

NUCLEAR POSTURE REVIEW



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58 Secretary's Preface

59 On January 27th, the President directed the Department of Defense to conduct a new Nuclear
60 Posture Review (NPR) to ensure a safe, secure, and effective nuclear deterrent that safeguards
61 the homeland, assures allies, and deters adversaries. This review comes at a critical moment in
62 our nation's history, for America confronts an international security situation that is more
63 complex and demanding than any since the end of the Cold War. In this environment, it is not
64 possible to delay modernization of our nuclear forces and remain faithful sentinels of our
65 nation's security and freedom for the next generation as well as our own.

66 For decades, the United States led the world in efforts to reduce the role and number of nuclear
67 weapons. The 1991 Strategic Arms Reduction Treaty (START) set a ceiling of 6,000
68 accountable strategic nuclear warheads – a deep reduction from Cold War highs. Shorter-range
69 nuclear weapons were almost entirely eliminated from America's nuclear arsenal in the early
70 1990s. This was followed by the 2002 Strategic Offensive Reduction Treaty and the 2010 New
71 START Treaty, which lowered strategic nuclear force levels to 1,550 accountable warheads. The
72 U.S. nuclear weapons stockpile has been reduced by more than 85 percent from its Cold War
73 high. It was a promising time. Many hoped conditions had been set for deep reductions in
74 global nuclear arsenals, and, perhaps, for their elimination.

75 These aspirations have not been realized. America's strategic competitors have not followed our
76 example. The world is more dangerous, not less.

77 While Russia initially followed America's lead and made similarly sharp reductions in its
78 strategic nuclear forces, it retained large numbers of non-strategic nuclear weapons. Today,
79 Russia is modernizing these weapons as well as its strategic systems. Even more troubling has
80 been Russia's adoption of military strategies and capabilities that rely on nuclear escalation for
81 their success. These developments, coupled with Russia's invasion of Crimea and nuclear
82 threats against our allies, mark Moscow's unabashed return to Great Power competition.

83 China, too, is modernizing and expanding its considerable nuclear forces. Like Russia, China
84 pursues entirely new nuclear capabilities tailored to achieve particular national security
85 objectives. At the same time, China is modernizing its conventional military, challenging
86 traditional U.S. military superiority in the Western Pacific.

87 Elsewhere, the strategic picture is no less bleak. North Korea's nuclear provocations threaten
88 regional and global peace, despite universal condemnation by the United Nations. Iran's nuclear
89 ambitions remain a significant concern. Globally, nuclear terrorism remains a constant threat.

90 We must look reality in the eye and see the world as it is, not as we wish it to be. This NPR
91 realigns our nuclear policy with a realistic assessment of the threats we face today and the
92 uncertainties regarding the future security environment.

93 Given the range of adversaries, their capabilities and strategic objectives, this review calls for a
94 flexible, tailored nuclear strategy. In nuclear deterrence, no "one-size fits all." A diverse set of
95 nuclear capabilities provides an American President with flexibility to tailor the approach to
96 deterring one or more potential adversaries in different circumstances.

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For any President, the use of nuclear weapons is contemplated only in the most extreme circumstances to protect our vital interests and those of our allies and partners.

This nuclear strategy, along with our conventional forces and other instruments of national power, are therefore first and foremost directed towards deterring aggression and preserving peace. Our goal is to convince adversaries they have nothing to gain and everything to lose from the use of nuclear weapons.

In no way does this approach “lower the nuclear threshold.” Rather, by convincing adversaries that even limited use of nuclear weapons will be more costly than they can countenance, it raises that threshold.

To this end, this review confirms the findings of previous NPRs that the nuclear Triad -- supported by North Atlantic Treaty Organization (NATO) dual-capable aircraft and a robust nuclear command, control, and communications system -- is the most cost-effective and strategically sound means of ensuring nuclear deterrence. The Triad provides the President needed flexibility while guarding against technological surprise or sudden changes in the geopolitical environment. To remain effective, however, these nuclear forces must be recapitalized. The United States last did this during the Cold War.

By the time these forces are replaced, they will have served decades beyond their initial life expectancy. This review affirms the modernization programs initiated during the previous Administration to replace our nuclear ballistic missile submarines, strategic bombers, nuclear air-launched cruise missiles, ICBMs, and associated nuclear command and control. Modernizing our dual-capable fighter bombers with next-generation F-35A fighter aircraft will maintain the strength of NATO’s deterrence posture and maintain our ability to forward deploy nuclear weapons, should the security situation demand it.

Recapitalizing the nuclear weapons complex of laboratories and plants is also long past due; it is vital we ensure the capability to design, produce, assess, and maintain these weapons for as long as they are required. Due to underfunding by previous administrations, significant and sustained investments will be required over the coming decade to ensure that National Nuclear Security Administration will be able to deliver the nuclear weapons at the needed rate to support the nuclear deterrent in the 2030s and beyond.

Maintaining an effective nuclear deterrent is much less expensive than fighting a war that we were unable to deter. Maintenance costs for today’s nuclear deterrent are approximately 3 percent of the annual defense budget. Additional funding of another 3 to 4 percent, over more than a decade, will be required to replace these aging systems. This is the top priority of the Department of Defense. We are mindful of the sustained financial commitment and gratefully recognize the ongoing support of the American people and the United States Congress for this important mission.

While we will be relentless in ensuring our nuclear capabilities are effective, the United States is not turning away from its long-held arms control, non-proliferation, and nuclear security objectives. Our commitment to the goals of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) remains strong. But the current environment makes further progress toward nuclear arms reductions in the near term extremely challenging.

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138 This review rests on a bedrock truth: nuclear weapons have and will continue to play a critical
139 role in deterring nuclear attack and in preventing large-scale conventional warfare between
140 nuclear-armed states for the foreseeable future. U.S. nuclear weapons not only defend our allies
141 against conventional and nuclear threats, they also help them avoid the need to develop their own
142 nuclear arsenals. This, in turn, furthers global security.

143 I would be remiss if I did not acknowledge the vital role our Airmen, Sailors, Marines, Soldiers,
144 Coast Guardsmen, and civilians play in maintaining a safe, secure, and ready nuclear force.
145 Without their tireless and often unheralded efforts, America would not possess a nuclear
146 deterrent. At the end of the day, deterrence comes down to men and women in uniform – in silos,
147 in the stratosphere, and beneath the sea.

148 To each and every one of them, I wish to express my personal gratitude and that of a grateful and
149 safe nation.

150

Executive Summary

Introduction

On January 27, 2017, President Donald Trump directed Secretary of Defense James Mattis to initiate a new Nuclear Posture Review (NPR). The President made clear that his first priority is to protect the United States, allies, and partners. He also emphasized both the long-term goal of eliminating nuclear weapons and the requirement that the United States have modern, flexible, and resilient nuclear capabilities that are safe and secure until such a time as nuclear weapons can prudently be eliminated from the world.

The United States remains committed to its efforts in support of the ultimate global elimination of nuclear, biological, and chemical weapons. It has reduced the nuclear stockpile by over 85 percent since the height of the Cold War and deployed no new nuclear capabilities for over two decades. Nevertheless, 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.

An Evolving and Uncertain International Security Environment

While the United States has continued to reduce the number and salience of nuclear weapons, others, including Russia and China, have moved in the opposite direction. They have added 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 outer space and cyber space. North Korea continues its illicit pursuit of nuclear weapons and missile capabilities in direct violation of United Nations (U.N.) Security Council resolutions. Iran has agreed to constraints on its nuclear program in the Joint Comprehensive Plan of Action (JCPOA). Nevertheless, it retains the technological capability and much of the capacity necessary to develop a nuclear weapon within one year of a decision to do so.

There now exists an unprecedented range and mix of threats, including major conventional, chemical, biological, nuclear, space, and cyber threats, and violent non-state actors. These developments have produced increased uncertainty and risk.

This rapid deterioration of the threat environment since the 2010 NPR must now shape our thinking as we formulate policy and strategy, and initiate the sustainment and replacement of U.S. nuclear forces. This 2018 NPR assesses previous nuclear policies and requirements that were established amid a more benign nuclear environment and more amicable Great Power relations. It focuses on identifying the nuclear policies, strategy, and corresponding capabilities needed to protect America in the deteriorating threat environment that confronts the United States, allies, and partners. It is strategy driven and provides guidance for the nuclear force posture and policy requirements needed now and in the future.

The United States does not wish to regard either Russia or China as an adversary and seeks stable relations with both. We have long sought a dialogue with China to enhance our understanding of our respective nuclear policies, doctrine, and capabilities; to improve

transparency; and to help manage the risks of miscalculation and misperception. We hope that China will share this interest and that meaningful dialogue with China can commence. The United States and Russia have in the past maintained strategic dialogues to manage nuclear competition and nuclear risks. Given Russian actions, including its illegitimate annexation of Crimea, this constructive engagement has declined substantially. We look forward to conditions that would once again allow for peaceful and constructive engagement with Russia.

Nevertheless, this review candidly addresses the challenges posed by Russian, Chinese, and other states' strategic policies, programs, and capabilities, particularly nuclear. It presents the flexible, adaptable, and resilient U.S. nuclear capabilities now required to protect the United States, allies, and partners, and promote strategic stability.

The Value of U.S. Nuclear Capabilities

The fundamental reasons why U.S. nuclear capabilities and deterrence strategies are necessary for U.S., allied, and partner security are readily apparent. U.S. nuclear capabilities make essential contributions to the deterrence of nuclear and non-nuclear aggression. The deterrence effects they provide are unique and essential to preventing adversary nuclear attacks, which is the highest priority of the United States.

U.S. nuclear capabilities cannot prevent all conflict, and should not be expected to do so. But, they contribute uniquely to the deterrence of both nuclear and non-nuclear aggression. They are essential for these purposes and will be so for the foreseeable future. Non-nuclear forces also play essential deterrence roles, but do not provide comparable deterrence effects--as is reflected by past, periodic, and catastrophic failures of conventional deterrence to prevent Great Power war before the advent of nuclear deterrence. In addition, conventional forces alone are inadequate to assure many allies who rightly place enormous value on U.S. extended nuclear deterrence for their security.

U.S. Nuclear Capabilities and Enduring National Objectives

The highest U.S. nuclear policy and strategy priority is to deter potential adversaries from nuclear attack of any scale. However, deterring nuclear attack is not the sole purpose of nuclear weapons. Given the diverse threats and profound uncertainties of the current and future threat environment, U.S. nuclear forces play the following critical roles in U.S. national security strategy. They contribute to the:

- Deterrence of nuclear and non-nuclear attack;
- Assurance of allies and partners;
- Achievement of U.S. objectives if deterrence fails; and
- Capacity to hedge against an uncertain future.

These roles are complementary and interrelated, and the adequacy of U.S. nuclear forces must be assessed against each role and the strategy designed to fulfill it. Preventing proliferation and denying terrorists access to finished weapons, material, or expertise are also key considerations in the elaboration of U.S. nuclear policy and requirements. These multiple roles and objectives constitute the guiding pillars for U.S. nuclear policy and requirements.

230 **Deterrence of Nuclear and Non-Nuclear Attack**

231 Effective U.S. deterrence of nuclear attack and non-nuclear strategic attack requires ensuring that
232 potential adversaries do not miscalculate regarding the consequences of nuclear first use, either
233 regionally or against the United States itself. They must understand that there are no possible
234 benefits from non-nuclear aggression or limited nuclear escalation. Correcting any such
235 misperceptions is now critical to maintaining strategic stability in Europe and Asia.

236 Potential adversaries must recognize that across the emerging range of threats and contexts: 1)
237 the United States is able to identify them and hold them accountable for acts of aggression,
238 including new forms of aggression; 2) we will defeat non-nuclear strategic attacks; and, 3) any
239 nuclear escalation will fail to achieve their objectives, and will instead result in unacceptable
240 consequences for them.

241 There is no “one size fits all” for deterrence. Consequently, the United States will apply a
242 tailored and flexible approach to effectively deter across a spectrum of adversaries, threats, and
243 contexts. Tailored deterrence strategies communicate to different potential adversaries that their
244 aggression would carry unacceptable risks and intolerable costs according to their particular
245 calculations of risk and cost.

246 U.S. nuclear capabilities, and nuclear command, control, and communications (NC3), must be
247 increasingly flexible to tailor deterrence strategies across a range of potential adversaries and
248 threats, and enable adjustments over time. Accordingly, the United States will maintain the
249 range of flexible nuclear capabilities needed to ensure that nuclear or non-nuclear aggression
250 against the United States, allies, and partners will fail to achieve its objectives and carry with it
251 the credible risk of intolerable consequences for potential adversaries now and in the future.

252 To do so, the United States will sustain and replace its nuclear capabilities, modernize NC3, and
253 strengthen the integration of nuclear and non-nuclear military planning. Combatant Commands
254 and Service components will be organized and resourced for this mission, and will plan, train,
255 and exercise to integrate U.S. nuclear and non-nuclear forces to operate in the face of adversary
256 nuclear threats and employment. The United States will coordinate integration activities with
257 allies facing nuclear threats and examine opportunities for additional allied burden sharing of the
258 nuclear deterrence mission.

259 **Assurance of Allies and Partners**

260 The United States has formal extended deterrence commitments that assure European, Asian, and
261 Pacific allies. Assurance is a common goal based on collaboration with allies and partners to
262 deter or defeat the threats we face. No country should doubt the strength of our assurance
263 commitments or the strength of U.S. and allied capabilities to deter, and if necessary defeat, any
264 potential adversary’s nuclear or non-nuclear aggression. In many cases, effectively assuring
265 allies and partners depends on their confidence in the credibility of U.S. extended nuclear
266 deterrence, which enables most to eschew possession of nuclear weapons, thereby contributing to
267 U.S. non-proliferation goals.

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269

270 **Achieve U.S. Objectives Should Deterrence Fail**

271 If deterrence fails, the United States will strive to end any conflict at the lowest level of damage
272 possible and on the best achievable terms for the United States, allies, and partners. U.S. nuclear
273 policy for decades has consistently included this objective of limiting damage if deterrence fails.

274 **Hedge Against an Uncertain Future**

275 The United States will continue efforts to create a more cooperative and benign security
276 environment, but must also hedge against prospective and unanticipated risks. Hedging
277 strategies help reduce risk and avoid threats that otherwise may emerge over time, including
278 geopolitical, technological, operational, and programmatic. They also contribute to deterrence
279 and can help reduce potential adversaries' confidence that they can gain advantage through a
280 "break out" or expansion of nuclear capabilities. Given the increasing prominence of nuclear
281 weapons in potential adversaries' defense policies and strategies, and the uncertainties of the
282 future threat environment, U.S. nuclear capabilities and the ability to quickly modify those
283 capabilities can be essential to mitigate or overcome risk, including the unexpected.

284 **U.S. Nuclear Enterprise Personnel**

285 Effective deterrence would be impossible without the thousands of members of the United States
286 Armed Forces and civilian personnel who dedicate their professional lives to the deterrence of
287 war and protecting the Nation. These exceptional men and women are held to the most rigorous
288 standards and make the most vital contribution to U.S. nuclear capabilities and deterrence.

289 The service members and civilians involved in the nuclear deterrence mission do so with little
290 public recognition or fanfare. Theirs is an unsung duty of the utmost importance. They deserve
291 the support of the American people for the safety, security, and stability they provide the Nation,
292 and indeed the world. The service reforms we have accordingly implemented were long
293 overdue, and the Department of Defense remains fully committed to properly supporting the
294 service members who protect the United States against nuclear threats.

295 **The Triad: Present and Future**

296 Today's strategic nuclear Triad, largely deployed in the 1980s or earlier, consists of: submarines
297 (SSBNs) armed with submarine-launched ballistic missiles (SLBM); land-based intercontinental
298 ballistic missiles (ICBM); and strategic bombers carrying gravity bombs and air-launched cruise
299 missiles (ALCMs). The Triad and non-strategic nuclear forces, with supporting NC3, provides
300 diversity and flexibility as needed to tailor U.S. strategies for deterrence, assurance, achieving
301 objectives should deterrence fail, and hedging.

302 The increasing need for this diversity and flexibility, in turn, is one of the primary reasons why
303 sustaining and replacing the nuclear Triad and non-strategic nuclear capabilities, and
304 modernizing NC3, is necessary now. The Triad's synergy and overlapping attributes help ensure
305 the enduring survivability of our deterrence capabilities against attack and our capacity to hold at
306 risk a range of adversary targets throughout a crisis or conflict. Eliminating any leg of the Triad
307 would greatly ease adversary attack planning and allow an adversary to concentrate resources
308 and attention on defeating the remaining two legs. Therefore, we will sustain our legacy Triad
309 systems until the planned replacement programs are deployed.

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310 The United States currently operates 14 OHIO-class SSBNs and will continue to take the steps
311 needed to ensure that OHIO SSBNs remain operationally effective and survivable until replaced
312 by the COLUMBIA-class SSBN. The COLUMBIA program will deliver a minimum of 12
313 SSBNs to replace the current OHIO fleet and is designed to provide required deterrence
314 capabilities for decades.

315 The ICBM force consists of 400 single-warhead Minuteman III missiles deployed in
316 underground silos and dispersed across several states. The United States has initiated the
317 Ground-Based Strategic Deterrent (GBSD) program to begin the replacement of Minuteman III
318 in 2029. The GBSD program will also modernize the 450 ICBM launch facilities that will
319 support the fielding of 400 ICBMs.

320 The bomber leg of the Triad consists of 46 nuclear-capable B-52H and 20 nuclear-capable B-2A
321 “stealth” strategic bombers. The United States has initiated a program to develop and deploy the
322 next-generation bomber, the B-21 Raider. It will first supplement, and eventually replace
323 elements of the conventional and nuclear-capable bomber force beginning in the mid-2020s.

324 The B83-1 and B61-11 gravity bombs can hold at risk a variety of protected targets. As a result,
325 both will be retained in the stockpile, at least until there is sufficient confidence in the B61-12
326 gravity bomb that will be available in 2020.

327 Beginning in 1982, B-52H bombers were equipped with ALCMs. Armed with ALCMs, the B-
328 52H can stay outside adversary air defenses and remain effective. The ALCM, however, is now
329 more than 25 years past its design life and faces continuously improving adversary air defense
330 systems. The Long-Range Stand-Off (LRSO) cruise missile replacement program will maintain
331 into the future the bomber force capability to deliver stand-off weapons that can penetrate and
332 survive advanced integrated air defense systems.

333 The current non-strategic nuclear force consists exclusively of a relatively small number of B61
334 gravity bombs carried by F-15E and allied F-16 dual capable aircraft (DCA). The United States
335 is incorporating nuclear capability onto the forward-deployable, nuclear-capable F-35A as a
336 replacement for the current aging DCA. In conjunction with the ongoing life extension program
337 for the B61 bomb, it will be a key contributor to continued regional deterrence stability and the
338 assurance of allies.

339 **Flexible and Secure Nuclear Capabilities: An Affordable Priority**

340 Throughout past decades, senior U.S. officials have emphasized that the highest priority of the
341 Department of Defense (DoD) is deterring nuclear attack and maintaining the nuclear capabilities
342 necessary to do so. While cost estimates for the program to sustain and replace U.S. nuclear
343 capabilities vary, even the highest of these projections place the highpoint of the future cost at
344 approximately 6.4 percent of the current DoD budget. Maintaining and operating our current
345 aging nuclear forces now requires between two and three percent of the DoD budget. The
346 replacement program to rebuild the Triad for decades of service will peak for several years at
347 only approximately four percent beyond the ongoing two to three percent needed for
348 maintenance and operations. This 6.4 percent of the current DoD budget required for the long-
349 term replacement program represents less than one percent of the overall federal budget. This
350 level of spending to replace U.S. nuclear capabilities compares favorably to the 13.9 percent of

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351 the DoD budget required during the last such investment period in the 1980s, which at the time
352 was almost 3.2 percent of the federal budget, and the 24.9 percent of the DoD budget required in
353 the early 1960s.

354 Given the criticality of effective U.S. nuclear deterrence to the safety of the American people,
355 allies and partners there is no doubt that the sustainment and replacement program should be
356 regarded as both necessary and affordable.

357 **Enhancing Deterrence with Non-strategic Nuclear Capabilities**

358 Existing elements of the nuclear force replacement program predate the dramatic deterioration of
359 the strategic environment. To meet the emerging requirements of U.S. strategy, the United
360 States will now pursue select supplements to the replacement program to enhance the flexibility
361 and responsiveness of U.S. nuclear forces. It is a reflection of the versatility and flexibility of the
362 U.S. Triad that only modest supplements are now required in this much more challenging threat
363 environment.

364 These supplements will enhance deterrence by denying potential adversaries any mistaken
365 confidence that limited nuclear employment can provide a useful advantage over the United
366 States and its allies. For example, Russia's belief that limited nuclear first use, potentially
367 including low-yield weapons, can provide such an advantage is based, in part, on Moscow's
368 perception that its greater number and variety of non-strategic nuclear systems provide a
369 coercive advantage in crises and at lower levels of conflict. Correcting this mistaken Russian
370 perception is a strategic imperative.

371 To address these types of challenges and preserve deterrence stability, the United States will
372 enhance the flexibility and range of its tailored deterrence options. To be clear, this is not
373 intended to, nor does it enable, "nuclear war-fighting." Expanding flexible U.S. nuclear options
374 now, to include low-yield options, is important for the preservation of credible deterrence against
375 regional aggression. It will raise the nuclear threshold and help ensure that potential adversaries
376 perceive no possible advantage in limited nuclear escalation, making nuclear employment less
377 likely.

378 Consequently, the United States will maintain, and enhance as necessary, the capability to
379 forward deploy nuclear bombers and DCA around the world. We are committed to upgrading
380 DCA with the nuclear-capable F-35A aircraft. We will work with NATO to best ensure—and
381 improve where needed—the readiness, survivability, and operational effectiveness of DCA based
382 in Europe.

383 Additionally, in the near-term, the United States will modify a small number of existing SLBM
384 warheads to provide a low-yield option, and in the longer term, pursue a modern nuclear-armed
385 sea-launched cruise missile (SLCM). Unlike DCA, a low-yield SLBM warhead and SLCM will
386 not require or rely on host nation support to provide deterrent effect. They will provide
387 additional diversity in platforms, range, and survivability, and a valuable hedge against future
388 nuclear "break out" scenarios.

389 DoD and National Nuclear Security Administration (NNSA) will develop for deployment a low-
390 yield SLBM warhead to ensure a prompt response option that is able to penetrate adversary

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defenses. This is a comparatively low-cost and near term modification to an existing capability that will help counter any mistaken perception of an exploitable “gap” in U.S. regional deterrence capabilities.

In addition to this near-term step, for the longer term the United States will pursue a nuclear-armed SLCM, leveraging existing technologies to help ensure its cost effectiveness. SLCM will provide a needed non-strategic regional presence, an assured response capability, and an INF-Treaty compliant response to Russia’s continuing Treaty violation.

In the 2010 NPR, the United States announced the retirement of its previous nuclear-armed SLCM, which for decades had contributed to deterrence and the assurance of allies, particularly in Asia. We will immediately begin efforts to restore this capability by initiating a requirements study leading to an Analysis of Alternatives (AoA) for the rapid development of a modern SLCM.

These supplements to the planned nuclear force replacement program are prudent options for enhancing the flexibility and diversity of U.S. nuclear capabilities. They are compliant with all treaties and agreements, and together, they will: provide a diverse set of characteristics enhancing our ability to tailor deterrence and assurance; expand the range of credible U.S. options for responding to nuclear or non-nuclear strategic attack; and, enhance deterrence by signaling to potential adversaries that their limited nuclear escalation offers no exploitable advantage.

Nuclear Command, Control, and Communications Modernization

The United States must have an NC3 system that provides control of U.S. nuclear forces at all times, even under the enormous stress of a nuclear attack. NC3 capabilities must assure the integrity of transmitted information and possess the resiliency and survivability necessary to reliably overcome the effects of nuclear attack. During peacetime and crisis, the NC3 system performs five crucial functions: detection, warning, and attack characterization; adaptive nuclear planning; decision-making conferencing; receiving Presidential orders; and enabling the management and direction of forces.

Today’s NC3 system is a legacy of the Cold War, last comprehensively updated almost three decades ago. It includes interconnected elements composed of warning satellites and radars; communications satellites, aircraft, and ground stations; fixed and mobile command posts; and the control centers for nuclear systems.

While once state-of-the-art, the NC3 system is now subject to challenges from both aging system components and new, growing 21st century threats. Of particular concern are expanding threats in space and cyber space, adversary strategies of limited nuclear escalation, and the broad diffusion within DoD of authority and responsibility for governance of the NC3 system, a function which, by its nature, must be integrated.

In light of the critical need to ensure our NC3 system remains survivable and effective, the United States will pursue a series of initiatives. This includes: strengthening protection against cyber threats, strengthening protection against space-based threats, enhancing integrated tactical warning and attack assessment, improving command post and communication links, advancing

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431 decision support technology, integrating planning and operations, and reforming governance of
432 the overall NC3 system.

433 **Nuclear Weapons Infrastructure**

434 An effective, responsive, and resilient nuclear weapons infrastructure is essential to the U.S.
435 capacity to adapt flexibly to shifting requirements. Such an infrastructure offers tangible
436 evidence to both allies and potential adversaries of U.S. nuclear weapons capabilities and thus
437 contributes to deterrence, assurance, and hedging against adverse developments. It also
438 discourages adversary interest in arms competition.

439 DoD generates military requirements for the nuclear warheads to be carried on delivery
440 platforms. NNSA oversees the research, development, test, assessment, and production
441 programs that respond to DoD warhead requirements.

442 Over the past several decades, the U.S. nuclear weapons infrastructure has suffered the effects of
443 age and underfunding. Over half of NNSA's infrastructure is over 40 years old, and a quarter
444 dates back to the Manhattan Project era. All previous NPRs highlighted the need to maintain a
445 modern nuclear weapons infrastructure, but the United States has fallen short in sustaining a
446 modern infrastructure that is resilient and has the capacity to respond to unforeseen
447 developments. There now is no margin for further delay in recapitalizing the physical
448 infrastructure needed to produce strategic materials and components for U.S. nuclear weapons.
449 Just as our nuclear forces are an affordable priority, so is a resilient and effective nuclear
450 weapons infrastructure, without which our nuclear deterrent cannot exist.

- 451 • The U.S. must have the ability to maintain and certify a safe, secure, and effective
452 nuclear arsenal. Synchronized with DoD replacement programs, the United States will
453 sustain and deliver on-time the warheads needed to support both strategic and non-
454 strategic nuclear capabilities by: Completing the W76-1 LEP by Fiscal Year (FY) 2019;
- 455 • Completing the B61-12 LEP by FY2024;
- 456 • Completing the W88 alterations by FY2024;
- 457 • Synchronizing NNSA's W80-4 life extension, with DoD's LRSO program and
458 completing the W80-4 LEP by FY2031;
- 459 • Advancing the W78 warhead replacement one year to FY19 to support fielding on GBSD
460 by 2030 and investigate the feasibility of fielding the nuclear explosive package in a
461 Navy flight vehicle;
- 462 • Sustaining the B83-1 past its currently planned retirement date until a suitable
463 replacement is identified; and,
- 464 • Exploring future ballistic missile warhead requirements based on the threats and
465 vulnerabilities of potential adversaries, including the possibility of common reentry
466 systems between Air Force and Navy systems.

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The United States will pursue initiatives to ensure the necessary capability, capacity, and responsiveness of the nuclear weapons infrastructure and the needed skills of the workforce, including the following:

- Pursue a joint DoD and Department of Energy advanced technology development capability to ensure that efforts are appropriately integrated to meet DoD needs.
- Provide the enduring capability and capacity to produce plutonium pits at a rate of no fewer than 80 pits per year by 2030. A delay in this would result in the need for a higher rate of pit production at higher cost.
- Ensure that current plans to reconstitute the U.S. capability to produce lithium compounds are sufficient to meet military requirements.
- Fully fund the Uranium Processing Facility and ensure availability of sufficient low enriched uranium to meet military requirements.
- Ensure the necessary reactor capacity to produce an adequate supply of tritium to meet military requirements.
- Ensure continuity in the U.S. capability to develop and manufacture secure, trusted strategic radiation-hardened microelectronic systems beyond 2025 to support stockpile modernization.
- Rapidly pursue the Stockpile Responsiveness Program established by Congress to expand opportunities for young scientists and engineers to advance warhead design, development, and production skills.
- Develop an NNSA roadmap that sizes production capacity to modernization and hedging requirements.
- Retain confidence in nuclear gravity bombs needed to meet deterrence needs.
- Maintain and enhance the computational, experimental, and testing capabilities needed to annually assess nuclear weapons.

Countering Nuclear Terrorism

The U.S. strategy to combat nuclear terrorism encompasses a wide range of activities that comprise a defense-in-depth against current and emerging dangers. Under this multilayered approach, the United States strives to prevent terrorists from obtaining nuclear weapons or weapons-usable materials, technology, and expertise; counter their efforts to acquire, transfer, or employ these assets; and respond to nuclear incidents, by locating and disabling a nuclear device or managing the consequences of a nuclear detonation.

For effective deterrence, the United States will hold fully accountable any state, terrorist group, or other non-state actor that supports or enables terrorist efforts to obtain or employ nuclear devices. Although the role of U.S. nuclear weapons in countering nuclear terrorism is limited, our adversaries must understand that a terrorist nuclear attack against the United States or its

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allies and partners would qualify as an “extreme circumstance” under which the United States could consider the ultimate form of retaliation.

Non-proliferation and Arms Control

Effective nuclear non-proliferation and arms control measures can support U.S., allied, and partner security by controlling the spread of nuclear materials and technology; placing limits on the production, stockpiling and deployment of nuclear weapons; decreasing misperception and miscalculation; and avoiding destabilizing nuclear arms competition. The United States will continue its efforts to: 1) minimize the number of nuclear weapons states, including by maintaining credible U.S. extended nuclear deterrence and assurance; 2) deny terrorist organizations access to nuclear weapons and materials; 3) strictly control weapons-usable material, related technology, and expertise; and 4) seek arms control agreements that enhance security, and are verifiable and enforceable.

The Nuclear Non-Proliferation Treaty (NPT) is a cornerstone of the nuclear non-proliferation regime. It plays a positive role in building consensus for non-proliferation and enhances international efforts to impose costs on those that would pursue nuclear weapons outside the Treaty.

However, nuclear non-proliferation today faces acute challenges. Most significantly, North Korea is pursuing a nuclear path in direct contravention of the NPT and in direct opposition to numerous U.N. Security Council resolutions. Beyond North Korea looms the challenge of Iran. Although the JCPOA may constrain Tehran’s nuclear weapons program, there is little doubt Iran could achieve a nuclear weapon capability rapidly if it decides to do so.

In continuing support of nuclear non-proliferation, the United States will work to increase transparency and predictability, where appropriate, to avoid potential miscalculation among nuclear weapons states and other possessor states through strategic dialogues, risk-reduction communications channels, and the sharing of best practices related to nuclear weapons safety and security.

Although the United States does not support ratification of the Comprehensive Nuclear Test Ban Treaty, it will continue to support the Comprehensive Nuclear Test Ban Treaty Organization Preparatory Committee and, through the U.S. Atomic Energy Detection System, continue its support for the related International Monitoring System and the International Data Center. The United States will not resume nuclear explosive testing unless necessary to ensure the safety and effectiveness of the U.S. nuclear arsenal, and calls on all states possessing nuclear weapons to declare or maintain a moratorium on nuclear testing.

Arms control can contribute to U.S. security by helping to manage strategic competition among states. It can foster transparency, understanding, and predictability in adversary relations, thereby reducing the risk of misunderstanding and miscalculation.

The United States is committed to arms control efforts that advance U.S., allied, and partner security; are verifiable and enforceable; and include partners that comply responsibly with their obligations. Such arms control efforts can contribute to the U.S. capability to sustain strategic stability. Further progress is difficult to envision, however, in an environment that is

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543 characterized by continuing significant non-compliance with existing arms control obligations
544 and commitments, and by potential adversaries who seek to change borders and overturn existing
545 norms.

546 In this regard, Russia continues to violate a series of arms control treaties and commitments. In
547 the nuclear context, the most significant Russian violation involves a system banned by the
548 Intermediate-range Nuclear Forces Treaty. In a broader context, Russia is either rejecting or
549 avoiding its obligations and commitments under numerous agreements, and has rebuffed U.S.
550 efforts to follow the New Strategic Arms Reduction Treaty (START) with another round of
551 negotiated reductions and to pursue reductions in non-strategic nuclear forces.

552 Nevertheless, New START is in effect through February 2021, and with mutual agreement may
553 be extended for up to five years, to 2026. The United States already has met the Treaty's central
554 limits which go into force on February 5, 2018, and will continue to implement the New START
555 Treaty.

556 The United States remains willing to engage in a prudent arms control agenda. We are prepared
557 to consider arms control opportunities that return parties to compliance, predictability, and
558 transparency, and remain receptive to future arms control negotiations if conditions permit and
559 the potential outcome improves the security of the United States, its allies, and partners.

560 I. Introduction

561 *“The Secretary shall initiate a new Nuclear Posture Review to ensure that the United States*
562 *nuclear deterrent is modern, robust, flexible, resilient, ready and appropriately tailored to*
563 *deter 21st century threats and reassure our allies.”*

564 **President Donald Trump, 2017**

565 On January 27, 2017, President Donald Trump directed Secretary of Defense James Mattis to
566 initiate a new Nuclear Posture Review (NPR). The President made clear that his first priority is
567 to protect the United States, allies and partners. He emphasized both the long-term goal of
568 eliminating nuclear weapons and the requirement that the United States have modern, flexible,
569 and resilient nuclear capabilities that are safe, secure, and effective until such a time as nuclear
570 weapons can prudently be eliminated from the world.

571 The United States remains committed to its efforts in support of the ultimate global elimination
572 of nuclear, biological, and chemical weapons. It has negotiated multiple arms control treaties
573 and has fully abided by its treaty commitments. In addition, the United States has deployed no
574 new nuclear capabilities for over two decades, continuously advanced further nuclear reduction
575 and non-proliferation initiatives to Russia and others, and strengthened alliance commitments
576 and capabilities to safeguard international order and prevent further proliferation of nuclear
577 weapons.

578 Nevertheless, global threat conditions have worsened markedly since the most recent, 2010 NPR.
579 There now exist an unprecedented range and mix of threats, including major conventional,
580 chemical, biological, nuclear, space, and cyber threats, and violent non-state actors. International
581 relations are volatile. Russia and China are contesting the international norms and order we have
582 worked with our allies, partners, and members of the international community to build and
583 sustain. Some regions are marked by persistent disorder that appears likely to continue and
584 possibly intensify. These developments have produced increased uncertainty and risk.

585 While the United States has continued to reduce the number and salience of nuclear weapons,
586 others, including Russia and China, have moved in the opposite direction. Russia has expanded
587 and improved its strategic and non-strategic nuclear forces. China's military modernization has
588 resulted in an expanded nuclear force, with little to no transparency into its intentions. North
589 Korea continues its illicit pursuit of nuclear weapons and missile capabilities in direct violation
590 of United Nations (U.N.) Security Council resolutions. Russia and North Korea have increased
591 the salience of nuclear forces in their strategies and plans and have engaged in increasingly
592 explicit nuclear threats. Along with China, they have also engaged in increasingly aggressive
593 behavior in outer space and cyber space.

594 As a result, the 2018 NPR assesses recent nuclear policies and requirements that were
595 established amid a more benign nuclear environment and more amicable Great Power relations.
596 It focuses on identifying the nuclear policies, strategy, and corresponding capabilities needed to
597 protect America, its allies, and partners in a deteriorating threat environment. It is strategy
598 driven and provides guidance for the nuclear force structure and policy requirements needed now
599 and in the future to maintain peace and stability in a rapidly shifting environment with significant
600 future uncertainty.

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601 The current threat environment and future uncertainties now necessitate a national commitment
602 to maintain modern and effective nuclear forces, as well as the infrastructure needed to support
603 them. Consequently, the United States has initiated a series of programs to sustain and replace
604 existing nuclear capabilities before they reach the end of their service lives. These programs are
605 critical to preserving our ability to deter threats to the Nation.

606

II. An Evolving and Uncertain International Security Environment

“For the first time in 25 years, the United States is facing a return to great power competition. Russia and China both have advanced their military capabilities to act as global powers...Others are now pursuing advanced technology, including military technologies that were once the exclusive province of great powers – this trend will only continue.”

Chief of Naval Operations, Admiral John Richardson, 2017

Each previous NPR emphasized that changes in the international security environment shape U.S. nuclear policy, strategy, and posture. The U.S. Joint Chiefs of Staff recently assessed that the emerging security environment, “can be described by simultaneous and connected challenges—contested norms and persistent disorder.” The rapid deterioration of the threat environment since the 2010 NPR must now shape our thinking as we formulate policy and strategy, while we sustain and replace U.S. nuclear capabilities.

The last NPR was based on a number of key findings and expectations regarding the nature of the security environment that have not since been realized. Most notably, it reflected the expectations that:

- The prospects for military confrontation with Russia, or among Great Powers, had declined and would continue to decline dramatically.
- The United States could decrease incentives for nuclear proliferation globally and reduce the likelihood of nuclear weapons employment by reducing both the role of nuclear weapons in U.S. national security strategy and the number of nuclear weapons in the U.S. arsenal. This was based in part on the aspiration that if the United States took the lead in reducing nuclear arms, other nuclear-armed states would follow.

U.S. efforts to reduce the roles and numbers of nuclear weapons, and convince other states to do the same, have included reducing the U.S. nuclear stockpile by over 85 percent since its Cold War high. Potential adversaries, however, have expanded and modernized their nuclear forces. This and additional negative developments in the international security environment presents new and serious challenges to U.S., allied and partner security. They have rendered our earlier, sanguine findings and expectations an outdated basis for U.S. nuclear policy, strategy, and posture going forward.

The Return of Great Power Competition

Since 2010 we have seen the return of Great Power competition. To varying degrees, Russia and China have made clear they seek to substantially revise the post-Cold War international order and norms of behavior. Russia has demonstrated its willingness to use force to alter the map of Europe and impose its will on its neighbors, backed by implicit and explicit nuclear first-use threats. Russia is in violation of its international legal and political commitments that directly affect the security of others, including the 1987 Intermediate-Range Nuclear Forces (INF) Treaty, the 2002 Open Skies Treaty, and the 1991 Presidential Nuclear Initiatives. Its occupation and illegitimate annexation of Crimea and direct support for Russia-led forces in Eastern Ukraine violate its commitment to respect the territorial integrity of Ukraine that they made in the 1994

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Budapest Memorandum. China has rejected the ruling of the Permanent Court of Arbitration Tribunal that found China's maritime claims in the South China Sea to be without merit and some of its related activities illegal under the U.N. Convention on the Law of the Sea and customary international law. Subsequently, China has continued to undertake assertive military initiatives to create "facts on the ground" in support of its territorial claims over features in the East and South China Seas.

Russia and China are pursuing asymmetric ways and means to counter U.S. conventional capabilities, thereby increasing the risk of miscalculation and the potential for military confrontation with the United States, its allies, and partners. Both countries are developing counter-space military capabilities to deny the United States the ability to conduct space-based intelligence, surveillance, and reconnaissance (ISR); nuclear command, control, and communications (NC3); and positioning, navigation, and timing. Both seek to develop offensive cyberspace capabilities to deter, disrupt, or defeat U.S. forces dependent on computer networks. Both are fielding an array of anti-access area denial (A2AD) capabilities and underground facilities to counter U.S. precision conventional strike capabilities and to raise the cost for the United States to reinforce its European and Asian allies and partners. While nuclear weapons play a deterrent role in both Russian and Chinese strategy, Russia may also rely on threats of limited nuclear first use, or actual first use, to coerce us, our allies, and partners into terminating a conflict on terms favorable to Russia.

The United States does not wish to regard either Russia or China as an adversary and seeks stable relations with both. We continue to seek a dialogue with China to enhance our understanding of our respective nuclear policies, doctrine, and capabilities; to improve transparency; and to help manage the risks of miscalculation and misperception. The United States and Russia have in the past maintained strategic dialogues to manage nuclear competition and nuclear risks. Given Russian actions, including its illegitimate annexation of Crimea, this constructive engagement has declined substantially. The United States looks forward to a new day when Russia engages with the United States, its allies, and partners peacefully and constructively, without aggressive actions and coercive nuclear threats.

Nevertheless, this review candidly addresses the challenges posed by Russian, Chinese, and other states' strategic policies, programs, and capabilities, particularly nuclear, and the flexible, adaptable, and resilient U.S. nuclear capabilities required to protect the United States, allies and partners.

Other Nuclear-Armed States Have Not Followed Our Lead

Despite concerted U.S. efforts to reduce the role of nuclear weapons in international affairs and to negotiate reductions in the number of nuclear weapons, since 2010 no potential adversary has reduced either the role of nuclear weapons in its national security strategy or the number of nuclear weapons it fields. Rather, they have moved decidedly in the opposite direction. As a result, there is an increased potential for regional conflicts involving nuclear-armed adversaries in several parts of the world and the potential for adversary nuclear escalation in crises or conflict.

Figure 1 illustrates the marked difference between U.S. efforts to reduce the salience of nuclear weapons and the contrary actions of others over the past decade.

708 *“Nuclear ambitions in the US and Russia over the last 20 years have evolved in opposite*
709 *directions. Reducing the role of nuclear weapons in US security strategy is a US objective,*
710 *while Russia is pursuing new concepts and capabilities for expanding the role of nuclear*
711 *weapons in its security strategy.”*

712 - U.S. National Intelligence Council, 2012

713 Russia possesses significant advantages in its nuclear weapons production capacity and in non-
714 strategic nuclear forces over the U.S. and allies. It is also building a large, diverse, and modern
715 set of non-strategic systems that are dual-capable (may be armed with nuclear or conventional
716 weapons). These theater- and tactical-range systems are not accountable under the New START
717 Treaty and Russia's non-strategic nuclear weapons modernization is increasing the total number
718 of such weapons in its arsenal, while significantly improving its delivery capabilities. This
719 includes the production, possession, and flight testing of a ground-launched cruise missile in
720 violation of the INF Treaty. Moscow believes these systems may provide useful options for
721 escalation advantage. Finally, despite Moscow's frequent criticism of U.S. missile defense,
722 Russia is also modernizing its long-standing nuclear-armed ballistic missile defense system and
723 designing a new ballistic missile defense interceptor.

724 Russia's increased reliance on nuclear capabilities to include coercive threats, nuclear
725 modernization programs, refusal to negotiate *any* limits on its non-strategic nuclear forces, and
726 its decision to violate the INF Treaty and other commitments all clearly indicate that Russia has
727 rebuffed repeated U.S. efforts to reduce the salience, role, and number of nuclear weapons.

728 *China*

729 Consistent with Chinese President Xi's statement at the 19th Party Congress that China's military
730 will be “fully transformed into a first tier force” by 2050, China continues to increase the
731 number, capabilities, and protection of its nuclear forces. While China's declaratory policy and
732 doctrine have not changed, its lack of transparency regarding the scope and scale of its nuclear
733 modernization program raises questions regarding its future intent. China has developed a new
734 road-mobile strategic intercontinental ballistic missile (ICBM), a new multi-warhead version of
735 its DF-5 silo-based ICBM, and its most advanced ballistic missile submarine armed with new
736 submarine-launched ballistic missiles (SLBM). It has also announced development of a new
737 nuclear-capable strategic bomber, giving China a nuclear triad. China has also deployed a
738 nuclear-capable precision guided DF-26 intermediate-range ballistic missile capable of attacking
739 land and naval targets. As with Russia, despite criticizing U.S. missile defense, China has
740 announced that it is testing a new mid-course missile defense system, plans to develop sea-based
741 mid-course ballistic missile defense, and is developing theater ballistic missile defense systems,
742 but has provided few details.

743 **Proliferation and Nuclear Terrorism**

744 The security environment has worsened given these developments and the threats posed by
745 further proliferation of nuclear weapons, potentially including proliferation to extremist groups.

746 *North Korea*

747 North Korea has accelerated its provocative pursuit of nuclear weapons and missile capabilities,
748 and expressed explicit threats to use nuclear weapons against the United States and its allies in
749 the region. North Korean officials insist that they will not give up nuclear weapons, and North
750 Korea may now be only months away from the capability to strike the United States with
751 nuclear-armed ballistic missiles. In the past few years, North Korea has dramatically increased
752 its missile flight testing, most recently including the testing of intercontinental-range missiles
753 capable of reaching the U.S. homeland. It has conducted six nuclear tests since 2006, including a
754 test of a significantly higher-yield device. Further, North Korea continues to produce plutonium
755 and highly-enriched uranium for nuclear weapons. Given North Korea's current and emerging
756 nuclear capabilities; existing chemical, biological, and conventional capabilities; and extremely
757 provocative rhetoric and actions, it has come to pose an urgent and unpredictable threat to the
758 United States, allies, and partners. Consequently, the United States reaffirms that North Korea's
759 illicit nuclear program must be completely, verifiably, and irreversibly eliminated, resulting in a
760 Korean Peninsula free of nuclear weapons.

761 North Korea's continued pursuit of nuclear weapons capabilities poses the most immediate and
762 dire proliferation threat to international security and stability. In addition to explicit nuclear
763 threats enabled by North Korea's development of nuclear weapons and delivery systems, North
764 Korea poses a "horizontal" proliferation threat as a potential source of nuclear weapons or
765 nuclear materials for other proliferators. North Korea's nuclear weapons program also increases
766 nuclear proliferation pressures on non-nuclear weapon states that North Korea directly and
767 explicitly threatens with nuclear attack.

768 *"North Korea's nuclear weapons and missile programs will continue to pose a serious threat*
769 *to US interests and to the security environment in East Asia in 2017. North Korea's export of*
770 *ballistic missiles and associated materials to several countries, including Iran and Syria, and*
771 *its assistance to Syria's construction of a nuclear reactor, destroyed in 2007, illustrate its*
willingness to proliferate dangerous technologies."

772 - Director of National Intelligence, Daniel R. Coats,
773 *Worldwide Threat Assessment, 2017*

774 *Iran*

775 Iran, too, poses proliferation threats. Iran's Supreme Leader, Ayatollah Ali Khamenei, has most
776 recently stated that, "America is the number one enemy of our nation." While Iran has agreed to
777 constraints on its nuclear program in the Joint Comprehensive Plan of Action (JCPOA), many of
778 the agreement's restrictions on Iran's nuclear program will end by 2031. In addition, Iran retains
779 the technological capability and much of the capacity necessary to develop a nuclear weapon
780 within one year of a decision to do so. Iran's development of increasingly long-range ballistic
781 missile capabilities, and its aggressive strategy and activities to destabilize neighboring
782 governments, raises questions about its long-term commitment to foregoing nuclear weapons
783 capability. Were Iran to pursue nuclear weapons after JCPOA restrictions end, pressures on
784 other countries in the region to acquire their own nuclear weapons would increase.

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785 Nuclear terrorism remains a threat to the United States and to international security and stability.
786 Preventing the illicit acquisition of a nuclear weapon, nuclear materials, or related technology
787 and expertise by a violent extremist organization is a significant U.S. national security priority.
788 The more states--particularly rogue states--that possess nuclear weapons or the materials,
789 technology, and knowledge required to make them, the greater the potential risk of terrorist
790 acquisition. Further, given the nature of terrorist ideologies, we must assume that they would
791 employ a nuclear weapon were they to acquire one.

792 **Uncertainties Regarding the Future Security Environment and the Threats it May Pose**

793 The significant and rapid worsening of the international security environment since the 2010
794 NPR demonstrates that unanticipated developments and uncertainty about near- and long-term
795 threats to the United States, allies, and partners are factors we must consider in formulating U.S.
796 nuclear policy, strategy, and posture. These uncertainties are a concern in the near term, and
797 potentially profound in the long term. Because this NPR lays the policy, strategy, and
798 programmatic foundation for sustaining and replacing the entire U.S. nuclear force needed to
799 address threats decades into the future, it focuses on the implications of such uncertainties.

800 There are two forms of uncertainty regarding the future security environment which U.S. nuclear
801 policy, strategy, and posture must take into account. The first is geopolitical uncertainty. This
802 includes the potential for rapid shifts in how other states view the United States, its allies, and
803 partners; changing alignments among other states; and relative power shifts in the international
804 system. The collapse of the government of a nuclear-armed state or a so-called "proliferation
805 cascade" would also fall in this category.

806 The second form of uncertainty is technological. This includes the potential for unanticipated
807 technological breakthroughs in the application of existing technologies, or the development of
808 wholly new technologies, that change the nature of the threats we face and the capabilities
809 required to address them effectively. For example, breakthroughs that would render U.S. nuclear
810 forces or U.S. command and control of those forces highly vulnerable to attack would
811 dramatically affect U.S. nuclear force requirements, policy, and posture. The proliferation of
812 highly-lethal biological weapons is another example.

813 Such geopolitical and technological uncertainties are, by definition, unpredictable, particularly
814 over the long term. Yet, it is near certain that unanticipated developments will arise.
815 Consequently, we must take them into account to the extent possible as we plan the U.S. nuclear
816 forces and related capabilities needed now and in future decades.

817

III. Why U.S. Nuclear Capabilities?

“Our nuclear deterrent underwrites all courses of diplomacy and every military operation...there is a direct line between a safe, secure, and reliable nuclear deterrent...and our responsibility as global defenders of freedom.”

U.S. Air Force Chief of Staff, General David Goldfein, 2017

U.S. Nuclear Capabilities

The fundamental reasons why U.S. nuclear capabilities and deterrence strategies are necessary for U.S., allied, and partner security are readily apparent. As Secretary of Defense Mattis has observed, “a safe, secure, and effective nuclear deterrent is there to ensure a war that can never be won, is never fought.” The deterrence effects they provide are unique and essential to preventing adversary nuclear attacks, which is the highest defense priority of the United States.

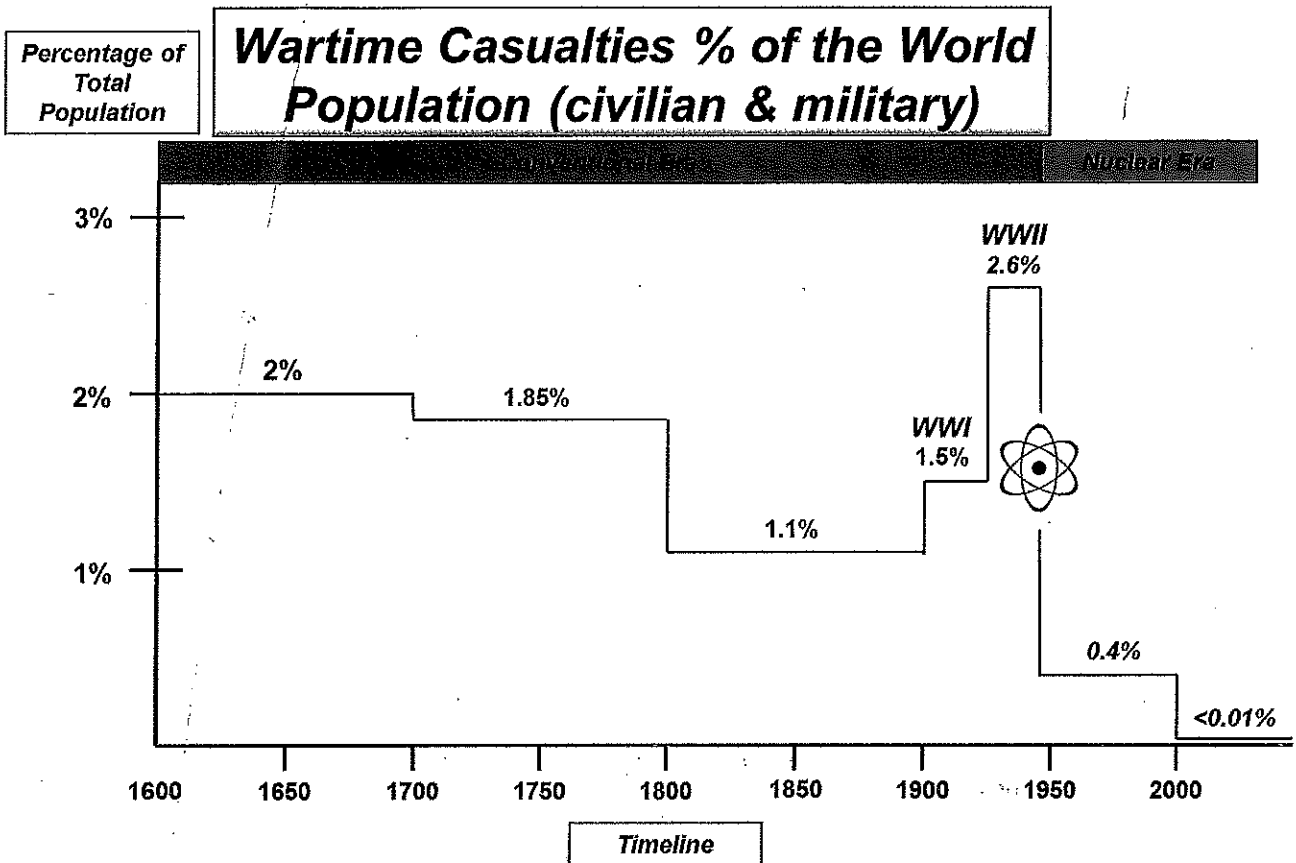
U.S. nuclear capabilities cannot prevent all conflict or provocations, and should not be expected to do so. But, the U.S. Triad of strategic bombers, ICBMs, and SLBMs, supplemented by dual-capable aircraft (DCA), overshadows any adversary’s calculations of the prospective benefits of aggression and thus contributes uniquely both to deterring nuclear and non-nuclear attack and to assuring allies and partners. The Triad and DCA are essential for these purposes, and will be so for the foreseeable future. As the Bipartisan Congressional Strategic Posture Commission—led by former Defense Secretaries William Perry and James Schlesinger—emphasized in 2009, “The conditions that might make possible the global elimination of nuclear weapons are not present today and their creation would require a fundamental transformation of the world political order.” That fundamental transformation has not since taken place, nor is it emerging.

For centuries prior to the era of nuclear deterrence, periodic and catastrophic wars among Great Powers were the norm, waged with ever more destructive weapons and inflicting ever higher casualties and damage to society. During the first half of the 20th century and just prior to the introduction of U.S. nuclear deterrence, the world suffered 80—100 million fatalities over the relatively short war years of World Wars I and II, averaging over 30,000 fatalities per day.

Since the introduction of U.S. nuclear deterrence, U.S. nuclear capabilities have made essential contributions to the deterrence of nuclear and non-nuclear aggression. The subsequent absence of Great Power conflict has resulted in a dramatic, sustained reduction in the number of lives lost to war globally, as illustrated by Figure 2.

849

Figure 2: Wartime Casualties Percentage of World Population



850

851 Non-nuclear forces also play essential deterrence roles. Alone, however, they do not provide
852 comparable deterrence effects, as reflected by the periodic and catastrophic failures of
853 conventional deterrence to prevent Great Power wars throughout history. Similarly,
854 conventional forces alone do not adequately assure many allies who place enormous value on
855 U.S. extended nuclear deterrence.

856

857 Properly sustained U.S. nuclear deterrence helps prevent attacks against the United States, allies,
858 and partners and the return to the frequent Great Power warfare of past centuries. In the absence
859 of U.S. nuclear deterrence, the United States, allies, and partners would be vulnerable to coercion
860 and attack by adversaries who retain or expand nuclear arms and increasingly lethal non-nuclear
861 capabilities. Until the “fundamental transformation of the world political order” takes place,
U.S. nuclear weapons remain necessary to prevent war and safeguard the Nation.

IV. Enduring National Objectives and the Roles of Nuclear Weapons in U.S. National Security Strategy

“We believe that by improving deterrence across the broad spectrum, we will reduce to an even lower point the probability of a nuclear clash between ourselves and other major powers.”

Secretary of Defense James Schlesinger, 1974

The highest U.S. nuclear policy and strategy priority is to deter potential adversaries from nuclear attack of any scale. However, deterring nuclear attack is not the sole purpose of nuclear weapons. Given the diverse threats and profound uncertainties of the current and future threat environment, U.S. nuclear forces play the following critical roles in U.S. national security strategy. They contribute to the:

- Deterrence of nuclear and non-nuclear attack;
- Assurance of allies and partners;
- Achievement of U.S. objectives if deterrence fails; and
- Capacity to hedge against an uncertain future.

These roles are complementary and interrelated, and we must assess the adequacy of U.S. nuclear forces against each role and the strategy designed to fulfill it. Preventing proliferation and denying terrorists access to finished weapons, material, or expertise are also key considerations in the elaboration of U.S. nuclear policy and requirements. These multiple roles and objectives are the guiding pillars for U.S. nuclear policy, strategy, and requirements.

Deterrence of Nuclear and Non-Nuclear Attack

The highest U.S. nuclear policy and strategy priority is to deter potential adversaries from nuclear attack of any scale. Potential adversaries must understand that the United States has the will and response options necessary to deter nuclear attack under any conditions.

The specific application of deterrence strategies changes across time and circumstance, but the fundamental nature of deterrence endures: it is about decisively influencing an adversary's decision calculus to prevent attack or the escalation of a conflict. Potential adversaries must understand that aggression against the United States, allies, and partners will fail and result in intolerable costs for them. We deter attacks by ensuring the expected lack of success and prospective costs far outweigh any achievable gains.

U.S. deterrence strategy has always integrated multiple instruments of national power to deter nuclear and non-nuclear attack. Integrating and exercising all instruments of power has become increasingly important as potential adversaries integrate their military capabilities, expanding the range of potential challenges to be deterred. This is particularly true of threats from potential adversaries of limited nuclear escalation and non-nuclear strategic attack.

For U.S. deterrence to be effective across the emerging range of threats and contexts, nuclear-armed potential adversaries must recognize that their threats of nuclear escalation do not give them freedom to pursue non-nuclear aggression. Potential adversaries must understand that: 1)

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the United States is able to identify them and hold them accountable for acts of aggression, including new forms of aggression; 2) we will defeat non-nuclear strategic attacks; and, 3) any nuclear escalation will fail to achieve their objectives, and will instead result in unacceptable consequences for them.

For effective deterrence, the United States will acquire and maintain the full range of capabilities needed to ensure that nuclear or non-nuclear aggression against the United States, allies, and partners will fail to achieve its objectives and carry with it the credible risk of intolerable consequences for the adversary. U.S. forces will strengthen 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 U.S. 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.

An important element of maintaining effective deterrence is the articulation of U.S. declaratory policy regarding the potential employment of nuclear weapons:

The United States would only consider the use of nuclear weapons in extreme circumstances to defend the vital interests of the United States, its allies, and partners. Extreme circumstances could include significant non-nuclear strategic attacks. Significant non-nuclear strategic attacks include, but are not limited to, attacks on the U.S., allied, or partner civilian population or infrastructure, and attacks on U.S. or allied nuclear forces, their command and control, or warning and attack assessment capabilities.

The United States will not use or threaten to use nuclear weapons against non-nuclear weapons states that are party to the NPT and in compliance with their nuclear non-proliferation obligations.

Given the potential of significant non-nuclear strategic attacks, the United States reserves the right to make any adjustment in the assurance that may be warranted by the evolution and proliferation of non-nuclear strategic attack technologies and U.S. capabilities to counter that threat.

To help preserve deterrence and the assurance of allies and partners, the United States has never adopted a “no first use” policy and, given the contemporary threat environment, such a policy is not justified today. It remains the policy of the United States to retain some ambiguity regarding the precise circumstances that might lead to a U.S. nuclear response.

In addition, the United States will maintain a portion of its nuclear forces on alert day-to-day, and retain the option of launching those forces promptly. This posture makes clear to potential adversaries that they can have no confidence in strategies intended to destroy our nuclear deterrent forces in a surprise first strike.

The de-alerting of U.S. ICBMs would create the potential for dangerous deterrence instabilities by rendering them vulnerable to a potential first strike and compelling the United States to rush

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938 to re-alert in a crisis or conflict. Further, U.S. ICBMs are not on “hair-trigger alert,” as
939 sometimes mistakenly is claimed. Over more than half a century, the U.S. has established a
940 series of measures and protocols to ensure that ICBMs are safe, secure, and under constant
941 control. Any U.S. decision to employ nuclear weapons would follow a deliberative process.
942 Finally, the United States will continue its long-standing practice of open-ocean targeting of its
943 strategic nuclear forces day-to-day as a confidence and security building measure.

944 **Assurance of Allies and Partners**

945 The United States has extended nuclear deterrence commitments that assure European, Asian,
946 and Pacific allies. The United States will ensure the credibility and effectiveness of those
947 commitments.

948 Assurance is a common goal and advances our common security interests. It is based on
949 collaboration with allies and partners to deter or defeat the threats we face. It includes sustained
950 allied dialogues to understand each other’s threat perceptions and to arrive at a shared
951 understanding of how best to demonstrate our collective capabilities and resolve. No country
952 should doubt the strength of our assurance commitments or the strength of U.S. and allied
953 capabilities to deter, or if necessary defeat, any potential adversary’s nuclear or non-nuclear
954 aggression.

955 In many cases, effectively assuring allies and partners depends on their confidence in the
956 credibility of U.S. extended nuclear deterrence. They have reaffirmed that extended nuclear
957 deterrence is essential to their security, enabling most to eschew possession of nuclear weapons
958 and thereby contributing to U.S. non-proliferation goals.

959 **Achieve U.S. Objectives Should Deterrence Fail**

960 For deterrence to be credible, the United States must prepare to respond effectively if deterrence
961 were to fail, in ways that will achieve U.S. objectives while protecting U.S., allied, and partner
962 interests. Non-nuclear capabilities can complement but not replace U.S. nuclear capabilities for
963 this purpose.

964 All U.S. Presidents since 1945 have considered U.S. employment of nuclear weapons only in
965 extreme circumstances and for defensive purposes. If deterrence fails, the initiation and conduct
966 of nuclear operations would adhere to the law of armed conflict and the Uniform Code of
967 Military Justice. The United States will strive to end any conflict and restore deterrence at the
968 lowest level of damage possible for the United States, allies, and partners, and minimize civilian
969 damage to the extent possible consistent with achieving objectives.

970 Every U.S. administration over the past six decades has called for flexible and limited U.S.
971 nuclear response options, in part to support the goal of reestablishing deterrence following its
972 possible failure. This is not because reestablishing deterrence is certain, but because it may be
973 achievable in some cases and contribute to limiting damage, to the extent feasible, to the United
974 States, allies, and partners. The goal of limiting damage if deterrence fails in a regional
975 contingency calls for robust adaptive planning to defeat and defend against attacks, including
976 missile defense and capabilities to locate, track, and target mobile systems of regional
977 adversaries. These and other non-nuclear capabilities, which we are now strengthening, can

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978 complement but not replace U.S. nuclear forces for this purpose. In the case of missile threats
979 from regional actors in particular, U.S. missile defense and offensive options provide the basis
980 for significant damage limitation in the event deterrence fails.

981 **Hedge Against an Uncertain Future**

982 The United States will continue efforts to create a more cooperative and benign security
983 environment, but must also hedge against prospective and unanticipated risks. Nuclear
984 capabilities alone do not provide the basis for hedging against future uncertainty; non-nuclear
985 forces also play a critical role. However, U.S. nuclear capabilities provide a necessary and
986 unique contribution.

987 Hedging strategies help reduce risk and avoid threats that otherwise may emerge over time.
988 Given the increasing prominence of nuclear weapons in the defense policies and strategies of
989 Russia and China, and the uncertainties of the future threat environment, particularly from illicit
990 North Korean nuclear and missile programs, U.S. nuclear capabilities and the ability to quickly
991 modify them are essential to mitigate or overcome risk. The capacity to hedge contributes to
992 deterrence and can help reduce potential adversaries' confidence that they can gain an advantage
993 via a "break out" or expansion of nuclear capabilities

994 Our hedging strategies must also help mitigate and overcome unexpected technical risks
995 throughout the life cycle of U.S. nuclear capabilities, and must mitigate risk in the development,
996 deployment, and operation of U.S. nuclear forces. As we acquire forces, and those forces age,
997 this requires a framework to continually assess risks and threats, identify whether to accept or
998 mitigate risks, and guide development of appropriate and effective solutions.

999 V. Tailored Strategies and Flexible Capabilities

1000 *“The challenges that each situation may present, such as time, place and circumstance, are*
1001 *distinct. Therefore, flexibility and adaptiveness are essential in a defence planning process*
1002 *that can never be informed reliably about the future contexts for action and requirements.”*

1003 **Professor Colin S. Gray, 2017**

1004 **Tailored Deterrence**

1005 There is no “one-size fits all” for deterrence. The requirements for effective deterrence vary
1006 given the need to address the unique perceptions, goals, interests, strengths, strategies, and
1007 vulnerabilities of different potential adversaries. The deterrence strategy effective against one
1008 potential adversary may not deter another. Consequently, the United States will apply a tailored
1009 approach to effectively deter across a spectrum of adversaries, threats, and contexts.

1010 Tailored deterrence strategies are designed to communicate the costs of aggression to potential
1011 adversaries, taking into consideration how they uniquely calculate costs and risks. This calls for
1012 a diverse range and mix of U.S. deterrence options, now and into the future, to ensure strategic
1013 stability.

1014 Tailored deterrence also calls for on-going analyses to adapt our strategies to different potential
1015 adversaries and contingencies. These analyses address how potential adversaries define
1016 unacceptable damage, and how the United States can credibly communicate to them the risks and
1017 costs that would accompany their aggression. Adjusting our deterrence strategies accordingly is
1018 what it means to tailor deterrence.

1019 **Flexible Capabilities**

1020 Flexibility means having the appropriate range and mix of nuclear and other capabilities required
1021 to tailor deterrence strategies now and into the future, and to fulfill the other roles of nuclear
1022 weapons in U.S. national security strategy. Flexibility must address a spectrum of adversaries
1023 and threats and enable adjustments over time. U.S. nuclear strategies, forces, and NC3 must be
1024 increasingly flexible to sustain that range of capabilities and options.

1025 The United States has understood the value of flexibility for nuclear deterrence for six decades,
1026 but its importance is now magnified by the emerging diversity of nuclear and non-nuclear
1027 strategic threats and the dynamism and uncertainties of the security environment. This need for
1028 flexibility to tailor U.S. capabilities and strategies to meet future requirements and unanticipated
1029 developments runs contrary to a rigid, continuing policy of “no new nuclear capabilities.”
1030 Potential adversaries do not stand still. On the contrary, they seek to identify and exploit
1031 weaknesses in U.S. capabilities and strategy. Thus, U.S. future force requirements for deterrence
1032 cannot prudently be considered fixed. The United States must be capable of developing and
1033 deploying new capabilities, if necessary, to deter, assure, achieve U.S. objectives if deterrence
1034 fails, and hedge against uncertainty.

1035 VI. U.S. Strategies to Counter Contemporary Threats

1036 *“The number one priority of the Department of Defense is that we maintain a safe, secure and*
1037 *effective nuclear deterrent so we make certain those weapons are never used.”*

1038 Secretary of Defense James Mattis, August 2017

1039 A Tailored Strategy for Russia

1040 Russia is not the Soviet Union and the Cold War is long over. However, despite our best efforts
1041 to sustain a positive relationship, Russia now perceives the United States and NATO as its
1042 principal opponent and impediment to realizing its destabilizing geopolitical goals in Eurasia.

1043 Russia has significantly increased the capabilities of its non-nuclear forces to project power into
1044 regions adjacent to Russia and, as previously discussed, has violated multiple treaty obligations
1045 and other important commitments. Most concerning are Russia’s national security policies,
1046 strategy, and doctrine that include an emphasis on the threat of limited nuclear escalation, and its
1047 continuing development and fielding of increasingly diverse and expanding nuclear capabilities.
1048 Moscow threatens and exercises limited nuclear first use, suggesting a mistaken expectation that
1049 coercive nuclear threats or limited first use could paralyze the United States and NATO and
1050 thereby end a conflict on terms favorable to Russia. Some in the United States refer to this as
1051 Russia’s “escalate to de-escalate” doctrine. “De-escalation” in this sense follows from
1052 Moscow’s mistaken assumption of Western capitulation on terms favorable to Moscow.

1053 Effective U.S. deterrence of Russian nuclear attack and non-nuclear strategic attack now requires
1054 ensuring that the Russian leadership does not miscalculate regarding the consequences of limited
1055 nuclear first use, either regionally or against the United States itself. Russia must instead
1056 understand that nuclear first-use, however limited, will fail to achieve its objectives,
1057 fundamentally alter the nature of a conflict, and trigger incalculable and intolerable costs for
1058 Moscow. Our strategy will ensure Russia understands that any use of nuclear weapons, however
1059 limited, is unacceptable.

1060 The U.S. deterrent tailored to Russia, therefore, will be capable of holding at risk, under all
1061 conditions, what Russia’s leadership most values. It will pose insurmountable difficulties to any
1062 Russian strategy of aggression against the United States, its allies, or partners and ensure the
1063 credible prospect of unacceptably dire costs to the Russian leadership if it were to choose
1064 aggression.

1065 This strategy will ensure Russia understands it has no advantages in will, non-nuclear
1066 capabilities, or nuclear escalation options that enable it to anticipate a possible benefit from non-
1067 nuclear aggression or limited nuclear escalation. Correcting any Russian misperceptions along
1068 these lines is important to maintaining deterrence in Europe and strategic stability.

1069 Correspondingly, at the 2016 NATO Summit, the Alliance emphasized that, “no one should
1070 doubt NATO’s resolve if the security of any of its members were to be threatened. NATO will
1071 maintain the full range of capabilities necessary to deter and defend against any threat to the
1072 safety and security of our populations, wherever it should arise.”

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To support these deterrence goals and correct any Russian misperceptions of advantage, the President will have an expanding range of limited and graduated options to credibly deter Russian nuclear or non-nuclear strategic attacks, which could now include attacks against U.S. NC3, in space and cyber space. These requirements put a premium on the survivability, flexibility and readiness of Western nuclear and non-nuclear capabilities to hold diverse types of Russian targets at risk throughout a crisis or conflict, and point to the continuing great value of the flexibility inherent in the combination of the U.S. nuclear Triad, U.S. and other NATO non-strategic nuclear forces deployed in Europe, and the nuclear forces of our British and French allies.

A Tailored Strategy for China

China's military modernization and pursuit of regional dominance have emerged as a major challenge to U.S. interests in Asia. It has adopted an increasingly assertive posture in disputes with its neighbors, many of whom are U.S. allies or partners. These encompass a variety of historical and border disputes, including over territorial boundaries, claims to contested island territory, and an island-building campaign in the South China Sea. China possesses nuclear warheads on protected ICBMs and SLBMs capable of reaching the United States and nuclear-armed, theater-range ballistic missiles capable of reaching U.S. territory, allies, partners, forces, and bases in the region. China's expanding non-nuclear military capabilities include space and cyber warfare capabilities that could decisively affect the outcome of a conflict.

China is developing capabilities to counter U.S. power projection operations in the region and to deny the United States the capability and freedom of action to protect U.S., allied, and partner interests. Direct military conflict between China and the United States would have the potential for nuclear escalation. Our tailored strategy for China is designed to prevent Beijing from mistakenly concluding that it could secure an advantage through the limited use of its theater nuclear capabilities or that any use of nuclear weapons, however limited, is acceptable.

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.

The United States is prepared to respond decisively to Chinese non-nuclear or nuclear aggression. U.S. exercises in the Asia-Pacific region, among other objectives, demonstrate this preparedness, as will increasing the range of graduated nuclear response options available to the President. Both steps will strengthen the credibility of our deterrence strategy and improve our capability to respond effectively to Chinese limited nuclear use if deterrence were to fail. The United States will also continue to seek a meaningful dialogue with China on our respective nuclear policies, doctrine, and capabilities in pursuit of a peaceful security environment and stable relations.

A Tailored Strategy for North Korea

North Korea poses a clear and grave threat to U.S. and allied security. North Korea openly states that its missiles are intended to deliver nuclear strikes against U.S., South Korean, and Japanese cities. North Korean state agencies have made numerous reckless nuclear threats, such as, "Japan is no longer needed to exist near us," and Japan "should be sunken into the sea by [North Korea's] nuclear bomb," and "Let's reduce the U.S. mainland to ashes and darkness."

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1115 A complete, verifiable and irreversible nuclear-free Korean peninsula is a long-standing U.S.
1116 objective. Yet, North Korea has prioritized continuing investments in nuclear capabilities over
1117 the well-being of the North Korean people, and also possesses significant conventional, cyber,
1118 chemical, and biological capabilities. Its expansive nuclear and missile programs suggest the
1119 potential for nuclear first use in support of conventional operations. The Kim regime may
1120 mistakenly believe that nuclear capabilities give it freedom to engage in a spectrum of bold
1121 provocations, including military attacks on South Korean territory and naval vessels, and test
1122 launching missiles over Japan.

1123 For North Korea, the survival of the Kim regime is paramount. Our deterrence strategy for
1124 North Korea makes clear that any North Korean nuclear attack against the United States or its
1125 allies and partners is unacceptable and will result in the end of that regime. There is no scenario
1126 in which the Kim regime could employ nuclear weapons and survive. Further, we will hold the
1127 Kim regime fully responsible for any transfer of nuclear weapons technology, material or
1128 expertise to any state or non-state actor.

1129 North Korea relies on hardened and deeply buried facilities to secure the Kim regime and its key
1130 military and command and control capabilities. It uses underground facilities and natural terrain
1131 features to protect North Korean military forces. Consequently, the United States will continue
1132 to field a range of conventional and nuclear capabilities able to hold such targets at risk.

1133 In addition to ensuring the ability to impose intolerable costs on the Kim regime, the United
1134 States and allies have defensive and offensive capabilities to intercept and otherwise defeat
1135 North Korea's missile capabilities, and thereby limit or preclude North Korea's ability to conduct
1136 effective missile strikes. Japan and South Korea have long expressed support for these
1137 capabilities. Although North Korea's missile forces are expanding and increasingly mobile, U.S.
1138 and allied missile defenses are increasingly capable against North Korea's missile threat, and the
1139 United States has the early warning systems and strike capabilities necessary to degrade North
1140 Korean missile capabilities prior to launch. We will continually improve these defensive
1141 capabilities as needed to stay ahead of North Korean missile threats if they continue to grow.

1142 **A Tailored Strategy for Iran**

1143 Iran views U.S. influence in the Middle East as the foremost threat to Iran's goal to establish
1144 itself as the dominant regional power. Iran is committed to increasing its influence over
1145 neighboring countries and countering U.S. influence. This goal directly threatens U.S. allies and
1146 partners, and Iran's defense policy, strategy, and force structure indicate an attempt to create
1147 exploitable military advantages.

1148 Iran continues to invest in the largest missile program in the Middle East and could, in the future,
1149 threaten or deliver nuclear weapons were Iran to acquire them following expiration of the
1150 JCPOA, in violation of the NPT and its nuclear non-proliferation obligations. Iran also is
1151 developing other non-nuclear military capabilities, including cruise missile systems and cyber
1152 warfare capabilities for offensive operations. It may also continue to invest in chemical and
1153 biological weapons.

1154 Many of the JCPOA's key constraints on Iran's nuclear program end by 2031, shortening the
1155 time it would take Iran to produce enough weapons-grade nuclear material for a nuclear weapon.

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1156 Iran's development of increasingly accurate and sophisticated ballistic missiles gives it the
1157 capability to threaten U.S. forces, allies, and partners in and outside the region. Were Iran to
1158 decide to acquire nuclear weapons, pressures on other countries in the region to acquire their
1159 own nuclear weapons would increase.

1160 Our deterrence strategy is designed to ensure that the Iranian leadership understands that any
1161 non-nuclear strategic attack against the United States, allies, and partners would be defeated, and
1162 that the cost would outweigh any benefits. There is no plausible scenario in which Iran may
1163 anticipate benefit from launching a strategic attack. Consequently, U.S. deterrence strategy
1164 includes the capabilities necessary to defeat Iranian non-nuclear, strategic capabilities, including
1165 the U.S. defensive and offensive systems capable of precluding or degrading Tehran's missile
1166 threats. The United States will continue to strengthen these capabilities as necessary to stay
1167 ahead of Iranian threats as they grow.

1168 **Extended Deterrence and Tailored Assurance**

1169 The United States has effectively assured allies and partners for decades. The United States
1170 affirms its commitment to the security of its allies and partners, who are concerned about the
1171 negative trends in the security environment. This concern is evident both in Europe, where there
1172 are understandable allied fears of Russia's nuclear and non-nuclear threats and its use of military
1173 force against neighbors, and in Asia, where there are understandable allied fears of China's
1174 military rise and North Korea's extreme nuclear and non-nuclear threats.

1175 Our ability to continue assuring allies and partners is challenged by the range and diversity of
1176 potential adversaries and the threats they pose. The United States extends deterrence to over 30
1177 countries with different views about the threat environment and the credibility of U.S. security
1178 commitments. Similar to deterrence, there is no "one size fits all" strategy for assurance.
1179 Assurance measures must continually adapt to the shifting requirements of a highly dynamic
1180 threat environment. Our assurance strategies are tailored to the differing requirements of the
1181 Euro-Atlantic and Asia-Pacific regions, accounting for the differing security environments,
1182 potential adversary capabilities, and varying alliance structures.

1183 Effective deterrence is the foundation for effective assurance. Allies under the U.S. nuclear
1184 umbrella, and potential adversaries, should not doubt our extended deterrence commitments or
1185 our ability and willingness to fulfill them. In support of U.S. extended deterrence commitments,
1186 the United States will maintain the capabilities necessary to deter effectively and, if necessary, to
1187 respond effectively and decisively across the spectrum of potential nuclear and non-nuclear
1188 scenarios. Critically, for deterrence and assurance purposes, we will retain the capability to
1189 adjust our nuclear force structure as required by the security environment. We will develop the
1190 necessary infrastructure, capabilities, and political arrangements, now and in the future, to deny
1191 adversaries any confidence that they can achieve their regional objectives through nuclear threats
1192 or nuclear use.

1193 Assurance also flows from a shared view of the security environment, including: shared interests
1194 at stake; deterrence challenges and required capabilities; roles, responsibilities, and expectations;
1195 and the appropriate combined response to different conflict scenarios. Consequently,
1196 communication and consultation on policy, strategy and capabilities are essential for assurance
1197 and will be sustained.

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1198 *Strengthening Deterrence in Europe*

1199 The U.S. commitment to NATO is unwavering. A strong, cohesive nuclear Alliance is the most
1200 effective means of deterring aggression and promoting peace and stability in the Euro-Atlantic
1201 region. NATO followed the U.S. post-Cold War trend in deemphasizing the role of nuclear
1202 weapons in NATO's deterrence and defense posture, but the Alliance never lost sight of the
1203 fundamental purpose NATO's nuclear capabilities play in preserving peace, preventing coercion,
1204 and deterring aggression.

1205 At both the 2014 Wales and 2016 Warsaw summits, NATO recognized that Russia's activities
1206 and policies have reduced stability and security, increased unpredictability, and introduced new
1207 dangers into the security environment. Importantly, NATO is addressing the changed security
1208 environment to make clear that any employment of nuclear weapons against NATO, however
1209 limited, would not only fundamentally alter the nature of a conflict, but would result in
1210 unacceptable costs to an adversary that would far outweigh the benefit it could hope to achieve.
1211 The Alliance has already initiated measures to ensure that NATO's overall deterrence and
1212 defense posture, including its nuclear forces, remain capable of addressing any potential
1213 adversary's doctrine and capabilities.

1214 In support of these efforts, the United States will consult and work cooperatively with NATO
1215 allies to:

- 1216 • Enhance the readiness and survivability of NATO DCA, improve the planning
1217 capabilities required to increase their operational effectiveness, and account for adversary
1218 nuclear and non-nuclear capabilities in such planning;
- 1219 • Promote the broadest possible participation of Allies in their agreed burden sharing
1220 arrangements regarding the DCA mission, nuclear mission support, and nuclear
1221 infrastructure;
- 1222 • Replace aging aircraft and weapons systems with modernized or life-extended
1223 equivalents as they age out;
- 1224 • Enhance the realism of training and exercise programs to ensure the Alliance can
1225 effectively integrate nuclear and non-nuclear operations, if deterrence fails; and
- 1226 • Ensure the NATO NC3 system is modernized to enable appropriate consultations and
1227 effective nuclear operations, improve its survivability, resilience, and flexibility in the
1228 most stressful threat environments.

1229 The United States will make available its strategic nuclear forces, and commit nuclear weapons
1230 forward-deployed to Europe, to the defense of NATO. These forces provide an essential
1231 political and military link between Europe and North America and are the supreme guarantee of
1232 Alliance security. Combined with the independent strategic nuclear forces of the United
1233 Kingdom and France, as well as Allied burden sharing arrangements, NATO's overall nuclear
1234 deterrence forces are essential to the Alliance's deterrence and defense posture now and in the
1235 future.

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1236 *Strengthening Deterrence in Asia*

1237 The U.S. commitment to our allies and partners in the Asia-Pacific region is unwavering. As in
1238 Europe, strong, cohesive alliances and credible deterrence measures are the most effective means
1239 of assurance in the Asia-Pacific region. However, North Korea, China, and Russia each present
1240 unique, and in some ways more complex, threats to our allies and interests in the Asia-Pacific
1241 region. Further, the perception and immediacy of these threats is unique to different allies.

1242 In addition, our alliance structure in Asia is different than it is in Europe. Rather than a single
1243 multinational alliance, in Asia we have a series of bilateral arrangements with varying degrees of
1244 multilateral cooperation across different missions. Our nuclear posture, too, is different.
1245 Following the Cold War, the United States removed all of its nuclear weapons based in Asia and
1246 instead relied on strategic nuclear capabilities, complemented by a sea-launched cruise missile
1247 (TLAM-N) to extend nuclear deterrence to our allies. With the retirement of the TLAM-N
1248 following the 2010 NPR, the United States currently relies almost exclusively on its strategic
1249 nuclear capabilities for nuclear deterrence and the assurance of allies in the region. For these
1250 reasons, consultation and cooperative arrangements in the Asia-Pacific region are appropriately
1251 different than those in Europe.

1252 To maintain credible extended deterrence and thus effective assurance in this complex
1253 environment, the United States will:

- 1254 • Maintain integrated, flexible, and adaptable U.S. nuclear and non-nuclear capabilities;
- 1255 • Continue to invest in missile defenses against North Korean missile threats;
- 1256 • Demonstrate with allies our joint commitment to deterrence through military exercises;
1257 and,
- 1258 • Work with our allies to improve our shared understanding of nuclear dangers and
1259 corresponding deterrence requirements through continued consultative dialogues.

1260 **Hedge Against Diverse Uncertainties**

1261 The United States will tailor its hedging strategy across the range of potential adversaries and be
1262 prepared to meet future risks and challenges that may emerge, but cannot be characterized with
1263 certainty today. The combination of a highly dynamic security environment and the rapid
1264 advancement and spread of military technology creates a range of possible threat developments
1265 for which we must be prepared. Additionally, the United States is embarking on a nuclear force
1266 sustainment and replacement program which is just in time. This requires a high degree of
1267 concurrency and synchronization and, thus, has the potential for scheduling shortfalls. We
1268 cannot predict with confidence when or if any of these potential challenges will occur, but there
1269 always exists the potential for geopolitical or technological surprise. Therefore, we must, and
1270 will, posture our nuclear capabilities to hedge against multiple potential risks and threat
1271 developments.

1272 We will, for example, hedge against the potential rapid growth or emergence of nuclear and non-
1273 nuclear strategic threats, including chemical, biological, cyber, and large-scale conventional
1274 aggression. The capacity to hedge helps ensure our ability to sustain effective deterrence and
1275 assurance amid unexpected change.

1276 Our hedge strategy addresses four categories of potential risk:

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- 1277 • Geopolitical risk includes the emergence of new adversaries, expansion of adversary
1278 nuclear forces, changes in adversary strategy and doctrine, new alignments among
1279 adversaries, and the further proliferation of nuclear weapons.
- 1280 • Technological risk includes technical challenges resulting from a breakdown of a key
1281 element of U.S. nuclear forces, or from adversaries' technological breakthroughs, that
1282 create a new threat to U.S. nuclear deterrent capabilities.
- 1283 • Operational risk includes the potential for operational shortfalls that reduce the
1284 effectiveness of U.S. nuclear forces. It includes reduced availability of deployed forces,
1285 intelligence collection gaps that inhibit identification or characterization of designated
1286 targets, and any unmet requirement needed to sustain effective deterrence.
- 1287 • Programmatic risk includes potential risks to the U.S. sustainment of adequate nuclear
1288 capabilities such as delays to maintenance programs, the age-out of legacy nuclear
1289 systems earlier or more precipitously than anticipated, and an inability to produce
1290 needed quantities of unique nuclear materials. These risks are particularly acute today
1291 because key elements of the U.S. nuclear acquisition and production infrastructure have
1292 "atrophied," as described in 2008 by the Secretaries of Defense and Energy. They
1293 noted "existing U.S. nuclear weapons—most of which were designed 20 to 30 years
1294 ago—are being maintained well beyond the service life for which they were designed."
1295 There is no further margin for delaying U.S. sustainment and replacement programs for
1296 our existing nuclear capabilities and nuclear weapons infrastructure. We will avoid
1297 shortfalls in the next decade only by carefully managing programmatic risk to those
1298 programs.

1299 The U.S. strategy for hedging against unexpected challenges is based on two parallel approaches:
1300 reducing the likelihood that challenges will emerge in the categories of geopolitical,
1301 technological, operational, and programmatic risk; and, reducing the harm that would result if
1302 preventive measures prove inadequate. This two-track hedging strategy will help guide the
1303 capabilities and size of U.S. nuclear forces and supporting infrastructure.

1304 *Preventing the Emergence of Challenges*

1305 We will counter the emergence of challenges to U.S. nuclear strategy by emphasizing: 1) the
1306 early detection of potential problems; 2) opportunities for risk reduction through diplomacy; and
1307 3) dissuading adversaries from attempting to challenge U.S., allied, and partner security.

1308 Detect and resolve potential challenges early. Detecting and addressing problems before they
1309 arise is the most direct way to reduce the likelihood that dangerous technological or operational
1310 surprises will emerge. To do so, the Department of Energy's (DOE) National Nuclear Security
1311 Administration (NNSA) will continue to conduct robust nuclear weapons surveillance and
1312 experimental programs to identify issues early enough to help prevent technical breakdowns,
1313 operational shortfalls, and programmatic challenges. DoD will continue to conduct a weapon
1314 system test and evaluation program to identify emerging issues early. DoD and NNSA will also
1315 work together to conduct ongoing evaluations of the current and potential future security
1316 environments. This will include threat-based analyses of what potential adversaries are doing or
1317 considering today, as well as what is possible in light of projected advancement and diffusion of

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1318 technology. Finally, the United States will remain at the forefront of science and technology to
1319 reduce the likelihood of technological surprise.

1320 Risk reduction through diplomacy. We will seek opportunities for diplomatic agreements that
1321 reduce the likelihood of future security challenges via mutual restraints that reduce the potential
1322 for miscalculation in crisis or conflict. Treaties and agreements for this purpose can benefit U.S.
1323 security when they are verifiable and compliance can reasonably be expected and enforced as
1324 necessary.

1325 Dissuade adversaries from seeking advantage. We will reduce the likelihood of geopolitical
1326 challenges by being prepared to respond effectively to changes in the security environment, and
1327 being seen as so capable. Adversaries will be less likely to seek strategic advantage through
1328 arms competition if the United States clearly demonstrates the capacity and will to meet any such
1329 challenge. Therefore, in preparing to respond to geopolitical challenges, we will prioritize
1330 measures that would help reduce the likelihood that adversaries will choose to challenge us in the
1331 first place.

1332 *Mitigating the Potential Consequences of Future Challenges*

1333 The United States can hedge in two complementary ways. One is by having a robust nuclear
1334 weapon production infrastructure that has the design, engineering, and manufacturing
1335 capabilities needed to quickly produce new or additional weapons needed to address changes in
1336 the threat environment. Another approach is to retain a significant non-deployed inventory of
1337 weapons that can be added to current delivery vehicles to address geopolitical threat or technical
1338 failure.

1339 Given the current state of our nuclear weapon production infrastructure, the United States will
1340 mitigate the potential consequences of future challenges to U.S. nuclear strategy by sustaining a
1341 reserve nuclear stockpile of non-deployed weapons able to support U.S. nuclear strategies amid
1342 unexpected change. This requires maintaining the U.S. capacity to upload hedge weapons onto
1343 existing delivery platforms to augment the deployed force as necessary if, for example, an
1344 unexpected operational or technical problem were to arise in U.S. forces.

1345 DoD will prioritize its nuclear hedge planning to sustain specific force attributes in the event of a
1346 technological or geopolitical challenge that threatens an element of U.S. nuclear forces. These
1347 attributes include survivability, the ability to penetrate adversary defenses, the ability to visibly
1348 signal deterrence messages, prompt response, and a range of warhead yield options.

1349 This strategy for risk mitigation helps to hedge against the possibility that an operational or
1350 technical problem or adversary breakthrough would compromise the effectiveness of our nuclear
1351 forces. It also helps to preclude nuclear arms competition by communicating to adversaries that
1352 we can deny them useful advantage through their arms racing.

1353 Flexibility supports our strategies for deterring adversaries and assuring allies by providing
1354 options for tailoring and responding effectively to future challenges. We will reduce future risk
1355 exposure by ensuring that flexibility is built into and sustained in our current and future nuclear
1356 force structure. This applies to delivery systems, platforms, warheads, command and control,
1357 and early warning and attack assessment.

1358 Across the nuclear enterprise, the United States will target investments in personnel, programs,
1359 and technologies that strengthen our ability to adjust course as necessary in response to emerging
1360 challenges. In order to identify and address potential needs, the United States will support and
1361 expand as necessary the NNSA Stockpile Responsiveness Program, the Navy SSBN Security
1362 Technology Program, and the Air Force Nuclear Weapons Center Red Team Program.

1363 In addition, DoD will explore prioritization of existing research and development funding for
1364 advanced nuclear delivery system technology and prototyping capabilities. This will support the
1365 U.S. development of hedging options and focus, as necessary, on the rapid development of
1366 nuclear delivery systems, alternative basing modes, and capabilities for defeating advanced air
1367 and missile defenses.

1368

VII. Current and Future U.S. Nuclear Capabilities

“Our nuclear deterrent is nearing a crossroads. To date, we have preserved this deterrent by extending the lifespan of legacy nuclear forces and infrastructure—in many cases for decades beyond what was originally intended. But these systems will not remain viable indefinitely. In fact, we are now at a point where we must concurrently modernize the entire nuclear triad and the infrastructure that enables its effectiveness.”

Vice Chairman, Joint Chiefs of Staff, General Paul Selva, 2017

U.S. Nuclear Enterprise Personnel

Effective deterrence would not be possible without the thousands of members of the United States Armed Forces and civilian personnel who dedicate their professional lives to the deterrence of war and protecting the Nation. These exceptional men and women are held to the most rigorous standards and make the most vital contribution to U.S. nuclear capabilities and deterrence.

As former Secretary of Defense Ashton Carter stated in 2016 when speaking to Air Force service members at Minot Air Force Base in North Dakota, “America’s nuclear deterrence is the bedrock of our security...You deter large-scale nuclear attack against the United States and our allies. You help convince potential adversaries that they can’t escalate their way out of a failed conventional aggression.”

The service members and civilians involved in the nuclear deterrence mission do so with little public recognition or fanfare. Theirs is an unsung duty of the utmost importance. They deserve the support of the American people for the safety, security, and stability they provide the Nation, and indeed the world. The service reforms we have accordingly implemented were long overdue, and the Department of Defense remains fully committed to properly supporting the service members who protect the United States against nuclear threats.

The Strategic Nuclear Triad

For more than six decades, U.S. officials have emphasized the need for U.S. nuclear capabilities, including NC3, with the attributes necessary to deter adversaries, assure allies, and achieve U.S. objectives should deterrence fail. They have called for the survivability and flexibility of U.S. nuclear forces to provide the United States with multiple options to deter effectively and respond as necessary to different threats and circumstances. This requirement is now magnified by the need to tailor U.S. strategies to a broader range of adversaries and contingencies and to hedge against unanticipated developments.

Today’s strategic nuclear Triad consists of: nuclear ballistic missile submarines (SSBNs) armed with SLBMs; land-based ICBMs; and strategic bombers carrying gravity bombs and air-launched cruise missiles (ALCMs). The Triad, with supporting NC3 and non-strategic nuclear forces, provides diversity and flexibility to tailor strategies for deterring, assuring, achieving objectives should deterrence fail, and hedging.

The increasing need for this diversity and flexibility, in turn, is one of the primary reasons why sustaining and replacing the nuclear Triad and non-strategic nuclear capabilities is necessary. The multiplicity of platforms, weapons, and modes of operation inherent in the Triad and U.S.

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1409 non-strategic nuclear forces, provide a significant margin of flexibility and resilience. Designing
1410 flexibility into the Triad sustainment and replacement programs will help ensure that we
1411 maintain this margin in the future. DoD and NNSA will design flexibility into U.S. nuclear
1412 capabilities during concept exploration and preliminary design phases that enable us to modify
1413 systems in the future at lower cost and with greater speed.

1414 The Triad must be considered as a whole because it functions as a whole, with each leg essential
1415 to overall effectiveness. As Secretary of Defense Mattis concluded regarding deterrence
1416 requirements and the Triad, “I also have looked at – I have questioned the triad, and I cannot
1417 solve the deterrent problem reducing it from a triad. If I want to send the most compelling
1418 message, I have been persuaded that the triad in its framework is – is the right way to go.” The
1419 Triad’s synergy and overlapping attributes help ensure the enduring survivability of our
1420 deterrence capabilities against attack and our capacity to hold a range of adversary targets at risk
1421 throughout a crisis or conflict. Eliminating any leg of the Triad would greatly ease adversary
1422 attack planning and allow an adversary to concentrate resources and attention on defeating the
1423 remaining two legs.

1424 The U.S. nuclear Triad provides key nuclear force attributes required to maintain sufficient
1425 diversity and flexibility. These include:

- 1426 • Survivable. The force and NC3 resilience needed to survive any potential adversary
1427 attack and endure throughout crises and conflict.
- 1428 • Forward Deployable. The mobility and range needed to temporarily or permanently
1429 relocate some U.S. nuclear capability to allied or partner territory for needed political or
1430 military effect.
- 1431 • Diverse and Graduated Options. The availability of forces with the spectrum of yield
1432 options, weapon types, and delivery options necessary to support the most effective
1433 tailoring of strategies across a range of adversaries and contingencies.
- 1434 • Accurate Delivery. The precision needed to hold adversary assets at risk while
1435 minimizing unintended effects.
- 1436 • Penetrating. The capacity to counter active and passive defenses, including hardened and
1437 buried facilities, to pose credible deterrent threats and achieve military objectives with
1438 high confidence.
- 1439 • Responsive. The capacity to deploy and employ forces as promptly as is necessary to
1440 pose credible threats.
- 1441 • Diversity of Ranges. The availability of forces with a spectrum of range options
1442 necessary to support the most effective tailoring of strategies.
- 1443 • Diversity of Trajectories. The capacity to locate forces at multiple geographical locations
1444 and with multiple flight profiles to complicate adversary active and passive defense
1445 planning.
- 1446 • Visible. The capacity to display national will and capabilities as desired for signaling
1447 purposes throughout crisis and conflict.

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- Weapon Reallocation. The capacity to change target information quickly to enable adaptive planning and effective employment.

Together with effective NC3, these force attributes provide the flexible and resilient capabilities needed to support four essential functions:

- Provide survivable, responsive capabilities to ensure adversaries do not attempt a disarming first strike;
- Demonstrate resolve through the positioning of forces, messaging, and flexible response options;
- Ensure the U.S. can respond to a broad range of contingencies with tailored options; and
- Mitigate the risk of a technological failure or adversary breakthrough while providing adaptability to changes in the security environment.

The Three Legs of the Strategic Nuclear Triad

Sea-Based Deterrent Force

The United States currently operates OHIO-class SSBNs equipped with Trident II (D5) SLBMs to provide its sea-based deterrent force. Ballistic missile submarines are the most survivable leg of the Triad. When on patrol, SSBNs are, at present, virtually undetectable, and there are no known, near-term credible threats to the survivability of the SSBN force. Nevertheless, we will continue to hedge against the possibility that advances in anti-submarine warfare could make the SSBN force less survivable in the future.

SLBMs also possess a number of other needed attributes. Their intercontinental range and constant readiness allows them to hold targets at risk throughout Eurasia from their launch areas in the Atlantic and Pacific oceans. They are equipped with highly accurate, high-yield warheads, which enhance their ability to hold many types of targets at risk. SLBMs are also prompt. Traveling at hypersonic speed, SLBMs can reach their targets quickly after launch. The SSBN force can upload additional warheads if necessary, contributing to the U.S. hedge capacity.

Finally, SSBNs are highly mobile. They can demonstrate U.S. nuclear presence and commitment for deterrence and assurance purposes via foreign port calls if desired.

The first OHIO-class SSBN entered service in 1981 and the others entered service through the late 1990s. It was originally designed for a 30-year service life and was subsequently extended to 42 years, the longest of any submarine in U.S. history. The D5 SLBM was first deployed in 1990, and its service life is being extended to run through the end of the last OHIO-class SSBN's lifetime in 2042. The OHIO-class cannot be extended further. In coming decades, advances in adversary anti-submarine warfare and missile defense capabilities could challenge the effectiveness of current SSBN and SLBM systems.

Land-Based Deterrent Force

The ICBM force consists of 400, single-warhead Minuteman III ICBMs deployed in 450 underground silos dispersed across several states. These ICBMs are in constant readiness and are

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1485 the most responsive leg of the Triad. This readiness helps preclude a potentially destabilizing
1486 rush to alert in a crisis.

1487 The ICBM force is highly survivable against any but a large-scale nuclear attack. To destroy
1488 U.S. ICBMs on the ground, an adversary would need to launch a precisely coordinated attack
1489 with hundreds of high-yield and accurate warheads. This is an insurmountable challenge for any
1490 potential adversary today, with the exception of Russia. In contrast, in the absence of our ICBM
1491 force, a large proportion of our strategic nuclear Triad, including SSBNs in port and non-alert
1492 bombers, could be subject to an attempted nuclear first strike involving a relatively small number
1493 of nuclear weapons.

1494 The capability to launch ICBMs promptly means that no adversary can be confident in its ability
1495 to destroy them prior to launch. This option contributes to deterrence of a nuclear first strike
1496 attack. The United States will continue to maintain open-ocean targeting of its strategic nuclear
1497 forces day-to-day as a confidence and security building measure. In addition, similar to SLBMs,
1498 we will act to ensure that the ICBM force remains effective despite potential advances in
1499 adversary ballistic missile defenses.

1500 The ICBM force has high-yield, accurate weapons and intercontinental range, enabling it to hold
1501 at risk targets throughout Eurasia. It also is prompt and can reach any target in 30 minutes or
1502 less. In addition, a portion of the ICBM force can be uploaded if there is a need to do so—a
1503 capability that contributes to our hedging capacity.

1504 The Minuteman III ICBM was first deployed in 1970, with a planned 10-year service life. A
1505 series of life extension programs have kept Minuteman III viable, but component aging and
1506 inventory attrition are rapidly driving it to the end of its sustainability. From 2002—2012,
1507 Minuteman III underwent a life extension program intended to maintain its viability to 2030. By
1508 that time, its 60 years of operation will make it the oldest deployed strategic ballistic missile in
1509 the world. The Minuteman III service life cannot be extended further. In addition, Minuteman
1510 III will have increasing difficulty penetrating future adversary defenses.

1511 *Air-Based Deterrent Force*

1512 Heavy bombers are the most flexible and visible leg of the Triad. The air leg consists of 46
1513 nuclear capable B-52H and 20 nuclear capable B-2A “stealth” strategic bombers supported by a
1514 fleet of Air Force refueling aircraft. While these bombers and air refueling aircraft are not
1515 maintained on day-to-day alert, as they were until 1992, they can be alerted and dispersed,
1516 improving their pre-launch survivability. Bombers and DCA can also be forward deployed to
1517 help deter regional aggression and assure distant allies.

1518 Unlike ICBMs or SLBMs, bombers typically require hours to reach their targets. The longer
1519 flight times and ability to recall bombers in flight contribute to their flexibility. Flights abroad
1520 display U.S. capabilities and resolve, providing effective signaling for deterrence and assurance,
1521 including in times of tension. Bombers can be refueled in flight, giving them virtually unlimited
1522 range and endurance. In recent years, B-52 and B-2A bombers have carried out Bomber
1523 Assurance and Deterrence missions, including nonstop, round-trip flights from the continental
1524 United States to the Korean peninsula.

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1525 Bombers can carry a variety of nuclear weapons with diverse attributes that contribute to the
1526 flexibility valuable for deterrence in different circumstances. The gravity bombs carried by B-
1527 2A bombers and the ALCMs carried by B-52H bombers provide multiple yield options. In
1528 addition, the B83-1 and B61-11 can hold at risk a variety of protected targets. As a result, both
1529 will be retained in the stockpile, at least until there is sufficient confidence in the B61-12 gravity
1530 bomb that will become available in 2020.

1531 The bombers also play a critical role in the U.S. hedging strategy. Their significant payload
1532 capacity provides the ability to upload additional weapons, in particular stand-off cruise missiles,
1533 in response to possible geopolitical surprises such as adversary nuclear “breakout” scenarios.
1534 Similarly, the upload potential of the U.S. bomber force provides an important hedge against
1535 programmatic risk in the strategic replacement programs.

1536 The B-2A bomber is now the only long-range, nuclear capable U.S. aircraft that can penetrate
1537 advanced air defenses. Beginning in 1982, our B-52H bombers were equipped with ALCMs in
1538 response to steady advances in adversary air defense systems. Armed with ALCMs, the B-52H
1539 can stay outside adversary air defenses and remain effective. The ALCM, however, is now more
1540 than 25 years past its design life and faces continuously improving adversary air defense
1541 systems. Life extension programs (LEPs) are underway to ensure the ALCM can be maintained
1542 until its replacement, the Long-Range Stand-Off (LRSO) cruise missile, becomes available.

1543 *Non-Strategic Nuclear Weapons*

1544 During the Cold War, the United States possessed large numbers and a wide range of non-
1545 strategic nuclear weapons, also known as theater or tactical nuclear weapons. However, we have
1546 since retired and dismantled almost all of those weapons. Current U.S. non-strategic nuclear
1547 forces consist exclusively of B61 gravity bombs carried by F-15EDCA, supported by responsive
1548 air refueling aircraft. Several NATO allies also provide F-16 DCA capable of delivering U.S.
1549 forward-deployed nuclear weapons. The forthcoming B61-12 gravity bomb will replace earlier
1550 versions of the B61, and be available for these DCA beginning in 2021.

1551 U.S. and NATO DCA, together with U.S. gravity bombs, are forward deployed in European
1552 NATO countries. Their forward presence contributes significantly to the deterrence of potential
1553 adversaries and the assurance of allies. Their presence is a clear deterrence signal to any
1554 potential adversary that the United States possesses the forward-deployed capability to respond
1555 to escalation. If necessary, the United States has the ability to deploy DCA and nuclear weapons
1556 to other regions, such as Northeast Asia.

1557 In sum, U.S. nuclear capabilities include the variety of attributes and flexibility needed to tailor
1558 deterrence to a range of potential adversaries and contingencies, assure allies, achieve our
1559 objectives if deterrence fails, and hedge against multiple future risks and uncertainties. No
1560 single leg of the Triad offers all of these attributes, but they are available in the Triad as whole,
1561 in combination with non-strategic nuclear forces. Relying on life extension programs since the
1562 1980s, and multiple delays in the recapitalization of our nuclear force, has removed all schedule
1563 margin between the necessary retirement of our legacy nuclear systems and the fielding of
1564 planned replacement systems. Consequently, we will move these forward without delay.

1565

1566 **The Department of Defense Replacement Program**

1567 The United States will replace its strategic nuclear Triad and sustain the warheads it carries –
1568 there is no higher priority for national defense. DoD and DOE will prioritize and fund their
1569 respective nuclear delivery system and warhead programs to remain on schedule for
1570 synchronized delivery, and they will seek opportunities to accelerate programs where cost
1571 effective.

1572 The United States has a two-pronged approach to sustaining the legacy nuclear systems to the
1573 extent practicable and to begin the replacement of retiring, legacy systems by the mid-2020s.
1574 We will sustain these systems until the planned replacement systems are fielded.

1575 This two-pronged approach responds to emerging threats and is codified by the 2017 National
1576 Defense Authorization Act, which directs that, “in support of a strong and credible nuclear
1577 deterrent, the United States must—(A) maintain a nuclear force with a diverse, flexible range of
1578 nuclear yield and delivery modes that are ready, capable, and credible; and (B) afford the highest
1579 priority to the modernization of the nuclear Triad, dual-capable aircraft, and related command
1580 and control elements.”

1581 *The Sea-Based Deterrent Force*

1582 The COLUMBIA-class program will deliver a minimum of 12 SSBNs to replace the current
1583 OHIO fleet and is designed to provide required capabilities for decades. The first COLUMBIA-
1584 class SSBN will become operational in 2031. COLUMBIA will include a number of
1585 technological features and preserve the flexibility to upgrade to ensure the fleet remains
1586 survivable.

1587 Under present building and fielding plans, the number of SSBNs available for deployment will
1588 reduce to ten during the 2030s as the OHIO SSBN retires and the COLUMBIA completes
1589 production. During the period of fielding COLUMBIA, there will be little-to-no margin for
1590 adjusting to an unforeseen event that would force an SSBN into unscheduled maintenance or
1591 early retirement. Thus, the United States will ensure that the COLUMBIA program stays on
1592 schedule and will continue to ensure that the OHIO SSBN remains operationally effective and
1593 survivable until replaced. Given the need to retire the OHIO at 42 years, there is no schedule
1594 margin for delay without degrading the critical attributes that the sea-based leg of the Triad
1595 provides.

1596 We will place similar emphasis on the timely replacement of the D5 SLBM. The D5 SLBM is in
1597 the early stages of a life extension that will allow it to be deployed until 2042 on both OHIO and
1598 COLUMBIA SSBNs. The Navy will begin studies in 2020 to define a cost-effective, credible,
1599 and effective SLBM that we can deploy throughout the service life of the COLUMBIA SSBN.

1600 *ICBMs*

1601 To sustain the ICBM's critical contributions to the Triad, the United States must and will begin
1602 fielding its replacement, the Ground-Based Strategic Deterrent (GBSD), on time in 2029. The
1603 GBSD program will modernize 450 ICBM launch facilities to support fielding 400 ICBMs to
1604 replace the retiring Minuteman III after six decades or more of service. This will provide an
1605 ICBM system effective for decades into the future.

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1606 *Strategic Bombers and Air-Delivered Weapons*

1607 The United States will sustain and modernize the B-52H and B-2A to ensure they remain
1608 effective into the future. Given the continuing proliferation and improvement of adversary air
1609 defense capabilities and the continued aging of the B-52H, the ALCM, and the B-2A, the United
1610 States has initiated a program to develop and deploy the next-generation bomber, the B-21
1611 Raider. The B-21 Raider will first supplement, and eventually replace elements of the
1612 conventional and nuclear-capable bomber force beginning in the mid-2020s.

1613 The replacement for the aging ALCM – the LRSO – is a modern air-launched cruise missile.
1614 The LRSO program will maintain into the future our bomber capability to deliver stand-off
1615 weapons that can penetrate and survive advanced integrated air defense systems, thus holding
1616 targets at risk anywhere on Earth.

1617 Arming our force of strategic bombers with LRSO is critical to ensuring their continuing
1618 effectiveness in the face of improving air defenses and to provide a diverse range of response
1619 options. The LRSO will enable the B-52H to remain an effective part of the nuclear-capable
1620 bomber force and preserve upload potential as a key hedge against unforeseen technical and
1621 geopolitical challenges. The B-21 will be able to deliver both gravity bombs and the LRSO.
1622 Crucial to the success of the heavy bomber force is a viable aerial refueling capability, which
1623 also needs recapitalization.

1624 The United States is also incorporating nuclear capability onto the F-35A, to be used by the
1625 United States and NATO allies, as a replacement for the current aging DCA. Improved DCA
1626 readiness and the arrival of the F-35A, a “fifth generation aircraft,” in conjunction with the
1627 ongoing B61-12 gravity bomb LEP, will preserve the DCA contribution to regional deterrence
1628 stability and assurance. In parallel with its warhead LEP, the B61-12 will be equipped with a
1629 guidance tail kit to sustain the military capability of existing B61 variants. As is the case with
1630 the sustainment and replacement programs necessary to maintain the Triad, the programs
1631 supporting the DCA mission must be completed on time.

1632 If this planned Triad and DCA replacement program experiences delays, or if existing systems
1633 reach obsolescence earlier than expected, fielded systems will age out before replacements are
1634 available and the United States will face potentially significant gaps in its diverse and flexible
1635 capabilities needed to deter, assure, achieve objectives if deterrence fails, and hedge against
1636 future uncertainty. Delays to the SSBN and SLBM replacement programs would reduce the
1637 survivability and flexibility of U.S. nuclear capabilities and challenge our ability to maintain
1638 rough parity with Russian strategic deployments, even at the reduced levels set by New START.
1639 Delays in the GBSD program, accompanied by a rapid age-out of our ICBM force, would
1640 dramatically reduce the scale of attack required for an adversary to threaten much of the U.S.
1641 deterrent forces in a first-strike attack. Delays in the B-21 bomber program or associated bomber
1642 weapons would reduce the ability of our strategic forces to penetrate adversary air defenses, limit
1643 the diversity of our response options, and compromise our ability to send the visible deterrence
1644 and assurance signals for which strategic bombers are particularly well suited.

1645

1646

1647 **Flexible and Secure Nuclear Capabilities: An Affordable Priority**

1648 *“What we want to do is to deter. Nobody wants to have a war. The only thing more expensive*
1649 *than deterrence is actually fighting a war, and the only thing more expensive than fighting a*
1650 *war is fighting one and losing.”*

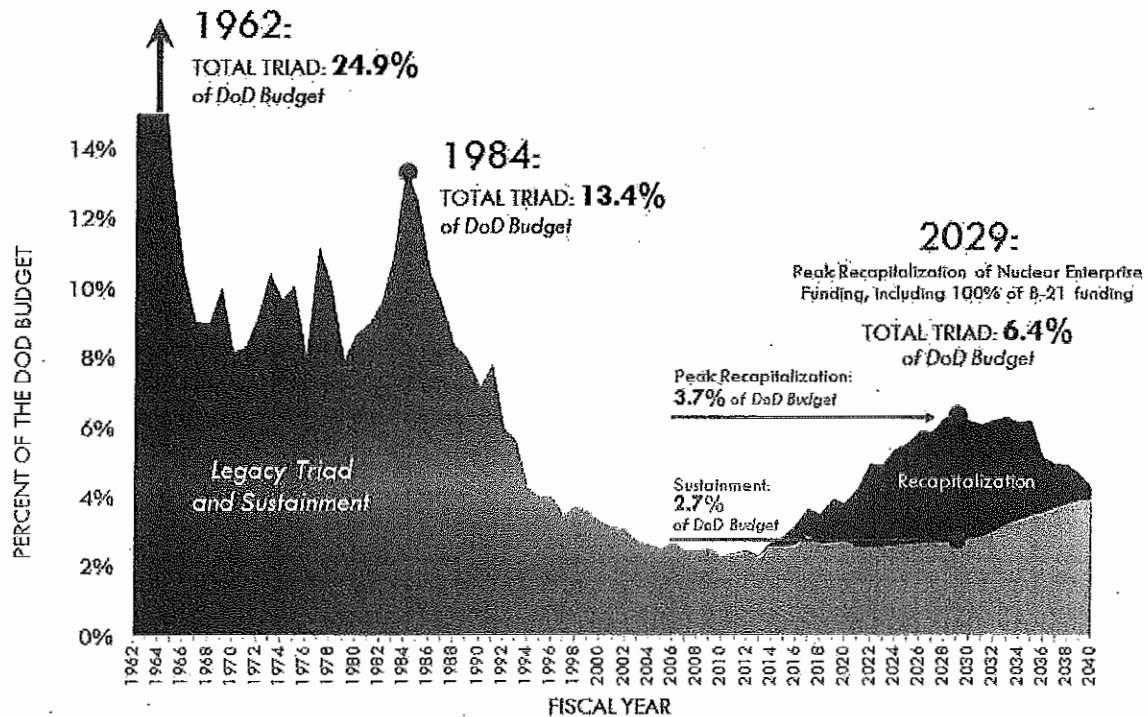
1651 **U.S. Army Chief of Staff, General Mark A. Milley, 2016**

1652 Throughout past decades, senior U.S. officials have emphasized that the highest priority of the
1653 Department of Defense is deterring nuclear attack and, therefore, sustaining the nuclear
1654 capabilities necessary to deter. More recently, Secretary of Defense Mattis, former Secretary of
1655 Defense Carter, and the Chairman of the Joint Chiefs, General Joseph Dunford, have all
1656 emphasized the priority of the nuclear deterrence mission and the necessity of our nuclear
1657 sustainment and replacement programs.

1658 While estimates of the cost to sustain and replace U.S. nuclear capabilities vary, based on the
1659 timeframe considered and how they account for various elements of the program, even the
1660 highest of these projections place the highpoint of the future cost at approximately 6.4 percent of
1661 the current DoD budget. Maintaining and operating our current aging nuclear forces now
1662 requires between two and three percent of the DoD budget, and the replacement program to
1663 rebuild the Triad for decades of service will peak for several years at only approximately four
1664 percent beyond the existing sustainment level of spending. This 6.4 percent of the current DoD
1665 budget required for the long-term program represents less than one percent of today’s overall
1666 federal budget. As indicated by Figure 3, this level of spending compares favorably to the 13.9
1667 percent of the DoD budget required during the last such investment period in the 1980s, which at
1668 the time was almost 3.2 percent of the federal budget, and the 24.9 percent of the DoD budget
1669 required in the early 1960s.

1670 **Figure 3: Cost of DoD Nuclear Force Replacement**

1671



1672

1673

Data provided by the DoD

1674 The projected DoD costs of sustaining and replacing the nuclear capabilities needed to support
1675 U.S. national security strategy, while substantial, are moderate in historical terms and represent a
1676 small fraction of the DoD budget. Given the criticality of effective U.S. nuclear deterrence to the
1677 assurance of allies, and, most importantly, the safety of the American people, there is no doubt
1678 that these programs are both necessary and affordable.

1679 Enhancing Deterrence with Non-Strategic Nuclear Capabilities

1680 Existing elements of the nuclear force replacement program predate the dramatic deterioration of
1681 the strategic environment. To meet the emerging requirements of U.S. strategy, the United
1682 States will now pursue select supplements to the replacement program to enhance the flexibility
1683 and responsiveness of U.S. nuclear forces. It is a reflection of the versatility and flexibility of the
1684 U.S. Triad that only modest supplements are now required in this much more challenging threat
1685 environment.

1686 These supplements will enhance deterrence by denying potential adversaries any mistaken
1687 confidence that limited nuclear employment can provide a useful advantage over the United
1688 States and its allies. For example, Russia's belief that limited nuclear first use, potentially
1689 including low-yield weapons, can provide such an advantage is based, in part, on Moscow's
1690 perception that its greater number and variety of non-strategic nuclear systems provide a
1691 coercive advantage in crises and at lower levels of conflict. Correcting this mistaken Russian
1692 perception is a strategic imperative.

1693 North Korea is illicitly developing a range of strategic and non-strategic nuclear systems to
1694 threaten the United States, allies, and partners. It may mistakenly perceive that these systems,

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1695 when coupled with the threat of a strategic nuclear attack against the United States, would
1696 provide advantageous nuclear escalation options in crises or conflict.

1697 To address these types of challenges and preserve deterrence stability, the United States will
1698 enhance the flexibility and range of its tailored deterrence options. U.S. strategy does not require
1699 non-strategic nuclear capabilities that quantitatively match or mimic Russia's more expansive
1700 arsenal. Rather, the United States will maintain a spectrum of capabilities sized and postured to
1701 meet U.S. needs, and particularly to ensure that no adversary under any circumstances can
1702 perceive an advantage through limited nuclear escalation or other strategic attack.

1703 For decades, the United States has deployed low-yield nuclear options to strengthen deterrence
1704 and assurance. Expanding flexible U.S. nuclear options now, to include low-yield options, is
1705 important for the preservation of credible deterrence against regional aggression. To be clear,
1706 this is not intended to enable, nor does it enable, "nuclear war-fighting." Nor will it reduce the
1707 nuclear threshold. Rather, expanding U.S. tailored response options will raise the nuclear
1708 threshold and help ensure that potential adversaries perceive no possible advantage in limited
1709 nuclear escalation, making nuclear weapons employment less likely.

1710 Consequently, the United States will maintain, and enhance as necessary, the capability to
1711 forward deploy nuclear bombers and DCA around the world. We are committed to upgrading
1712 DCA with the nuclear-capable F-35A aircraft. We will work with NATO to best ensure—and
1713 improve where needed—the readiness, survivability, and operational effectiveness of DCA based
1714 in Europe.

1715 Additionally, in the near-term, the United States will modify a small number of existing SLBM
1716 warheads to provide a low-yield option, and in the longer term, pursue a modern nuclear-armed
1717 sea-launched cruise missile (SLCM). Unlike DCA, a low-yield SLBM warhead and SLCM will
1718 not require or rely on host nation support to provide deterrent effect. They will provide
1719 additional diversity in platforms, range, and survivability, and a valuable hedge against future
1720 nuclear "break out" scenarios.

1721 DoD and NNSA will develop for deployment a low-yield SLBM warhead to ensure a prompt
1722 response option that is able to penetrate adversary defenses. This is a comparatively low-cost and
1723 near-term modification to an existing capability that will help counter any mistaken perception of
1724 an exploitable "gap" in U.S. regional deterrence capabilities. Doing so will not increase the
1725 number of deployed U.S. ballistic missile warheads, as the low-yield weapons will replace
1726 higher-yield weapons currently deployed.

1727 In addition to this near-term step, for the longer term the United States will pursue a nuclear-
1728 armed SLCM, leveraging existing technologies to help ensure its cost effectiveness. SLCM will
1729 provide a needed non-strategic regional presence, an assured response capability, and an INF-
1730 Treaty compliant response to Russia's continuing Treaty violation. If Russia returns to Treaty
1731 compliance, reduces its non-strategic nuclear arsenal, and corrects its other destabilizing
1732 behaviors, the United States may reconsider the pursuit of a SLCM.

1733 Indeed, U.S. pursuit of a SLCM may provide the necessary incentive for Russia to negotiate
1734 seriously a reduction of its non-strategic nuclear weapons, just as the prior Western deployment
1735 of intermediate-range nuclear forces in Europe led to the 1987 INF Treaty. As then Secretary of

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State George Schultz stated, "If the West did not deploy Pershing II and cruise missiles, there would be no incentive for the Soviets to negotiate seriously for nuclear weapons reductions."

In the 2010 NPR, the United States announced the retirement of its previous nuclear-armed SLCM, which for decades had contributed to deterrence and the assurance of allies, particularly in Asia. Given the increasing need for flexible and low-yield options to strengthen deterrence and assurance, we will immediately begin efforts to restore this capability by initiating a requirements study leading to an Analysis of Alternatives (AoA) for the rapid development of a modern SLCM. It will strengthen the effectiveness of the sea-based nuclear deterrence force and is complementary to LRSO, but cannot substitute for it because LRSO is required to sustain an effective air leg of the Triad.

These supplements to the planned nuclear force replacement program--a modified SLBM warhead and modern SLCM--are prudent options for enhancing the flexibility and diversity of U.S. nuclear capabilities to help address emerging deterrence requirements in the near term and beyond. They are compliant with all treaties and agreements, and together, they will: provide a more diverse set of characteristics greatly enhancing our ability to tailor deterrence and assurance; expand the range of credible U.S. options for responding to nuclear or non-nuclear strategic attack; and, enhance deterrence by signaling to potential adversaries that their concepts of coercive, limited nuclear escalation offer no exploitable advantage.

Nuclear Command, Control, and Communications (NC3) Modernization

"We have to modernize the entire architecture. And so, as you see the modernization plans coming in; make sure, number one, it's the 21st century information architecture."

Commander, United States Strategic Command, General John Hyten, 4 April 2017

The United States must have an NC3 system that ensures command and control of U.S. nuclear forces at all times, even under the enormous stress of a nuclear attack. NC3 capabilities must assure the integrity of transmitted information and possess the resiliency and survivability necessary to reliably overcome the effects of adversary nuclear attack. The NC3 architecture is essential for deterrence and enables a response if deterrence fails.

During peacetime and crisis, the NC3 system performs five crucial functions: detection, warning, and attack characterization; nuclear planning; decision-making conferencing; receiving Presidential orders; and enabling the management and direction of forces.

Today's NC3 system is a legacy of the Cold War, last comprehensively updated almost three decades ago. It includes interconnected elements composed of warning satellites and radars; communications satellites, aircraft, and ground stations; fixed and mobile command posts; and the control centers for nuclear systems.

- Warning systems include fixed, terrestrial phased array warning radars; the Defense Support Program (DSP) system and its replacement, the Space Based Infrared System (SBIRS); and the U.S. Nuclear Detonation Detection System (USNDS).
- Communications systems include the Military Strategic and Tactical Relay (MILSTAR) satellites and its replacement, the Advanced Extremely High Frequency (AEHF)

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1775 satellites; a wide variety of ground-based transmission systems across the radio frequency
1776 spectrum; and Take Charge and Move Out (TACAMO) relay aircraft.

1777 • The fixed command posts include the National Military Command Center (NMCC) and
1778 the U.S. Strategic Command Global Operations Center. Fixed command posts also
1779 include linkages to U.S. forward-deployed forces in USEUCOM and elsewhere. Mobile
1780 command posts include the E4B National Airborne Operations Center (NAOC), the E6B
1781 Airborne Command Post (ABNCP), and ground mobile systems.

1782 • Control centers for nuclear systems are in ICBM Launch Control Centers, on SSBNs, and
1783 aboard bomber aircraft.

1784 While once state-of-the-art, the NC3 system is now subject to challenges from both aging system
1785 components and new, growing 21st century threats. Of particular concern are expanding threats
1786 in space and cyber space, adversary strategies of limited nuclear escalation, and the broad
1787 diffusion within DoD of authority and responsibility for governance of the NC3 system, a
1788 function which, by its nature, must be integrated.

1789 Expanding Threats. Space is no longer a sanctuary and orbital space is increasingly congested,
1790 competitive, and contested. A number of countries, particularly China and Russia, have
1791 developed the means to disrupt, disable, and destroy U.S. assets in space. Because space is no
1792 longer an uncontested domain, U.S. NC3 space systems need to be more survivable, defensible,
1793 and provide resilient capabilities.

1794 The emergence of offensive cyber warfare capabilities has created new challenges and potential
1795 vulnerabilities for the NC3 system. Potential adversaries are expending considerable effort to
1796 design and use cyber weapons against networked systems. While our NC3 system today remains
1797 assured and effective, we are taking steps to address challenges to network defense,
1798 authentication, data integrity, and secure, assured, and reliable information flow across a resilient
1799 NC3 network.

1800 Nuclear Environment. Because potential adversaries are emphasizing the employment of limited
1801 nuclear options, our NC3 system must be resilient in the context of adversary limited nuclear
1802 strikes. The U.S. leadership, including Combatant Commanders, must be able to communicate
1803 and share information across networked command and control systems, and to integrate nuclear
1804 and non-nuclear military planning and operations in the context of adversary nuclear
1805 employment.

1806 *Modernizing the NC3 System*

1807 In light of the critical need to ensure our NC3 system remains survivable and effective in crisis
1808 and conflict, the United States will pursue a series of initiatives to strengthen NC3 and address
1809 21st century needs and challenges.

1810 Strengthen Protection Against Space-based Threats. The United States will ensure space assets
1811 are agile and resilient, thereby deterring and if necessary overcoming attempts to extend conflict
1812 into space. The United States will enhance the training of operational space forces to ensure that

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1813 we are prepared to successfully achieve mission objectives against the range of 21st century
1814 threats.

1815 Strengthen Protection Against Cyber Threats. The United States will protect NC3 components
1816 against current and future cyber threats and ensure the continuing availability of U.S.-produced
1817 information technology necessary for the NC3 system.

1818 Enhance Integrated Tactical Warning and Attack Assessment. The United States will develop a
1819 future architecture which will include modernized SBIRS satellites and integrate missile defense
1820 sensors to maximize warning time. The United States will also continue to transition the DSP
1821 system to SBIRS and enhance ground-based radars. The upgraded SBIRS constellation will
1822 include six satellites supported by the existing DSP architecture to enhance the survivability of
1823 U.S. satellites. Additionally, we will continue to sustain and upgrade the USNDS to support
1824 accurate attack assessment.

1825 Improve Command Posts and Communications Links. The United States will upgrade and
1826 modernize critical NC3 airborne systems, including the NAOC, the ABNCP, and the TACAMO
1827 aircraft. We will also develop planning systems at all fixed and mobile sites to enhance
1828 command and control, and field modernized communication transmitters and terminals across
1829 the NC3 system to better ensure assured, reliable, and resilient communications at all levels of
1830 the nuclear force.

1831 Advance Decision Support Technology. The United States will continue to adapt new
1832 technologies for information display and data analysis to improve support for Presidential
1833 decision making and senior leadership consultations.

1834 Integrate Planning and Operations. The United States will improve the capability of our
1835 Combatant Commands to communicate and share information across networked command and
1836 control systems in the context of adversary nuclear employment. U.S. forces will strengthen
1837 their ability to integrate nuclear and non-nuclear military operations to deter limited nuclear
1838 escalation and non-nuclear strategic attacks. Finally, Combatant Commands will plan, organize,
1839 train, and exercise for this mission.

1840 Reform Governance of the Overall NC3 System. The United States will improve its NC3
1841 governance to ensure DoD is properly organized to maintain a fully capable NC3 system to
1842 address current and future environments. To address this challenge, the Chairman of the Joint
1843 Chiefs of Staff in consultation with key DoD stakeholders will deliver to the Secretary of
1844 Defense no later than May 1, 2018, a plan to reform NC3 governance to ensure its effective
1845 functioning and modernization.

1846 VIII. Nuclear Weapons Infrastructure

1847 *“NNSA’s ability to achieve its vital national security missions is dependent on safe and*
1848 *reliable infrastructure. If not appropriately addressed, the age and condition of NNSA’s*
1849 *infrastructure will put NNSA’s missions, safety of its workers, the public, and the environment*
1850 *at risk.”*

1851 NNSA Administrator, Frank Klotz, 2017

1852 An effective, responsive, and resilient nuclear weapons infrastructure is essential to the U.S.
1853 capacity to adapt flexibly to shifting requirements. Such an infrastructure offers tangible
1854 evidence to both allies and potential adversaries of U.S. nuclear weapons capabilities and can
1855 help to deter, assure, hedge against adverse developments, and discourage adversary interest in
1856 arms competition.

1857 The NNSA is responsible for the Nation’s nuclear weapons infrastructure. DoD generates
1858 military requirements for the nuclear warheads to be carried on delivery platforms. The NNSA
1859 oversees the assessment, design development, production, test, and research programs that
1860 respond to DoD warhead requirements.

1861 The infrastructure consists of people with the requisite skills (e.g., scientists, engineers,
1862 production personnel) and the associated experimental and industrial facilities that:

- 1863 • Sustain today’s nuclear stockpile and ensure its continued safety, security, and
1864 effectiveness;
- 1865 • Extend the life of a select sub-set of nuclear warheads, and design, develop, and produce
1866 nuclear weapons as needed for today and into the future;
- 1867 • Assess and certify annually whether the safety and reliability of the future nuclear
1868 stockpile can be assured in the absence of underground nuclear testing, and, as a
1869 safeguard, maintain a nuclear test capability;
- 1870 • Maintain the capability to design, develop and produce nuclear warheads with new or
1871 different military capabilities if required in the future; and
- 1872 • Provide an effective response to technical problems with a warhead or to adverse
1873 geopolitical developments that call for force augmentation.

1874 In addition, the scientists, engineers, and production personnel of the nuclear infrastructure
1875 support nuclear arms control, threat reduction, naval nuclear propulsion, non-proliferation
1876 efforts, assessment of foreign nuclear weapons programs, nuclear counterterrorism, and
1877 emergency response.

1878 The main challenge to an effective and resilient infrastructure is the need to maintain design,
1879 development, manufacturing, and testing capabilities during the lengthy periods of time between
1880 rebuilding cycles to ensure the enduring health of the infrastructure. During the Cold War, the
1881 United States carried out an intensive and balanced program on roughly a five-year cycle. The
1882 last new, modern warhead development program (the W88) was completed by the early 1990s.

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We are now in the early stages of a comprehensive warhead sustainment program. To provide the required strategic vision needed to inform critical warhead modernization investments, the DoD and DOE Nuclear Weapons Council approved a strategic plan. This plan describes a current and future path for the nuclear warhead stockpile to meet deterrence, assurance, and technical hedging requirements.

The U.S. must have the ability to maintain and certify a safe, secure, and effective nuclear arsenal. Synchronized with DoD replacement programs, the United States will sustain and deliver on-time the warheads needed to support both strategic and non-strategic nuclear capabilities by:

- Completing the W76-1 LEP by Fiscal Year (FY) 2019;
- Completing the B61-12 LEP by FY2024;
- Completing the W88 alterations by FY2024;
- Synchronizing NNSA's W80-4 life extension, with DoD's LRSD program and completing the W80-4 LEP by FY2031;
- Advancing the W78 warhead replacement one year to FY19 to support fielding on GBSD by 2030 and investigate the feasibility of fielding the nuclear explosive package in a Navy flight vehicle;
- Sustaining the B83-1 past its currently planned retirement date until a suitable replacement is identified; and,
- Exploring future ballistic missile warhead requirements based on the threats and vulnerabilities of potential adversaries, including the possibility of common reentry systems between Air Force and Navy systems.

Over the past several decades, the U.S. nuclear weapons infrastructure has suffered the effects of aging and underfunding. Over half of NNSA's infrastructure is over 40 years old, and a quarter dates back to the Manhattan Project era. All previous NPRs highlighted the need to maintain a modern nuclear weapons infrastructure, but the United States has fallen short in sustaining a modern infrastructure that is resilient and has the capacity to respond to unforeseen developments. There is now no margin for further delay in recapitalizing the physical infrastructure needed to produce strategic materials and components for U.S. nuclear weapons.

In 2008, the Secretary of Defense and Secretary of Energy released a joint report stating, "While the service lives of existing warhead types are being extended through refurbishment, at present the United States does not have the ability to produce new nuclear weapons." While North Korea can illicitly produce nuclear warheads, the United States does not have a sustained plutonium pit manufacturing capability needed to avoid stockpile age-out, support life extension programs, and prepare for future uncertainty. Plutonium pits are critical components of every nuclear warhead, with nearly all current stockpile pits having been produced from 1978—1989. Today, the U.S. capability to produce plutonium pits is limited to research and development pits unsuitable for stockpile use. To avoid age-related risks, DoD requires NNSA to produce at least 80 plutonium pits per year by 2030, and to sustain the capacity for future LEPs and follow-on programs.

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1923 U.S. production of tritium, a critical strategic material for nuclear weapons, is now insufficient to
1924 meet the forthcoming U.S. nuclear force sustainment demands, or to hedge against unforeseen
1925 developments. Programs are planned, but not yet fully funded, to ease these critical production
1926 shortfalls. In the absence of sustained support for these programs, including a marked increase
1927 in the planned production of tritium in the next few years, our nuclear capabilities will inevitably
1928 atrophy and degrade below requirements.

1929 The U.S. is also unable to produce or process a number of other critical materials, including
1930 lithium and enriched uranium. For instance, the United States largely relies on dismantling
1931 retired warheads to recover lithium to sustain and produce deployable warheads. This may be
1932 inadequate to support the nuclear force replacement program and any supplements to it.

1933 Past assumptions that our capability to produce nuclear weapons would not be necessary and that
1934 we could permit the required infrastructure to age into obsolescence have proven to be mistaken.
1935 It is now clear that the United States must have sufficient research, design, development, and
1936 production capacity to support the sustainment and replacement of its nuclear forces. To meet
1937 these needs, the United States must resolve the current significant infrastructure funding
1938 shortfalls over the next five years.

1939 To remain postured to address challenges that may emerge, the United States needs the
1940 flexibility to hedge against future risks. Consequently, NNSA will explore approaches for rapid
1941 prototyping, develop options for modifying warheads to increase flexibility and responsiveness,
1942 examine the potential for retired warheads and components to augment the future hedge
1943 stockpile, and survey past and extant warhead designs to better understand what can be certified
1944 without resuming full-scale nuclear testing. An additional measure for needed flexibility is to
1945 reduce the time required to design, develop, and initially produce a warhead, from a decision to
1946 enter full-scale development.

1947 Along with its nuclear weapon development and production infrastructure, NNSA will maintain
1948 the capability to resume underground nuclear explosive testing if called upon to do so. The
1949 United States will not seek Senate ratification of the Comprehensive Nuclear Test Ban Treaty,
1950 but will continue to observe a nuclear test moratorium that began in 1992. This posture was
1951 adopted with the understanding that the United States must remain ready to resume nuclear
1952 testing if necessary to meet severe technological or geopolitical challenges.

1953 The nuclear weapons infrastructure depends on a highly skilled, world-class workforce from a
1954 broad array of disciplines, including engineering, physical sciences, mathematics, and computer
1955 science. Maintaining the necessary critical skills and retaining personnel with the needed
1956 expertise requires sufficient opportunities to exercise those skills. Should a technical or
1957 geopolitical development demand a new nuclear weapon, it is crucial that the nuclear weapons
1958 workforce possess the skills and the knowledge needed to design, develop, and manufacture
1959 warheads of different design in a timely manner.

1960 Yet, the United States, unlike potential adversaries, has not executed a new nuclear weapon
1961 program for decades. Ongoing work involves life extension programs for existing weapons. To
1962 ensure we sustain the necessary skills and knowledge required to take new warhead designs from
1963 initial concept through development, prototyping, and plans for certification, NNSA should
1964 assess capabilities currently being exercised by: life extension programs, stockpile certification,

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1965 laboratory directed research and development, and technology maturation. On this basis, NNSA
1966 will identify any gaps in the full range of the skills needed to design and develop nuclear
1967 weapons. The Stockpile Responsiveness Program that Congress recently instituted with
1968 bipartisan support explicitly directs that the United States ensure the responsiveness and
1969 flexibility of our nuclear weapons infrastructure. This is an important element of the U.S.
1970 hedging strategy because it promises to provide more timely availability of new capabilities if
1971 they are needed to meet changes in the security environment.

1972 The United States will pursue initiatives to ensure the necessary capability, capacity, and
1973 responsiveness of the nuclear weapons infrastructure and the needed skills of the nuclear
1974 enterprise workforce, including the following:

- 1975 • Pursue a joint DoD and DOE advanced-technology development capability to ensure that
1976 efforts are appropriately integrated to meet DoD needs.
- 1977 • Provide the enduring capability and capacity to produce plutonium pits at a rate of no
1978 fewer than 80 pits per year by 2030. A delay in this would result in the need for a higher
1979 rate of pit production at higher cost.
- 1980 • Ensure that current plans to reconstitute the U.S. capability to produce lithium
1981 compounds are sufficient to meet military requirements.
- 1982 • Fully fund the Uranium Processing Facility and ensure availability of sufficient low-
1983 enriched uranium to meet military requirements.
- 1984 • Ensure the necessary reactor capacity to produce an adequate supply of tritium to meet
1985 military requirements.
- 1986 • Ensure continuity in the U.S. capability to develop and manufacture secure, trusted
1987 strategic radiation-hardened microelectronic systems beyond 2025 to support stockpile
1988 modernization.
- 1989 • Rapidly pursue the Stockpile Responsiveness Program established by Congress to expand
1990 opportunities for young scientists and engineers to advance warhead design,
1991 development, and production skills.
- 1992 • Develop an NNSA roadmap that sizes production capacity to modernization and hedging
1993 requirements.
- 1994 • Retain confidence in nuclear gravity bombs needed to meet deterrence needs.
- 1995 • Maintain and enhance the computational, experimental, and testing capabilities needed to
1996 annually assess nuclear weapons.

1997 Due to underfunding by previous administrations, significant and sustained investments will be
1998 required over the coming decade to ensure that NNSA will be able to deliver the nuclear
1999 weapons at the needed rate to support nuclear deterrence in the 2030s and beyond.

2000

2001 IX. Countering Nuclear Terrorism

2002 *“[W]e must prevent nuclear weapons and materials from coming into the hands of terrorists*
2003 *and being used against us, or anywhere in the world...”*

2004 **President Donald J. Trump, August 21, 2017**

2005 Nuclear terrorism remains among the most significant threats to the security of the United States,
2006 allies, and partners. The Joint Chiefs of Staff, in 2015, emphasized, “Nuclear, chemical, and
2007 biological agents pose uniquely destructive threats. They can empower a small group of actors
2008 with terrible destructive potential. Thus combatting weapons of mass destruction (WMD) as far
2009 from our homeland as possible is a key mission for the U.S. military.”

2010 U.S. strategy to combat the threat of nuclear terrorism encompasses a wide range of activities
2011 that comprise a defense-in-depth against current and emerging dangers. Under this multilayered
2012 approach, the United States strives to prevent terrorists from obtaining nuclear weapons or
2013 weapons-usable materials, technology, and expertise; counter terrorist efforts to acquire, transfer,
2014 or employ these assets; and respond to nuclear incidents, by locating and disabling a nuclear
2015 device or managing the consequences of a nuclear detonation. Key U.S. efforts under this
2016 strategy include:

2017 • Securing nuclear weapons, materials, related technology, and knowledge to prevent their
2018 malicious use.

2019 • Enhancing cooperation with allies, partners, and international institutions to combat
2020 nuclear terrorism.

2021 • Deterring state support for nuclear terrorism through advanced forensics and attribution
2022 capabilities.

2023 • Strengthening defenses against nuclear terrorism to protect the American people and U.S.
2024 interests at home and abroad.

2025 • Enhancing preparedness to mitigate the effects of nuclear incidents.

2026 With the cooperation of overseas partners, the United States has worked for nearly three decades
2027 to keep nuclear and radiological materials out of the hands of terrorists. As the number of
2028 nuclear facilities and the quantity of nuclear material worldwide continue to increase, we will
2029 maintain our focus on reducing the vulnerability of these materials to theft or seizure. We will
2030 also decrease the availability of sensitive equipment and technologies on the black market and
2031 thereby hinder terrorist access to them.

2032 The most effective way to reduce the risk of nuclear terrorism is to secure nuclear weapons and
2033 materials at their sources. The United States will continue to work with allies and partners to
2034 disrupt proliferation networks and interdict transfers of nuclear materials and related technology.
2035 In particular, we will improve coordination with international export-control and law-
2036 enforcement agencies to bolster information sharing to detect and interdict nuclear and
2037 radiological material. Through collaboration with foreign partners, we will maintain the
2038 constellation of radiation detection technologies that have been deployed in 60 countries around

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2039 the world to thwart the smuggling of nuclear weapons and materials by land, sea, and air.
2040 Domestically, we will sustain and build upon the roughly 57,000 radiation detectors operating at
2041 U.S. seaports, border crossings, and within the American interior.

2042 As part of this defense-in-depth, the United States will sustain its specialized capabilities to
2043 search for, interdict, characterize, and disable nuclear devices. These assets are strategically pre-
2044 positioned throughout the country to respond rapidly to nuclear incidents and save American
2045 lives. Should an act of nuclear terrorism occur, the United States also maintains advanced
2046 nuclear forensics capabilities to identify the source of the material used in a nuclear device,
2047 thereby strengthening the deterrence of such an attack. We will continue to improve our ability
2048 to attribute the source of a nuclear attack by establishing a nuclear materials archive to store,
2049 consolidate, and analyze high-value nuclear materials.

2050 The United States will hold fully accountable any state, terrorist group, or other non-state actor
2051 that supports or enables terrorist efforts to obtain or employ nuclear devices. Although the role
2052 of U.S. nuclear weapons in countering nuclear terrorism is limited, for effective deterrence our
2053 adversaries must understand that a terrorist nuclear attack against the United States or its allies
2054 and partners would qualify as an “extreme circumstance” under which the United States could
2055 consider the ultimate form of retaliation.

2056

2057 X. Non-proliferation and Arms Control

2058 *“In a world with no overarching global authority, rules are only as strong as the willingness*
2059 *of states to follow or enforce them.”*

2060 **Joint Chiefs of Staff, 2016**

2061 Effective nuclear non-proliferation and arms control measures can support U.S., allied, and
2062 partner security by controlling the spread of nuclear materials and technology; placing limits on
2063 the production, stockpiling, and deployment of nuclear weapons; decreasing misperception and
2064 miscalculation; and avoiding destabilizing nuclear arms competition. Consequently, the United
2065 States will continue its efforts to: 1) minimize the number of nuclear-armed states, including by
2066 maintaining credible U.S. extended nuclear deterrence and assurance; 2) deny terrorist
2067 organizations access to nuclear weapons, materials, and expertise; 3) strictly control weapons-
2068 usable material, related technology, and expertise; and 4) seek arms control agreements that
2069 enhance security, and are verifiable and enforceable.

2070 **Non-Proliferation and the Nuclear Non-Proliferation Treaty**

2071 The NPT is the cornerstone of the nuclear non-proliferation regime. It provides the formal
2072 international legal framework for measures to constrain and deny proliferators and to identify,
2073 contain, and sanction transgressors. The Treaty establishes a framework governing peaceful uses
2074 of nuclear energy, allowing states to pursue civil nuclear programs under safeguards that help
2075 provide transparency and confidence that such programs will not contribute to proliferation. The
2076 NPT's positive role in building consensus for non-proliferation enhances international efforts to
2077 impose costs on those who would pursue nuclear weapons outside the Treaty. It also contributes
2078 to U.S. and international efforts to mitigate threats of nuclear terrorism by helping to safeguard
2079 nuclear and radiological material and prevent the spread of sensitive nuclear technologies and
2080 expertise.

2081 The United States remains committed to nuclear non-proliferation, continues to abide by its
2082 obligations under the NPT, and will work to strengthen the NPT regime. In addition, the United
2083 States will continue to maintain a credible nuclear umbrella extended to over thirty allies and
2084 partners. This is essential to meeting their need for nuclear deterrence, while enabling them to
2085 forego independent nuclear weapons capabilities. Credible U.S. extended nuclear deterrence will
2086 continue to be a cornerstone of U.S. non-proliferation efforts.

2087 Nuclear non-proliferation today faces acute challenges. Most significantly, North Korea is
2088 pursuing a nuclear path in direct contravention of the NPT and in direct opposition to numerous
2089 U.N. Security Council resolutions. The risk of North Korea employing nuclear weapons or
2090 attempting to sell its nuclear technology and expertise is an international problem and the
2091 international community must continue to work toward preventing this threat.

2092 Beyond North Korea looms the challenge of Iran. Although the JCPOA may constrain Tehran's
2093 nuclear program, Iran retains the ability to produce weapons grade uranium for use in a nuclear
2094 weapon if it decides to do so. This, combined with Iran's ongoing missile testing, is a serious
2095 concern.

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2096 Despite these challenges, the institutions that support the NPT, such as the International Atomic
2097 Energy Agency, help identify violations, provide evidentiary support for the imposition of
2098 multilateral sanctions, and, as is the case with Iran, establish international monitoring and
2099 verification capabilities. Perhaps most importantly, strengthening these institutions and the
2100 international safeguards system supports verifiable, durable progress on non-proliferation and
2101 potentially further negotiations on nuclear reductions if the security environment permits.

2102 In continuing support of nuclear non-proliferation, the United States will continue to pursue the
2103 political and security conditions that could enable further nuclear reductions. We will work to
2104 increase transparency and predictability, where appropriate, to avoid potential miscalculation
2105 among nuclear weapons states and other possessor states through strategic dialogues, risk-
2106 reduction communications channels, and sharing of best practices related to nuclear weapons
2107 safety and security.

2108 To further strengthen the NPT regime, the United States will support initiatives to improve
2109 capabilities to detect, deter, and attribute proliferation and use; reduce the vulnerability of
2110 nuclear and radiological materials to theft or seizure around the world; and reduce the
2111 availability of proliferation-sensitive equipment and technologies through illicit transfers. These
2112 activities will reduce potential terrorist access to this equipment and technology. The United
2113 States will also support the efforts of multilateral supplier regimes such as the Zangger
2114 Committee and the Nuclear Suppliers Group. We will continue to perfect forensics capabilities
2115 for attribution purposes by establishing a nuclear materials archive to store, consolidate, and
2116 analyze high-value nuclear materials to work in concert with the existing Nuclear Materials
2117 Information Program.

2118 Further, the United States remains committed to finding long-term solutions to the technical
2119 challenges of verifying nuclear reductions, and therefore will explore new concepts and
2120 approaches for this goal, including continued support for the International Partnership for
2121 Nuclear Disarmament Verification.

2122 The number of nuclear facilities and the quantities of nuclear materials worldwide continue to
2123 increase, with a wide variance in security measures and potential vulnerabilities that could result
2124 in terrorist acquisition of nuclear materials. Consequently, the United States will continue to
2125 work with allies and partners to disrupt proliferation networks; interdict transfers of WMD-
2126 related materials, technology, and expertise; prevent the employment of improvised nuclear
2127 devices; attribute responsibility to perpetrators; and mitigate the consequences of WMD
2128 employment.

2129 Although the United States will not seek Senate ratification of the Comprehensive Nuclear Test
2130 Ban Treaty, it will continue to support the Comprehensive Nuclear Test Ban Treaty Organization
2131 Preparatory Committee, and through the U.S. Atomic Energy Detection System, continue its
2132 support for the related International Monitoring System and the International Data Center, which
2133 detect nuclear tests and monitor seismic activity. The United States will not resume nuclear
2134 explosive testing unless necessary to ensure the safety and effectiveness of the U.S. nuclear
2135 arsenal, and calls on all states possessing nuclear weapons to declare or maintain a moratorium
2136 on nuclear testing.

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2137 Finally, it is important to recognize that the Nuclear Weapons Ban Treaty, opened for signature
2138 at the U.N. in 2017, is fueled by wholly unrealistic expectations of the elimination of nuclear
2139 arsenals without the prerequisite transformation of the international security environment. This
2140 effort has polarized the international community and seeks to inject disarmament issues into non-
2141 proliferation fora, potentially damaging the non-proliferation regime. This Treaty could damage
2142 U.S. security and the security of many allies and partners who rely on U.S. extended nuclear
2143 deterrence. The terms of the Nuclear Weapons Ban Treaty also could undermine ongoing and
2144 prospective military cooperation between the United States and signatory states, cooperation that
2145 is critical to the maintenance of credible extended nuclear deterrence.

2146 **Arms Control**

2147 Arms control can contribute to U.S., allied, and partner security by helping to manage strategic
2148 competition among states. By codifying mutually agreed-upon nuclear postures in a verifiable
2149 and enforceable manner, arms control can help establish a useful degree of cooperation and
2150 confidence among states. It can foster transparency, understanding, and predictability in
2151 adversary relations, thereby reducing the risk of misunderstanding and miscalculation. In
2152 addition to formal agreements, regular dialogues on doctrine and forces can also contribute to
2153 mutual understanding and reduce the risk of miscalculation.

2154 In a series of Cold War arms control agreements, for example, the United States and
2155 Soviet Union increased transparency, moderated competition, codified rough parity in
2156 strategic nuclear arms, and closed off areas of competition. The most recent 2010 New
2157 START Treaty caps accountable U.S. and Russian strategic force levels, and includes
2158 some intrusive verification measures to help monitor compliance.

2159 New START is in effect through February 2021 and with mutual agreement, may be
2160 extended for up to five years, to 2026. The United States has already met the Treaty's
2161 central limits which go into force on February 5, 2018, and will continue to implement
2162 the New START Treaty and verify Russian compliance.

2163 Progress in arms control is not an end in and of itself, and depends on the security
2164 environment and the participation of willing partners. The United States is committed to
2165 arms control efforts that advance U.S., allied, and partner security; are verifiable and
2166 enforceable; and include partners that comply responsibly with their obligations. Such
2167 arms control efforts can contribute to the U.S. capability to sustain strategic stability.
2168 Further progress is difficult to envision, however, in an environment that is characterized
2169 by nuclear-armed states seeking to change borders and overturn existing norms, and by
2170 significant, continuing non-compliance with existing arms control obligations and
2171 commitments.

2172 In this regard, Russia continues to violate a series of arms control treaties and
2173 commitments, the most significant being the INF Treaty. In a broader context, Russia is
2174 either rejecting or avoiding its obligations and commitments under numerous agreements,
2175 including the Conventional Armed Forces in Europe Treaty, the Budapest Memorandum,
2176 the Helsinki Accords, and the Presidential Nuclear Initiatives. In addition, Russia has
2177 violated the Open Skies Treaty and is selectively implementing the politically binding

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2178 Vienna Document to avoid transparency of its major military exercises. Russia has also
2179 rebuffed U.S. efforts to follow New START with another round of negotiated reductions,
2180 and to pursue reductions in non-strategic nuclear forces.

2181 Regarding the INF Treaty, the United States complies with and remains committed to
2182 preserving the Treaty. However, the value of the INF Treaty, or any arms control treaty,
2183 depends on all parties remaining in compliance. For over four years, the United States
2184 has pressed Russia to return to compliance, and will continue to exert appropriate
2185 pressure to restore Russian compliance and preserve the INF Treaty.

2186 Nevertheless, Moscow must understand that the United States will not forever endure
2187 Russia's continuing non-compliance. The status quo, in which the United States
2188 continues to comply while Russia continues deployments in violation of the Treaty, is
2189 untenable. Agreements that are violated cannot provide predictability; undermine the
2190 prospects for future arms control; and can harm U.S., allied, and partner security.
2191 Concluding further agreements with a state in violation of multiple existing agreements
2192 would indicate a lack of consequences for its non-compliance and thereby undermine
2193 arms control broadly.

2194 Consequently, the United States will work to convince states in violation of their legal
2195 arms control obligations to return to compliance. Arms control efforts must now
2196 emphasize confidence and security building measures to rebuild trust and
2197 communication. The United States seeks to reestablish the conditions necessary for
2198 greater trust with Russia and improved transparency with China as it expands and
2199 modernizes its nuclear forces.

2200 The United States remains willing to engage in a prudent arms control agenda. We are
2201 prepared to consider arms control opportunities that return parties to predictability and
2202 transparency, and remain receptive to future arms control negotiations if conditions
2203 permit and the potential outcome improves the security of the United States and its allies
2204 and partners.

