

Weapons of Mass Destruction

John P. Caves, Jr.

The next U.S. administration faces four pressing WMD challenges. First, the prospects of a direct clash between the United States and a nuclear-armed adversary that could escalate to the nuclear level are likely to grow. Second, the scope of North Korea's nuclear, chemical, and suspected biological weapons programs likely will require resources for countering weapons of mass destruction that exceed those currently available. Third, longstanding international efforts to prohibit chemical and biological weapons are threatened by the reemergence of chemical weapons use and potentially by rapid advances in the life sciences. Finally, concern that the 2015 Joint Comprehensive Plan of Action may only postpone—rather than prevent—Iran's acquisition of nuclear weapons will perpetuate tensions and proliferation pressures in the region.

The 2015 National Security Strategy identifies the proliferation and/or use of weapons of mass destruction (WMD) among the top strategic risks to the Nation's interests.¹ This chapter examines four pressing WMD challenges for the next U.S. administration. First, the prospects of a direct clash between the United States and a nuclear-armed adversary that could escalate to the nuclear level are likely to grow. Russia in particular has become more assertive in challenging U.S. interests and has developed concepts for the limited use of nuclear weapons in a conflict with the North Atlantic Treaty Organization (NATO). Second, the scope of North Korea's nuclear, chemical, and suspected biological weapons programs likely will require resources for countering WMD that exceed those currently available to the United States and South Korea. Third, longstanding international efforts to prohibit chemical and biological weapons are threatened by the reemergence of chemical weapons use and potentially by rapid advances in the life sciences. Finally, concern that the 2015 Joint Comprehensive Plan of Action may only postpone—rather than prevent—Iran's acquisition of nuclear weapons will perpet-

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uate tensions and proliferation pressures in the region. To meet these challenges, the next U.S. administration needs to:

- close gaps in capabilities, plans, and policies that weaken deterrence
- reduce incentives for further proliferation by enhancing monitoring and verification measures and reassuring allies and partners
- strengthen the Nation's countering-WMD posture with increased resources and improved organization
- stay on top of and leverage rapid scientific and technological developments in the life sciences and related fields
- improve the education of military officers, civilian national security professionals, and the broader public on WMD challenges and the necessary responses thereto.

Challenges

The next U.S. administration will face numerous challenges in addressing the threats arising from WMD, both large and small, but the four challenges discussed below are expected to be most pressing.

Detering and Managing Escalation in Conflicts with Nuclear-Armed Adversaries

The United States is entering a new period of heightened risk of direct conflict with nuclear-armed regional powers, with the potential to escalate to the nuclear level. The nuclear problem is no longer just about proliferation and global threat reduction, the twin imperatives that characterized post-Cold War policy.² Today we also confront the challenge of deterring an adversary's first use of nuclear weapons and managing the risks of further escalation.³ Being better prepared for new and complex escalation situations requires adapting capabilities, plans, policies, exercises, and education.

A number of nuclear-armed states are challenging important U.S. interests through both military and nonmilitary means. Russia has been most aggressive, invading Georgia, annexing Crimea, enabling separatists in eastern Ukraine, and militarily intervening in Syria. Meanwhile, China has asserted its claims to disputed territory in the East and South China seas through more aggressive measures, including armed patrols,⁴ commercial exploitation activities with armed escorts,⁵ and physical en-

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largement of disputed formations that it controls.⁶ North Korea frequently issues threats, including nuclear ones, against Seoul and Washington, and periodically perpetrates military provocations.⁷ These activities threaten the territorial integrity and security of U.S. treaty allies, and more broadly the rules-based order that the United States views as central to global security. As such they carry the possibility of direct conflict with U.S. forces.

Russia's and China's increasing assertiveness may be explained by a confluence of ambition and opportunity. The ambition is their respective aspirations for a more powerful role globally and primacy in their own regions. Both view the United States as the principal obstacle to realizing such ambitions. The opportunity principally is the mitigation of U.S. military superiority resulting from their aggressive military modernization programs, particularly in antiaccess/area-denial (A2/AD) capabilities, power projection, and other information-centric capabilities.⁸ That sense of opportunity may be enhanced by a perceived asymmetry of interests with the United States in regional conflicts and a certain war-weariness among the United States and some of its Western allies after more than a decade of conflict in Afghanistan and Iraq.

The ability of U.S. forces to prevail in the early stages of conventional conflicts with Russia and China in areas close to their borders—and by extension the ability to deter such conflicts—should no longer be assumed. Geography and growing deployments of modern A2/AD capabilities⁹ increase the vulnerability of U.S. forces in these regions and complicate U.S. reinforcement efforts.¹⁰ This situation makes it more likely that Russia or China could achieve a rapid *fait accompli*, such as seizing territory in the Baltic region or East China Sea, respectively, and shift the burden of escalation onto the United States if those gains are to be reversed.

The burden of escalation is heavy in conflicts with nuclear-armed adversaries.¹¹ To degrade adversary capabilities threatening U.S. and allied efforts to assemble and employ sufficient force to reverse a *fait accompli*, U.S. forces likely would have to strike assets, including missile, integrated air defense, and command and control sites, on Russian or Chinese territory.¹² Such attacks could be viewed as escalatory and strategic by those nations and invite retaliatory strikes on U.S. and other allies' territories. Some Chinese strategic thinkers have suggested that conventional attacks on strategic targets would merit a nuclear response, notwithstanding China's longstanding nuclear no-first-use policy.¹³ Of more direct concern, Russia reportedly has adopted a concept, generally referred to as “escalate-to-de-escalate,” by which it would resort early in a conflict to nuclear as well as conventional strikes against critically

important adversary targets to convince the adversary that the risks of continuing the conflict outweigh any possible rewards.¹⁴ Indeed, Russia has been keen to impress upon others its readiness to employ nuclear weapons. It espouses a military doctrine reliant on nuclear weapons to deter and defeat major conventional as well as nuclear aggression.¹⁵ It also frequently rattles its nuclear saber, as it did to deter intervention in the Ukraine conflict and to try to dissuade European states from hosting U.S. missile defense assets.¹⁶

U.S. nuclear escalation options currently are more limited than those available to Russia. Nonstrategic U.S. nuclear weapons based in Europe and assigned to NATO are an important rung on the escalation ladder: they can signal resolve and under the right circumstances have real military effect, but can also demonstrate restraint by allowing strategic systems to be held in abeyance. Russia holds a much larger number and greater variety of nonstrategic nuclear weapons than the United States does.¹⁷ Some Russian delivery systems also are more modern and capable, for example, the Iskander missile system, which can deliver nuclear- or conventionally armed ballistic and cruise missiles that are maneuverable and re-targetable in flight.¹⁸ This suggests that Russia may accord greater importance and more roles to nonstrategic nuclear weapons than does NATO. The Alliance's land-based nuclear deterrent is limited to aging gravity bombs delivered by dual-capable tactical aircraft (DCA) that are vulnerable to Russia's integrated air defense systems.¹⁹ The planned replacement of most DCA with F-35s and completion of the life extension program for the B-61 bombs will not occur before the 2020s.²⁰

The threat posed by Russia's Iskander missile system to NATO is currently limited by range. The 1987 Intermediate Range Nuclear Forces (INF) Treaty bars Russia and the United States from developing, testing, or deploying ballistic missiles or ground-launched cruise missiles (GLCM) with ranges between 310 and 3,400 miles.²¹ The Iskander-M extended-range ballistic missile system currently deployed with the Russian army has a range of 250 miles.²² The more recent Iskander-K variant launches the R-500 cruise missile, which some analysts believe has an intermediate range but which the United States has not identified as a treaty violation.²³ The United States, however, has accused Russia of testing a different GLCM in violation of the INF Treaty, though it has not publicly identified the missile.²⁴

Russia's development and deployment of intermediate-range nuclear missiles would pose a particular problem for NATO. These missiles could strike targets across Europe within minutes without threatening U.S. territory. When the Soviet Union fielded such systems in the 1970s, NATO governments considered it so serious a threat to Alliance cohesion

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that they unanimously agreed, despite widespread public opposition, to pursue a dual-track approach of deploying a comparable capability in Europe while seeking to negotiate mutual limits with the Soviets. Only after those NATO deployments actually began did the Soviet Union agree to negotiate what would become the INF Treaty. Contemporary Russian violations would be consistent with dissatisfaction that Russian officials have expressed with the treaty in recent years for constraining their ability to counter intermediate-range missiles deployed by countries such as China and Pakistan or by missile defense and conventional precision-strike capabilities possessed by the United States.²⁵

China poses its own escalation challenges for the United States. Not a party to the INF Treaty, it fields a large and growing force of modern, medium-range, conventionally armed ground-based ballistic missiles. These MRBMs as well as a variety of land-attack cruise missiles hold U.S. bases in Japan at risk. There are reports that China is developing a new advanced intermediate-range ballistic missile (IRBM) that could strike U.S. bases in Guam.²⁶ China also is fielding an anti-ship ballistic missile with a range of 900 miles and maneuverable warhead that can attack ships, including aircraft carriers, in the western Pacific Ocean.²⁷ China's growing missile force is part of its expanding A2/AD capabilities that challenge the U.S. ability to fulfill its security commitments to regional states.

China also currently deploys nuclear-armed MRBMs and IRBMs as well as intercontinental ballistic missiles and submarine-launched ballistic missiles.²⁸ Unlike Russia, China does not have, nor has it sought, nuclear parity with the United States. It currently maintains only about 200 operational nuclear warheads in support of a long-stated nuclear doctrine of no-first-use and minimum deterrence.²⁹ China, however, is modernizing and expanding its nuclear arsenal, which may promote stability in some regards by making its arsenal more survivable, but also may afford China greater scope to employ its weapons in counterforce or nonstrategic roles without compromising the counter-value retaliatory capacity at the heart of its strategic doctrine.³⁰ Also, unlike Russia, China does not share a ground border with any U.S. ally, making its military competition with the United States more focused on the sea and associated air and space domains. These domains may be more inviting to operational use of nuclear weapons since they offer less scope for collateral damage.

North Korea also poses nuclear deterrence and escalation management challenges but of a different scale and circumstance from Russia or China. The long-feared prospect of a massive North Korean invasion of the South to achieve reunification has receded as the quality of its con-

ventional forces has deteriorated along with its economy,³¹ but Pyongyang has managed to build a small and growing nuclear arsenal and a ballistic missile force of increasing range with which to deliver those weapons.³² The greater risk of conflict now is seen as arising from an escalatory spiral initiated by a North Korean provocation or the possibility of serious unrest in the North that necessitates outside intervention to address a humanitarian crisis, secure WMD, and/or respond to a related attack against an external actor.³³ Given North Korea's huge investment in its nuclear weapons program and the frequency and virulence of its nuclear threats, it is only prudent to anticipate that it may respond to such developments with nuclear weapons use.

Preparing for WMD Contingencies on the Korean Peninsula

Beyond deterrence and escalation management risks, North Korea also poses a major countering WMD (CWMD) challenge.³⁴ In the event of a collapse of the Pyongyang regime or as the result of a major conflict on the peninsula, the United States and its allies must be prepared to defend against the possible use of North Korean chemical and biological as well as nuclear weapons and to enter North Korea to secure and eliminate its WMD capabilities. North Korea represents the most comprehensive CWMD challenge we face, one whose potential scale could exceed the resources currently available to the United States and South Korea. Being fully prepared for WMD contingencies on the peninsula and beyond will require a larger pool of forces with specialized training and equipment and improved organization.

North Korea may have between 6 and 30 nuclear weapons and could expand its stockpile, perhaps dramatically, over the coming years.³⁵ Its growing and increasingly sophisticated ballistic missile force spans from short- to intercontinental-range missiles.³⁶ According to an unclassified assessment by South Korea's Ministry of National Defense (MND), the North likely possesses between 2,500 and 5,000 metric tons of chemical warfare agents. This probably includes first- and second-generation agents, such as mustard and sarin. Less is known about North Korea's biological weapons (BW) capabilities, but the MND assesses the North has the capability to cultivate and weaponize various types of agents, such as anthrax and smallpox.³⁷

In the event of a major conflict on the peninsula and/or the collapse of the North Korean regime, it will be a high priority task for U.S. and South Korean forces to locate, control, defeat, disable, and/or dispose of North Korean WMD capabilities to prevent their use by North Korean forces or agents, or their loss to third parties. This task will be complicated by incomplete knowledge of the locations and specific types and

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quantities of WMD and related capabilities. WMD programs, especially chemical and biological ones, are difficult intelligence targets, especially in North Korea. Parts of North Korea may be difficult to access, and coalition forces also may have to accomplish other priority tasks like non-combatant evacuations, humanitarian operations, and/or conventional warfighting.

The potential scale of this task exceeds existing coalition resources, particularly units with specialized training and equipment for CWMD missions. These units number in the single digits while WMD sites may number in the hundreds.³⁸ It will not be possible to reach and secure all or most sites of concern in a timely fashion, except in the most limited and permissive contingencies. Even with little or no North Korean resistance, the difficult terrain alone is a major obstacle to timely access. The less warning of a crisis, the longer will be the response time to deploy forces from home bases. The United States also will have to anticipate the possibility of some WMD assets proliferating off the peninsula and devote resources to their interdiction.³⁹

Successful North Korean use of WMD against U.S. and South Korean forces in the context of a shooting war could seriously complicate operations. Chemical and biological attacks may not preclude ultimate victory by the combined forces, but large-scale attacks in particular would increase the length and costs of the fight and could have unpredictable political consequences.⁴⁰ If North Korea also employed nuclear weapons on the battlefield—which it will have greater scope to do as its arsenal expands—this would re-introduce a dimension to warfighting for which U.S. forces have not extensively prepared since the Cold War's height.⁴¹

Holding the Line Against Chemical and Biological Weapons

New chemical and biological weapons threats are emerging. Some on the chemical side have already manifested. These developments challenge the integrity and force of international norms and regimes prohibiting chemical and biological weapons. They also impose new demands on Department of Defense (DOD) force protection. To hold the line against a resurgence in the proliferation and use of chemical and biological weapons, the United States needs to lead international efforts to update nonproliferation regimes for the new strategic environment and hold accountable those who defy international norms and law in these areas. The United States also needs a greater understanding of emerging technologies and the threats and opportunities they pose.

The Biological Weapons and Toxins Convention (BWC) and Chemical Weapons Convention (CWC) came into force in 1972 and 1997, respectively, to prohibit biological and chemical weapons. Almost all

states are now party to these agreements.⁴² No state is known to have employed biological weapons (BW) since the BWC entered into force. Nor had any state been known to employ chemical weapons (CW) since the CWC entered into force—until 2012–2013, when Syria, not then a CWC state party,⁴³ used sarin on several occasions on its own territory.⁴⁴ The large-scale sarin attack in eastern Ghouta in August 2013, which caused at least hundreds of civilian deaths,⁴⁵ prompted threats of military action against the Syrian regime by the United States, United Kingdom, and France. That crisis was resolved when Russia and the United States brokered Syria's agreement to join the CWC, declare its CW capabilities, and submit its declared stocks to destruction (largely accomplished in 2014).⁴⁶ With this accession to the CWC by one of its most significant holdouts, the cause of prohibiting CW, initially undermined by Syria's sarin use, appeared to be reinforced.

But that moment was short-lived. Even before the most dangerous of Syria's declared chemicals were destroyed, reports emerged of the employment of chlorine-containing chemicals as a weapon of war in Syria. During 2015 the Organisation for the Prohibition of Chemical Weapons (OPCW) Fact-Finding Mission in Syria (FFM) investigated alleged incidents of CW use and concluded that several uses of chlorine likely had occurred in Syria's Idlib Governorate between March 16 and 20, 2015.⁴⁷ Although the FFM's mandate proscribes it from attributing responsibility for these attacks, Secretary of State John Kerry and others expressed high confidence that at least the preponderance of attacks were perpetrated by the Syrian regime.⁴⁸

If the Syrian regime conducted these chlorine attacks, as is widely believed, it would constitute an unprecedented violation of the CWC by a state party. The CWC prohibits the use of any toxic chemical as a method of warfare, whether it is listed in the convention's Schedules of Chemicals.⁴⁹ But in contrast to the explicit Western threats of military action following the Ghouta attacks, no comparable threat or sanction was visited upon Syria in the immediate wake of these chlorine uses. This may reflect several factors. First, the chlorine attacks have caused few deaths because chlorine is much less lethal than sarin. Second, the human toll caused by chlorine (or all CW) use in Syria pales in comparison to the mounting carnage there caused by conventional weapons.⁵⁰ Third, the longer and more complex the Syrian conflict becomes, the less inclined other countries may be to take strong stands that complicate achievement of a political settlement. The United States and its allies chose first to seek an official finding of the Syrian regime's responsibility for chlorine use from a cognizant international body. In August 2015 the United Nations Security Council adopted Resolution 2235 establishing

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a Joint Investigative Mechanism of the United Nations and the OPCW (JIM) to attribute responsibility for the use of CW in Syria.⁵¹ In August 2016 the JIM found the Syrian regime to be responsible for two chemical attacks during 2014 and was continuing to assess several other cases.⁵² The United States and its allies now need to decide how to respond.

Unfortunately, the CW use problem extends beyond the Syrian regime's actions. There is increasing evidence that the Islamic State of Iraq and the Levant (ISIL) also has employed CW in Iraq as well as Syria.⁵³ For example, in its August 2016 report, the JIM found that ISIL was "the only entity with the ability, capability, motive, and the means to use sulfur mustard" during an attack in Marea, Syria, on August 21, 2015.⁵⁴ Like the Syrian regime since 2014, ISIL's apparent CW use to date has caused few fatalities, featuring relatively low-lethal toxic industrial chemicals (TICs) and sulfur mustard.⁵⁵ The use of mustard suggests ISIL may be producing chemical agents in addition to commandeering widely available TICs. ISIL's conquest of territory in Syria and Iraq, including the major city of Mosul, has afforded it control of modern scientific facilities and perhaps also expertise seldom available to terrorist organizations. This may enable ISIL to develop, produce, and employ more lethal chemical agents than mustard and perhaps biological weapons, too, but there also is skepticism about ISIL's ability to do so.⁵⁶

It also is noteworthy that ISIL, like the Syrian regime, appears to have used CW primarily to support military objectives rather than for more purely terror purposes. While both ISIL and the Syrian regime use chemicals against civilians and likely, at least in part, for their psychological effect, both are doing so in the prosecution of a war in which they are attempting to defeat an adversary and control territory. But more traditional forms of terrorism using CW or even BW cannot be ruled out, considering ISIL has claimed responsibility for recent mass casualty attacks outside the region.⁵⁷ This has been on the mind of some European officials.⁵⁸

CW use in the Middle East points to several limitations of the CW nonproliferation regime. The Syria case demonstrates the difficulty of mobilizing sufficiently unified, timely, and strong international action to deter or sanction a CWC state party that violates its treaty obligations, at least when its use of CW is killing few people. The ISIL case reminds us that terrorist organizations are not bound by the norms and agreements made by states. Both cases show that CW encompass more than the sophisticated chemical warfare agents that are the monitoring and verification focus of the CWC. Widely available TICs also can be employed as weapons with both military and terror effect.

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No comparable recent instances of BW use have occurred, but this should not be cause for complacency. There are indications of interest in BW by both state and nonstate actors. For example, the United States discovered an al Qaeda BW program when it invaded Afghanistan,⁵⁹ and more recently a document on BW production was found on an ISIL member's captured laptop.⁶⁰ On the state side, Russian President Vladimir Putin spoke in 2012 about the future emergence of genetic weapons,⁶¹ a disturbing reference in light of the Soviet BW program. BW also is potentially more impactful than CW, generally possessing a far lower mass-to-effect ratio.⁶²

Technological barriers to BW development, production, and use also are receding. Dual-use production and dissemination equipment that was hard to acquire is now widely available.⁶³ Rapid developments in the life sciences (for example, genetic mapping, “big data” genetic analytic capability, specific gene editing), other emerging technology areas (nanotechnology, additive manufacturing), and the broad dissemination of the resulting information via the Internet also have made it possible and/or easier to perform an ever broader range of biological activities. These include enhancing traditional forms of BW (for example, resistance to medical countermeasures), recreating agents of past scourges (the 1918 Spanish Influenza), and even creating entirely new organisms.⁶⁴ It may even become possible to design BW that target specific individuals or groups on the basis of their unique genetic profiles.⁶⁵

These rapid and far-reaching scientific and technological developments increase the prospects for technological surprise and pose significant challenges for the BW nonproliferation regime. The BWC was drawn broadly enough to prohibit new forms of BW that may emerge from technological change, but its current processes are hard-pressed to keep pace with such change. The BWC's review conferences occur only every 5 years, a period in which major scientific and technological developments can transpire. Also, no standing body of experts exists to regularly assess scientific and technological developments and to advise state parties' political representatives of their implications for the convention, as the Scientific Advisory Board and OPCW Technical Secretariat do for CWC state parties.

The new BW possibilities enabled by these scientific and technological developments also pose serious challenges for the protection of forces, populations, and economies, but they could provide means to counter these threats, too. They already are the source of many positive improvements in other areas, such as medicine, energy, and agriculture. The potential impacts of emerging technologies are the subject of increasing interest and activity across the U.S. Government, but the activi-

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ty generally lacks structure, integration, and a focus on what needs to be done, though there are recent efforts to rectify these shortcomings. Government research, development, and acquisition processes in most cases also lack the dexterity to capitalize quickly on rapidly emerging technological opportunities to address biodefense and public health needs.⁶⁶

Containing Nuclear Proliferation Pressures in the Middle East

The 2015 Iran nuclear agreement—the Joint Comprehensive Plan of Action (JCPOA)—constrains Iran’s ability to develop nuclear weapons but does not eliminate proliferation pressures within the region. Indeed, the nature of the agreement could heighten such pressures if regional rivals are concerned that Iran may resume its pursuit of nuclear weapons when the agreement’s key restrictions on its enrichment capability expire. To contain these proliferation pressures, the United States will need to reassure its regional partners that together they can keep an aggressive Iran in check while trying to induce Iran to behave more responsibly.

The JCPOA limits Iran’s ability to produce fissile material through a set of physical constraints and intrusive monitoring and verification measures.⁶⁷ But the JCPOA also allows Iran to retain a substantial nuclear infrastructure (including virtually all of the physical infrastructure associated with its uranium enrichment program) and the capacity to expand its enrichment program after the physical constraints on fissile material production and most of the verification and enforcement provisions expire in 10 to 15 years. Assuming that the JCPOA is implemented and effectively deters Iran from producing fissile material from its *declared* facilities, there remains concern that Iran will bide its time until the agreement’s latter years in order to reap the benefits of sanctions relief and then resume pursuit of nuclear weapons from a stronger economic position.⁶⁸ In addition, there is concern that Iran might cheat on the margins during the JCPOA by conducting small-scale enrichment or weaponization work at *undeclared* facilities, the detection of which will rely heavily on national intelligence capabilities.⁶⁹

Iran’s regional rivals could be motivated to pursue their own nuclear hedging strategies to guard against the possibility of a future nuclear-armed Iran. Saudi Arabia, the leader of the Sunni Arab bloc opposed to Iran, has warned it would have to respond to Iran’s acquisition of nuclear weapons.⁷⁰ Hedging strategies could include pressing ahead with civilian nuclear energy programs (which can provide a foundation for nuclear weapons development), developing enrichment and/or reprocessing capabilities (which is permissible under the Nuclear Non-Proliferation Treaty (NPT) if done openly and with safeguards), covertly inves-

tigating nuclear weapons technologies, and/or pursuing nuclear security guarantees from outside powers.

Saudi Arabia was among a number of Arab states that initiated civilian nuclear energy programs in the mid-2000s.⁷¹ It likely was not a coincidence that these initiatives appeared within a few years of revelations of Iran's secret enrichment activities and the failure of the initial, European Union–led negotiations to end those activities. While this may represent a Saudi hedging strategy for the longer term, some observers believe that Riyadh might also pursue a nuclear deterrence strategy for the shorter term, one that presumably would leverage its historic relationship with Pakistan.⁷² Alternatively, the Saudis and other Gulf Cooperation Council (GCC) states could seek a formal security guarantee from the United States or possibly France.

Lingering questions about Iran's ultimate nuclear intentions also could inhibit efforts to resolve or mitigate key sources of regional instability. Some observers believe the nuclear agreement could motivate both Iran and its Saudi-led Arab opponents to become more confrontational toward one another, at least in the short term. Iranian hardliners may act to heighten tensions to preclude the agreement from serving as a springboard for wider diplomatic and economic cooperation with the international community. Iranian Supreme Leader Ali Hoseini-Khamenei may acquiesce to assuage concerns within Iran's conservative political establishment while JCPOA implementation proceeds.⁷³ The financial windfall that Iran expects from sanctions relief under the agreement also could underwrite increased funding and weapons shipments to Shia militants and proxies in Iraq, Syria, Yemen, Lebanon, and Palestine.⁷⁴ For its own part, the Saudi-led Arab coalition states may feel compelled to stand up more vigorously to Iran to offset any perceived lessening of the U.S. commitment to their security.⁷⁵ Arab states are concerned that the agreement may lead to a closer U.S.-Iran relationship or a progressive U.S. disengagement from the region.⁷⁶ Saudi Arabia's uncharacteristic commitment of its own forces and prestige to the difficult conflict in Yemen can be seen as a case in point. The JCPOA, moreover, has not alleviated Israel's concerns about Iran's nuclear program. Israeli Prime Minister Binyamin Netanyahu appealed directly to the U.S. Congress to oppose the agreement.⁷⁷

Recommendations

The foregoing WMD challenges are serious but surmountable. To meet them, the next U.S. administration should:

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- close gaps in capabilities, plans, and policies that weaken deterrence
- reduce incentives for further proliferation by strengthening monitoring and verification measures and reassuring allies and partners
- strengthen the Nation's countering WMD posture with increased resources and improved organization
- stay on top of and leverage rapid scientific and technological developments in the life sciences and related fields
- improve the education of military officers, civilian national security professionals, and the broader public on WMD challenges and the necessary responses thereto.

Close Gaps that Weaken Deterrence

The United States should strengthen its own and regional allies' abilities to resist and thus deter a territorial fait accompli by Russia and China that would shift the burden of escalation on the United States and its allies. For Europe, this means implementing the proposed expansion of the European Reassurance Initiative in DOD's fiscal year 2017 budget request to enable a larger rotational force presence on the ground of NATO Allies most vulnerable to Russian aggression. If Russia acts more aggressively, consider a larger, permanent force presence in those allied states. If Russia fields MRBMs and IRBMs, accord the U.S. European missile defense architecture an orientation against such missiles and consider developing and deploying comparable U.S. missiles. Expand air defense systems in the theater to protect a larger array of assets against cruise missile attack. In the Pacific, complete the redeployment of 60 percent of all U.S. naval and air forces to that theater.⁷⁸ Continue to expand and integrate U.S. and East Asian regional allies' missile defense capabilities. Vigorously pursue the Third Offset Strategy that DOD announced in 2015 to strengthen U.S. conventional deterrence in the face of both China's and Russia's growing capabilities.⁷⁹

Modernize U.S. nuclear forces and employment plans to enhance nuclear deterrence. Press ahead with the programmed life extension of the B61 nuclear bombs and the replacement of NATO dual-capable aircraft with F-35s. Proceed with the planned modernization of the broader U.S. nuclear force, including development of the long-range standoff nuclear cruise missile as a replacement for the aging air-launched cruise missile to provide a more reliable standoff attack capability against modern in-

tegrated air defenses. The planned modernization effort will require a significant increase in spending for U.S. nuclear forces, but these costs will still represent a small portion of the overall U.S. defense budget,⁸⁰ and there is no substitute for modernizing an aging nuclear force that is fundamental to U.S. security. The bomber leg of the triad, including standoff cruise missiles and gravity bombs deliverable by penetrating bombers, is especially important to the effectiveness and credibility of U.S. extended deterrence commitments to major allies.⁸¹

Expand theater nuclear planning expertise in relevant geographic combatant commands (GCCMDs) and better integrate conventional and nuclear force planning at the theater level.⁸² Because the effective posturing and potential employment of nuclear assets in a theater may be critical to preventing a regional conflict from escalating to the strategic level, GCCMDs need to be well-versed and centrally involved in planning for the nuclear dimensions of regional conflicts. They also must be able to deconflict their conventional operations with nuclear ones, which may be directed by U.S. Strategic Command (USSTRATCOM), so as not to undermine the conventional campaign. Deterrence and warfighting will be further strengthened by GCCMDs' understanding of how to enhance their forces' resilience in conducting operations in a nuclear environment.

Review existing doctrine, concepts, and campaign plans for conflicts with nuclear-armed adversaries to assess their implications for nuclear escalation and revise them as appropriate to minimize that risk. This mindset was not necessary for post-Cold War conflicts because U.S. adversaries were not nuclear armed. The United States could and did apply overwhelming conventional force to rapidly crush those adversaries' capacity to wage war wherever it existed and also, in some cases, to overthrow their regimes. The United States will need to pursue more limited aims with calibrated applications of force, and associated messaging, in potential future conflicts with states that are able to wreak nuclear devastation upon U.S. allies, forces, and even populations.⁸³ This mindset is especially salient to planning for war in Korea, which long assumed a decisive counteroffensive to reunify the peninsula under South Korea, as opposed to wars with Russia and China, for which invasion and regime change have not been war aims.

Hold accountable those who are using CW in the Middle East. If other actors observe that CW use goes largely unpunished, they may be less deterred from similar resort in their own conflicts if they perceive advantage in doing so. To deter such use, the United States needs to provide leadership in holding the Syrian regime accountable for its CWC violations. The JIM's continuing efforts to ascribe responsibility for CW use in Syria must be actively supported. If the ultimate outcome in Syria is

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the demise of the Bashar al-Asad regime, members of the regime deemed responsible for CW use should still be pursued and prosecuted. As concerns ISIL, the United States must continue to pursue aggressively its comprehensive defeat, including denying it the sanctuary and facilities of the territory it now controls in Iraq and Syria, which likely contribute to its ability to produce CW. In the meantime, priority should be accorded to efforts to understand and disrupt ISIL's WMD activities, deter use, and prevent proliferation to affiliate groups.⁸⁴

Determine why Syria and ISIL have resorted to proscribed chemical weapons. Do they see these weapons as having unique military advantages, such as the ability to reach opponents within structures that protect them from bullets and high explosives? Is it because chemical weapons terrorize target populations into fleeing territory that they are trying to seize? Is it because widely available TICs are cost-effective alternatives to conventional weapons, such as improvised barrel bombs are to military-grade bombs? Understanding their motivations can inform future efforts to dissuade and deter CW proliferation and use.

Reduce Incentives for WMD Proliferation

Advocate for and contribute to increased funding, inspectors, and intelligence resources for International Atomic Energy Agency monitoring and verification of Iran's nuclear program. Confidence in Iran's essential compliance with the JCPOA will be necessary to achieving the agreement's goal of preventing Iran from acquiring nuclear weapons. These measures could help allay Israel's and GCC states' concerns that Iran will seek to increase its enrichment capacity during the JCPOA, and eventually make the decision to build nuclear weapons. The United States also should begin working as soon as practical with key allies and partners to identify ways to induce Iran, positively and negatively, to abide by its NPT obligations once the JCPOA's limitations and enforcement provisions expire. Planning now for the post-JCPOA period could mitigate a tendency to assume the JCPOA is only a hiatus in Iran's pursuit of a nuclear arsenal.

Address the security concerns of U.S. regional allies and partners arising from the JCPOA to reduce their incentives to pursue courses of action that could harm U.S. interests or lead to a more proliferated region. An effort to reassure partners was at the heart of President Barack Obama's Camp David summit with GCC states in May 2015, a number of whom were reported to be dissatisfied with U.S. attention to their security concerns.⁸⁵ The resulting joint statement reaffirmed the "unequivocal" U.S. commitment to "deter and confront external aggression against [its] allies and partners" and indicated that the assembled leaders had discussed "a new U.S.-GCC strategic partnership to enhance their

work to improve security cooperation, especially on fast-tracking arms transfers.⁸⁶ Conventional arms transfers have gained additional significance given concerns that the lifting of sanctions and unfreezing of Iranian assets under the JCPOA will enable Iran to acquire sophisticated arms from Russia and elsewhere.⁸⁷ The United States will need to reassure Israel, however, that efforts to strengthen GCC states will not come at the expense of its qualitative military edge. A new 10-year military assistance agreement that the United States and Israel signed on September 14, 2016, providing for a substantial increase in U.S. military aid to Israel, should help in that regard.⁸⁸ The United States also should be open to adding an explicit nuclear dimension to its statements intended to reassure regional partners, albeit short of a nuclear security guarantee to any particular partner that likely would be politically unsalable.⁸⁹ For example, the United States could state publicly that it will never tolerate the threatened or actual use of nuclear weapons *against its vital interests in the region* and that it would be prepared to use all the instruments at its disposal to defend those interests. At the same time, it should reinforce privately with its nonnuclear partners that it will not tolerate their pursuit of nuclear weapons capabilities.

Increase Resources and Improve Organization for CWMD Contingencies

Make more effective use of U.S. and South Korean resources to prepare for countering weapons of mass destruction contingencies on the Korean Peninsula, the most likely and demanding of current CWMD challenges facing the United States. DOD should seek to expand CWMD expertise among Reserve and Guard forces and raise the readiness of such forces to deploy for CWMD missions. It also should look for ways to broaden and deepen interagency contributions to CWMD operations, such as by the Department of Energy's National Nuclear Security Administration, which has expertise and capabilities relevant to nuclear elimination tasks.⁹⁰ It also should encourage South Korea to expand its specialized CWMD forces and ensure that their training and equipment are comparable to and interoperable with counterpart U.S. forces, especially to deal with North Korea's chemical and biological programs. The United States and South Korea, a nonnuclear weapons state, further should determine to what extent South Korean forces can participate in operations associated with eliminating North Korea's nuclear weapons program, consistent with the NPT and U.S. Atomic Energy Act.

Engage other countries with advanced CWMD capabilities to determine how they might contribute to CWMD operations in Korea. This includes allies and partners such as the Australia, France, Germany, Japan,

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the United Kingdom, and Singapore. China also could bring resources to bear on this problem. China inescapably will play a major role in any conflict or crisis in North Korea, possibly with forces on the ground. China has its own interest in ensuring that a crisis does not lead to the use or loss of North Korean WMD, lest it also become a victim of or at least be seen as culpable in such an eventuality. Still, the obstacles to eliciting China's cooperation in matters concerning the possible collapse or defeat of its North Korean ally are obvious.⁹¹ But the need remains, and the situation is changing as North Korea's behavior creates more problems for China and as China bids for influence in South Korea. Efforts should continue to engage China in discussions about how it can contribute to preventing the use or loss of North Korean WMD.⁹²

Implement the reassignment of the DOD CWMD mission to U.S. Special Operations Command (USSOCOM). In 2005, DOD established CWMD as a distinct military mission and assigned U.S. Strategic Command responsibility for synchronizing CWMD efforts across the department.⁹³ USSTRATCOM made strides toward increasing military focus on CWMD, including instituting semiannual CWMD Global Synchronization Conferences and preparing CWMD Concept Plan 8099. Yet with an unusually diverse set of missions—also including strategic deterrence; intelligence, surveillance and reconnaissance; space; and cyber—USSTRATCOM could not devote as much effort to the CWMD mission as it required. The reassignment of CWMD to another command able to give the mission greater attention should enable stronger leadership, improved planning, and more effective advocacy. USSOCOM is best suited of the combatant commands to assume the mission given its global scope, special authorities, existing CWMD roles, and interest in the mission.⁹⁴

Stay on Top of and Leverage Rapid Scientific and Technology Developments

Actively encourage ongoing efforts across the U.S. Government to understand the implications of emerging technologies, but provide them with more structure, better integration, and a focus on identifying what can and should be done. Rapid developments in the life sciences and other relevant fields may lead to new types of biological and chemical weapons, but also new means for countering these threats. The mindset needs to be one of leveraging these developments to the maximum extent possible, such as in achieving better countermeasures and applying controls only where necessary and practical. Nimble research and development capabilities will be needed to exploit rapid advances that offer the prospects for developing new kinds of countermeasures to address existing and emerging biological threats.

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Strengthen the BW nonproliferation regime's capacity to deal with rapid scientific and technological change. Create structures and working methods that allow BWC state parties to tackle issues in a more effective way, such as by meeting more frequently between review conferences and delegating more authority to those gatherings. A body of experts also should be established to regularly assess relevant scientific and technological developments and their implications for the purposes of the convention, and the annual Meeting of Experts should be used as an opportunity to advise state party representatives on these matters. Recognizing the limits to controlling the availability and utilization of rapidly developing technologies, BWC state parties also need to reinforce the international norm against BW through active outreach to the science and technology communities to dissuade their involvement in proliferation efforts.

Educate Military Officers, Civilian Officials, and the Broader Public on WMD Challenges

Make deterrence and escalation management essential elements of the education and experiential learning of all military officers and civilian national security officials. The knowledge and skills needed to address these challenges, once sharpened by the centrality of the Cold War nuclear threat, atrophied thereafter as the risk of nuclear war rapidly receded and attention turned to conventional wars against nonnuclear states, terrorism, and irregular warfare. But with the increased potential for nuclear weapons use today, deterrence and escalation management, including a greater understanding of adversary doctrine and the elements of crisis management, must again figure prominently in the core educational curricula for military officers and civilian officials.⁹⁵ It also is no longer acceptable to rule out the possibility of nuclear weapons use when designing and conducting exercises involving conflict with nuclear-armed adversaries; these threats must be faced head on so military and civilian leaders gain valuable experiential learning in this area.

Improve CWMD education for military officers and civilian national security professionals with related responsibilities. Many military officers still arrive at CWMD planning positions with no or little CWMD background. DOD can improve CWMD planning by expanding CWMD training and education offerings and making them available earlier in officers' careers.⁹⁶

Inform the broader public, at home and abroad, about the changing nature of the WMD threat and the circumstances necessitating countermeasures like those discussed above, particularly as they relate to the politically difficult subject of nuclear weapons. The President and senior advisors need to acknowledge regularly and forthrightly the essen-

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tial contribution that nuclear weapons and other elements of military strength make to U.S. and international security in the current and foreseeable international security environment. At the same time, they need to reiterate that the United States is no less committed to its NPT Article VI obligations to pursue negotiations toward nuclear disarmament, and show it by continuing to attempt to engage Russia, foremost, and other nuclear weapons states, as and when appropriate, toward that end. Rebutting the false premise that the dangers posed by nuclear weapons can be eliminated by simply outlawing these phenomena, as some supporters of the Humanitarian Initiative advocate,⁹⁷ or by disarmament by example (unilateral disarmament), is a continuous task from which responsible national security leaders must not shrink.

Conclusion

Weapons of mass destruction pose diverse, complex, and enduring challenges for U.S. and international security. The challenges no longer are predominately about preventing proliferation; they are again increasingly about deterring and responding to the use of WMD. To surmount the most pressing WMD challenges it will face, the next U.S. administration will need to invest in the skills and capabilities required to deter and manage escalation risks in conventional conflicts with nuclear-armed adversaries, especially Russia and China. It will need to expand the resources and improve the organization required to meet the countering WMD problem posed by North Korea. To hold the line against a resurgence in the proliferation and use of chemical and biological weapons, it will need to hold accountable those who violate international norms and laws in these areas and to invest in acquiring a greater understanding of new and emerging threats and opportunities and how to defeat and exploit them, respectively. Finally, to contain regional proliferation pressures in the aftermath of the Iran nuclear agreement, the next U.S. administration will need to reassure regional partners that together we can keep an aggressive Iran in check while incentivizing Tehran to adopt a more responsible and moderate position in the region and around the world.



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Notes

¹ *National Security Strategy* (Washington, DC: The White House, February 2015), 2, available at <www.whitehouse.gov/sites/default/files/docs/2015_national_security_strategy.pdf>. Additionally, the National Military Strategic identifies maintaining a secure and effective nuclear deterrent and countering weapons of mass destruction (WMD) among the Joint Force Prioritized Missions. See *National Military Strategy of the United States of America 2015* (Washington, DC: The Joint Staff, 2015), 11, available at <www.jcs.mil/Portals/36/Documents/Publications/2015_National_Military_Strategy.pdf>.

² The 2010 Nuclear Posture Review states, “changes in the nuclear threat environment have altered the hierarchy of our nuclear concerns and strategic objectives. In coming years, we must give top priority to discouraging additional countries from acquiring nuclear weapons capabilities and stopping terrorist groups from acquiring nuclear bombs or the materials to build them. At the same time, we must continue to maintain stable strategic relationships with Russia and China and counter threats posed by any emerging nuclear-armed states, thereby protecting the United States and our allies and partners against nuclear threats or intimidation, and reducing any incentives they might have to seek their own nuclear deterrents.” See *Nuclear Posture Review Report* (Washington, DC: Department of Defense, April 2010), v, available at <www.defense.gov/Portals/1/features/defenseReviews/NPR/2010_Nuclear_Posture_Review_Report.pdf>. This chapter, in contrast, argues that subsequent developments have altered the Nuclear Posture Review’s assessment and have elevated the importance of deterring limited nuclear weapons by state adversaries.

³ For example, see Keir A. Lieber and Daryl G. Press, “The Nukes We Need: Preserving the American Deterrent,” *Foreign Affairs*, November 1, 2009, available at <www.foreignaffairs.com/articles/2009-11-01/nukes-we-need>.

⁴ For example, see Christopher Harress, “South China Sea Dispute: Japan Spots Armed Chinese Ships Patrolling Senkaku Islands,” *International Business Times*, December 22, 2015, available at <www.ibtimes.com/south-china-sea-dispute-japan-spots-armed-chinese-ships-patrolling-senkaku-islands-2236290>.

⁵ For example, see Gerry Mullaney and David Barboza, “Vietnam Squares Off with China in Disputed Seas,” *New York Times*, May 7, 2014, available at <www.nytimes.com/2014/05/08/world/asia/philippines-detains-crew-of-chinese-fishing-vessel.html?_r=0>.

⁶ For example, see Derek Watkins, “What China Has Been Building in the South China Sea,” *New York Times*, October 27, 2015, available at <www.nytimes.com/interactive/2015/07/30/world/asia/what-china-has-been-building-in-the-south-china-sea.html>.

⁷ For example, Jethro Mullen, “North Korea Warns U.S. It’s Ready to Use Nuclear Weapons ‘Any Time,’” *CNN.com*, September 15, 2015, available at <www.cnn.com/2015/09/15/asia/north-korea-nuclear-program/>. North Korean military provocations are examined in Ken E. Gause, *North Korea’s Provocation and Escalation Calculus: Dealing with the Kim Jong-un Regime* (Arlington, VA: Center for Naval Analyses, August 2015), 4–14, available at <www.cna.org/CNA_files/PDF/COP-2015-U-011060.pdf>.

⁸ For concise discussions of Russia’s and China’s challenge to U.S. dominance, see “Why America’s Military Is Losing Its Edge,” *The Economist*, June 11, 2015, available at <www.economist.com/blogs/economist-explains/2015/06/economist-explains-9>; “The Great Game: America’s Dominance Is Being Challenged,” *The Economist*, October 17, 2015, available at <www.economist.com/news/leaders/21674699-american-dominance-being-challenged-new-game>.

⁹ Antiaccess/area-denial capabilities include such systems as advanced integrated air defense systems, medium-to-intermediate range ballistic and cruise missiles, modern attack submarines, antisatellite systems, and cyber warfare capabilities. While there is no official Department of Defense (DOD) definition of the term, at least as reflected in Joint

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Publication 1-02, *Department of Defense Dictionary of Military and Associated Terms*, see, for example, Nathan Freier, “The Emerging Anti-Access/Area-Denial Challenge,” Center for Strategic and International Studies, Washington, DC, May 17, 2012, available at <<https://csis.org/publication/emerging-anti-accessarea-denial-challenge>>.

¹⁰ Regarding China’s improving military capabilities vis-à-vis the United States, see Eric Heginbotham et al., *U.S.-China Military Scorecard: Forces, Geography, and the Evolving Balance of Power, 1996–2017* (Santa Monica, CA: RAND, 2015), available at <www.rand.org/content/dam/rand/pubs/research_reports/RR300/RR392/RAND_RR392.pdf>. On Russia’s military improvements, see Stephen J. Blank, “Imperial Ambitions: Russia’s Military Buildup,” *World Affairs*, May/June 2015, available at <www.worldaffairsjournal.org/article/imperial-ambitions-russia%E2%80%99s-military-buildup>.

¹¹ See, for example, Elbridge Colby, “America Must Prepare for Limited War,” *The National Interest*, November–December 2015, available at <<http://nationalinterest.org/print/feature/america-must-prepare-limited-war-14104>>.

¹² Indeed, strikes against the Chinese mainland are associated with what used to be known as the U.S. AirSea Battle concept of operations for conflict with China, as described in Jan Van Tol, *AirSea Battle: A Point-of-Departure Operational Concept* (Washington, DC: Center for Strategic and Budgetary Assessments, 2010), available at <<http://csbaonline.org/publications/2010/05/airsea-battle-concept/>>. It also is one of the aspects of the concept critiqued in T.X. Hammes, “Sorry, Air Sea Battle is No Strategy,” *War on the Rocks*, August 7, 2013, available at <<http://nationalinterest.org/commentary/sorry-air-sea-battle-no-strategy-8846>>. In January 2015 the AirSea Battle concept was renamed the Joint Concept for Access and Maneuver in the Global Commons. See memorandum from Lieutenant General David L. Goldstein, director, Joint Staff, “Subject: Joint Concept for Access and Maneuver in the Global Commons,” DSJM 0009-14, January 8, 2015, available in redacted form at <<http://news.usni.org/2015/01/20/document-air-sea-battle-name-change-memo>>.

¹³ Phillip C. Saunders, “China’s Nuclear Forces and Strategy,” testimony before the U.S.-China Economic and Security Review Commission Hearing on “Developments in China’s Cyber and Nuclear Capabilities,” March 26, 2012, 4–5, available at <www.uscc.gov/sites/default/files/3.26.12saunders.pdf>.

¹⁴ Nikolai N. Sokov, “Why Russia Calls a Limited Nuclear Strike ‘De-escalation,’” *Bulletin of the Atomic Scientists*, March 13, 2014, available at <<http://thebulletin.org/why-russia-calls-limited-nuclear-strike-de-escalation>>.

¹⁵ “The Russian Federation reserves the right to use nuclear weapons in response to use against it and (or) its allies of nuclear and other weapons of mass destruction, as well as in the case of aggression against the Russian Federation with the use of conventional weapons, when under threat [to] the very existence of the state.” See *Military Doctrine of the Russian Federation*, 2014, Section II, paragraph 27, available at <www.scribd.com/doc/251695098/Russia-s-2014-Military-Doctrine#scribd>. Russia’s reliance on nuclear weapons to offset the conventional military superiority that the United States and its North Atlantic Treaty Organization (NATO) Allies now enjoy is not unlike the United States and NATO’s reliance on nuclear weapons during the Cold War to counter the assessed conventional military superiority of the Soviet Union and its Warsaw Pact allies. Until circumscribed in 2010, it was also U.S. policy to reserve the right to use nuclear weapons against those who might employ chemical and biological as well as nuclear weapons against the United States and its allies. Current U.S. policy is to “only consider the use of nuclear weapons in extreme circumstances to defend the vital interests of the United States or its allies and partners” and to “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 nonproliferation obligations.” See *Nuclear Posture Review Report*, vii–ix. Despite the broad areas of overlap between current Russian policy and the earlier U.S. one, there are important differences. Russia in recent years has explicitly threat-

ened other nations with nuclear weapons in evident attempts to intimidate and coerce them (see following note), whereas the United States and its NATO Allies have issued no comparable threats and indeed have been generally reluctant to discuss the use of nuclear weapons at all. Russia also identifies NATO as its main external danger (*Military Doctrine of the Russian Federation*), and has been unwilling to negotiate mutual reductions in nonstrategic nuclear weapons; see Amy E. Woolf, *Nonstrategic Nuclear Weapons*, RL32572 (Washington, DC: Congressional Research Service, February 23, 2015), 34–37, available at <www.fas.org/sgp/crs/nuke/RL32572.pdf>. In contrast, NATO policy emphasizes that it considers no country to be its adversary, that it views the circumstances that would merit nuclear weapons use as extremely remote, and that it contemplates reducing the number of the Alliance's nonstrategic nuclear weapons. See *Deterrence and Defence Posture Review* (Brussels: NATO, May 20, 2012), available at <www.nato.int/cps/en/natolive/official_texts_87597.htm>. Russia's caveat that it would use nuclear weapons against conventional aggression only when such aggression threatens the very existence of the Russian state also may be less reassuring than it sounds given that some observers believe that the Putin regime equates its regime survival with the survival of the state. As such, any conventional aggression that imperils the Putin regime, which may include its impending defeat in a regional war of its own making if such defeat undermined popular Russian support for the regime, could justify the regime's resort to nuclear weapons. See Kroenig, *The Renewed Russian Nuclear Threat and NATO Nuclear Deterrence Posture*, Issue Brief (Washington, DC: Atlantic Council, February 2016), 2; Paul Bernstein and Deborah Ball, "Putin's Russia and U.S. Defense Strategy," workshop report on same subject held at National Defense University, August 19–20, 2015, 5, available at <<http://inss.ndu.edu/Portals/82/Documents/conference-reports/Putins-Russia-and-US-Defense-Strategy.pdf>>.

¹⁶ For example, see "NATO Chief Says Russian Nuclear Threats Are 'Deeply Troubling and Dangerous,'" *The Guardian*, May 27, 2015, available at <www.theguardian.com/world/2015/may/28/nato-chief-says-russian-nuclear-threats-are-deeply-troubling-and-dangerous>; Adam Withnall, "Russia Threatens Denmark with Nuclear Weapons If It Tries to Join NATO Defence Shield," *Independent* (London), March 22, 2015, available at <www.independent.co.uk/news/world/europe/russia-threatens-denmark-with-nuclear-weapons-if-it-tries-to-join-nato-defence-shield-10125529.html>.

¹⁷ Russia possesses approximately 2,000 nonstrategic nuclear weapons, spanning antiballistic missile, short-range ballistic missile, ground-launched cruise missile, and a variety of naval systems. All Russian nonstrategic nuclear weapons reportedly are in storage. See Hans S. Kristensen and Robert S. Morris, "U.S. Nuclear Forces, 2015," 115, available at <<http://bos.sagepub.com/content/71/2/107.full.pdf+html>>; "Russia Nuclear Forces, 2015," 1–2, available at <<http://bos.sagepub.com/content/early/2015/04/13/0096340215581363.full.pdf+html>>. While the *Bulletin of the Atomic Scientists* reflects all of Russia's nonstrategic nuclear weapons in storage, the Congressional Research Service notes that the status of nonstrategic nuclear weapons in Russia is uncertain. It notes that some estimates put the number of active Russian nuclear warheads assigned to nonstrategic delivery vehicles at 2,000. See Woolf, *Nonstrategic Nuclear Weapons*, 12.

¹⁸ "Iskander Tactical Ballistic Missile System, Russia," *Army-Technology.com*, available at <www.army-technology.com/projects/iksander-system/iksander-system2.html>.

¹⁹ For a discussion of the problems that Russia's modern integrated air defense systems pose for fourth-generation aircraft, see David Majumdar, "American F-22s and B-2s Bombers vs. Russia's S-300 in Syria: Who Wins?" *The National Interest*, September 22, 2015, available at <<http://nationalinterest.org/blog/the-buzz/american-f-22s-b-2-bombers-vs-russias-s-300-syria-who-wins-13905>>.

²⁰ Current NATO dual-capable aircraft are scheduled for retirement in the 2020s; see Rachel Oswald, "U.S. Tactical Nuclear Arms Mission Could Shift Among NATO Jets," Nuclear Threat Initiative, March 26, 2014, available at <www.nti.org/gsn/article/aircraft-could-be-given-nato-tactical-nuclear-arms-mission/>. The U.S. National Nuclear

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Security Administration (NNSA) aims to have the first production unit of the refurbished B61 gravity bomb ready by the end of fiscal year 2020. See NNSA, “Life Extension Programs,” December 23, 2015, available at <<http://nnsa.energy.gov/ourmission/managingthestockpile/lifeextensionprograms>>.

²¹ Treaty between the United States of America and the Union of Soviet Socialist Republics on the Elimination of Their Intermediate-Range and Shorter-Range Missiles, signed at Washington, DC, December 8, 1987, Articles I, II, available at <www.state.gov/t/avc/trty/102360.htm#text>.

²² “Iskander Tactical Ballistic Missile System, Russia.”

²³ Rod Lyon, “The Great Nuclear Guessing Game: Has Russia Violated the INF Treaty?” *The National Interest*, September 25, 2015, available at <www.nationalinterest.org/blog/the-buzz/the-great-nuclear-guessing-game-has-russia-violated-the-inf-13936>.

²⁴ *Interfax*, interview with Rose Gottemoeller, U.S. Under Secretary of State for Arms Control and International Security, June 23, 2015, available at <www.interfax.com/interview.asp?id=600960>.

²⁵ Amy F. Woolf, *Russian Compliance with the Intermediate Range Nuclear Forces (INF) Treaty: Background and Issues for Congress*, R43832 (Washington, DC: Congressional Research Service, October 13, 2015), 5–8, 16–18, available at <www.fas.org/spp/crs/nuke/R43832.pdf>.

²⁶ *Annual Report to Congress on Military and Security Developments Involving the People's Republic of China 2015* (Washington, DC: Office of the Secretary of Defense, 2015), 34–35, available at <www.defense.gov/Portals/1/Documents/pubs/2015_China_Military_Power_Report.pdf>.

²⁷ *Annual Report to Congress on Military and Security Developments Involving the People's Republic of China 2016* (Washington, DC: Office of the Secretary of Defense, 2016), 25, available at <www.defense.gov/Portals/1/Documents/pubs/2016%20China%20Military%20Power%20Report.pdf>.

²⁸ *Annual Report to Congress on Military and Security Developments Involving the People's Republic of China 2015*, 32.

²⁹ Saunders, 1.

³⁰ For example, see Daniel Blumenthal and Michael Mazza, “Why China May Want More Nuclear Weapons,” American Enterprise Institute, Washington, DC, April 6, 2011, available at <www.aei.org/publication/why-china-may-want-more-nuclear-weapons/>.

³¹ See, for example, Institute for International Security Studies (IISS), *North Korean Security Challenges: A Net Assessment* (London: IISS, July 21, 2011), chapters 3, 5, 6, available at <www.iiss.org/en/publications/strategic%20dossiers/issues/north-korean-security-challenges-4a8d>; *Military and Security Developments Involving the Democratic Republic of Korea* (Washington, DC: Office of the Secretary of Defense, 2015), 9, 10, 13, 14, 21, available at <www.defense.gov/Portals/1/Documents/pubs/Military_and_Security_Developments_Involving_the_Democratic_Peoples_Republic_of_Korea_2015.PDF>; Van Jackson, “Preparing for the Next Korean War,” *The Diplomat*, August 24, 2015, available at <<http://thediplomat.com/2015/08/preparing-for-the-next-korean-war/>>.

³² Shane Smith, *North Korea's Evolving Nuclear Strategy*, North Korea Nuclear Futures Series (Baltimore, MD: U.S.-Korea Institute at SAIS, August 2015), 7, available at <<http://38north.org/2015/08/nukefuture082415/>>.

³³ For a discussion of the risks of a limited conflict with North Korea, see Jackson. For a discussion of the risks of a collapse of the North Korean regime, see Robert D. Kaplan and Abraham M. Denmark, “The Long Good-Bye: The Future of North Korea,” *World Affairs*, May/June 2011, available at <www.worldaffairsjournal.org/article/long-goodbye-future-north-korea>.

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³⁴ The 2014 Strategy for Countering WMD defines *countering WMD* as “efforts against actors of concern to curtail the conceptualization, development, possession, proliferation, use and effects of WMD, related expertise, materials, technologies, and means of delivery.” See *Strategy for Countering Weapons of Mass Destruction* (Washington, DC: Department of Defense, June 2014), 17, available at <http://archive.defense.gov/pubs/DoD_Strategy_for_Countering_Weapons_of_Mass_Destruction_dated_June_2014.pdf>. This is a separate DOD mission from the nuclear one, wherein a safe, secure, and effective nuclear deterrent force is maintained to deter strategic attacks against the United States and to assure its allies; see U.S. Strategic Command Web site, “About/Missions & Priorities,” available at <www.stratcom.mil/mission/>. Another way to state the difference between the missions is that countering WMD is what we do about other’s WMD, while the nuclear mission is what we do with our own nuclear forces. Clearly there is some overlap in that U.S. nuclear forces primarily deter others’ use of their nuclear weapons against the United States and its allies. U.S. Strategic Command currently has responsibility for both of these DOD missions.

³⁵ Smith. The estimate of the number of nuclear weapons that North Korea possesses varies with assumptions about how much fissile material it has produced and the designs of its weapons.

³⁶ James R. Clapper, “Worldwide Threat Assessment of the U.S. Intelligence Community,” Statement for the Record before the Senate Armed Services Community, February 26, 2015, 6, available at <www.dni.gov/index.php/newsroom/testimonies/209-congressional-testimonies-2015/1174-statement-for-the-record-worldwide-threat-assessment-of-the-u-s-ic-before-the-sasc>.

³⁷ *2014 Defense White Paper* (Seoul: Ministry of National Defense, 2014), 32, available at <www.mnd.go.kr/user/mnd_eng/upload/pblicitn/PBLICTNEBOOK_201506161156164570.pdf>. The U.S. Department of State also judges that Pyongyang may still consider the use of biological weapons as an option, even though it is a state party to the Biological Weapons Convention (BWC). The State Department further notes that North Korea has a longstanding biological weapons (BW) capability and biotechnology infrastructure that could support a BW program, although the United States does not possess definitive information to support a finding of North Korean noncompliance with the BWC. See *2015 Report on Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments* (Washington, DC: Department of State, June 5, 2015, Part III, “North Korea,” available at <www.state.gov/t/avc/rls/rpu/2015/243224.htm#North%20Korea>.

³⁸ Bruce Bennett has estimated the existence of 200 or so WMD sites in North Korea. See Bruce W. Bennett, *Preparing for the Possibility of a North Korean Collapse* (Santa Monica, CA: RAND, 2013), 99, available at <www.rand.org/content/dam/rand/pubs/research_reports/RR300/RR331/RAND_RR331.pdf>.

³⁹ For an expanded discussion of the challenges of WMD elimination operations in North Korea and ways of responding to them, see Robert J. Peters, *The WMD Challenges Posed by a Collapse of North Korea* (Baltimore, MD: U.S.-Korea Institute at SAIS, April 14, 2015), available at <<http://38north.org/2015/04/rpeters041415/>>; Scott Daulton and Bill Shavce, “The Challenge of Countering Weapons of Mass Destruction on the Korean Peninsula,” *Military Review*, November–December 2014, available at <http://usac.army.mil/CAC2/MilitaryReview/Archives/English/MilitaryReview_20141231_art011.pdf>.

⁴⁰ It is worth noting that U.S. forces’ capability to fight through large-scale chemical and biological attacks is a matter of conjecture, based on simulations and noncombat testing, since U.S. forces have not encountered any such attacks since World War I.

⁴¹ For example, see Sydney J. Freedberg, Jr., “No Longer Unthinkable: Should U.S. Be Ready for ‘Limited’ Nuclear War?” *BreakingDefense.com*, May 30, 2013, available at <<http://breakingdefense.com/2013/05/no-longer-unthinkable-should-us-be-ready-for-limited-nuclear-war/2/>>.

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⁴² The BWC entered into force on March 26, 1975, and the Chemical Weapons Convention (CWC) entered into force on April 29, 1997. Only three states currently remain outside the CWC: Egypt, North Korea, and South Sudan. Israel signed the convention in 1993 but has never ratified it. Angola, Myanmar, and Syria joined within the last 3 years. Fourteen states remain outside the BWC: Angola, Chad, Comoros, Djibouti, Eritrea, Guinea, Israel, Kiribati, Micronesia, Namibia, Niue, Samoa, South Sudan, and Tuvalu. Myanmar and Andorra are the most recent state parties, joining in December 2014 and March 2015, respectively. See Arms Control Association, Fact Sheets and Briefs, “Chemical Weapons Convention Signatories and States-Parties,” available at <www.armscontrol.org/factsheets/cwcsig>; “Biological Weapons Convention Signatories and States-Parties,” available at <www.armscontrol.org/factsheets/bwcsig>; United Nations Office for Disarmament Affairs, “The Biological Weapons Convention, Status and Text of the Treaty,” available at <<http://disarmament.un.org/treaties/t/bwc>>; Organisation for the Prohibition of Chemical Weapons, “Note by the Technical Secretariat, Status of Participation in the Chemical Weapons Convention as at 17 October 2015,” available at <www.opcw.org/fileadmin/OPCW/S_series/2015/en/s-1315-2015_e_.pdf>.

⁴³ Syria, however, had acceded in December 1968 to the *Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous, or Other Gases, and of Bacteriological Methods of Warfare* (also known as the 1925 Geneva Protocol). United Nations Office for Disarmament Affairs, Treaties Database, available at <<http://disarmament.un.org/treaties/t/1925>>. As such, Syria’s use of sarin in 2012–2013 violated its obligations under the 1925 Geneva Protocol.

⁴⁴ The White House, “Government Assessment of the Syrian Government’s Use of Chemical Weapons on August 21, 2013,” press release, August 30, 2013, available at <www.whitehouse.gov/the-press-office/2013/08/30/government-assessment-syrian-government-s-use-chemical-weapons-august-21>.

⁴⁵ *Ibid.* Estimates of the number of fatalities range from the low hundreds to more than 1,400. On August 30, 2013, the White House claimed 1,429 deaths resulted from Syria’s use of sarin. On August 29, 2013, the Chairman of the British government Joint Intelligence Committee report referred to “at least 350 fatalities.” See United Kingdom Chairman of the Joint Intelligence Committee, “Syria: Reported Chemical Weapons Use,” August 29, 2013, available at <www.gov.uk/government/uploads/system/uploads/attachment_data/file/235094/jp_115_JD_PM_Syria_Reported_Chemical_Weapon_Use_with_annex.pdf>. The term *hundreds of deaths* is used in a Human Rights Watch report from September 2013. See Human Rights Watch, “Attacks on Ghouta,” September 10, 2013, available at <www.hrw.org/report/2013/09/10/attacks-ghouta/analysis-alleged-use-chemical-weapons-syria>.

⁴⁶ See Organisation for the Prohibition of Chemical Weapons (OPCW), “Syrian Chemical Destruction Data as of 27 July 2015,” available at <www.opcw.org/special-sections/syria/destruction-statistics/>.

⁴⁷ OPCW, “Report of the OPCW Fact-Finding Mission in Syria Regarding Alleged Incidents in the Idlib Governorate of the Syria Arab Republic between 16 March and 20 May 2015,” S/1319/2015, October 29, 2015.

⁴⁸ Theodore Schleifer, “Kerry: Syrian Regime ‘Absolutely’ Used Chlorine in Attacks,” *CNN.com*, June 17, 2015, available at <www.cnn.com/2015/06/16/politics/john-kerry-syrian-chemical-weapons-chlorine/>. Numerous eyewitness accounts indicate that the weapons were delivered by helicopters, which the Syrian regime possesses but not by the rebels it is fighting. See, for example, OPCW, “Report of the OPCW Fact-Finding Mission in Syria,” annex 2.

⁴⁹ Inaccurate media reports have given rise to the fallacy that Syria’s use of chlorine as a weapon of war is not prohibited by the CWC. The likely basis of these reports is the fact that chlorine is not listed on the CWC’s Schedules of Chemicals. However, the schedules were drawn up during the negotiation of the CWC to inform the convention’s monitor-

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ing and verification efforts and focused on the types of chemical warfare agents known to be in military arsenals of the time. Though chlorine was the chemical released in the first successful, large-scale chemical attack of the modern age—by Germany in the 1915 World War I Battle of Ypres—the world's militaries had long moved on to more potent agents optimized for warfare purposes such as phosgene, sulfur mustard, sarin, and VX. Chlorine came to be viewed as a toxic industrial chemical widely used for commercial purposes rather than a chemical warfare agent. But that does not exempt it from the CWC's prohibition on chemical weapons, which is defined as applying to any toxic chemical used as a method of warfare. Syria's use of chlorine as a weapon of war unequivocally is a violation of its CWC obligations.

⁵⁰ Per *The Economist*, "the last precise death toll published by the [United Nations] was 191,369 in August 2014, followed by an estimate of more than 250,000 in August 2015. But it then stopped updating the figure because of dwindling sources of good information. On February 11 the Syrian Centre for Policy Research, a nonprofit group, claimed that the true figure is now almost double that estimate at about 470,000." See "Quantifying Carnage," *The Economist*, February 20, 2016, available at <www.economist.com/news/middle-east-and-africa/21693279-how-many-people-has-syrias-civil-war-killed-quantifying-carnage>.

⁵¹ United Nations, "Security Council Unanimously Adopts Resolution 2235 (2015), Establishing Mechanism to Identify Perpetrators Using Chemical Weapons in Syria," SC/12001, August 7, 2015, available at <www.un.org/press/en/2015/sc12001.doc.htm>. Russia insisted at the time that, if the Joint Investigative Mechanism attributes the attacks to the Syrian regime, another United Nations Security Council Resolution (UNSCR) would be required to authorize any punitive action. If Russia and others block adoption of such a UNSCR, the United States and its allies will need to determine whether the situation merits taking action on their own.

⁵² United Nations, "Joint Investigative Mechanism Presents Its Third Report to Security Council," DC/3651, August 30, 2016, available at <www.un.org/press/en/2016/dc3651.doc.htm>.

⁵³ Stephen Hummel, "The Islamic State and WMD: Assessing the Future Threat," *CTC Sentinel* 9, no. 1 (January 2016), 18–22, available at <www.ctc.usma.edu/v2/wp-content/uploads/2016/01/CTC-SENTINEL-Vol9Iss13.pdf>. Also see Beatrix Immenkamp, *ISIL/Da'esh and "Non-Conventional" Weapons of Terror* (London: European Parliamentary Research Service, 2015), available at <[www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS_BRI\(2015\)572806](http://www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS_BRI(2015)572806)>.

⁵⁴ United Nations, "Joint Investigative Mechanism."

⁵⁵ The Fact-Finding Mission (FFM) "confirmed with utmost confidence" that two individuals in Syria suffered exposure to sulfur mustard and concluded that it was "very likely" that a baby also died from exposure to that chemical. See OPCW, "Report of the OPCW Fact-Finding Mission in Syria Regarding Alleged Incidents in Marea, Syrian Arab Republic, August 2015," S/1320/2015, October 29, 2015. Consistent with its mandate, the FFM did not attempt to ascribe responsibility for the attack, but media reports suggested the Islamic State of Iraq and the Levant (ISIL).

⁵⁶ For example, see Hummel, 18–22; Robert Windrem and Tracy Connor, "Could ISIS Strike the West with Chemical Weapons?" NBC News, November 19, 2015, available at <www.nbcnews.com/storyline/isis-terror/could-isis-strike-west-chemical-weapons-n466431>.

⁵⁷ ISIL claimed responsibility for the March 2016 terror attacks in Brussels, Belgium. See Kim Hjelmgard, Delphine Reuter, and John Bacon, "Islamic State Claims Responsibility for Brussels Attack That Killed Dozens," *USA Today*, March 23, 2016, available at <<http://www.usatoday.com/story/news/world/2016/03/22/explosions-rock-brussels-airport/82107254/>>; for the November 2015 attacks in Paris, see Rukmini Callimachi, "ISIS

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Claims Responsibility, Calling Paris Attacks ‘First of the Storm,’” *New York Times*, November 14, 2015, available at <www.nytimes.com/2015/11/15/world/europe/isis-claims-responsibility-for-paris-attacks-calling-them-miracles.html>.

⁵⁸ In November 2015, as French Prime Minister Manuel Valls observed, “Terrorism hit France not because of what it is doing in Iraq and Syria . . . but for what it is. We know that there could also be a risk of chemical or biological weapons.” See Hamza Hendawi, Qassim Abdul-Zahra, and Ken Dilanian, “Officials: Islamic State Determined to Produce Chemical Weapons,” Associated Press, November 19, 2015, available at <<http://bigstory.ap.org/article/b6c721d1beb34b989bf46aa101cf361a/iraqi-us-officials-working-produce-chemical-weapons>>. In December 2015 the European Parliamentary Research Service wrote, “the European Union and its Members States must prepare for the possibility of a chemical or biological attack on their territory by the self-styled ‘Islamic State’ in Iraq and the Levant.” See Immenkamp, 1.

⁵⁹ Rolf Mowatt-Larssen, *Al Qaeda Weapons of Mass Destruction Threat: Hype or Reality?* (Cambridge, MA: Belfer Center for Science and International Affairs, January 2010), available at <http://belfercenter.ksg.harvard.edu/publication/19852/al_qaeda_weapons_of_mass_destruction_threat.html>.

⁶⁰ Harald Doornbus and Jenan Moussa, “Found: The Islamic State’s Terror Laptop-top of Doom,” *Foreign Policy*, August 28, 2014, available at <<http://foreignpolicy.com/2014/08/28/found-the-islamic-states-terror-laptop-of-doom/>>.

⁶¹ Vladimir Putin, “Being Strong: National Security Guarantees for Russia,” *Rossiiska-ya Gazeta*, February 20, 2012, available at <<http://archive.premier.gov.ru/eng/events/news/18185/>>.

⁶² “Chemical and Biological Weapons: The Poor Man’s Atom Bomb,” North Atlantic Assembly, International Secretariat, AN 253, STC (96) 8, Lord Lyell, General Rapporteur, October 4, 1996, table 1, available at <<http://fas.org/irp/threat/an253stc.htm>>.

⁶³ John P. Caves, Jr., and W. Seth Carus, *The Future of Weapons of Mass Destruction*, Center for the Study of Weapons of Mass Destruction Occasional Paper 10 (Washington, DC: NDU Press, June 2014), 27, available at <http://wmdcenter.dodlive.mil/files/2014/07/CSWMD_OccasionalPaper-10.pdf>.

⁶⁴ *Ibid.*, 27–28.

⁶⁵ See, for example, Andrew Hessel, March Goodman, and Steven Miller, “Hacking the President’s DNA,” *The Atlantic*, November 2012, available at <www.theatlantic.com/magazine/archive/2012/11/hacking-the-presidents-dna/309147/?single_page=true>; Gigi K. Gronvall, *Mitigating the Risks of Synthetic Biology*, CFR Discussion Paper (New York: Council on Foreign Relations, 2015), available at <www.cfr.org/health/mitigating-risks-synthetic-biology/p36097>; Laurie Garrett, “Biology’s Brave New World,” *Foreign Affairs* 92, no. 6 (December 2013), 28–46.

⁶⁶ For a discussion of the limitations of and possibilities for achieving a “rapid and nimble” medical countermeasures capability for infectious disease, see Theresa Wizemann, Megan Reeve Snair, and Jack Herrmann, *Rapid Medical Countermeasure Response to Infectious Diseases: Enabling Sustainable Capabilities Through Ongoing Public- and Private-Sector Partnerships: Workshop Summary* (Washington, DC: National Academies Press, 2015), available at <<http://www.nap.edu/catalog/21809>>.

⁶⁷ Joint Comprehensive Plan of Action (JCPOA), Vienna, Austria, July 14, 2015, available at <www.state.gov/e/eb/tfs/spi/iran/jcpoa/>.

⁶⁸ See, for example, Mark Dubowitz, congressional testimony, “Hearing before the U.S. House Committee on Foreign Affairs,” Washington, DC, July 23, 2015; Institute for Science and International Security (ISIS), *The Joint Comprehensive Plan of Action “Kicks the Can Down the Road”: How to Prepare for the Day When the Can Finally Lands* (Washington,

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DC: ISIS, July 22, 2015); Eliot Cohen, Eric Edelman, and Ray Takeyh, "Time to Get Tough on Tehran: Iran Policy After the Deal," *Foreign Affairs*, January/February 2016, 65.

⁶⁹ For a discussion of the verification challenges of the JPCOA, see, for example, David Albright, testimony for the Senate Foreign Relations Committee, "Joint Comprehensive Plan of Action (JPCOA): Non-Proliferation, Inspections, and Nuclear Constraints," August 4, 2015, 9–14, available at <www.foreign.senate.gov/imo/media/doc/080415_Albright_Testimony.pdf>; Ollie Heinonen, *Strengthening the Verification and Implementation of the Joint Comprehensive Plan of Action* (Washington, DC: Foundation for Defense of Democracies Press, November 25, 2015), available at <www.defenddemocracy.org/media-hit/strengthening-the-verification-and-implementation-of-the-joint-comprehensiv/>.

⁷⁰ Kenneth M. Pollack, "Regional Implications of a Nuclear Agreement with Iran," testimony before the House Committee on Foreign Affairs, July 9, 2015, 7, available at <www.brookings.edu/research/testimony/2015/07/09-pollack-iran-nuclear-agreement>.

⁷¹ World Nuclear Association, "Emerging Nuclear Energy Countries," updated December 2015, available at <www.world-nuclear.org/info/Country-Profiles/Others/Emerging-Nuclear-Energy-Countries/>.

⁷² Saudi Arabia conceivably could attempt to purchase nuclear weapons or seek some form of extended nuclear deterrence commitment from Pakistan. Pakistan has a longstanding defense cooperation relationship with Saudi Arabia, and Pakistan's nuclear weapons development program benefited from Saudi support. See Feroz Hassan Khan, *Eating Grass: The Making of the Pakistani Bomb* (Stanford: Stanford University Press, 2012), 172, 280, 363. A discussion on one possible manifestation of a Pakistani extended nuclear deterrence commitment to Saudi Arabia is discussed in Kenneth M. Pollack, "U.S. Policy Toward the Middle East after the Iranian Nuclear Agreement," testimony before the Senate Committee on Foreign Relations, August 5, 2015, 9, available at <www.brookings.edu/research/testimony/2015/08/05-us-policy-iran-nuclear-deal-pollack>.

⁷³ For example, see *ibid.*, 3. Pollack considers it more likely that Iran does not change its regional strategy as a result of the nuclear agreement, but believes other courses, like the one discussed here, are possible.

⁷⁴ Ben Hubbard, "Arab World Split Over Iran Nuclear Deal," *New York Times*, July 14, 2015, available at <www.nytimes.com/2015/07/15/world/middleeast/iran-nuclear-deal-provokes-sharp-reactions-across-the-arab-world.html>.

⁷⁵ For example, see Payam Mohseni, "Introduction: Views from the Arab World and Iranian Politics Post-Nuclear Deal," in *Iran and the Arab World after the Nuclear Deal: Rivalry and Engagement in a New Era*, ed. Payam Mohseni (Cambridge: The Belfer Center for Science and International Affairs, August 2015), 8–9, available at <<http://belfercenter.ksg.harvard.edu/files/Impact%20on%20Arab%20World%20-%20Web.pdf>>. The local observers on regional implications of the nuclear agreement generally believe that the short-term increase in tensions could give way to a longer term improvement.

⁷⁶ For example, see *ibid.*, 9–10; Pollack, "U.S. Policy Toward the Middle East," 4–5.

⁷⁷ Peter Baker, "In Congress, Netanyahu Faults 'Bad Deal' on Iran Nuclear Program," *New York Times*, March 3, 2015, available at <www.nytimes.com/2015/03/04/world/middleeast/netanyahu-congress-iran-israel-speech.html?_r=0>.

⁷⁸ According to a Deputy Secretary of Defense statement in 2014, this is supposed to occur by 2020. See Cheryl Pellerin, "Budget Constraints Won't Halt Asia-Pacific Rebalance, Work Says," *DoD News*, October 1, 2014, available at <www.defense.gov/News-Article-View/Article/603364/budget-constraints-wont-halt-asia-pacific-rebalance-work-says>.

⁷⁹ *Third Offset Strategy* refers to a DOD initiative to identify and exploit new capabilities to preserve U.S. military technological advantages over its most capable adversaries as they "catch up" to current U.S. capabilities. Deputy Secretary of Defense Robert Work has described it as "new combinations of technologies, operational concepts, and organiza-

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tional constructs to once again bolster a weakened conventional deterrence.” See “The Third Offset Strategy and America’s Allies and Partners,” prepared remarks by Deputy Secretary of Defense Bob Work at Royal United Services Institute, London, September 10, 2015, available at <<https://rusi.org/event/robert-work-united-states-deputy-secretary-defense-third-offset-strategy-and-americas-allies>>. Deputy Secretary Work later identified five technological focuses for Third Offset investments: learning machines, human-machine collaboration, assisted-human operations, advanced manned and unmanned combat teaming, and network-enabled autonomous weapons that are hardened for cyber attack and electronic-warfare environments. See Jason Sherman, “DoD Unveils Technology Areas That Will Drive ‘Third Offset’ Investments,” *InsideDefense.com*, December 9, 2015, available at <<http://nges.insidedefense.com/inside-pentagon/dod-unveils-technology-areas-will-drive-third-offset-investments>>.

⁸⁰ The Congressional Budget Office (CBO) estimates that the Obama administration’s plans for nuclear forces—including the cost to field, operate, maintain, and modernize—would cost \$348 billion over the 2015–2024 period or about 5–6 percent of the administration’s plans for national defense. See CBO, *Projected Costs of U.S. Nuclear Forces, 2015 to 2024* (Washington, DC: CBO, January 22, 2015), 3, available at <www.cbo.gov/publication/49870>. A report estimated that the United States plans to spend approximately \$1 trillion over the next 30 years on maintaining and modernizing its nuclear forces. See Jon B. Wolfsthal, Jeffrey Lewis, and Marc Quint, *The U.S. Trillion Dollar Nuclear Triad* (Monterey, CA: James Martin Center for Nonproliferation Studies, January 2014), 4, available at <www.nonproliferation.org/wp-content/uploads/2016/04/140107_trillion_dollar_nuclear_triad.pdf>. Modernization costs will peak in the latter 2020s and early 2030s. In April 2016 Secretary of Defense Ashton Carter stated, “We expect the total cost of nuclear modernization to be in the range of \$350–\$450 billion. Although this still presents an enormous affordability challenge for DOD, we believe it must be funded. Previous modernizations of America’s strategic deterrent and nuclear security enterprise were accomplished by topline increases to avoid having to make drastic reductions to conventional forces, and it would be prudent to do so again.” See Secretary Carter, “Submitted Statement—Senate Appropriations Committee—Defense (FY 2017 Budget Request),” Washington, DC, April 27, 2016, available at <www.defense.gov/News/Speeches/Speech-View/Article/744066/submitted-statement-senate-appropriations-committee-defense-fy-2017-budget-req>.

⁸¹ The U.S. nuclear force has been the foundation of national security as long as adversaries have possessed nuclear weapons. It is not only the primary and irreplaceable means by which the United States deters a potentially existential attack, but it also underpins extended deterrence commitments to major allies. Some have asserted that the United States cannot afford the planned modernization of its nuclear force and advocated various cost-savings measures, including reducing the number of delivery platforms and warheads, eliminating the intercontinental ballistic missile (ICBM) or bomber legs of the triad, and canceling the development of the long-range standoff cruise missile. See, for example, James E. Doyle, “Better Ways to Modernize the U.S. Nuclear Arsenal,” *Survival* 58, no. 4 (August–September 2016), 27–50; Tom Z. Collina et al., *The Unaffordable Arsenal: Reducing the Costs of the Bloated U.S. Nuclear Stockpile* (Washington, DC: Arms Control Association, October 2014), available at <www.armscontrol.org/files/The-Unaffordable-Arsenal-2014.pdf>; and Global Zero, *Modernizing U.S. Nuclear Strategy, Force Structure and Posture* (Washington, DC: Global Zero, May 2012), available at <www.globalzero.org/files/gz_us_nuclear_policy_commission_report.pdf>. Reducing the number of warheads and delivery platforms within the triad force may have merit, but only as part of mutual, binding, and verifiable reductions with Russia that preserve or strengthen strategic stability. The United States has declared its willingness to pursue further reductions, but Russia has not taken up the offer. See “Remarks by President Obama at the Brandenburg Gate—Berlin, Germany,” June 19, 2013, available at <www.whitehouse.gov/the-press-office/2013/06/19/remarks-president-obama-brandenburg-gate-berlin-germany>. Unilateral reductions, especially given an aggressive Russia that is deploying

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multiple new nuclear weapons systems and issuing explicit nuclear threats, would weaken deterrence. Discarding any leg of the U.S. triad would be highly risky as each has attributes that complement the others and together ensure that no rational adversary could calculate, on the basis of capabilities (leaving aside questions of will), that it could successfully execute a disarming first strike against the United States or use limited nuclear strikes to decisive effect in a regional conflict. The latter consideration is particularly pertinent to bombers and their associated nuclear weapons (standoff cruise missiles and gravity bombs) as these capabilities provide less escalatory and more credible options to respond to an adversary's limited employment of nuclear weapons than those afforded by higher yield weapons delivered by ICBMs and submarine-launched ballistic missiles. Both standoff cruise missiles and gravity bombs deliverable by penetrating bombers are needed to complicate sufficiently the air defense challenge of sophisticated allies with increasingly effective integrated air defense systems. As long as alliances and extended deterrence commitments remain central to U.S. national security strategy, the United States will require an effective nuclear bomber force.

⁸² A recent DOD Inspector General (DODIG) investigation found, inter alia, that theater nuclear planning expertise has not been maintained and that there is no resident expertise on integrated theater nuclear planning at any of the geographic combatant commands (GCCMD). The Chairman of the Joint Chiefs of Staff and Under Secretary of Defense for Policy agreed with the DODIG recommendation that they update policy documents and provide oversight of the capability to integrate nuclear options into conventional plans. They also agreed with the DODIG that applicable GCCMD commanders should develop nuclear planning capabilities and processes and exercise those plans. See DODIG, "(U) Assessment of the U.S. Theater Nuclear Planning Process, (Report No. DODIG-20150134), June 18, 2015"; Information memo from John T. Rymer, Inspector General, DOD, to Secretary of Defense, Subject: "(U) Release of Inspector General Report, 'Assessment of the U.S. Theater Nuclear Planning Process, dated June 18, 2015.'" These are classified documents; only excerpts specifically marked unclassified are reflected in this chapter. "Gulf Leaders Back Out of Camp David Summit in 'Snub' to Obama," *BBC.com*, May 12, 2015, available at <www.bbc.com/news/world-us-canada-32694184>.

⁸³ See, for example, Colby.

⁸⁴ In March 2016 the U.S. military conducted airstrikes against ISIL chemical weapons-related targets based on information obtained by a senior ISIS detainee. Barbara Starr, "U.S.: ISIS Detainee Providing Information on Chemical Weapons," *CNN.com*, March 9, 2016, available at <www.cnn.com/2016/03/09/politics/u-s-isis-detainee-providing-crucial-information-on-chemical-weapons/>.

⁸⁵ BBC.

⁸⁶ The White House, "U.S.-Gulf Cooperation Council Camp David Joint Statement," press release, May 14, 2015, available at <www.whitehouse.gov/the-press-office/2015/05/14/us-gulf-cooperation-council-camp-david-joint-statement>.

⁸⁷ Nicole Gaouette and Tony Capaccio, "U.S. Offers Billions in Arms to Ease Mideast's Iran Anxiety," *Bloomberg.com*, July 9, 2015, available at <www.bloomberg.com/news/articles/2015-07-09/u-s-offers-billions-in-arms-to-ease-mideast-s-iran-deal-anxiety>.

⁸⁸ Michael Bowman, "U.S., Israel Sign Record Military Aid Agreement," *Voice of America*, September 14, 2016, available at <www.voanews.com/a/us-israel-military-aid-agreement/3509463.html>.

⁸⁹ It would be a much bigger step for the United States to explicitly extend its nuclear umbrella to Gulf Cooperation Council (GCC) partners. It also may not be politically saleable to the U.S. Congress or broader public given that GCC partners are not treaty allies, unlike other states that enjoy the explicit protection of the U.S. nuclear umbrella, and given the connection that a significant segment of the U.S. population seems to draw between Muslims generally and terrorism, as highlighted in the 2016 Presidential pri-

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mary season. Others may object to the United States adding to its international security obligations at a time when the country already is stretched thin by security challenges in Eastern Europe and East Asia, as well as in the Middle East and South Asia.

⁹⁰ In the 1990s the U.S. Government seconded Department of Energy employees to the International Atomic Energy Agency to support South African elimination operations as well as the United Nations Special Commission in Iraq.

⁹¹ For a discussion of why China would not cooperate with the United States and South Korea concerning a North Korean contingency, see Yun Sun, *The North Korean Contingency: Why China Will Not Cooperate* (Baltimore, MD: U.S.-Korea Institute at SAIS, July 25, 2014), available at <<http://38north.org/2014/07/ysun072514/>>.

⁹² The value of engaging China about cooperation in the event of North Korean contingencies has been widely recognized. For example, see *North Korea Contingency Planning and U.S.-ROK Cooperation* (Washington, DC: Asia Foundation, September 2009), available at <<https://asiafoundation.org/resources/pdfs/DPRKContingencyCUSKP0908.pdf>>; Paul B. Stares et al., *Instability in North Korea and Its Impact on U.S.-China Relations* (New York: Council on Foreign Relations, 2011), 18–24, available at <www.cfr.org/asia-and-pacific/managing-instability-chinas-periphery/p25838>. The United States has sought to do so in both official (Track I) and unofficial (Track II) channels, but China largely has been unresponsive. For example, see “U.S.-China Discuss North Korean Collapse Possibility,” *Global Security Newswire*, January 13, 2014, available at <www.nti.org/gsn/article/us-china-discussed-regime-collapse-north-korea-years-ago/>.

⁹³ This was a significant step toward increasing military focus on WMD contingencies. WMD use is a low-probability (albeit increasing), high-impact contingency that has tended to garner more attention from civilian policymakers than military leaders.

⁹⁴ On September 21, 2016, *Marketwired.com* reported that the countering WMD mission would soon move from U.S. Strategic Command to U.S. Special Operations Command. See “DTRA/SCC-WMD Hosts the 15th Combating Weapons of Mass Destruction Global Synchronization Conference,” *Marketwired.com*, September 21, 2016, available at <www.marketwired.com/press-release/dtra-scc-wmd-hosts-15th-combating-weapons-mass-destruction-global-synchronization-conference-2160546.htm>.

⁹⁵ Paul Bernstein, “Deterrence in Professional Military Education,” *Air and Space Journal* 29, no. 6 (November–December 2015), available at <www.airpower.maxwell.af.mil/digital/pdf/articles/2015-Jul-Aug/C-Bernstein.pdf>.

⁹⁶ This challenge, inter alia, was addressed in a U.S. Strategic Command DOTMLPF-P (doctrine, organization, training, materiel, leadership and education, personnel, facilities, and policy) Change Recommendation recently approved by the DOD Joint Requirements Oversight Council (JROC), per the JROC decision memorandum issued by General Paul J. Selva, USAF, Vice Chairman of the Joint Chiefs of Staff, Subject: DOTMLPF-P Change Recommendation for the Countering Weapons of Mass Destruction Leader Development Education and Training, JROC Memorandum 123-IS, December 7, 2015.

⁹⁷ See, for example, “Humanitarian Impact of Nuclear Weapons,” *ReachingCriticalWill.org*, March 11, 2016, available at <www.reachingcriticalwill.org/disarmament-fora/himw/>.