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In mid-2014, an American-led coalition of states and international organizations completed a remarkable task, eliminating one of the largest remaining chemical weapons (CW) stockpiles in the world, declared by Syria only the year before. This effort concluded a process of elimination that began after the Syrian regime employed CW in a large-scale attack against civilians in Ghouta, a suburb of Damascus controlled by the opposition, in August 2013.

Although this effort was in many ways unique, it was far from the first of its kind. The United States and its international partners have eliminated weapons of mass destruction (WMD) programs in Libya, Iraq, and former Soviet states. This project provides new insights into and lessons from these experiences.

Similar opportunities for elimination are likely to arise in the future. At least three categories of future potential elimination missions can be identified: Those of possessor states, North Korea being the most challenging cases; of non-state actors, likely located in failed or fragile states or ungoverned territories; and of residual cases, i.e. past possessors who never completely disarmed, such as Iraq, Libya, and Syria.

In possessor states, any current or future WMD program might be a candidate for elimination. In addition to its well-publicized nuclear weapon program and rapidly advancing missile capabilities, North Korea is thought to possess large stockpiles of CW and the ability to produce significant amounts of biological weapons (BW). In time, the opportunity to eliminate these programs may arise, either in cooperation with a North Korean government seeking to change its relationship with the outside world or in the event of the collapse or overthrow of the regime.

A handful of other states also remain outside the Chemical Weapons Convention (CWC) and are suspected of CW possession; one or more member states might also try to cheat. No state currently acknowledges an existing BW program, but concerns about the activities of some states go beyond just North Korea. There are five acknowledged nuclear-weapons possessors within the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), plus another four states outside the treaty: India, Pakistan, Israel, and North Korea. Non-nuclear NPT member states could also try to cheat.

The WMD elimination challenge is not just limited to states' programs. The Islamic State (IS) organization is reported to have employed CW on the battlefield in Syria and Iraq. The group is believed to have used both chlorine and sulfur mustard, possibly of its own manufacture. IS may also be recruiting experts and establishing procurement pipelines to bolster those efforts. The United States and its partners may have opportunities, or feel compelled, to eliminate those capabilities. This is a new type of threat, involving a non-state actor operating inside failed or fragile states, including places like Iraq, Syria, and Libya—all states where CW elimination has taken place, but was not completed.

Background

Understanding and incorporating the lessons of past elimination efforts should take place before the next crisis unfolds. Although this problem is hardly unknown to national security policy makers, practitioners and close observers of WMD elimination have noted a tendency to "reinvent the wheel" each time an opportunity to pursue such an effort presents itself. In most instances, there will be little time available for study or contemplation the next time the opportunity or need for WMD elimination arises; the insights from these experiences should therefore be grasped today.

The record of preparedness for elimination missions is poor. The disintegration of the Soviet Union, and the nuclear, biological, and chemical insecurity it produced, caught most by surprise. Neither Iraq's 1990 invasion of Kuwait nor the extent of its unconventional weapons programs were anticipated. Although the United States initiated the 2003 invasion of Iraq, partly on the basis of misperceptions of the status of Iraq's WMD programs, it entered the conflict largely unprepared to secure and eliminate what remained of those capabilities, let alone what had been expected. Libya's agreement to disarm following years of negotiation, yet implementation entailed unforeseen challenges, particularly after the civil war erupted.

The opportunity to eliminate Syria's chemical weapons also arose unexpectedly, but it represents a different model, one of readiness. The US government and its allies and partners, including states and international organizations, were ready to take advantage of the opening precisely because they had spent months beforehand intensively preparing for potential chemical weapons-

related contingencies. Thus, when the opportunity to eliminate Syria's chemical weapons arsenal arose, the international community was able to move swiftly.

Recognizing the need for a comprehensive framework for eliminating WMD is not new. But while past cases of elimination have received considerable attention, no single work broadly captures their lessons to aid future policy and planning.[1] The insights of this project and the accompanied articles will be published as a double issue of *The Nonproliferation Review* in August 2016. It is the culmination of a project funded by the US Defense Threat Reduction Agency, intended to help governments, international organizations, and non-governmental experts to prepare for WMD elimination contingencies. Each article stands alone, but taken together, they cover multiple thematic areas and case studies. Early drafts were discussed at a November 2015 workshop in Washington, DC, with over 40 participants. Those present included current and former officials from the US government and international organizations, as well as non-government experts.

Defining WMD elimination

How to define WMD and WMD elimination was an important part of our discussions with the contributors to this project. There is no one generally accepted definition of WMD elimination, even within the US government. For the purposes of this project, WMD elimination was defined

[1] See for example, United Nations Monitoring, Verification And Inspection Commission (UNMOVIC) Compendium, Ch. 3, "Observations and Lessons Learned," <http://www.un.org/depts/unmovic/new/documents/compendium/Chapter_VIII.pdf>; Trevor Findlay, "The lessons of UNSCOM and UNMOVIC," *Verification Yearbook 2004,* VERTIC, <http://www.vertic.org/media/Archived_Publications/Yearbooks/2004/VY04_Findlay.pdf>; Raymond T. Van Pelt, "JTF - WMD Elimination, An Operational Architecture for Future Contingencies," April 28, 2004, The Industrial College of the Armed Forces, National Defense University, Fort McNair, Washington, D.C., <http://www.dtic.mil/get-tr-doc/pdf?AD=ADA436471>; Rebecca K. C. Hersman and Todd M. Koca, "Eliminating Adversary WMD: Lessons for Future Conflicts," *Strategic Forum*, No. 211; Rebecca K.C. Hersman, "Eliminating Adversary WMD: What's at Stake?," NDU Occasional Paper 1, December 2004, <http://wmdcenter.dodlive.mil/files/2012/02/Eliminating-Adversarial-WMD.pdf;> Johnny Hall Jr., "Compelled Compliance: WMD Elimination in the New Era of Arms Control," Thesis, Naval Postgraduate School, Monterey, California, September 2006; Łukasz Kulesa, "Elimination of Chemical Weapons Stockpiles: Lessons for Syria," The Polish Institute for International Affairs, No. 100 (553), 25 September 2013; Norman Cigar, "Libya's Nuclear Disarmament: Lessons and Implications for Nuclear Proliferation," MES Monographs No. 2, Marine Corps University, January 2012, and Zachary Kallenborn and Raymond A. Zilinskas, "Disarming Syria of its Chemical Weapons: Lessons Learned from Iraq and Libya," CNS Issue Brief for NTI, Oct. 31, 2013, <http://www.nti.org/analysis/articles/disarming-syria-its-chemical-weapons-lessons-learned-iraq-and-libya/>.

as efforts to eradicate nuclear, biological, and chemical weapons and their means of production and delivery that involve states other than the possessor. The decision to eliminate WMD might be more or less cooperative: directly imposed by outside forces, coerced or induced, or wholly internally driven. Similarly, the implementation of elimination might be performed wholly by external actors, performed cooperatively, or performed largely or exclusively by the possessor state alone.

Figure 1: WMD Elimination - Typology

		How was the decision reached?		
		Imposed	Coerced	Induced/Voluntary
How was the dismantlement implemented?	External	Iraq (2003)		
	Cooperative		Iraq (1990s) Syria	Libya fSU (CTR)
	Internal			South Africa CW elim (most)

Elimination carried out solely by the possessor state falls beyond this project's scope. For example, the elimination of declared CW and associated capabilities in the United States, although subject to verification by the Organisation for the Prohibition of Chemical Weapons (OPCW), the implementing body of the CWC, does not meet the definition for WMD elimination adopted here. Nevertheless, one of the case studies included in this project, involving South Africa, despite falling outside of our definition, was included on the grounds that it offers useful lessons for future efforts within the project's focus. It is also worth noting that although elimination might be necessary for global disarmament, these concepts are not synonymous.

Despite largely agreeing on a definition, individual authors still preferred to use the term in slightly different ways, as discussed in their articles. Some authors have treated cooperative threat reduction programs as falling within the elimination mission. Others have included the

control of dual-use capabilities, information, and expertise. This broader family of missions offers a number of relevant lessons.

The collection of papers is divided into two parts. The first part explores themes relevant to WMD elimination work, including strategic, diplomatic, legal, technical, and inter- and intra-agency dynamics. The second part covers six case studies (post-Soviet CTR, Iraq in the 1990s and 2003, South Africa, Libya, and Syria). The authors seek to identify best practices and lessons learned that future decision makers and experts should consider when planning and executing elimination missions. While not an exhaustive treatment of the subject—and the authors' hope is that this content stimulates further analysis of these important topics—this provides what we believe is the most comprehensive overview of the issues to date.

Major observations

Based on specific lessons identified in each of the topics mentioned above, the November 2015 workshop, and follow up briefings, several broad observations may be offered.

The need for a "checklist." Because of the complexity and unpredictability of the WMD elimination problem set, no single "playbook" or generic plan is likely to encompass every aspect of the problem or provide sufficient preparation. Instead, it may be more useful to use the lessons identified in this study to develop a framework or checklist that helps to identify and think through the crucial aspects of different situations and contingencies.

Lack of institutionalization. Despite considerable activity in the last quarter-century, WMD elimination lacks recognition as a well-bounded field with an associated professional community. Its scope, despite efforts at definition here, is not firmly established or agreed upon. There is no clear group of community of experts that cover these issues or is responsible for them on a daily basis. There is neither a single template nor a clearly established lead organization for WMD elimination, internationally as well as within the US Government. Each new case is a "pickup game" and as a result, resources and authorities often must be applied creatively and flexibly.

A multiplicity of actors and conditions. At a minimum, each WMD elimination case involves a possessor state (or, in the case of a potential non-state actor case, one or more host countries), along with one or more international partners. Depending on the context, the international partners can be countries or international agencies such as the United Nations (UN), the International Atomic Energy Agency (IAEA), World Health Organization (WHO), or the OPCW, each of which has unique authorities and competencies. They may be called upon to operate in "permissive" environments, where they can move and operate with relative freedom, or "non-permissive" environments, where security may not be assured. Sometimes information may not be shared among partners for reasons of security, legal limitations, or other reasons. These complexities demand intensive efforts at coordination, which sometimes have extended to the creation of *ad hoc* bodies between or within governments and international organizations. Even within the United States alone, WMD elimination almost invariably involves multiple departments, agencies, and their components, with overlapping and potentially competing roles, and their own diversity of authorities and capabilities. High-level support and attention are required, as well as a clear vision and capable leadership, at both the political and operational levels. Furthermore, both strong working relationships and personal relationships between officials in different organizations are often necessary to clear the path for success.

Demands of multinational collaboration. International coalitions are crucial to get any elimination mission authorized, financed, legitimized, and accomplished. Working across national boundaries and organizations, however, also usually means WMD elimination is not conducted within the confines of a clearly defined chain of command or existing concept of operations. Control of activities in the field tends to be indirect; sometimes those activities are in the hands of the possessor or host country government and its contractors. Sensitive issues such as sovereignty and public health are usually involved, as are multiple stakeholders, potentially down to the level of local communities. This situation demands routine communication and cooperation to avoid misunderstandings and surprises and to synchronize what can be a complex set of activities. These circumstances demand flexibility and responsiveness. For these reasons, too, diplomatic interventions are a recurrent feature of elimination activity, to gain cooperation either by appealing to common interests, offering inducements, or threatening consequences. It

was also recognized that in most, if not all elimination cases, US-Russian cooperation has been essential for both adopting the elimination mandate and executing it.

Sustaining institutional support. Beyond operational leadership, institutional support cannot be taken for granted. Activities that require significant money and time require stronger and deeper support than has sometimes been evidenced. For example, Congress was deeply skeptical of the Russian and other former Soviet authorities, and imposed numerous conditions on CTR funds and activities, which complicated implementation. In Iraq in the 1990s, some members of the UN Security Council gradually seemed to lose their appetite for supporting the inspection activities of the UN Special Commission (UNSCOM), which led to the commission's dissolution and replacement. Because sustaining the political and financial support necessary to eliminate WMD has been proven to be a challenge, advocacy for the mission, the identification of "champions" in key institutions, and the management of relationships should be viewed as essential activities.

The persistence of surprise. As noted above, surprise is common and flexibility is therefore crucial to success. Each case looks different, and for a variety of reasons, including complex and heterogeneous legal and organizational environments. Governments, international agencies, and experts rarely anticipate cases of insecure WMD in time to plan and organize. The Syrian case was a notable exception. The United States government and its partners foresaw a possible opportunity and need to eliminate Syria's CW arsenal; thus, when that opportunity arose, they had suitable destruction technology, and the broader diplomatic, bureaucratic, legal, and technical context required to use it, at the ready. Even then, however, a great deal of flexibility was required to agree on a legal mandate, organize suitable partners, modalities, and venues for destruction activities.

The need for investment. Preparation takes investment, especially in technology. The political and environmental sensitivities involved in elimination significantly complicate the problem; there is rarely an off-the-shelf technical solution that meets all needs. Continued research and development is crucial, especially in highly adaptable destruction technologies. Furthermore, the resulting capabilities must be represented in acquisition budgets ahead of time, or they will not be available when needed. As a result, there is always a need to sustain institutional support for

WMD elimination, to ensure that the resources and people to support the mission are available when WMD elimination is actually underway.

Focusing on both technology and people. The definition of WMD elimination adopted here emphasizes weapons, their means of production, and their delivery systems. Nevertheless, many cases also illustrate the importance of a more comprehensive approach that covers the entire program, not only weapons. A comprehensive approach is also crucial during the verification process to reconstruct the scope and scale of the WMD programs and should include access to documents and personnel. During and after the elimination process, it will also be important to ensure that possessor-country scientists, engineers, and industrial specialists with sensitive knowledge find and remain engaged in constructive and peaceful work that provides them with a living. Otherwise, as has happened in past cases, they may end up contributing to the further proliferation of WMD.

A partial checklist

Given the above observations, policy makers should consider the following issues when preparing for future elimination missions. This is not an exhaustive list and many more recommendations can be found in the specific case studies.

Prior to the elimination decision itself, the challenge is to identify the proper mix of instruments of national and international power (military, economic, diplomacy etc.) to convince the country to abandon its WMD program. The Libyan case illustrates that it was possible to create a win-win formula both during the negotiations leading to the elimination decision, and during the elimination process itself.

Once the elimination decision has taken place, it is essential to incorporate several important aspects into the scope of the elimination mandate. These include an international legal and domestic (when relevant) basis for action, ideally through a UN Security Council Resolution (UNSCR) and based on Chapter 7 of the UN Charter; adequate and timely funding; a specific and well-defined mission, which includes a definition of what should be eliminated (weapons vs. programs); clearly defined political relations, including a dispute resolution mechanism with the

country to be disarmed, and an enforcement mechanism, ideally through a UNSCR with a Chapter 7 mandate.

Given that complete elimination depends on motivations, not (only) capabilities, decision makers should recognize that uncertainties about total elimination usually will persist after the elimination mission is completed and the state will retain most of the weapon expertise and dual-use capabilities. As a result, the elimination mandate should incorporate mechanisms for effective verification and monitoring. The verification and monitoring should include access to people, documents, industry and dual-use materials, as well as plans for the redirection of scientists. To strengthen the nonproliferation regime and muster international legitimacy, it is advisable to rely on existing international treaties and regimes but retain flexibility and agility. Decision makers should also recognize that the above mentioned short and long term WMD elimination goals (destruction vs monitoring) are different or even in tension and should be thought through when developing the mandate, especially if the elimination process, its verification, and the responsibility of monitoring fall under different entities.

The study also identified several gaps relevant to WMD elimination on the international and US Government levels. On the international level, no international organization or readily available mechanism exists for BW elimination. There is also a gap in diagnostic capabilities to identify and characterize WMD in a timely manner, especially biological weapons. Nuclear weapons have never been dismantled by a country other than the one that built them, posing potential challenges should the target of an elimination effort be uncooperative.

To prepare for future elimination cases, concerned governments should work more closely with partners and international organizations to further identify relevant lessons learned from past elimination cases and develop contingency plans. They should also consider providing partners and international organizations with elimination technologies and train them to use them effectively.

In the case of US policy planners specifically, there is no single entity within the US government that has clear responsibility for planning or executing WMD elimination. Furthermore, despite being charged to do so, the military has not historically maintained the capabilities to carry out

these missions. Additionally, since funding such operations has proven both critical and challenging, it was noted that in the US, outside the Department of State's Nonproliferation and Disarmament Fund (NDF), and some US Department of Defense (DOD) monies, most US agencies do not have dedicated funding available for elimination missions, which means that special authorization is required to shift funds, which could impede timely action.

Related to this, coordination among the US government agencies and within them will be a key challenge. Challenges include identifying resources (principally, though not only, money) and authorities (legal permission to engage in specific activities) to allow the government to do things that are outside its normal scope of activity.

A pre-crisis planning body that examined existing assumptions and associated concepts of operation, provided a space to air and work through disagreements, worked to defuse interagency conflicts by establishing clear priorities and responsibilities, and encouraged non-traditional international partners to take a more active role in potential WMD elimination missions should be considered.

An additional gap that should be addressed is related to sharing information. The problem is relevant both within the US Government, but particularly acute with regard to coordination with international partners. For example, significant legal restrictions in the U.S. exist on the sharing of nuclear weapons-related information—including information about the composition of materials, samples of material, and nuclear weapons design information. These could hamper future nuclear elimination efforts. Solutions and workarounds should be thought through now, rather than later. Relevant practices and lessons learned can be borrowed from the way information is shared between intelligence agencies as related to counter-terrorism or the Five Eyes arrangement. Challenges associated with the US policy of "no US boots on the ground" further emphasizes the need to rely on and work with others – contractors, governments and international organizations -- to accomplish the mission.

To best utilize technological solutions, it was recommended to remain innovative and agile by using a range of scenarios for planning technical options, consulting early with the full range of stakeholders who could support or challenge technical decisions, developing strong

communications plans, and ensuring that planning accounts for critical enabling technologies. To maintain elimination "on-ramps" for a range of potential future missions, it was recommended to consider creating a standing body to help maintain technical capacities, and internationalize planning and implementation.

A related future challenge is how the US government, and partners elsewhere, might retain and institutionalize enduring WMD elimination capabilities. The sporadic and often unpredictable nature of WMD elimination contingencies feed into this dynamic and will be specifically relevant in the chemical field after the US will complete eliminating its chemical weapons stockpiles.

Conclusion

For all its complications, ensuring the viability of WMD elimination in the face of legal, organizational, technological, budgetary, security, and other constraints should be a matter of concern to all seeking to enhance national and international security, regardless of views on the practicality or desirability of a world without nuclear, chemical, or biological weapons. In this sense, it could be compared to more institutionalized activities in the WMD arena, such as verification or materials security.

This project will not and should not be the last word on the topic of WMD elimination. Instead, we hope it will prompt governments, international organizations, and non-governmental experts to deepen their engagement with these important issues.