAF has also played a key leadership role in missile defense; more than half of the commanders of the SDIO, BMDO, and MDA have been USAF general officers.

MDA's primary functions are research and development, acquisition, and material provision to the warfighter. Once fielded, missile defense operations are carried out by the Army, Navy, and Air Force personnel, coordinated through the combatant and allied commands. The GMD system, for example, is coordinated via US Northern Command (NORTHCOM) and the North American Aerospace Defense Command (NORAD) out of Schriever Air Force Base, Colorado. Command and control for North Atlantic Treaty Organization (NATO) missile defense is run by NATO's BMD Operations Center at Ramstein Air Base.

Despite its current lack of interceptor systems, the USAF plays a central, if sometimes underappreciated, role in US missile defense operations. Airmen operate the upgraded early warning radars and the Cobra Dane radar, which feed crucial tracking and classification data to GMD. Airmen will operate the new long-range discriminating radar currently under construction at Clear Air Force Station, Alaska. The USAF also maintains and operates the overhead persistent infrared (OPIR) satellite constellation, which provides the first warning of a ballistic missile launch, queuing the entire US BMDS to address the threat. While OPIR now falls under the newly minted Space Force (USSF), airmen assigned to the USSF will continue supporting space activities for the foreseeable future.¹⁵

In the future, the United States may ask airmen to contribute even more to the missile defense mission. The 2019 MDR, for example, noted that the Air Force and NORAD are upgrading aircraft to be able to track and target cruise missiles as an initial step towards a more comprehensive

cruise missile defense architecture. The MDR also called for a study of how best to integrate the F-35 into the BMDS. The F-35's sensor suite could provide high-quality tracking data of ballistic and cruise missile threats. There is also the potential to equip F-35s with interceptors to engage missile threats in their boost and ascent phases.¹⁶

As the US BMD evolves further towards IAMD capability, there will likely also be increasing demand for aerial sensors to provide situational awareness, tracking, and even fire control data for missile defenses. The Earth's curvature limits ground-based radar's ability to detect and track low-flying threats at actionable ranges, requiring the integration of airborne sensors to see over the horizon. This mission would, in many instances, fall to manned and unmanned USAF assets.

Missile Defense Critics

Despite its general acceptance as a core military capability, the pursuit of missile defenses continues to generate some criticism and opposition. Organizations advocating nuclear disarmament, for example, typically also lobby against the development and deployment of missile defenses. Two of the most common criticisms of the missile defense enterprise are that missile defenses do not work, and that missile defense encourages arms racing.

Critics of missile defense have long asserted that missile defense does not work. Some of this sentiment stems from test failures during GMD's early development and deployment. Since 1999, GMD has intercepted its target in just

under 60 percent of tests (11 hits in 19 attempts).¹⁷ However, of the eight testing failures, only one has occurred in a configuration that the United States currently deploys. Five of the failures occurred before 2006, using a prototype kill vehicle in a nonoperational configuration. The other two failures took place in 2010, the result of an anomaly within the kill vehicle. MDA has since corrected this anomaly across the fleet. Other elements of the BMDS experienced positive results, too. The Aegis BMD system using SM-3 and SM-6 has had an 81 percent success rate in intercept testing across four block developments. THAAD has a 100 percent success rate in its operational configuration.

Observers sometimes question the realism of missile defense testing, however, arguing that successful tests do not indicate real combat capability. MDA indeed tests missile defense systems under controlled circumstances. Live-fire exercises require range protocols that can undercut the operational realism of a test. However, MDA has continually worked to make missile defense targets more threat representative, to include the use of decoys and countermeasures.

As with any complex weapon system, however, it is difficult to fully predict how missile defense systems will perform until the acid test of combat arrives. Neither GMD, Aegis, nor THAAD have ever intercepted a ballistic missile fired in anger. In 2008, the Navy used an SM-3 to intercept a malfunctioning satellite, an operation quite like a ballistic missile engagement (although still under highly controlled circumstances). Patriot, on the other hand, has had extensive combat use and has performed well since its post-Gulf War reconfiguration. In Operation Iraqi Free-

dom, US Army Patriot units intercepted 100 percent of the Iraqi ballistic missiles they engaged. In the conflict in Yemen, Saudi and Emirati Patriot units intercepted more than 160 ballistic missiles since 2015.¹⁸

Another criticism of missile defense is that it encourages arms racing. The claim suggests that states will seek to amass enough weaponry to overwhelm their opponent's defensive capacity.¹⁹ While there is an intuitive logic to this argument, there is also a lack of compelling evidence to suggest that the phenomenon actually occurs. The number of Soviet nuclear warheads, for instance, continued to increase dramatically even after the signing of the ABM Treaty in 1972. Soviet nuclear weapons continued to climb until the United States and the Soviet Union concluded the START Treaty in 1987 (a year when research and development efforts under SDI were in full swing). Russian nuclear numbers continued to fall after the USSR dissolved and continued to decline even after the US withdrew from the ABM Treaty.²⁰ Russia and the United States concluded the Strategic Offensive Reduction Treaty (SORT) just five months after President Bush announced that the United States would withdraw from the ABM Treaty. The SORT Treaty cut the number of US- and Russian-deployed strategic nuclear warheads by more than 60 percent.

Conclusion

The United States' nuclear deterrent remains the bedrock of US national security. Yet today's complex threat environment requires more than the triad to deter aggres-

sion and maintain peace. Conventional strike forces, space assets, air and missile defenses, and numerous other capabilities all fit into the puzzle of contemporary deterrence strategy. American airmen make vital contributions to all these elements at all levels. As the United States takes up the challenge of great power competition, those contributions will become ever more critical.

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Chapter 21

Fight Through Command and Control...Nuclear and Joint All Domain

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The 2018 *National Defense Strategy* (NDS) acknowledges a world evolved from that in which counterterror operations predominate, but more importantly, it explicitly confronts the grey zone competition across the spectrum of military and non-military operations. An implied task in implementing any strategy—specifically the 2018 NDS—is addressing the means and ways of command and control to ensure the viability of the strategy when placed under varying levels of technical and operational duress. Command and control processes and systems are the ways and means we use to fight through the fog and friction of war and competition. The successful outcome of effective command and control results in exploitable advantages created in time and space.

The principles of military operations have not varied greatly over the centuries; practitioners prove time and again there is no single recipe for operational success. When it comes to command and control, there is at least one rule that is fundamental: a commander must assess and understand a constantly changing situation while making the most constructive use of the forces. In line with this rule, an operational concept for command and control

must adhere to military principles while holding fast to its central, functional purpose of providing multiple means and procedures to assess and understand circumstances and direct forces.

The Emergence of Joint All Domain Command and Control

In the spring of 2020, as a follow-on action in the spirit of fully integrating the NDS across the services, the Joint Staff published the *Joint All Domain Command and Control (JADC2) High Level Operational Viewpoint (OV-1)*.¹ It is the product of a seven-month collaboration across the combatant commands, services, defense agencies, and Joint Staff. It is a busy graphic, but it has much to say, and like any product, attempting to depict elevated concepts simply it will be taken and acted on differently based on the experiences and operational understanding of the reader.

As a starting proposition, JADC2 is defined as the art and science of decision-making and the ability to translate those decisions into action, leveraging capabilities across all domains and with mission partners to achieve operational advantage in both competition and conflict.²

At the most fundamental levels, what might constitute a command and control system that is considered effective for a joint all domain environment? Across land, sea, air, space, and cyber it must make possible three things: all domain awareness, a command and control architecture that makes possible integrated force direction, and with timely and scalable defeat capabilities. Conceptually,

JADC2 tackles the same military challenges that have existed throughout history, but through an operational design that does so in ways that are timely and operationally relevant for today's joint commanders.

To constrain the concept of JADC2—all forms of command and control—in the context of rapid decision-making with secure and resilient connectivity, four fundamental questions must be in the front of a commander's mind: (1) Who is in the conference/decision loop? (2) What are they deciding? (3) Against whom is the decision being made? (4) What is the desired end state?

To begin exploring the OV-1, it is helpful to break it down and attempt to understand what each section of the graphic is trying to communicate. Stripped to its most basic, the graphic depicts:³ JADC2 capabilities; strategic, operational, and tactical C2 structures; convergence across domains, joint functions, and tiers of C2; globally integrated operations; adversary actions across the competition continuum; and enabling technologies. Bring all of these processes and capabilities together and “this JADC2 OV-1 operational concept is to achieve the synchronized, globally integrated effects across all domains on any/all adversaries as required.”⁴

Multi-Domain Approach and Evolving Paradigms

Historically, resilient nuclear command, control, and communications (NC3), often referred to as the “thin line,” was developed, operationally fielded, exercised, and sustained as a system of strategic command and control capa-

bilities to handle crucial tasks so the president could reliably and quickly conduct nuclear command and control (NC2) and direct forces under the most extreme circumstances. It is designed to be rigid, resilient, global, and exercised on a daily basis, and, in at least a rudimentary fashion, accomplishes many of the capabilities and functions identified in the JADC2 OV-1—doing so for decades. However, as ever-evolving adversaries make less of a distinction between the development and connected/dual-use nature of cyber and space capabilities, NC3—as currently fielded—faces an array of accelerating and unremitting challenges. JADC2—with a core tenet of enabling nuclear command and control through assured communications, has the potential to provide the means to address the challenges levied by technologically savvy, authoritarian, legally unconstrained, and militarily subversive near-peers. Having a means to confront and fight through these challenges makes possible the opportunity to seize and create advantage during competition or conflict.

Since at least 2015, the Air Force has explicitly sought capabilities that are the vanguard framework of JADC2. The 2015 Air Force strategic master plan translates the service's 30-year strategy, *America's Air Force: A Call to the Future*, into comprehensive guidance, goals, and objectives. The Air Force strategy's five strategic vectors identify priority areas for investment, institutional change, and operational concepts with a directive to "pursue a multi-domain approach" and to "achieve the most effective solutions across the spectrum of military operations, we will increasingly integrate and employ capabilities operating in

or through the cyberspace and space domains in addition to air capabilities.”⁵

Multi-Domain Mindset

The strategic master plan goes further, saying that the Air Force must

focus on ensuring and sustaining freedom of action within temporal and spatial bounds in all domains, enabled by multi-domain, synergistic mission execution. The most critical component of this approach will be the development of a multi-domain mindset among airmen throughout the service. The Air Force must ensure that its systems and processes support this mindset to safeguard mission accomplishment in a complex environment.⁶

It does not take much imagination to see that the accumulation of challenges and opportunities across these domains has the potential to outpace hierarchical decision-making.

The critical enabler for this mindset shift is to first understand and envision how capabilities that are bureaucratically siloed by domain can be networked in useful, secure, and resilient ways. For example, a joint task force commander in the field who happens to be an Air Force aviator and lieutenant general will not have the technical savvy of a 28-year space professional to immediately sense peril or strategic opportunity based on raw intelligence from the space domain. However, Air Force capabilities that are already fielded for future air domain control have the potential to drive deeper, more useful awareness, integration, and operational tempo by design through JADC2 initial operational capabilities.

In many cases, the revolution in JADC2 begins by aggregating data in a control plane to capture and make available multi-domain awareness through a fused sensing grid of already extant systems. By design, these systems can begin to tackle the deficiency of cross-domain awareness through the aggregation of cloud data through and from sensor grid/edge cloud (resilient) systems, which will expand the possibilities for real-time predictive data analytics, machine learning, and deep learning. From this, a multi-domain common operational picture becomes a tool not just limited to building shared situational awareness, but a tool of force direction across domains for timely strategic effects. As Air Force Vice Chief of Staff General Stephen Wilson noted, “The general nature of war will not change, but the speed of connectivity will. The Air Force must be able to collect and decipher information and produce dilemmas for our adversaries at a rate they can never keep up with. It is not just speed in decision-making.”⁷

JADC2 and NC3

Vice Chairman of the Joint Chiefs of Staff General John Hyten, commented extensively on the value of JADC2 and the needed mindset. He explained, “Because if we figure that out, we’ll have a significant advantage over everybody in the world for a long time, because it’s the ability to integrate and effectively command and control all domains in a conflict or in a crisis seamlessly.”⁸ In his capacity as vice chairman and principal deputy to the chairman he has provided insight and oversight into the

joint staff's role as global integrator. As such, he is integrally linked to the global synchronization of combatant command plans and he knows that for these complex and detailed plans to be matched to dynamic circumstances that do not abide by the lines on combatant commanders' maps, JADC2 is the pathway for the technical capabilities that will bring this all together, especially in day-to-day competition.

When it comes to nuclear business, he is also routinely and directly involved with oversight of the joint staff to provide nuclear command and control processes and capabilities so the chairman can act immediately and reliably in his capacity as senior military advisor to the president. The vice chairman is a central figure in the NC3 enterprise and General Hyten is uniquely prepared for this as a former global, functional combatant commander who was deeply involved with nuclear, space, and cyber forces.

From a service perspective, former Chief of Staff of the Air Force General David Goldfein weighed in on the then-forthcoming *National Defense Strategy* in his September 18, 2018, address to the Air Force Association, "The next phase of work is preparing the Air Force we need for multi-domain operations—the convergence of military capabilities in any or all domains to achieve military objectives on a global scale."⁹

In examining mission essential functions at the doctrinal level, NC2 and JADC2 capabilities are clearly similar and situated within the core principles required for command and control. JADC2 capabilities are listed on the

far left side of the OV-1 (see Figure 21.1) and are broken out below. In matching rows in Table 21.1, NC2 mission essential functions (MEF) as defined by Air Force Instruction are paired with the matching JADC2 capabilities requirements.

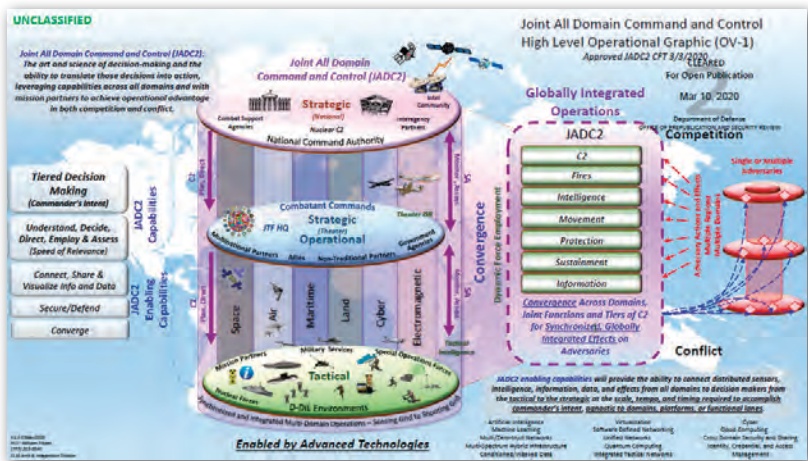


Figure 21.1. The OV-1 provides a high-level graphical/textual description of the operational concept.

Table 21.1. JADC2 Capabilities versus NC2 MEFs

<i>JADC2 Capabilities Requirements</i>	<i>NC2 Mission Essential Functions¹⁰</i>
Understand	Situation monitoring
Decide	Decision-making
Direct	Force management
Employ	Force direction
Assess	Situation monitoring

Everything expected of JADC2 is already narrowly achieved in NC3 operational capabilities—even as they merged under joint staff oversight as defined in the National Military Command System (NMCS). The JADC2

OV-1 is the information age iteration of the NMCS. Just as nuclear weapons remain foundational to the NDS, the nuclear “thin line” remains foundational to national-level command and control in whatever domain(s) adversary actions are contemplated and executed.

In thinking more deeply on the similarities of core capabilities and essential functions in JADC2 and NC3, the criticality of driving the requirements and fielded capabilities of these systems to next-generation performance becomes apparent. According to the Chinese strategy document, *Unrestricted Warfare*, “He who wants to win today’s wars, or those of tomorrow, to have victory firmly in his grasp, must ‘combine’ all of the resources of war which he has at his disposal.”¹¹

It is apparent to near-peer adversaries like Russia and China the importance of joint all domain operations and JADC2. In the spring of 2018, Russia’s chief of the general staff of the armed forces, General Valery Gerasimov stated, “The enemy’s economy and state command and control system will be the priority targets. Besides traditional spheres of armed struggle, the information sphere and space will be actively involved.”¹² He also said,

The content of military actions itself is changing.... A transition from sequential and concentrated actions to continuous and distributed ones, conducted simultaneously in all spheres of confrontation, and also in distant theaters of military operations is occurring.... The transition to systematic destruction of the enemy on the basis of integrating the forces of all strike and fire means into a single system is occurring.¹³

Challenges

By almost any measure, JADC2 is a simple concept once the technological possibilities are laid out. However, it is proving to be a wicked problem in its execution due to current organizational structures, industrial age acquisition strategies, unreliable funding, the rapid pace of technological change, and the challenge of big data—that is classified in ways impossible to architect under current rule sets.

In a recent MITRE report on the subject, several obstacles were discussed: platform-centric acquisition, service-based authorities, insufficient focus on C2, and technological myopia.¹⁴ The DoD's organizational myopia was presciently observed in *Unrestricted Warfare*: “the American military clearly is technologically stagnant and it is not good at seizing opportunities provided by new technology for new military tactics.”¹⁵ Innovation initiatives such as AFWERX and STRIKEWERX may help. However, even if the Air Force overcomes stagnation, this will be insufficient to determine how the appropriate information gets from the tactical operator to the strategic decision-maker.

Funding JADC2

The Air Force is planning on investing heavily, \$1.1 billion in 2024,¹⁶ on the Advanced Battle Management System (ABMS) that will be key to the emerging JADC2 architecture. However, Congress may not be on the same page. In the case of ABMS, the House Appropriations Committee-Defense (HAC-D) recently cut \$50 million from the

service's \$302.3 million request.¹⁷ The HAC-D cites a recent Government Accountability Office report that identified concerns the Air Force “has not established a plan or business case for ABMS...and has not yet determined how to meet the capabilities or identify systems that will comprise ABMS.”¹⁸ As a result, the Air Force will continue to develop and brief Congress quarterly on ABMS' status.

Protecting Data

General Wilson said, “It is about data—the oil of the twenty-first century. The intent is to invest in technology and apply it flexibly across all domains.”¹⁹ Given the importance of data, protecting it is key to success. This is particularly critical as JADC2 and NC3 move toward cloud computing, integrated tactical/unified networks, and multi-trust and zero-trust networks. The function of often unstructured data protection is a challenge that must be tackled because at least one of the United States' peer adversaries claims, “One hacker plus one modem causes an enemy damage and losses almost equal to those of a war. Because it has the breadth and secrecy of trans-level combat, this method of individual combat very easily achieves results on the strategic and even war policy levels.”²⁰

Twenty-First-Century Threats

In many cases, individuals, oversight organizations, allies, and adversaries identified concerns with JADC2. Addressing these concerns is now the focus of much thought, coor-

dination, and action. As General Terrence O'Shaughnessy, commander, US Northern Command suggests, "We cannot defend the nation against twenty-first century threats with twentieth century technology."²¹ With NC3 modernization underway and JADC2 becoming enmeshed in all command and control systems and functions, it is important to regularly reassess how the Air Force tackles roles and missions within the evolution and revolution of JADC2.

Enduring Mission

As stated in the 2018 NDS, the DoD's "enduring mission is to provide combat-credible military forces needed to deter war and protect the security of our nation. Should deterrence fail, the joint force is prepared to win."²² The NDS further demands as a key tenet that we must evolve "innovative operational concepts" in order to successfully rebuild military readiness. JADC2 is at the top of the list of innovative operational concepts needed to better protect America in the twenty-first century.

As nuclear mission professionals, airmen must focus on core requirements as the Air Force and Department of Defense (DoD) moves JADC2 from an operational concept to operational capability. To do this faster, we must adopt the "DevOps" approach of the disciplined explorer that marks the historical trail with an eye on the objective destination to build upon demonstrated, historical strengths while remaining curious and open to emergent opportunities as they arise within the effort to field JADC2. This is not a matter of if, but when. As General Hyten recently stated, "it's important to

realize that JADC2 and NC3 are intertwined because, well, NC3 will operate in elements of JADC2.”²³

Airmen will play a critical role and must stay fully engaged to ensure NC3 is successfully brought into the twenty-first century. Capabilities will continue to emerge and, thus, airmen need to understand “modernization is not defined solely by hardware; it requires change in the ways we organize and employ forces.”²⁴ General Tim Ray, commander of Air Force Global Strike Command, reiterates this in the command’s *2020 Vision and Beyond*. As Ray writes, “We are empowering every Airman in our command to compete to win.”²⁵

The Future

General Ray further writes, “We are a very small command with a huge mission set, and we know we have to think about things differently. We have to move faster.”²⁶ The history of nuclear command and control capability development is instructive and will serve as a guidepost into the future. As the joint force moves toward the future, NC3 and JADC2 need to be designed and architected to leverage the best possibilities of both. However, it can never be forgotten that if NC3 fails, or America’s adversaries believe it has or can fail, deterrence is no longer credible. This may precipitate the unthinkable. Perhaps General Hyten says it best, “To effectively deter and respond if necessary in this multi-polar, all domain world, we must out-think, out-maneuver, out-partner, out-innovate our adversaries. Deterrence in the twenty-first century requires the integration of all our capabilities across all domains.”²⁷

Notes

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Chapter 22

Why Minimum Deterrence Is Doubtful

Stephen J. Cimbala

United States strategic nuclear forces provide the umbrella under which deterrence of major war against America or its allies can be reliable and affordable. Some nuclear arms control experts argue for “minimum deterrence” as a framework for US nuclear force structure planning.¹ Those who call for minimum deterrence believe that the ability of the United States to destroy in retaliation the social and economic fabric of a modern society will forestall any attacker who is otherwise considering a nuclear first strike. From this perspective, the current American strategic nuclear arsenal is larger than necessary and could be reduced to 1,000 or fewer operationally deployed long-range weapons. Some experts have even contended that as few as several hundred US weapons deployed on intercontinental launchers would suffice for credible deterrence against Russian or other attack. If these assessments are correct, then the United States, going forward, could save considerable amounts of money on nuclear modernization and avoid deployment of superfluous weapons that could contribute to an expanded nuclear arms race.

Relevance to Airmen

Minimum deterrence seeks to provide a compromise plan that will contribute to US-Russia nuclear arms control,

economize on defense spending for nuclear forces and infrastructure, and set an example for other states to follow in limiting their acquisition of nuclear arsenals. Minimum deterrence assumes that states are rational actors who make decisions on the basis of cost-benefit analysis. Therefore, rational actors should prefer to deploy the smallest number of intercontinental or shorter-range nuclear weapons consistent with stable deterrence based on the concept of “assured retaliation” or “assured destruction.”

Assured destruction was a concept first articulated by former Secretary of Defense Robert McNamara under Presidents John Kennedy and Lyndon Johnson. This idea suggests that US defense planners could establish an objective metric that defined exactly how much retaliatory destruction was required to deter any aggressor from choosing a nuclear first strike. From this perspective, deterrence was stable when neither the United States nor Russia could prevent “unacceptable” retaliation against a variety of targets, including nuclear and conventional military forces, war-supporting industry, command and control systems, and the economic and social fabric of the adversary.² Given the atmosphere of global confrontation between the United States and the Soviet Union during the Cold War, assured retaliation meant that the US and the Soviets would deploy many thousands of weapons in order to guarantee nuclear-strategic stability based on second-strike survivability. In fact, there was massive “overkill” in these Cold War deployments by the nuclear superpowers, recognized beginning in the 1970s by their willingness to agree to limitations under a series of SALT (Strategic Arms

Limitation Talks) and later START (Strategic Arms Reduction Treaty), the latter continuing beyond the Cold War into the twenty-first century.

The end of the Cold War and the collapse of the Soviet Union caused US presidents and their defense establishments to plan for future nuclear forces that were smaller in number, albeit reliable. Under the New START agreement currently in force between the United States and Russia, each state is permitted to deploy a maximum of 1,550 warheads on a maximum of 700 intercontinental launchers: intercontinental ballistic missiles; submarine-launched ballistic missiles; and heavy bombers.³ These numbers are drastically reduced from Cold War standards, and to some extent reflect the immediate post-Cold War expectation of political rapprochement between Russia and the West. However, Russia's military resurgence under President Vladimir Putin includes a commitment to modernization of Russia's strategic nuclear forces, featuring newer generations of offensive nuclear weapons specifically intended to defeat American missile defenses (to which Russia objects). In 2019, the United States and Russia both let lapse the Intermediate Nuclear Forces Treaty, a Cold War landmark signed in 1987 by Presidents Ronald Reagan and Mikhail Gorbachev. Tense US-Russia political relations characterized the Barack Obama and Donald Trump administrations, further constraining arms control options and placing into jeopardy even the New START agreement, which would expire in 2021 unless Moscow and Washington agreed to extend the agreement for another five years in good time.

Arguments Pro and Con

Whether current or prospective US nuclear forces are adequate depends upon their missions and tasking. US strategic nuclear forces might be expected to perform the following functions on a graduated scale of complexity: (1) guarantee assured retaliation against any aggressor; (2) provide for assured retaliation plus flexible targeting and “withholds” for follow-on attacks and interwar coercive bargaining; (3) provide for assured retaliation, flexible response, and endurance throughout the various phases of a protracted (and presumably limited) nuclear war; or (4) establish escalation dominance and nuclear-strategic superiority over any prospective opponent, including the capability to deny the attacker his objectives by deployment of highly competent missile defenses.⁴

Detractors of current and prospective US nuclear modernization plans contend that they preserve a pointless arms race, threaten future deterrence and arms race stability, and are unacceptably expensive. Advocates of minimum deterrence would prefer to scale down American and Russian strategic nuclear forces to several hundred deployed weapons on each side. These smaller numbers of deployed weapons, according to minimum deterrence theorists, would still provide enough survivable firepower to inflict “unacceptable” damage against any attacker. The prospective loss of many if not most of its major cities and social infrastructure should deter any rational policy maker. Minimum deterrence advocates also point to cases in which the efficacy of small nuclear arsenals in deterring

attacks, even from states with larger numbers of weapons, has been demonstrated. Superior numbers of US nuclear weapons did not deter the Soviet Union from emplacing nuclear missiles in Cuba in 1962.

North Korea today effectively deters a number of larger nuclear powers from a conventional war to overthrow its regime. For much of the Cold War, France distanced itself from North Atlantic Treaty Organization (NATO) military planning and sought a nuclear force independent of alliance control, but its *force de dissuasion* was negligible in size and capability compared to that of the Soviet Union. Nevertheless, France's deterrent was credible, not only because it had the de facto protection of the American superpower, but also because France could credibly threaten to "tear an arm off" of the Soviet Union by destroying some of its major cities before exhausting its arsenal. Indeed, all nuclear weapons states begin their nuclear histories with finite or minimum deterrents; thus far, no nuclear weapon has been fired in anger since the bombing of Nagasaki.

On the other hand, critics of minimum deterrence make a number of points in rebuttal to its advocates. First, there can be no way to determine any exact number of weapons and/or launchers that will suffice for deterrence or reassurance against attack. The attacker's estimate of the situation may not be rational or sensible in US terms or according to American decision-making logic.⁵ Instead of proceeding on the basis of cost-benefit analysis, adversaries of the United States may be motivated by considerations of fear, honor, or interest (in Thucydides' well-known triptych) among other factors. A conventional war between nuclear

powers might escalate into nuclear first use by one side, or into tit-for-tat exchanges between the combatants below the threshold of all-out nuclear war but dangerously close to that precipice. The manipulation of risk and skill in controlling escalation will count for more at this stage than the balance of power measured by the sides' remaining numbers of nuclear weapons.⁶

Second, critics of minimum deterrence contend that it does not provide for flexibility or resilience that political leaders and their military advisors might need to maintain deterrence credibility and, in the event that deterrence should fail, an adaptive capacity for war termination on favorable terms. A minimum deterrent retaliatory force would be entirely or mostly targeted against enemy cities and socio-economic values. It would not provide for selective counterforce attacks against enemy forces that might limit further damage to US forces or to the American homeland. From this perspective, a minimum deterrence force also lacks resilience. A force of several hundred deployed weapons would be quickly exhausted of any strategic reserve once its limited second-strike capability became depleted. The postattack bargaining position of a minimum deterrent force would be unsupported by sufficient numbers of surviving weapons, control systems, and nuclear infrastructure.

Third, future war between nuclear powers might well begin with preemptive attacks against space assets, or by cyberattacks against command-control or launch systems. Satellites for warning, navigation, communication and/or intelligence gathering could be disabled by prompt attacks

from hostile “repair” satellites orbiting within range. Cyberattacks against command-control or nuclear missile launch systems could scramble the reliable information available to enemy leaders or cause a missile launch to go off course.⁷ The combination of cyber and space attacks could leave a country with an imperfect picture of what is happening to its forces and command systems, degrading its retaliatory capabilities and the connectivity of its nuclear brain and spinal cord. Precious time would be needed to reestablish command and control coherence and high-confidence communications. The possibility of space and cyberattacks, added to the uncertainties already inherent in calculations about nuclear-deterrence credibility, argue for more redundancy in force structure and in command and control proficiency than that required for a minimum-deterrent force.

Fourth, numbers do matter—at least in policymakers’ and publics’ imaginations. The United States and Russia draw international prestige and gain military respect by virtue of their uniquely large and capable nuclear arsenals. In fact, Russia’s nuclear weapons are the keys to its ability to lay claim to major military power status, since its conventional forces, although substantially improved since serious reforms began in 2007, remain inferior to the combined arms of NATO. Other nuclear weapons states are modernizing their forces, some aggressively, in quality and in quantity. None of the current nuclear weapons states shows any interest in drastically reducing or totally eliminating its existing arsenal. Few, if any, of these states actually expect to ever have to fight a nuclear war, given the

obviously destructive effects on their own societies that would result. Instead, they deploy these weapons for deterrence or for “swaggering” to add credibility to their images as military powers: in short, for reasons of psychology.

What It Means for the Air Force

The future of the US nuclear deterrent will be part of a broader picture of American military preparedness for challenges across the spectrum of conflict. Prospective adversaries of the United States, including Russia and China, are increasing their military potential related to all the domains of conflict: land, sea, air, space, and cyberspace. US nuclear forces directly or indirectly support missions in each of these domains. With respect to the deterrence and reassurance missions of US strategic and nonstrategic nuclear forces, Americans can expect to see improving offensive capabilities on the part of our aspiring peer competitors.⁸ Russian and Chinese strategic and tactical nuclear weapons support broader strategies of diplomatic coercion, access denial, and forward presence. Pre-nuclear deterrence, based on improved capabilities for long-range, precision conventional strikes, is an explicit focus for Russian military planning. In addition, both Russian and Chinese military thinking emphasize a holistic understanding of conflict in the twenty-first century as necessarily inclusive of social, cultural, and informational variables.

Russia's efforts to intervene in American and other elections are part of a broader strategy to weaken the Western alliance and political democracies by active measures that

include propaganda, disinformation, cyber intrusions, and nullification of leaders' and publics' faith in their democratic processes. China's unrestricted warfare strategy of total conflict under informatized conditions also includes intellectual property theft, disinformation, and strategic deception, together with a global effort to underwrite national infrastructure projects (Belt and Road Initiative, among others) and thereby influence governments on issues favorable to Chinese policy.

Aspiring peer competitors are only one aspect of future American security challenges. Hostile states such as Iran and North Korea also pose threats to US security, including North Korea's existing nuclear arsenal and Iran's aspirations for its own nuclear weapons capability. US policy has thus far failed to reverse North Korea's nuclear proliferation, despite various carrot and stick approaches on the part of the George W. Bush, Barack Obama, and Donald Trump administrations. North Korea remains a tinder box capable of igniting a large-scale conventional or nuclear war in Asia, possibly including face-offs among China, Russia, and the United States. An Iranian nuclear weapons state would pose unacceptable risks not only for the United States but also for regional Middle Eastern state actors, including Israel and Saudi Arabia. On the heels of an Iranian nuclear force, several countries, including Egypt, Saudi Arabia, and Turkey, might move toward the acquisition and deployment of nuclear weapons.

Unfortunately, there are few low-cost or risk-free military options for containing Iranian and North Korean military aspirations, or, if necessary, disarming their military

capabilities. A US military invasion and occupation of Iran with the goal of regime change would require massive commitments of manpower and resources, on a scale even larger than the forces and resources needed for Operation Iraqi Freedom in 2003. Iranian resistance to American military intervention could include widespread insurgency within Iran, promotion of insurgencies and terrorism in Iraq and Afghanistan, and efforts to choke off the Strait of Hormuz in order to interrupt shipments of oil supplies. Support for a military commitment of this size and cost on the part of the US public or Congress could not be taken for granted. In the case of North Korea, a conventional war against South Korea, the latter supported by the United States, would probably turn out badly for the Democratic People's Republic of Korea. Therefore, its foreign policy of intimidation against rivals in Asia and against Washington requires a nuclear backdrop that Pyongyang will be reluctant to give up. As well, North Korean leader Kim Jong-un might view his nuclear forces as an insurance policy against US regime change of the kind imposed on Iraq in 2003. China remains a key to unlocking the diplomatic deadlock with the recalcitrant regime in North Korea and integrating it with the larger international community on responsible terms. However, to date China has played a two-sided game in which it passes itself off as a moderator of North Korean excesses, even as China is North Korea's lifeline of economic and political support, and its last-ditch guarantor against forcible regime overthrow.

The North Korean and Iranian cases illustrate the relationship between US security commitments even outside Europe and the credibility of American nuclear forces in support of “extended deterrence” with respect to allies, including those in Europe. Iran already deploys an arsenal of ballistic missiles capable of hitting targets in Europe. A pandemic of nuclear weapons spread throughout the Middle East would only compound European insecurities, already troubled by the brooding omnipresence of a resurgent Russia and the increasing management challenges for an enlarged (to thirty countries) NATO. The US nuclear deterrent, the backbone that empowers NATO military preparedness and political influence, thus provides a critical support for both European and Middle Eastern political reassurance and stable deterrence.

Another aspect of this discussion is that military power and diplomacy go together as components of national security strategy. For example, “airpower diplomacy” is expedited by the ubiquitous US military presence in numerous overseas bases and underwritten by the global reach of American air power, including a capability for the use of air-delivered nuclear weapons.⁹ Airpower diplomacy includes the contacts between US Air Force personnel and their foreign counterparts, together with their engagement with those societies and cultures. Overseas deployed Air Force officers and enlisted personnel (along with other US armed forces) can be valuable advertisements for the American way of life and for American political values: including the rule of law, respect for

human rights, and the accountability of militaries to democratically elected governments.

The preceding discussion emphasizes that nuclear weapons and deterrence are part of a larger spectrum of influence strategies that include diplomacy, economics, psychological operations, offensive and defensive cyber capabilities, and other means to influence the behavior of prospective or actual opponents. Future challenges to Air Force officers and enlisted personnel will include the “human-machine” interfaces already being explored in neuroscience, nanotechnology, and other fields.¹⁰ No matter how promising these new technologies prove to be, their application to the various domains of warfare (land, sea, air, space, and cyberspace) requires leaders capable of adaptive thinking of a truly “strategic” kind: connecting policy objectives with the appropriate use or threat of force, under conditions of uncertainty.¹¹ Neither nuclear weapons nor other instruments of warfare can function to good effect unless subjected to the discipline of clear strategic thinking based on experience, insight, and commitment to national purpose.

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Chapter 23

The Role of Conventional Nuclear Integration

James Ragland

With large-scale conventional operations returning to the forefront of American strategic concerns, the ability to effectively fight and win on a battlefield where conventional and nuclear weapons are employed is necessary. Conventional nuclear integration (CNI) is the developing concept that critically examines how best to prepare and operate for such an environment. Should the United States need to fight a regional conventional conflict that may escalate and involve the use of nuclear weapons, success will largely depend on the effectiveness of conventional nuclear integration. If deterrence seeks to make the costs of taking an undesirable action outweigh its benefits, then it is to the advantage of the United States to demonstrate to nuclear-armed adversaries that they cannot successfully escalate their way to victory.

This leaves the United States little option but to develop a credible plan for addressing adversary plans and capabilities that seek to do just that—escalate to win. Failure to take CNI seriously could have several consequences. First, without credible assurances for American allies, that the United States can deter or defeat an adversary's conventional military aggression even if a conflict goes nuclear, America's extended deterrent faces a serious credibility issue. Second, allies may decide to develop their own nuclear force, fur-

thering nuclear proliferation and fostering strategic instability. Third, the nation's adversaries may begin believing the United States would succumb to nuclear threats, and thus inadvertently precipitate, for example, the breakdown of deterrence and a Russian invasion of the Baltic states.

Historical Context

Conventional nuclear integration, or the ability to combine nuclear and conventional weapons capabilities and assets to accomplish effective deterrence/assurance—while guaranteeing victory—is long a part of the nation's deterrence strategy. For example, NSC-30 (1948) asserted, "It is recognized that, in the event of hostilities, the National Military Establishment must be ready to utilize promptly and effectively all appropriate means available, including atomic weapons, in the interest of national security and must, therefore, plan accordingly."¹ Likewise, NSC-162/2 (1958) stated, "In the event of hostilities, the United States will consider nuclear weapons to be as available for use as other munitions."² The Eisenhower administration went even further in NSC 5707/8, stating that the military needs "to integrate nuclear weapons with other weapons in the arsenal of the United States; to consider them as conventional weapons from a military point of view."³

Early in the Cold War, CNI was central to American strategy. However, the United States' focus on CNI waned with the dissolution of the Soviet Union in 1991. This was largely because policymakers assumed that nuclear deterrence would be less important in overall US security strategy—

particularly on the battlefields of the twenty-first century. To the extent nuclear threats were contemplated, policymakers envisioned threats coming from terror groups or rogue states such as North Korea and Iran. This thinking became particularly popular after the attacks of September 11, 2001, and the launch of the Global War on Terror (GWOT). As a result, not only did the modernization and maintenance of the nuclear enterprise “atrophy,” what Clark Murdock warned was a danger of “rusting to obsolescence,” but American attention to nuclear strategy and policy suffered by serious inattention—including concepts such as CNI.⁴

America’s adversaries, on the other hand, increased their CNI capabilities. Russia has a long-standing practice of conducting war games that involve a significant nuclear weapons component. China is developing advanced nuclear weapons systems including “survivable” systems such as road mobile systems and more jin-class submarines.⁵ The Democratic People’s Republic of North Korea (DPRK) indicated it would use its nuclear capability to achieve its military aims on the Korean peninsula that would, it is assumed, start with conventional military attacks.⁶ In short, China, the DPRK, and Russia are preparing for a conventional conflict that could possibly escalate into a nuclear conflict.

A motivating factor for these combined strategies is the fear of American superiority in all domains of conventional warfare, not because these countries think the United States will attack them, but because conventional capability enables the United States to stop any planned aggression by China, the DPRK, or Russia. It is part of an

adversary's calculus that the threat of escalating to the nuclear level would force the United States to stand down or surrender because they believe American leadership has not thought through what is required to integrate nuclear weapons into a conventional conflict.

According to the 2018 *Nuclear Posture Review* (NPR), the overarching guidance for the direction of the US nuclear enterprise, states, "While Russia initially followed America's lead and made similarly sharp reductions in its strategic nuclear forces, it retained large numbers of non-strategic nuclear weapons."⁷ The NPR continues, "Today, Russia is modernizing these weapons as well as its other strategic systems. Even more troubling has been Russia's adoption of military strategies and capabilities that rely on nuclear escalation for their success. These developments, coupled with Russia's seizure of Crimea and nuclear threats against our allies, mark Moscow's decidedly serious return to Great Power competition."⁸

Escalate to Win

Russia may have already integrated nuclear weapons into their current warfighting doctrine. For example, during Russia's *Grom* (Thunder)-2019 strategic nuclear forces exercise, the Russians tested their strategic nuclear triad along with nonstrategic systems. Many of the delivery systems tested could either have a conventional or nuclear capability and will be added to the Russian weapons inventory in the next decade.⁹ Again, the NPR is clear:

Moscow threatens and exercises limited nuclear first use, suggesting a mistaken expectation that coercive nuclear threats or limited first use could paralyze the United States and NATO [North Atlantic Treaty Organization] and thereby end a conflict on terms favorable to Russia. Some in the United States refer to this as Russia's "escalate to de-escalate" doctrine. De-escalation in this sense follows from Moscow's mistaken assumption of Western capitulation on terms favorable to Moscow.¹⁰

How serious is Russia about this change in nuclear doctrine? One indication is the extent to which Russia has expanded the offensive capabilities designed to deliver nuclear weapons including short- and close-range ballistic missiles, anti-ballistic and anti-submarine missiles, as well as a variety of gravity bombs.¹¹ Russia's deployment of hypersonic glide vehicles is further evidence of their offensive integration of conventional and nuclear capabilities.¹²

While China does not follow lockstep Russian nuclear doctrine, the People's Republic of China has three main nuclear-delivery platforms, intercontinental, medium-range, and submarine-launched ballistic missiles, which hold at risk not just American cities but US and allied military assets throughout the Indo-Pacific.¹³ China continues to expand what it claims is Chinese territory, such as the numerous island chains throughout the South China Sea, where the People's Liberation Army is deploying key military missile capabilities. As for North Korea, the country has expanded its nuclear arsenal since its first 2006 test, and the regime is successfully building and testing both medium- and short-range ballistic missiles, while less successfully testing sea-launched and long-range ballistic missiles.¹⁴

CNI: The Response to Escalate to De-Escalate

As such, these new weapon systems, particularly missiles, are part of Chinese, North Korean, and Russian emerging strategy to “escalate to de-escalate” or “escalate to win” in any conflict with the United States. To varying degrees each of these adversaries believes that the early and limited use of nuclear weapons would bring a conventional conflict to a close on terms beneficial to them.

Given this reality, the 2018 NPR argues for a renewed focus on CNI:

US forces will ensure their ability to integrate nuclear and non-nuclear military planning and operations. Combatant commands and service components will be organized and resourced for this mission and will plan, train, and exercise to integrate US nuclear and non-nuclear forces and operate in the face of adversary nuclear threats and attacks. The United States will coordinate integration activities with allies facing nuclear threats and will examine opportunities for additional allied burden-sharing in the nuclear deterrence mission.¹⁵

As for American forces, to markedly increase such deterrence, the CNI mission planning of the services will involve land, air, and sea components. And with the Air Force (USAF) tasked with a large portion of the CNI mission, the CNI strategy will complicate USAF operations and planning.

Historically, airmen stay in their conventional or nuclear lanes—with the exception of those bomber and fighter pilots who fly both conventional and nuclear missions. In the past, this was prudent, considering the strict security standards surrounding the nuclear mission. However, CNI demands more flexibility and the ability to adhere to aus-

tere security standards. This may require airmen to operate in an environment where the distinction between conventional and nuclear operations is blurred.

A number of plausible scenarios are readily apparent, which might be useful in illustrating the challenges facing the Air Force. A nuclear-capable adversary might strike a conventional asset or forces that is co-located with a nuclear capability using either conventional or nuclear munitions. If an overseas installation, for example, were struck first by conventional and then by low yield nuclear munitions, could the installation recover and resume operations? Nuclear weapons effects, such as blast and shock, fire, and radiation, will expose personnel to harmful doses of radiation over long distances, further complicating USAF planning. A nuclear detonation at altitude could cause a high-altitude electromagnetic pulse (HEMP). This could damage or destroy electronic components and equipment over an extremely large area.¹⁶

How Serious Is the New Russian Nuclear Strategy?

The extent to which the Air Force adopts CNI strategies will largely depend on how seriously the United States takes recent Russian changes to nuclear strategy. Of high importance is whether the Russian policy of escalate to de-escalate or escalate to win is reflective of actual Russian strategy.

As Dr. Brad Roberts, director of the Center for Global Security Research at Lawrence Livermore National Laboratories, asserts, “The Persian Gulf War of 1990–1991 was

a wake-up call for any leader fearful of the exercise of American military power.” The United States and the coalition demonstrated to the world that their combined efforts were nearly unstoppable. Russia, in particular, was further alarmed later that decade when they saw the devastation that US and NATO airpower inflicted in the war in Kosovo.¹⁷

Richard Weitz echoes this Russian fear, explaining in a new study that “Russian policymakers clearly hope to deter the kind of decapitation strikes the US Air Force employed at the outset of the US wars in Iraq and Kosovo. In this regard, the [Russian] document also confirms Putin’s earlier statements about Moscow’s ‘launch under attack’ posture, which considers the use of nuclear weapons based on reliable information of incoming strikes.”¹⁸

Russia recently published an extensive assessment of its new nuclear doctrine. One of the conditions that may warrant a nuclear response according to the Kremlin is “aggression against the Russian Federation using conventional weapons when the nation’s very existence is threatened.”¹⁹

Currently one of the main concerns is Russia’s desire to expand its sphere of influence into the Baltic countries. This would have negative consequences with the Baltic states that are members of NATO. This could bring the United States into the conflict that would potentially have a nuclear dimension.²⁰

Credible CNI Strengthens Deterrence

The fundamental purpose of nuclear weapons is nuclear deterrence. Effective CNI will change the cost-benefit analysis of adversaries by demonstrating that any attack on American interests, to include nuclear weapons, will impose costs that make such an action too costly. Often unappreciated but critical to mission success is the assurance American deterrence provides allies and partners. Assurance, in its simplest form, states that the United States will come to the defense of allies. Effective CNI requires the United States to demonstrate the ability to operate in a combat environment where conventional and nuclear are present. Assuming that the first use of nuclear weapons will either lead to the end of war or the destruction of mankind is far from accurate and certainly not the view of America's adversaries.

Assuring allies and partners is paramount to the success of American nonproliferation objectives and the stability of the alliance system. If, however, American allies do not believe assurance (nuclear or conventional) is credible, they may seek other security agreements or develop their own (nuclear) capabilities. A breakdown in this trust might encourage an adversary to exploit such alliance weakness by encouraging offensive action.

Implementing Effective CNI in the USAF

The best approach to implementing effective CNI requires careful treatment. The answer lies in education,

planning, and training. Airmen must understand there is no one answer, but rather a spectrum of answers to the task of developing an effective CNI. It is easiest to digest when broken into the “big bins” of service organizational structure—manpower, intelligence, operations, logistics, plans, and requirements. Policymakers need to ensure that the additional “nuclear component” has the manpower available to accomplish the mission. Airmen need to ensure the unobstructed flow of information to prioritize requirements supporting this difficult mission. Airmen will also need to coordinate and implement operations ensuring mission success along with potentially modifying existing operating concepts to reflect the constraints imposed by a nuclear strike. In the face of such a strategic threat, the NPR calls for “well-coordinated integration activities” to better face current threats and examine opportunities for additional allied burden-sharing in the nuclear-deterrence mission, with CNI implementation through enhanced training exercises and planning.²¹

Conclusion: The Threat Is Real

The role of the Air Force in conventional nuclear integration is critically important. The United States must respond as potential adversaries challenge American security interests. As the nation responds through education, planning, and training, the foundations of nuclear deterrence and assurances are fortified. Since the end of the Cold War, in which the ability of the United States to credibly deter adversaries declined, the United States has begun

the process of integrating conventional and nuclear capabilities in order to both better deter adversaries and prevail in a conflict. Former Obama administration official Brad Roberts was one of the first high-level defense officials to bring attention to the Russian attempt to integrate nuclear weapons use into conventional war plans. Roberts originated the phrase escalate to de-escalate and has detailed these issues in *Theories of Victory: Red and Blue*. And since the beginning of the Trump administration, the Russian strategy of escalate to win has also received a considerable amount of top-level leadership attention. Most concerning is that US superiority in the conventional battlespace may indeed lead Russia to believe that they need to threaten the use of nuclear weapons to offset such inferiority.

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Abbreviations

ABMS	Advanced Battle Management Systems
AFGSC	Air Force Global Strike Command
ASBM	Anti-Ship Ballistic Missile
AWS	Array Warning System
BMEWS	Ballistic Missile Early Warning System
CBO	Congressional Budget Office
CCP	Chinese Communist Party
CNI	Convention Nuclear Integration
CTBT	Comprehensive Test Ban Treaty
DoD	Department of Defense
DOE	Department of Energy
DSP	Defense Support Program
ERCS	Emergency Rocket Communication System
GBSD	Ground-based strategic deterrent
GCCS	Global Command and Control System
GMD	Ground-based midcourse defense
IAMD	Integrated Air and Missile Defense
ICBM	Intercontinental Ballistic Missile
INF Treaty	Intermediate Nuclear Forces Treaty
IRBM	Intermediate-Range Ballistic Missile
JADC2	Joint All Domain Command and Control
LRSO	Long-range standoff weapon
MDA	Missile Defense Agency
MDR	<i>Missile Defense Review</i>
MiDAS	Missile Defense Alarm System
MSTR	Military Strategic and Tactical Relay
NATO	North Atlantic Treaty Organization

NC2	Nuclear command and control
NC3	Nuclear command, control, and communications
NCCS	Nuclear Command and Control System
NDAA	National Defense Authorization Act
NDS	<i>National Defense Strategy</i>
New START	New Strategic Arms Reduction Treaty
NFU	No first use
NMCS	National Military Command Systems
NNSA	National Nuclear Security Administration
NNSS	Nevada National Security Site
NORAD	North American Aerospace Defense Command
NPR	<i>Nuclear Posture Review</i>
NSC	National Security Council
NSS	National Security Strategy
NWC	Nuclear Weapons Council
OCO	Overseas contingency operations
OPIR	Overhead persistent infrared
OST	Office of Secure Transportation
PAVE PAWS	Precision acquisition vehicle entry phased array warning system
PLA	People's Liberation Army
PLARF	People's Liberation Army Rocket Force
POG	Program Officers Group
SAC	Second Artillery Corp
SACCS	Strategic Automated Command and Control System
SAGE	Semi-Automatic Ground Environment

SALT	Strategic Arms Limitation Treaty
SBIRS	Space-based infrared system
SDI	Strategic Defense Initiative
SLBM	Submarine-launched ballistic missile
SSBN	Strategic ballistic missile submarine
SSP	Stockpile Stewardship Program
START	Strategic Arms Reduction Treaty
THAAD	Terminal High Altitude Area Defense
TNW	Tactical nuclear weapons
UN	United Nations
USAF	United States Air Force
USSF	US Space Force
UUV	Unmanned underwater vehicle

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Guide to Nuclear Deterrence Operations in the Age of Great-Power Competition is designed to serve as a field practitioners guide to the many aspects of nuclear deterrence operations. Targeted at the airmen of Air Force Global Strike Command, each chapter covers a major topic of relevance. The book is divided into three sections: deterrence and national security, America's adversaries, and service contributions to deterrence. Chapters in the first section discuss the many facets of deterrence strategy and how deterrence fits into the nation's larger approach to defending American interests. The second section is devoted to chapters that discuss the nuclear strategies of America's great-power rivals and those adversaries who have or are seeking nuclear weapons. The final section offers a series of chapters discussing the Department of Defense and Department of Energy contributions to deterrence.

Each chapter is designed to be read in about half an hour and cover the most important aspects of the given topic. When finished with the book, airmen will have a firm understanding of the mission they support and its critical contribution to national security.