

Disarming Libya?

A reassessment after the Arab Spring

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Beginning in late 2010, a revolutionary wave of protests and popular revolts that came to be known as the 'Arab Spring' spread across countries in the Middle East and North Africa, including Libya. Over the next several months, Libya was wracked by a civil war between forces supporting Colonel Muammar Gaddafi and rebel forces reinforced by NATO air power. The rebel forces gradually gained momentum, eventually toppling the Gaddafi regime in August 2011. A few months later, in October 2011, Libya's new National Transitional Council announced that it had discovered an undeclared cache of chemical weapons (CW).¹ This discovery was later confirmed to be an undeclared stockpile of mustard gas and associated artillery shells by the Organization for the Prohibition of Chemical Weapons (OPCW).²

This announcement was startling to many observers, since Libya had publicly renounced its weapons of mass destruction (WMD) programmes in 2003 and had apparently dismantled its WMD stockpiles, related equipment and delivery vehicles in the months following that announcement. Indeed, after Libya's declaration and the verified dismantlement of its declared programmes, governmental officials, non-proliferation experts and various international organizations across the globe joined in praising the Libyan regime for its cooperation. For example, in words that would come back to haunt him in 2011, British Prime Minister Tony Blair stated in March 2004 that Libya had provided 'full and transparent cooperation' throughout the disarmament process.³ US President George W. Bush similarly stated in September 2004: 'Libya was a threat. Libya's now peacefully dismantling its weapons programs ... [And] the world is better for it.'⁴

Such statements were certainly not unusual. Libya's public renunciation of its WMD and long-range missile programmes, and the subsequent removal of

¹ These remarks are the authors' own and not those of the Los Alamos National Laboratory, the National Nuclear Security Administration, the Department of Energy or any other US government agency.

² 'Libya: stockpiles of chemical weapons found', *Daily Telegraph*, 27 Oct. 2011, <http://www.telegraph.co.uk/news/worldnews/africaandindianocean/libya/8851973/Libya-stockpiles-of-chemical-weapons-found.html>, accessed 4 Feb. 2013.

³ Chris Schneidmiller, 'OPCW verifies secret Libyan chemical arms', *Global Security Newswire*, 20 Jan. 2012.

⁴ Mark Oliver, 'Blair meets Gadafy', *Guardian*, 25 March 2004, <http://www.guardian.co.uk/world/2004/mar/25/libya.politics>, accessed 4 Feb. 2013.

⁵ Commission on Presidential Debates, 'Transcript of the first Bush-Kerry presidential debate', University of Miami, 30 Sept. 2004, <http://www.debates.org/index.php?page=september-30-2004-debate-transcript>, accessed 4 Feb. 2013.

large amounts of those programmes, had repeatedly been referred to as a positive 'model' for non-proliferation: here was an instance in which a country had more or less voluntarily renounced its WMD programmes—or at least was willing to renounce them without the application of force.⁵ Scholars have frequently contrasted the Libyan case with that of Iraq, which required the use of force and ultimately a regime change to accomplish the same goal. For example, as Joseph Cirincione, former director of the Carnegie Endowment for International Peace's Non-proliferation Project, argued only six months prior to the 2011 CW discovery in Libya, 'The world now has two very different models for how to eliminate a threatening nation's nuclear and missile capabilities. The Iraq model of regime change has been enormously costly, chaotic and uncertain. And the Libyan model of changing regime behavior has been efficient, effective, and almost cost free.'⁶

The descriptions of the Libyan case changed dramatically after the CW discovery. Shortly after the Transitional Council's announcement, British Prime Minister David Cameron stated: 'Although Gaddafi agreed to declare and dismantle all his weapons of mass destruction and although we made real progress diminishing the threat he posed, in the last few days we have learnt that the new Libyan authorities have found chemical weapons that were kept hidden from the world.'⁷ This recent discovery forces us to wonder whether the Libyan 'model' really was as successful as initially claimed.

In reality, significant questions had already been raised in certain quarters about the verification and dismantlement of Libya's WMD programmes as early as 2005. The 2005 report of the bipartisan US Commission on the Intelligence Capabilities of the United States Regarding Weapons of Mass Destruction (the Robb–Silberman Report) raised a number of questions about the Libyan case, reporting: 'There is little doubt that significant questions remain about Libya's WMD programs.'⁸ The report stated that 'it is clear that Libya has been considerably less forthcoming about the details of its chemical and biological weapons efforts than about its nuclear and missile programs'. It also cautioned that there was a growing concern in the intelligence community that 'shifting priorities' and the belief that 'Libya is done' might 'leave collectors and analysts without the resources needed to track and monitor future change'.⁹ These suspicions have to some degree been validated.

Despite the recent revelations, weapons inspectors did dismantle large parts of the Libyan nuclear and CW programmes in 2003–2004—and the Libyan case

⁵ Gawdat Bahgat, 'Non-proliferation success: the Libyan model', *World Affairs* 168: 1, Summer 2005, pp. 3–12; 'US points to Libya as disarmament model', *Arms Control Today* 34: 3, April 2004, p. 29; Paul Kerr, 'Libya's disarmament: a model for US policy?', *Arms Control Today* 34: 5, June 2004, pp. 34–8.

⁶ Joseph Cirincione, 'How we dodged Libya's nuclear bullet', *Huffington Post*, 11 March 2011, http://www.huffingtonpost.com/joe-cirincione/how-we-dodged-libyas-nucl_b_829669.html, accessed 4 Feb. 2013.

⁷ David Cameron, quoted in Patrick Wintour, 'UK to investigate Libya's chemical weapons', *Guardian*, 14 Nov. 2011, p. 2.

⁸ Commission on the Intelligence Capabilities of the United States Regarding Weapons of Mass Destruction, *Report to the President of the United States* (Robb–Silberman Report) (Washington DC: US Government Printing Office, 31 March 2005), p. 263, <http://www.gpo.gov/fdsys/pkg/GPO-WMD/pdf/GPO-WMD.pdf>, accessed 4 Feb. 2013.

⁹ Robb–Silberman Report, p. 263.

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may still provide positive lessons for monitoring and verification regimes tasked with confirming that countries have in fact rolled back their WMD programmes.¹⁰ Nevertheless, the Libyan case also illustrates a number of questions and difficulties that can arise even if there is cooperation. For example, how does one assess 'genuine' cooperation? Will we be confident that all the information, equipment and materials used in the programmes were turned over? Will we have the expertise to determine how advanced the programmes were? Will the state's willingness to renounce one type of WMD (e.g. nuclear) cause people to assume that it is renouncing all types of WMD (e.g. chemical and biological as well)? What should the requirements be for long-term monitoring? How will we be confident that, once a state receives a clean 'bill of health', and, presumably, any sanctions on the state are lifted, it will not start up the WMD programmes again?

Any of these problems can undermine the effectiveness of the monitoring and verification regimes, or, even worse, can make them serve the opposite of their intended purpose by giving states cover for proscribed stockpiles and activities. Such, at least to a degree, appears to have been the case in Libya. Although the Libyan case is unique and may not be repeated, it offers important lessons for the international community as it attempts to address the challenges of monitoring and verification.

This article will therefore examine the successes and challenges of the Libyan case of WMD renunciation and verification, and the lessons that can be learned from it. As one model of cooperative verification, the Libyan case highlights not only the opportunities for monitoring and verification regimes, but also some of the difficulties that any such regime will encounter in real-world circumstances, however positive.

Verifying and dismantling Libya's WMD and long-range missile programmes

On 19 December 2003, Colonel Gaddafi made the surprise public announcement that Libya was renouncing its WMD programmes. In a joint US–British–Libyan broadcast statement, Gaddafi agreed to 'disclose and dismantle' all of Libya's WMD programmes and 'immediately and unconditionally' allow weapons inspectors to verify the dismantlement process.¹¹ Over the next several months, verification teams removed highly sensitive stockpiles and equipment that were part of Libya's WMD and missile programmes and conducted verification activities 'to

¹⁰ 'Monitoring' is the technical process of gathering data allowed under any agreement or regime or other relevant data, such as that which is available through national technical means. 'Verification' is a political process that involves authoritative judgements about the collected data and interpretations provided by the monitoring community. For fuller explanations of monitoring and verification, see Joseph F. Pilat and Nathan E. Busch, 'WMD monitoring and verification regimes: lessons from Iraq', *Contemporary Security Policy* 32: 2, Aug. 2011, pp. 401–431; Joseph F. Pilat, 'Verification and transparency: relics or future requirements?', in Jeffrey A. Larsen, ed., *Arms control: cooperative security in a changing environment* (Boulder, CO: Lynne Rienner, 2002), pp. 79–96.

¹¹ Jack Boureston and Yana Feldman, 'Verifying Libya's nuclear dismantlement', in Trevor Findlay, *Verification Yearbook, 2004* (London: Verification Research, Training and Information Centre, 2005), p. 87, http://www.vertic.org/media/Archived_Publications/Yearbooks/2004/VY04_Boureston-Feldman.pdf, accessed 4 Feb. 2013.

better understand the extent of those programmes, and the procurement work supporting them'.¹²

Libya's announcement was, of course, not a surprise to the team of US and British diplomats who had been secretly working for months with Libyan officials to negotiate this renunciation. Although Libya had broached the subject of renouncing its WMD programmes several times over a period reaching back as far as 1992, Libyan officials reportedly approached British officials formally with a firm overture to abandon these programmes in March 2003, when Operation Iraqi Freedom was imminent.¹³ Over the next several months, US and British officials attempted to persuade Libyan officials to set a date for a technical meeting to discuss Libya's programmes.¹⁴

The tempo of negotiations increased dramatically, however, after the interdiction on 3 October 2003 of the *BBC China*, a German-flagged vessel carrying over 1,000 assembled gas centrifuges and components, on its way to Libya.¹⁵ After the evidence was presented to Libya on 7 October, a date for a technical visit was immediately set and a US–UK technical team made its first visit beginning on 19 October.¹⁶ In November 2003, Libyan officials were presented with additional intelligence information about their nuclear programme.¹⁷ Only a few weeks later, following a period of intense negotiation, Libya announced the decision to renounce its WMD, and the dismantlement process began shortly thereafter.¹⁸

The verification and dismantlement process

After Gaddafi's declaration of 19 December, the verification and dismantlement process proceeded very quickly. Indeed, US-led verification teams were already on the ground and receiving equipment by 20 January 2004, just one month later.¹⁹ As Robert Joseph emphasized, there were important reasons for moving this process forward so rapidly: 'The US and UK participants understood that speed was essential. A drawn-out process would have increased the prospects for press leaks. Moreover, once the first team was granted access to visit Libya, any delay in moving forward would decrease the pressure on the Libyan leadership, and

¹² Paula DeSutter, testimony before the Subcommittee on International Terrorism, Non-proliferation, and Human Rights, Subcommittee on International Relations, US House of Representatives, 22 Sept. 2004, <http://www.state.gov/s/l/2004/78305.htm>, accessed 7 Feb. 2013.

¹³ Sharon Squassoni, *Disarming Libya: weapons of mass destruction*, CRS Report to Congress (Washington DC: Congressional Research Service, 22 Sept. 2006), <http://fpc.state.gov/documents/organization/78338.pdf>, accessed 4 Feb. 2013; Michael Evans, 'Libya knew game was up before Iraq War', *The Times*, 13 March 2004, p. 8.

¹⁴ Robert Joseph, *Countering WMD: the Libyan experience* (Fairfax, VA: National Institute Press, 2009), p. 55.

¹⁵ Boureston and Feldman, 'Verifying Libya's nuclear dismantlement', p. 87. See also Joseph, *Countering WMD*, pp. 55–6.

¹⁶ Joseph, *Countering WMD*, p. 56.

¹⁷ Joseph, *Countering WMD*, p. 56. According to one account, the United States provided Libyan officials with a compact disc 'containing intercepts of a conversation about Libya's nuclear weapons program between Libya's nuclear chief and A. Q. Khan—that reinforced Col. Gadhafi's decision to reverse course on WMD'. See Judith Miller, 'How Gadhafi lost his groove: the complex surrender of Libya's WMD', *Wall Street Journal*, 16 May 2006.

¹⁸ For an insider's account of the negotiations during this period, see Joseph, *Countering WMD*, pp. 59–69.

¹⁹ Paula DeSutter, testimony before the Committee on Foreign Relations, US Senate, 26 Feb. 2004, <http://www.gpo.gov/fdsys/pkg/CHRG-108shrg94557/html/CHRG-108shrg94557.htm>, accessed 7 Feb. 2013.

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could allow time for opposition to mobilize internally and within the region.²⁰ Dr Joseph indicates that the necessity for rapid progress meant that the US–British team had to move forward before it had fully answered all the critical questions about Libya’s WMD and missile programmes. Nevertheless, he argued, inspectors were confident enough with the declarations to proceed.

While a number of questions remained even after the return of the experts in December [2003]—including the precise nature of the North Korean connection to Libya’s missile project, the extent of the work on nerve agents, and the possibility of hidden centrifuges—the intelligence assessment was that sufficient confidence existed to proceed to policy discussions and that these outstanding questions should not be an obstacle to moving forward.²¹

The verification and dismantlement process itself was carried out in three phases. Phase I focused on removing the most proliferation-sensitive materials and equipment from Libyan territory: these included warhead designs, uranium hexafluoride (UF₆), centrifuges, SCUD-C missiles, and related parts for these sensitive technologies. Phase II, which began in mid-February 2004, involved the dismantling, removal or destruction of any remaining components of Libya’s WMD programmes. This stage reportedly involved much larger quantities of equipment, including the destruction of more than 3,000 chemical munitions, the removal of SCUD-C missiles and launchers, further dismantling of the centrifuge programme, and an agreement to remove 16 kg of highly enriched uranium (HEU). Phase III was ‘primarily a verification phase’. According to Paula DeSutter, then Assistant Secretary of State for Verification and Compliance, Phase III was the most difficult part of the process, since the inspection teams had to meet with large numbers of personnel and work to ‘determine whether Libya had truly eliminated its WMD programs’. On 22 September 2004, DeSutter testified that these three phases were more or less complete.²²

At Gaddafi’s insistence, various international verifying organizations, especially the International Atomic Energy Agency (IAEA) and the OPCW, were brought into the process as soon as was feasible to oversee significant aspects of the verification and dismantlement process. By rapidly involving these organizations, Libya helped maintain the image that it had undertaken the decision of its own free will and not as a result of coercion.²³

What the verification process revealed

Although there had long been concerns about Libya’s WMD programmes, most of the suspicions had been focused on Libya’s suspected CW programmes. However, the declarations by Libya in 2003–2004 revealed a great deal about a range of WMD and missile programmes. Perhaps most disturbingly, Libya revealed four

²⁰ Joseph, *Countering WMD*, pp. 93–4.

²¹ Joseph, *Countering WMD*, p. 57.

²² DeSutter, testimony of Sept. 2004.

²³ Wyn Q. Bowen, *Libya and nuclear proliferation*, Adelphi Papers 380, May 2006 (London: Routledge), p. 72.

undeclared nuclear sites previously unknown to inspectors including IAEA director Mohamed ElBaradei.²⁴ Overall, the declared WMD programmes revealed greater capabilities in a number of areas than had previously been estimated in intelligence reports.

Nuclear weapons

Libya's declarations revealed that the regime had acquired a great deal of the equipment and material necessary for producing nuclear weapons, including nearly all the material necessary for providing fuel for atomic bombs, along with bomb designs. Although initial statements by the IAEA downplayed the significance of the programme, these statements were later revised in the light of the evidence.²⁵

Overall, the Libyan regime had managed to acquire the majority of the necessary components of a successful nuclear weapons programme, although there were some questions about the quality of Libya's workforce and not a lot was done in putting the pieces together. As Sharon Squassoni stated: 'Many observers over the years discounted Libya's nuclear weapons program because of its failure to procure key components and lack of indigenous resources and expertise. Yet, Libya's declarations revealed that A. Q. Khan seemed to have solved the procurement problem, if not the problem of expertise.'²⁶ Indeed, as David Albright wrote in a detailed study of the A. Q. Khan smuggling network: 'The Khan network established an impressive transnational supply operation aimed at providing Libya with the ability to make nuclear weapons. IAEA and US experts who have reviewed the evidence judge that the network would have succeeded if the network had not been exposed and Libya had continued to pursue its nuclear ambitions.'²⁷

What was uncovered was indeed substantial. For example, Libya had reportedly received a warhead design from the A. Q. Khan network, as had other countries (such as Iran) that had done business with Khan's network. According to some reports, this warhead design was based on an early, but operational, Chinese nuclear weapon that had been provided to Pakistan in the 1980s (before China signed the Nuclear Non-Proliferation Treaty).²⁸ Libya had also acquired a large amount of the necessary equipment and materials for uranium production from the A. Q. Khan network. The verification teams removed 1.8 tonnes of UF₆ and more than 15 kg of fresh HEU. Libya had also received a modular uranium conversion facility that could produce uranium dioxide, UF₄ or uranium metal.

²⁴ Patrick E. Tyler, 'Libya's atom bid in early phases', *New York Times*, 30 Dec. 2003, p. A9.

²⁵ Joseph, *Countering WMD*, p. 51. See also Tyler, 'Libya's atom bid', p. A9.

²⁶ Squassoni, *Disarming Libya*, p. 3.

²⁷ David Albright, 'Libya: a major sale at last', special report, Institute for Science and International Security, 1 Dec. 2010, p. 41, http://isis-online.org/uploads/isis-reports/documents/Libya_and_the_Khan_Network_1Dec2010.pdf, accessed 4 Feb. 2013. See also Joseph, *Countering WMD*, p. 51.

²⁸ Joby Warrick and Peter Slevin, 'Libyan arms designs traced back to China', *Washington Post*, 15 Feb. 2004, p. A1; 'Warhead blueprints link Libya project to Pakistan figure', *New York Times*, 4 Feb. 2004, p. A1; Bates Gill, 'China's role in non-proliferation', in Nathan E. Busch and Daniel H. Joyner, *Combating weapons of mass destruction: the future of international nonproliferation policy* (Athens, GA: The University of Georgia Press, 2009), p. 247.

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Perhaps even more troubling, Libya had also forged a deal with the A. Q. Khan network for a turnkey centrifuge-based enrichment facility, along with the capability to make centrifuges. In the terms of the deal, Libya would pay US\$100–200 million for the centrifuges, along with associated equipment and materials.²⁹ By the time the network was discovered, Libya had also received 20 pre-assembled P-1 gas centrifuges and the components for another 200.³⁰ By 2002, Libya had assembled an operational nine-centrifuge cascade and had partially completed installation of two additional cascades (one with 19 centrifuges and another with 64).³¹ Libya also received two completed centrifuges of the more advanced P-2 design and thousands of additional P-2 parts.³² Although Libya possessed only a small number of P-2 rotors, Tripoli ‘possessed the specialized equipment and materials for P2 motor production and was working on obtaining a domestic production capacity for UF6’.³³ Libya had already tested some centrifuges and had placed orders for 10,000 more.³⁴

Although, as Albright notes, Libya was still about four years from starting the centrifuge plant when it ended its nuclear weapons programme, ‘the Libyan program appeared sized to produce at least four nuclear weapons per year. For a country like Libya, this production rate was enough to create a formidable, albeit small, nuclear arsenal.’³⁵

Chemical weapons

Libya had long been suspected of having a large-scale CW programme and this programme was discussed repeatedly in intelligence estimates during the 1990s.³⁶ Libya’s 2003 declaration revealed that its CW programme was housed in three main facilities—those at Rabta, Sebha and Tarhunah—which were previously declared to be petrochemical or water delivery complexes.³⁷

The country’s declared CW infrastructure consisted of 3,563 chemical bombs, a 23 tonnes stockpile of mustard gas, small amounts of the nerve agents sarin and

²⁹ Albright, ‘Libya: a major sale at last’.

³⁰ Albright, ‘Libya: a major sale at last’, p. 7.

³¹ Sammy Salama, ‘Was Libyan WMD disarmament a significant success for non-proliferation?’, Center for Non-proliferation Studies (CNS) Monterey Institute of International Studies, Sept. 2004, <http://www.nti.org/analysis/articles/was-libyan-wmd-disarmament-success/>, accessed 7 Feb. 2013.

³² The uranium enrichment throughput of a P-2 centrifuge is reportedly estimated to be about 2.5 times greater than that of the P-1 centrifuge. See David Albright and Jacqueline Shire, ‘Iran installing more advanced centrifuges at Natanz Pilot Enrichment Plant: factsheet on the P-2/IR-2 centrifuge’, Institute for Science and International Security (ISIS), 7 Feb. 2008, http://www.isis-online.org/publications/iran/ISIS_Iran_P2_7Feb2008.pdf, accessed 7 Feb. 2013.

³³ Joseph, *Countering WMD*, p. 51.

³⁴ Albright, ‘Libya: a major sale at last’, p. 10.

³⁵ Albright, ‘Libya: a major sale at last’, pp. 13, 41.

³⁶ John Deutch, ‘Worldwide threat assessment’, brief to the Senate Select Committee in Intelligence, 22 Feb. 1996, <http://www.dtic.mil/cgi-bin/GetTRDoc?Location=U2&doc=GetTRDoc.pdf&AD=ADA312173>, accessed 7 Feb. 2013; George Tenet, testimony before the Senate Select Committee on Intelligence, 5 Feb. 1997, https://www.cia.gov/news-information/speeches-testimony/1997/dci_testimony_020597.html, accessed 7 Feb. 2013; George Tenet, ‘The worldwide threat in 2000: global realities to our national security’, testimony before the Senate Foreign Relations Committee, 21 March 2000, https://www.cia.gov/news-information/speeches-testimony/2000/dci_speech_032100.html, accessed 7 Feb. 2013.

³⁷ Joshua Sinai, ‘Libya’s pursuit of weapons of mass destruction’, *Nonproliferation Review* 4: 3, Spring–Summer 1997, p. 95.

soman, and 1,300 tonnes of precursor agents.³⁸ (Interestingly, Libya's initial declaration had only reported 1,500 chemical bombs instead of 3,563. When asked why they did not declare the full amount, 'the Libyans explained that they have not yet believed that Gaddafi would go through with the disarmament plan'.³⁹)

Although some of the biggest unresolved questions in the early stages of the verification process reportedly involved Libya's nerve agent programme, the Libyan regime did apparently have initial aspirations to develop a large-scale production capability for nerve agents, especially sarin and soman.⁴⁰ To this end, Libya's CW programme included 'equipment to begin a second production line for more advanced agents, as well as precursors that could be used to produce mustard and nerve agents'.⁴¹ Libya had reportedly imported 'corrosion-resistant equipment for the planned production facility at Tarhunah, along with industrial quantities of the sarin precursor isopropyl alcohol and a few hundred gallons of the soman precursor pinacolyl alcohol'.⁴²

By September 2004 the OPCW had verified all declared CW stockpiles, destroyed the declared aerial bombs, negotiated plans for the destruction of the declared chemical weapons stockpiles and set in motion the conversion of the Rabta facility into a pharmaceuticals plant.⁴³

Biological weapons

Throughout the 1990s and early 2000s, reported US intelligence assessments as well as congressional reports alleged that Libya maintained a small-scale biological weapons (BW) programme. For example, a 2001 State Department report indicated that 'evidence suggests Libya is seeking to acquire the capability to develop and produce BW agents for offensive purposes'.⁴⁴ A 2006 Department of Defense report noted that Libya's biological weapons programme was 'in the early research and development stage'.⁴⁵ And a 2003 CIA report indicated that 'evidence suggested that Libya also sought dual-use capabilities that could be used to develop and produce biological agents'.⁴⁶

Despite these fears, the verification activities following Libya's 2003 declaration did not reveal an advanced BW programme or any operable facility. Although

³⁸ Salama, 'Was Libyan WMD disarmament a significant success?'; Jonathan B. Tucker, 'The rollback of Libya's chemical weapons program', *Nonproliferation Review* 16: 3, Nov. 2009, p. 366.

³⁹ Tucker, 'Rollback', p. 375.

⁴⁰ Joseph, *Countering WMD*, p. 57; Tucker, 'Rollback', p. 366.

⁴¹ Joseph, *Countering WMD*, p. 52.

⁴² Tucker, 'Rollback', p. 376.

⁴³ Tucker, 'Rollback', pp. 376–9; DeSutter, testimony of Sept. 2004.

⁴⁴ US Department of State, 'Adherence to and compliance with arms control and non-proliferation agreements and commitments', Washington DC, 2001, p. 11, <http://www.state.gov/documents/organization/22466.pdf>, accessed 4 Feb. 2013.

⁴⁵ Office of the Secretary of Defense, US Department of State, 'Proliferation: threat and response', April 1996, <http://www.dod.mil/pubs/prolif>, accessed 4 Feb. 2013.

⁴⁶ Office of the Director of Central Intelligence, 'Unclassified report to Congress on the acquisition of technology relating to weapons of mass destruction and advanced conventional munitions, 1 January through 30 June 2003', Nov. 2004, https://www.cia.gov/library/reports/archived-reports-1/jan_jun2003.pdf, accessed 4 Feb. 2013.

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Paula DeSutter would later write that the United States visited ‘sites that had been part of Libya’s biological-weapons program’, analysts at the time reportedly agreed that, on the basis of the evidence they had seen, Libya’s BW programme would have been small scale.⁴⁷ However, an overall lack of substantive evidence either for or against a Libyan BW programme made it impossible for the intelligence community to definitively confirm or deny its existence. According to the Robb–Silberman Report, Libya’s ‘declarations have failed to shed light on Tripoli’s plans and intentions for its biological program’.⁴⁸ Carl Kropf, a spokesman for the Robb–Silberman Commission, indicated that there was a ‘discrepancy’ between the information that Libya provided about its BW efforts and US intelligence reports, but refused to elaborate because the information was classified.⁴⁹

Ballistic missiles

In the 19 December agreement Libya pledged to eliminate all ballistic missiles with ranges of 300 km or greater and payloads of 500 kg or greater. By 22 September 2004, the verification teams had removed Libya’s five SCUD-C missiles, which had a range of 800 km, and their launchers.

Libya had initially decided to convert its arsenal of 417 SCUD-B missiles, which had a range of 300 km, in order to reduce their range below that threshold and ensure their payload was less than 500 kg.⁵⁰ Given questions about the technical feasibility of accomplishing this task, and difficulties in negotiating a monitoring arrangement to oversee the modifications, the United States eventually managed to persuade Gaddafi to destroy all Libya’s SCUD-B missiles. This agreement faltered, however, when Libya struggled to find an acceptable replacement for the SCUD-Bs, and the regime still retained the SCUD-B missiles at the time of its collapse.⁵¹

Initial assessments of Libya’s cooperation

Libya was praised for its clear cooperation in numerous areas throughout the verification and disarmament process. By late 2004, senior officials in the United States and Britain were declaring the process to be largely complete.⁵² On 22 September 2004, in testimony before Congress, Paula DeSutter stated: ‘Verification is not a science, and no verification determination can be absolutely certain. But what we

⁴⁷ Paula DeSutter, ‘Libya, WMDs, and Musa Kusa’, *National Review*, 4 April 2011, <http://www.nationalreview.com/blogs/print/263744>, accessed 4 Feb. 2013; Robb–Silberman Report, p. 256.

⁴⁸ Robb–Silberman Report, p. 256.

⁴⁹ Paul Kerr, ‘Commission slams WMD intelligence’, *Arms Control Today* 35: 4, May 2005, p. 29.

⁵⁰ Judith Miller, ‘US says Libya will convert missiles to defensive weapons’, *New York Times*, 11 April 2004, p. N6; Paul Kerr, ‘Libya to keep limited missile force’, *Arms Control Today* 34: 4, May 2004, p. 28.

⁵¹ For an excellent summary of the events involving Libya’s SCUD-B missiles, see Jeffrey Lewis, ‘Libya’s Scud-B force’, *Arms Control Wonk*, 22 Aug. 2011, <http://lewis.armscontrolwonk.com/archive/4383/libyas-scud-b-force>, accessed 4 Feb. 2013. See also DeSutter, testimony of Sept. 2004; Office of the Spokesperson, US Department of State, ‘Libya: securing stockpiles promotes security’, Washington DC, 26 Aug. 2011, <http://www.state.gov/t/pa/prs/ps/2011/08/171101.htm>, accessed 4 Feb. 2013.

⁵² Oliver, ‘Blair meets Gadafy’.

can say, and what I am saying with regard to Libya, is that we have verified with *reasonable* certainty that Libya has eliminated, or has set in place the elimination of all its WMD and MTCR-class missile programmes.⁵³

The IAEA was somewhat more guarded in its final assessments of the Libyan verification and disarmament process, but also deemed the process a success. For example, in 2008 the Director-General reported:

Libya's past nuclear programme, from the mid-1980s until 2003, was aimed at the development of nuclear weapons. However, Libya has stated that it did not proceed with the design of nuclear weapons nor did it have complete fissile material production capabilities. The Agency did not find any indications of actual work related to nuclear weapons development. Given the fact that Libya's programme extended over two decades and was conducted to a great extent clandestinely, and in view of the corresponding lack of supporting documentation, there are some parts of Libya's past programme which the Agency has not been able to reconstruct fully. However, with the cooperation and transparent response shown by Libya, the Agency has been able to conclude that Libya's statements concerning its nuclear programme are not inconsistent with the Agency's findings.⁵⁴

The IAEA report went on to conclude that the Agency 'will continue to implement safeguards in Libya as a routine matter and work to reach a conclusion about the absence of undeclared nuclear material and activities in Libya'.⁵⁵

Remaining stocks and undeclared facilities, 2011–2012

During the initial months of the verification, inspection teams made rapid progress in dismantling large amounts of Libya's WMD programmes. The majority of the equipment and materials were removed, and a plan of action was set in place for the destruction or removal of the remaining declared stockpiles and equipment. Over time, however, the schedules began to slip and Libya increasingly began to delay taking the final steps to disarm. US officials were quick to repeat that Libya was a success story, but the disarmament process dragged out over the next seven years. Libyan officials, including Gaddafi, increasingly expressed frustration that that they were not receiving sufficient benefits as a result of their WMD renunciation.⁵⁶

Prior to the uprising that ultimately brought down the Gaddafi regime, Libya was believed to possess approximately 11.3 tonnes of mustard agent, 845 tonnes

⁵³ DeSutter, testimony of Sept. 2004. For more information on the missile classifications of the Missile Technology Control Regime (MTCR), see 'MTCR Guidelines and the Equipment, Software and Technology Annex', Missile Technology Control Regime website, <http://www.mtcr.info/english/guidelines.html>, accessed 7 Feb. 2013.

⁵⁴ Mohamed ElBaradei, Report of the Director-General, 'Implementation of the NPT Safeguards Agreement in the Socialist People's Libyan Arab Jamahiriya', IAEA, GOV/2008/39, p. 7, <http://www.iaea.org/Publications/Documents/Board/2008/gov2008-39.pdf>, accessed 7 Feb. 2013.

⁵⁵ ElBaradei, 'Implementation of the NPT Safeguards Agreement in the Socialist People's Libyan Arab Jamahiriya'.

⁵⁶ Alex Bollfrass, 'Libya backs out of CW destruction agreement', *Arms Control Today* 37: 6, July–Aug. 2006, p. 29; Alex Bollfrass, 'Details bedevil Libyan grand bargain', *Arms Control Today* 37: 8, Oct. 2007, pp. 33–4; Max Fisher, 'A nuclear standoff with Libya', *The Atlantic*, Nov. 2010, <http://www.theatlantic.com/international/archive/2012/11/a-nuclear-standoff-with-libya/67076>, accessed 4 Feb. 2013; Lewis, 'Libya's Scud-B force'.

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of chemical precursors and a substantial cache of natural uranium.⁵⁷ According to the OPCW, ‘the Gaddafi government succeeded in destroying 54% of its declared sulfur mustard and about 40% of the precursor chemicals before operations had to be suspended in February 2011 when the destruction facility malfunctioned’.⁵⁸ OPCW inspectors left the country at that time and did not return until the following October, well after the Gaddafi regime had been overthrown.

Although many policy-makers and arms control experts expressed relief that a great deal of Libya’s WMD materials had been removed prior to the revolt, many raised concerns about a potential loss of centralized control over the remaining materials during the upheaval of the revolt and the subsequent transition.⁵⁹ For example, Representative Mike Rogers, chairman of the House Permanent Select Committee on Intelligence, argued that the United States had to help secure caches of Libyan military hardware, including missiles and chemical agents, to avoid their falling into terrorist hands.⁶⁰ General Carter Ham, chief of US Africa Command, likewise indicated that there was ‘a very great concern about the security’ of various chemical agents remaining in the country: ‘It’s not weaponized—it’s not easily weaponized, but nonetheless we want to make sure that the OPCW gets back in there and completes the destruction of the remaining materials.’⁶¹

Much more troubling, however, was the National Transitional Council’s announcement in October 2011 that a cache of suspected CW agent and hundreds of associated artillery shells had been discovered.⁶² These shells were reportedly found at two sites in central Libya and had not been declared by the Gaddafi regime. Libya had previously declared only CW aerial bombs, which were destroyed in 2004. One senior US official was quoted as saying: ‘‘We are pretty sure we know’’ that the shells were custom-designed and produced by Iran for Libya.’ Another US official was quoted as saying: ‘These were acquired over many years.’⁶³

The OPCW sent inspectors to investigate the newly discovered materials and artillery shells on 17 January 2012. On 20 January it released a brief stating that the ‘inspectors verified the declared chemical weapons, which consist of sulfur

⁵⁷ Office of the Spokesperson, US Department of State, ‘Securing stockpiles’. See also Nuclear Threat Initiative, ‘Weapons stocks still a worry in post-Qadhafi Libya’, *Global Security Newswire*, 21 Oct. 2011, <http://www.nti.org/gsn/article/weapons-stocks-still-a-worry-in-post-qadhafi-libya/>, accessed 7 Feb. 2013.

⁵⁸ OPCW, ‘OPCW inspectors verify newly declared chemical weapons materials in Libya’, 20 Jan. 2012, <http://www.opcw.org/news/article/opcw-inspectors-verify-newly-declared-chemical-weapons-materials-in-libya>, accessed 4 Feb. 2013.

⁵⁹ See e.g. Bilal Y. Saab, ‘Can Libya be locked down? In a post-Qaddafi era, who will secure Libya’s chemical and biological weapons materials?’, WMD Junction, James Martin Center for Non-proliferation Studies, 22 Sept. 2011, http://cns.miis.edu/wmdjunction/110922_libya_lockdown.htm, accessed 4 Feb. 2013; Fredrik Dahl, ‘Nuclear experts warn of Libya “dirty bomb” material’, Reuters, 24 Aug. 2011.

⁶⁰ Carlo Munoz, ‘US should help secure Libyan WMD, House intel chief says’, AolDefense.com, 16 Sept. 2011, <http://defense.aol.com/2011/09/16/u-s-should-help-secure-libyan-wmd-house-intel-chief-says/>, accessed 7 Feb. 2013; Mike Rogers, interviewed in ‘Libyan weapons stockpiles remain a concern’, National Public Radio, 24 Aug. 2011, <http://www.npr.org/2011/08/24/139923591/libyan-weapons-stockpiles-remain-a-concern>, accessed 26 Feb. 2013.

⁶¹ Carter Ham, ‘TRANSCRIPT: AFRICOM Commander Ham discusses African security with defense writers’, US AFRICOM Public Affairs, 15 Sept. 2011, <http://www.africom.mil/Newsroom/Article/8587/transcript-africom-commander-ham-discusses-african>, accessed 7 Feb. 2013.

⁶² R. Jeffery Smith, Joby Warrick and Colum Lynch, ‘Iran may have sent Libya shells for chemical weapons’, *Washington Post*, 20 Nov. 2011.

⁶³ Smith et al., ‘Iran may have sent Libya shells’.

mustard agent that is not loaded into munitions'.⁶⁴ Although the brief did not specify how much mustard agent was discovered, OPCW spokesman Michael Luhan indicated that it was 'a fraction of what was in the original declaration'.⁶⁵

The OPCW brief also referred to the artillery shells, stating that 'at the same time, at the request of the Libyan authorities, the inspectors examined munitions, mainly artillery shells, which they determined are chemical munitions and hence declarable'.⁶⁶ That is, these were munitions that Libya was obliged to declare according to the terms of the agreement with the OPCW. Contrary to prior reports, Luhan indicated that the shells were not currently usable because they were not loaded with chemical weapons agents.⁶⁷

These statements by the OPCW were revealing. Why, for example, did the OPCW not give any details on the amounts of chemical weapons or artillery shells that were verified? Luhan's statements appeared almost to be dismissing these findings as unimportant, since Libya had initially declared a much larger amount and since the artillery shells were apparently empty. But, put together, these undeclared chemical weapons and CW delivery vehicles in effect gave Libya a small but potentially viable hedge chemical weapons arsenal—clearly something that should be considered a serious breach of Libya's international commitments.

The Libyan case: an assessment

The Libyan case reveals positive and negative aspects of verification and ongoing monitoring after a WMD and missile rollback. In late 2003, US and British officials were able to respond quickly, negotiate effectively and steer the trilateral agreement—in many cases, at least—to require the removal of equipment rather than allow for a drawn-out dismantlement process. The IAEA and OPCW worked effectively with British and US officials to coordinate and lead dismantlement efforts.

However, the Libyan case also reveals a number of problems with both the international monitoring and verification regimes and those ad hoc groups that are brought together to verify and dismantle declared WMD programmes in specific cases. Clearly these problems were driven home most powerfully by the 2011 discovery of the undeclared CW arsenal and delivery vehicles. According to Donald A. Mahley, a former Deputy Assistant Secretary of State who was the Senior WMD Representative in Libya, this incident showed that 'we will have to think very seriously about finding inspectors with a different skill set, and about more intelligence-sharing, and about looking widely, not just at declared sites'.⁶⁸ These comments are very revealing and point to lessons about monitoring and verification that extend beyond the Libyan case.

⁶⁴ OPCW, 'OPCW inspectors verify'.

⁶⁵ Schneidmiller, 'OPCW verifies secret Libyan chemical arms'.

⁶⁶ OPCW, 'OPCW inspectors verify'.

⁶⁷ Jill Reilly, 'Revealed: international inspectors discover Gaddafi's secret stockpile of chemical weapons', *Daily Mail*, 21 Jan. 2012.

⁶⁸ Smith et al., 'Iran may have sent Libya shells'.

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Even if an undeclared CW stockpile had not been discovered in 2011, the host of difficulties and shortcomings encountered by the verification process conducted in Libya would need to be examined. Indeed, as noted above, serious questions about the Libyan case were raised as early as 2005 by the Robb–Silberman Report.⁶⁹ In the following discussion, we address the difficulties that the Libyan case brings to light both within the international monitoring and verification organizations such as the IAEA and OPCW and within ad hoc groups.

Shortcomings in the work of the IAEA, OPCW and other international organizations

As we will see, Libya was able to exploit various structural limitations in international monitoring to develop a significant WMD programme. As IAEA Deputy Director-General Herman Nackaerts candidly stated in 2011, ‘Only when Libya was caught red handed as a result of intelligence, did it decide to renounce this programme ... The Agency missed the indicators and played no role in the detection of Libya’s clandestine programme.’⁷⁰ And while some of these structural limitations have been addressed through agreements such as the Additional Protocol (AP), which gave increased authority to the IAEA, some have been impaired by implementation issues—including ineffective or incomplete use of both old and new authorities, technological limitations and funding constraints.

Structural limitations to monitoring and verification

Monitoring and verification regimes encounter various structural limitations that are inherent in the monitoring and verification processes themselves. These limitations include the geographical expanse of the area to be monitored; limited access to facilities; uncertainties produced by poor, lost, distorted or otherwise incomplete information; and uncertainties resulting from active efforts to conceal and deceive by the inspected party. In addition, there are often misunderstandings arising from poor intelligence and cultural differences. As a result, there is considerable uncertainty or ambiguity surrounding any conclusions, which are very often ‘judgement calls’, even in the best cases.⁷¹

It should be noted that international verifying bodies such as the IAEA and OPCW have been effective in monitoring declared facilities. However, they face much greater difficulties in detecting covert facilities and stockpiles, in part because of the inherent difficulties of this task and in part because states can exploit the limitations on monitoring and verification. This was certainly the case with Libya. As Wyn Bowen put it, the IAEA ‘had been stung by the nuclear revelations that came out of Libya as they demonstrated the wholesale failure of the agency’s safeguards’.⁷² Robert Joseph states this issue more starkly, arguing

⁶⁹ Robb–Silberman Report, pp. 263–5.

⁷⁰ Herman Nackaerts, ‘Towards more effective safeguards: learning hard lessons’, opening plenary address, Institute of Nuclear Materials Management (INMM) annual meeting, 18 July 2011, p. 1.

⁷¹ Pilat and Busch, ‘WMD monitoring and verification regimes’, pp. 419–20.

⁷² Bowen, *Libya and nuclear proliferation*, p. 73.

that the Libyan case demonstrates that ‘illicit activities by a state willing to cheat on its NPT [Nuclear Non-Proliferation Treaty] and IAEA safeguard obligations are not likely to be detected by the international monitoring practices in place’.⁷³ While these statements may judge the IAEA too harshly overall, they are certainly applicable to the IAEA’s ability to detect undeclared facilities before the introduction of the AP.

Some of the structural problems with IAEA oversight have been improved by the AP, which expands the authority of the IAEA to conduct routine inspections at both declared and undeclared buildings at declared nuclear sites, conduct wide area environmental sampling (WAES), and utilize technological monitoring capabilities (including via satellites). However, significant inherent or structural limitations to IAEA authority remain. Because the AP provides only for IAEA inspectors to have ‘complementary access’ at undeclared buildings *at declared nuclear sites*, the IAEA’s strengthened authority, especially outside such sites, falls far short of the ‘any time, any place’ standard often cited. A 2006 report by the US Government Accountability Office (GAO) report highlighted the continuing limitations of IAEA oversight, even with the strengthened authority established by the AP, arguing that: ‘The IAEA faces a number of limitations that impact its ability to draw conclusions—with absolute assurance—about whether a country is developing a clandestine nuclear programme. For example, the IAEA does not have unfettered inspection rights and cannot make visits to suspected sites anywhere at any time.’⁷⁴ As a result, the GAO concludes, even under the AP, ‘a determined country can still conceal a nuclear weapons program’.⁷⁵

The Libyan case demonstrates similar structural limitations within chemical and biological weapons monitoring and verification regimes as well. As we have seen, significant questions remain about Libya’s pre-2003 BW programme, but at a minimum Libya could have maintained a small-scale BW R&D programme without detection—despite being a member of the Biological Weapons Convention (BWC) since 1982. Because there are no verification measures associated with this treaty, other countries would potentially be able to conceal BW programmes in similar ways.⁷⁶ The verification mechanisms for the Chemical Weapons Convention

⁷³ Joseph, *Countering WMD*, p. 91.

⁷⁴ Gene Aloise, US Government Accountability Office, ‘Nuclear non-proliferation: IAEA safeguards and other measures to halt the spread of nuclear weapons and material’, testimony before the Subcommittee on National Security, Emerging Threats, and International Relations, House of Representatives, 26 Sept. 2006, <http://www.gao.gov/new.items/do61128t.pdf>, accessed 4 Feb. 2013.

⁷⁵ Aloise, ‘Nuclear non-proliferation’.

⁷⁶ Over the years, there have been some efforts to strengthen the BWC, most notably in the lead-up to the fifth review conference, held in December 2001, where a number of countries attempted to model a strengthened BWC on the significantly expanded authorities granted to the IAEA by the AP. However, the United States (among other countries) rejected the draft protocol, arguing that such steps would be prohibitively costly, unacceptably intrusive—and probably ineffective anyway. More recently, the Obama administration has promoted a somewhat new approach which emphasizes the importance of getting the life sciences community (including doctors, biologists and the pharmaceutical industry) involved in preventing BW development and use. See Donald A. Mahley, ‘Statement of the United States to the Ad Hoc Group of Biological Weapons Convention States Parties’, Geneva, 25 July 2001, <http://2001-2009.state.gov/t/ac/rls/rm/2001/5497.htm>, accessed 7 Feb. 2013; Jonathan B. Tucker, ‘Seeking biosecurity without verification: the new US strategy on biotreats’, *Arms Control Today* 41: 1, Jan.–Feb. 2010, pp. 8–14; Gregory D. Koblenz, ‘From biodefense to biosecurity: the Obama administration’s strategy for countering biological threats’, *International Affairs* 88: 1, Jan. 2011, pp. 131–48.

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(CWC) are significantly stronger, at least on paper. Nevertheless, inherent difficulties remain in confirming or disproving claims in both the chemical and biological arenas, in part because of the technical difficulty of detecting the presence of chemical and biological agents, which is greater than that of detecting nuclear materials. This holds true both for both the BWC and the CWC. The latter may have stronger verification authority, but this authority has not been fully implemented. As a result, countries still have the potential ability to conceal illicit CW and BW activities or stockpiles, as Libya did with CW both before and after 2003.

Finally, the Libyan case highlights a new and almost unprecedented threat to non-proliferation regimes: the emergence of non-state smuggling rings. As Wyn Bowen has argued, 'revelations about the A. Q. Khan network's activities vis-à-vis Libya have also generated significant concerns about the true nature and scale of the nuclear black market'.⁷⁷ Herman Nackaerts voiced similar concerns, arguing that the Libyan case 'highlighted the emergence of a new non-State threat—that is, covert nuclear technology supply networks—the most notable example of which was that operated by A. Q. Khan'. The Libyan case among others, Nackaerts continued, serves 'to illustrate the ever-evolving nature of the IAEA's operating environment, and help[s] to underscore the importance of the Agency better preparing itself for the future and of improving both the effectiveness and the efficiency of the safeguards system'.⁷⁸

Problems with implementation

As discussed above, some of the greatest shortcomings with the monitoring and verification regimes in Libya occurred before 2003, when Libya acceded to the AP and the CWC. After 2003, certain of the structural difficulties with monitoring and verification in Libya were to some degree improved. But this by no means implies that all the difficulties were resolved. There were significant shortcomings in the implementation of these agreements, weakening the monitoring and verification regimes in Libya (and elsewhere). This would have made it difficult for the regimes to discover illicit stockpiles and weapons.

In many ways, the IAEA and the OPCW are not sufficiently implementing all the monitoring and verification authorities at their disposal. 'Special inspections' are not being fully used by the Agency, whose board (which comprises representatives from 35 IAEA member states) decided this authority should be used only 'rarely'.⁷⁹ Nor does the IAEA appear to be making optimal use of the authority granted by the AP to inspect undeclared buildings at nuclear sites. In addition, the technical tools and capabilities for detecting undeclared activities are limited. Although the AP gives the IAEA the authority to use WAES and satellite imagery to help detect clandestine facilities, it appears these tools have not been optimally

⁷⁷ Bowen, *Libya and nuclear proliferation*, p. 83.

⁷⁸ Herman Nackaerts, 'A changing nuclear landscape: preparing for future verification challenges', International Forum on Peaceful Use of Nuclear Energy and Nuclear Non-Proliferation, Vienna, Austria, 2 Feb. 2011, <http://www.iaea.org/newscenter/statements/ddgs/2011/nackaerts020211.html>, accessed 4 Feb. 2013.

⁷⁹ Olli Heinonen, 'The case for an immediate IAEA special inspection in Syria', *Policy Watch*, 5 Nov. 2010.

used for this purpose.⁸⁰ And, although the CWC authorizes the OPCW to inspect dual-use facilities, it has not demonstrated much interest in exercising its authority to do so.⁸¹

The most significant of these problems is that neither the IAEA nor the CWC is using the most stringent verification tool it has: the authority to employ 'special' or 'challenge' inspections. The IAEA is empowered by both INFCIRC-66 and INFCIRC-153 (IAEA Information Circulars) to carry out 'special inspections' at suspected facilities in those countries bound by the agreements. Although this authority is in fact much *stronger* than the new authorities granted by the AP, the IAEA has never effectively exercised it.⁸² Similarly, the CWC gives the OPCW the authority to conduct 'challenge inspections', which are even more invasive than the 'special inspections' of the IAEA. Under the CWC's 'challenge inspection' procedure, parties to the CWC 'have committed themselves to the principle of "any time, anywhere" inspections with no right of refusal'.⁸³ Despite these significant authorities, the OPCW has to date never undertaken a challenge inspection.⁸⁴ By not using all the verification tools at their disposal, the IAEA and OPCW are actually making it more difficult to uncover clandestine programmes. Indeed, we have to recall that it took the overthrow of the Gaddafi regime for the undeclared stockpile of Libya's CW to come to light—even after the OPCW had full authority to operate in the country.

The reluctance of these agencies to use their full authorities is in some respects very understandable. Their member states are concerned about costs, reciprocity (other states retaliating in various ways when a state levels charges against them), revealing their intelligence sources and methods, and other issues.⁸⁵ However, as the Libyan and other recent cases of non-compliance suggest, there is a need to work to reduce these barriers. As Herman Nackaerts recently argued:

The problem is that, over the years, some of these provisions have been interpreted in too narrow a manner, or neglected altogether. An obvious example is 'special inspections'. The agency may conduct these, inter alia, if the state's explanation and information gained

⁸⁰ On the capabilities of both WAES and satellite imagery for reinforcing nuclear safeguards, see International Panel on Fissile Materials, *Global Fissile Material Report, 2007*, pp. 101–17, <http://fissilematerials.org/library/gfmr07.pdf>, accessed 7 Feb. 2013; Bhupendra Jasani, Irmgard Niemeyer, Sven Nussbaum, Bernd Richter, and Gotthard Stein, eds, *International safeguards and satellite imagery: key features of the nuclear fuel cycle and computer-based analysis* (Berlin: Springer, 2009); Sven Nussbaum and Irmgard Niemeyer, 'Automated extraction of change information from multispectral satellite imagery', *ESARDA Bulletin*, no. 36, July 2007, pp. 19–25; Bhupendra Jasani, Martino Pesaresi, Stefan Schneiderbauer and Gunter Zeug, eds, *Remote sensing from space: supporting international peace and security* (Berlin: Springer, 2009).

⁸¹ Jonathan B. Tucker, 'Verifying the chemical weapons ban: missing elements', *Arms Control Today* 37: 1, Jan.–Feb. 2007, pp. 6–13.

⁸² Special inspections have been invoked only twice. In the first instance, Romania requested that the IAEA verify unreported plutonium experiments conducted by the Ceausescu regime. In the second instance, the IAEA requested a special inspection in North Korea in 1993, but was denied access. See Heinonen, 'The case for an immediate IAEA special inspection in Syria'; Jack Boureston and Charles D. Ferguson, 'Strengthening nuclear safeguards: special committee to the rescue?', *Arms Control Today* 35: 10, Dec. 2005, p. 20.

⁸³ OPCW, 'The Chemical Weapons Convention', <http://www.opcw.org/chemical-weapons-convention>, accessed 4 Feb. 2013.

⁸⁴ Ambassador Ahmet Üzümcü, OPCW Director-General, 'Organisation for the Prohibition of Chemical Weapons', The John Gee Memorial Lecture, Australian National University, Canberra, Australia, 26 July 2012, p. 12, http://www.opcw.org/index.php?eID=dam_frontend_push&docID=15594, accessed 7 Feb. 2013.

⁸⁵ For some of these concerns, see Tucker, 'Verifying the chemical weapons ban', pp. 11–12.

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from routine and ad hoc inspections are inadequate. I believe we should now be less wary of deploying this verification tool. It is also important to look with a pair of fresh eyes at the way historically we have implemented some of the other measures contained in the safeguards agreements and whether some of the tools at our disposal have not been fully utilized.⁸⁶

Shortcomings in ad hoc disarmament efforts, 2003–2004

The Libyan case also yields important lessons about ad hoc efforts to verify declared WMD rollback in specific cases. In particular, it highlights a number of questions about the levels of confidence the international community can have in such verification processes. As noted above, some of these questions were already highlighted in the 2005 Robb–Silberman Report, and these and other questions about the US-led verification in Libya have become all the more important in the light of the 2011 CW revelations.⁸⁷

Problems with the process

Robert Joseph's first-hand account of the verification and dismantlement processes underscores several important constraints that faced US and British diplomats. First, and perhaps most importantly, it is clear that Gaddafi's serious decision to disarm was made fairly rapidly. Although the Gaddafi regime floated the idea in March 2003, the majority of the diplomatic advances were made between 7 October and 19 December—and the actual dismantlement process began soon after that.⁸⁸

At most, US officials would have had only a few weeks to prepare for this major undertaking. This was a very short time to gather a sufficient team of technical experts who knew what to look for, which sites should be visited, what technologies were the most vital, and what equipment they needed to bring with them to make the verifications as effective as possible. Indeed, some of the limited time leading up to the verification activities was consumed resolving basic implementation issues—for example, there was no basic diplomatic process to build upon, and no passports to enable various personnel even to enter Libya.⁸⁹ Furthermore, as Robert Joseph emphasizes, even once the verification teams were on the ground in Libya, they needed to move very quickly to ensure that they were able to remove key equipment before the mercurial Gaddafi changed his mind, before opposing forces within the Libyan regime gained momentum, or before word leaked out about the negotiations.⁹⁰

All of this makes sense from a political or strategic standpoint, but clearly it has the potential to undermine the verification process itself. Indeed, as Dr Joseph

⁸⁶ Nackaerts, 'Towards more effective safeguards', p. 3.

⁸⁷ Robb–Silberman Report, p. 263.

⁸⁸ Joseph, *Countering WMD*, pp. 93–4.

⁸⁹ Bowen, *Libya and nuclear proliferation*, p. 74.

⁹⁰ Joseph, *Countering WMD*, pp. 93–4.

emphasizes, US teams were forced to move forward before they had fully answered questions about Libya's missile project, its work with nerve agents, the possibility of hidden centrifuges—or, indeed, the possibility of hidden CW stockpiles. If this process had taken place with North Korea, which has a far more extensive and complex programme, it would have been a disaster.

The easing of standards

During the efforts to verify Libyan disarmament, there was an easing of standards in both the ad hoc group and the international organizations, which were confident about Libya's apparently 'full and transparent cooperation'. There are probably several reasons for this overconfidence. First, Libya *appeared* to be cooperating. Unlike their counterparts in Iraq, Libyan officials revealed previously undisclosed sites, turned over substantial equipment and stockpiles, and allowed inspectors access to multiple facilities. Once it appeared that Libya was complying, the bar was apparently lowered. This may reflect an interest in moving towards new modes of verification that could be ad hoc, tailored and fully responsive to national and regional circumstances, including such factors as overall relations with the state, levels of cooperation etc.⁹¹ The tendency to lower the standards for compliance was exposed both in the ad hoc US/British effort and in the international organizations tasked with monitoring Libya's programmes after 2003. One should recall, for example, the IAEA Director-General's statement in 2008 that, despite the fact that 'there are some parts of Libya's past programme which the Agency has not been able to reconstruct fully', the agency was largely satisfied because of 'the cooperation and transparent response shown by Libya'.⁹²

A second reason why the ad hoc group was confident that Libya was not concealing anything was the apparent lack of development of the programmes, at least on the nuclear side. Because much of the equipment and material were still in boxes, inspectors concluded that Libya did not have a sophisticated programme to hide.

A possible third reason why the ad hoc group was willing to accept Libya's declarations at face value was a fear that if US diplomats applied too much pressure on Libya they would undercut Libya's cooperation before the job was finished.

None of these reasons justified the easing of standards that took place, and the consequences of what was done were significant. As noted above, the Robb–Silberman Report stated that: 'It is clear that Libya has been considerably less forthcoming about the details of its chemical and biological weapons than about its nuclear and missile programs.' We now know that some of those concerns were justified. But we may not even have a complete picture of Libya's nuclear and missile programmes, because it is not clear that the ad hoc teams conducted a sufficiently thorough or sustained verification process.

⁹¹ One can see a similar approach to verification of US–Russian strategic weapons reductions in the Moscow Treaty.

⁹² ElBaradei, 'Implementation of the NPT Safeguards Agreement in the Socialist People's Libyan Arab Jamahiriya', p. 7.

Lessons to be learned

The Libyan case is more complex than it appeared, and offers lessons that may be useful in addressing future cases of non-compliance.

The limits of international monitoring and verification

As noted above, there are intrinsic limits to international monitoring and verification. Faced with these limits, the IAEA and OPCW have not made optimal use of the authorities they possess, including systematic use of inspections of undeclared buildings at declared nuclear sites or dual-use chemical facilities, detection technologies such as WAES or satellites, and ‘special’ or ‘challenge’ inspections.

It might be argued that Libya’s most egregious violations of the NPT and safeguards commitments with the IAEA were carried out before Libya bound itself to the AP in 2003, and are therefore irrelevant to today’s world. This is not the case. Safeguards have been significantly improved by the additional authorities provided under the AP, even though some of those authorities are not being implemented effectively. However, some of the states of greatest concern in respect of WMD proliferation are currently not bound by the AP—or in some cases even by the NPT itself. These countries include North Korea, Iran, Syria and Burma (Myanmar), as well as other potential proliferators.⁹³ Because the IAEA will continue to have access only to limited information about the nuclear activities in these countries, its ability to implement a key provision of the AP—detecting illicit facilities and activities—will be sharply constrained.⁹⁴ The lessons from Libya’s pre-2003 activities will thus continue to provide important insights about safeguards for the foreseeable future.

This does not diminish the role of safeguards or other efforts at monitoring and verification. The mission of inspection agencies is very difficult, especially the need to detect undeclared WMD programmes and stockpiles even in countries that are determined to conceal them. As the Robb–Silberman Report suggests, the intelligence community will be expected to detect such covert activities, but its capabilities will be limited if inspection agencies are not doing all they can to put ‘boots on the ground’. The ability of inspection agencies to do this is constrained by limited authorities, unused authorities and poor intelligence. There is also increasingly (in the last 15 years or so) a mistrust among intelligence agencies, states and international organizations.

The international community must be aware of these limits, work to improve the political, cultural and technological means to minimize them, and tailor responses to non-compliance with full knowledge of those limits.

⁹³ IAEA, ‘Status list: conclusion of safeguards agreements, additional protocols and small quantities protocols’, 20 Feb. 2012, http://www.iaea.org/OurWork/SV/Safeguards/documents/sir_table.pdf, accessed 4 Feb. 2013.

⁹⁴ Aloise, ‘Nuclear non-proliferation’.

The problems with cooperation

Cooperation is rightly valued in monitoring and verification efforts; however, apparent cooperation can also be a strategy designed to hinder monitoring and verification. The strategy that Libya appeared to follow was to give the appearance of full cooperation in some areas (such as its nuclear programme and parts of its CW programme) but to conceal stockpiles or programmes in other areas. Thus, the most troubling implication of the 2011 CW discovery is that the Libyan regime might actually not have completely changed course in the first place, despite appearances. It is still fairly soon after the Libyan regime was overturned; it is even possible that more illicit stockpiles or programmes will come to light.

Given the stakes, the appearance of cooperation is not a sufficient criterion of compliance unless it is *truly* borne out through a thorough verification.⁹⁵ In fact, one might wonder whether undisputable evidence of serious non-compliance in the past might make the verification bar *higher* than for normal cases—regardless of whether the country later appeared to be cooperating. Such cases of non-compliance should require a more stringent demand for transparency, more intensive ad hoc verification, and ongoing and sustained monitoring. If, as was the case in Libya, the country's officials demand that an international organization conduct the verification, the authorities granted to that organization in these instances should exceed normal authorities.

The need for long-term monitoring

Given the potential for revival of WMD programmes or retention of covert stockpiles and facilities, there need to be mechanisms to implement more intrusive, long-term monitoring to provide greater assurance that a given country did not have an ulterior motive for renouncing its proscribed weapons. This holds true for Libya and other apparent cases of rollback. And yet the various ad hoc groups and verification regimes do not appear to have mechanisms for stringent long-term monitoring after non-compliance has been discovered.

Indeed, at the time of the Libyan mission, there appears to have been little recognition of the need for mechanisms that went beyond normal, or routine, monitoring. In fact, as the Robb–Silberman Report warned in 2005, attention appeared to be moving away from Libya as a potential proliferator altogether:

There is growing concern within the Intelligence Community that thinking 'Libya is done' may leave collectors and analysts without the resources needed to track and monitor future change. Competing priorities have reduced focus on Libya since the 2003 declarations, and

⁹⁵ Similar questions could be raised about South Africa's renunciation and dismantlement of its nuclear weapons programme in the early 1990s. Because South Africa unilaterally dismantled its programme and brought in the IAEA only after the dismantlement was complete, information vital to the verification process was lost. For example, the IAEA found South Africa's 'initial report' on HEU production to be 'consistent with' the amount of HEU that could have been produced. But if South Africa's records were inaccurate or doctored, a small HEU stockpile could have been concealed. As Mitchell Reiss later wrote, 'a complete accounting of South Africa's enriched uranium inventory may never be known': see Mitchell Reiss, *Bridled ambition: why countries constrain their nuclear capabilities* (Baltimore, MD: Johns Hopkins University Press, 1995), p. 25.

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Libya may again become a low priority for collectors. Some analysts say they have already begun to feel the effects of the shift in priorities.⁹⁶

A similar perception that 'Libya is done' may have affected the behaviour of the international verification organizations as well. Clearly, they do not seem to have taken steps to provide for long-term monitoring and verification sufficient to ensure that non-compliance had been addressed and that it did not recur.

In part, these are cultural problems, implementation problems, and are related to the structural problems with monitoring and verification organizations previously discussed. One is reminded of the statement by Donald Mahley in this context—that 'we will have to think very seriously about finding inspectors with a different skill set, and about more intelligence-sharing, and about looking widely, not just at declared sites'.⁹⁷ Mahley's criticism may be a bit unfair to the ad hoc group that led the disarmament process in Libya, since the US-led group did bring in many of the right technical experts to work on the dismantlement.⁹⁸ However, Mahley correctly highlights serious deficiencies in long-term monitoring, including a lack of information-sharing and an incomplete use of inspections of undeclared buildings and facilities.

The potential consequences of failure

As we have seen, there were significant concerns over a potential loss of control over Libya's WMD technologies and materials during the uprising and after the regime change. Even now, the more recent events in Benghazi, where Al-Qaeda-affiliated groups were able to infiltrate Libya and carry out a successful attack on a US diplomatic post, raise concerns about the ability of the new Libyan government to control the stockpiles of chemical agents that remain in the country awaiting destruction.⁹⁹ Indeed, this attack reportedly prompted the removal of US intelligence agents operating in the country who were said to be assisting the Libyan government in tracking insurgents and securing the remaining chemical stockpiles.¹⁰⁰ Given these events, there is a clear need for the new Libyan government to continue working with the United States and the international community to maintain security for its remaining chemical weapons. It will also be important for the new Libyan government to work with the OPCW to move as rapidly as possible to destroy these weapons and related technologies. Furthermore, particularly in the light of the recent clandestine stockpile discovery, it would be advisable for the new Libyan government and the international community to take

⁹⁶ Robb-Silberman Report, p. 256.

⁹⁷ Smith et al., 'Iran may have sent Libya shells'.

⁹⁸ Author's interviews with technical monitoring and verification experts, including safeguards professionals, Washington DC and Los Alamos, NM, March–June 2012.

⁹⁹ Chris Schneidmiller, 'No sign of changes to Libyan chemical arms security after Benghazi attack', *Global Security Newswire*, 14 Sept. 2012, <http://www.nti.org/gsn/article/no-sign-changes-libya>, accessed 4 Feb. 2013.

¹⁰⁰ Eric Schmitt, Helene Cooper and Michael S. Schmidt, 'Deadly attack in Libya was major blow to C.I.A. efforts', *New York Times*, 23 Sept. 2012, <http://www.nytimes.com/2012/09/24/world/africa/attack-in-libya-was-major-blow-to-cia-efforts.html>, accessed 4 Feb. 2013.

new steps to assess whether there may be other areas in which the dismantlement process is falling short.

Given that prospects for long-term regime stability in most, if not all, of the 'tough cases'—such as Iran, North Korea and Syria—are not great, similar concerns may surface in these countries as well. Indeed, at the time of writing, it is quite possible that the Assad regime in Syria may become the latest regime to be brought down by the Arab Spring.¹⁰¹ Needless to say, the risks of loss of central control over weapons stockpiles, equipment and related technologies would be much worse if these states never adopted the Libyan course of turning over the majority of their WMD programmes. But even if they did, there could still be concerns over stolen or lost WMD materials, as we have seen in Libya after the end of the Gaddafi regime. The United States, NATO, the UN Security Council, and international verification entities such as the IAEA and OPCW need to be prepared to act—rapidly—to secure suspected WMD facilities, stockpiles and munitions depots should these sorts of crises come about.

Conclusions

The Libyan case offers important lessons for the international community as it attempts to address WMD monitoring and verification in the most challenging cases, such as North Korea, Iran and Syria. Through numerous rounds of negotiations and years of diplomacy, the international community has attempted to persuade these countries to submit voluntarily to comprehensive international verifications and irreversibly abandon any suspect programmes.¹⁰² To date, there has been little reason to be optimistic about such favourable outcomes in these cases. But even if there were unexpected breakthroughs in negotiations over these programmes, serious questions would remain about what such a verification and dismantlement process would look like. It is therefore very important to examine the Libyan case, not only because it represents one of the best scenarios one could hope for in such hard cases, but also because it helps identify the pitfalls and challenges associated with verifying and monitoring WMD and missile 'rollback'—and in some cases shows us what *not* to do—even in the most optimistic cases.

The Libyan case reveals the most basic difficulty with monitoring and verification regimes: even in what one might consider the best-case scenario, it is very

¹⁰¹ See 'US general warns of danger of unsecured Syrian chemical arms', *Global Security Newswire*, 7 March 2001, <http://www.nti.org/gsn/article/unsecured-syrian-chemical-arms-could-be-serious-threat-us-commander-says>, accessed 7 Feb. 2013; Leonard Spector, 'Assad's chemical romance', *Foreign Policy*, 23 Aug. 2011, http://www.foreignpolicy.com/articles/2011/08/23/assads_chemical_romance, accessed 7 Feb. 2013; Nicholas Blanford, 'Syria's chemical weapons: how secure are they?', *Christian Science Monitor*, 26 June 2012, <http://www.csmonitor.com/World/Middle-East/2012/0626/Syria-s-chemical-weapons-How-secure-are-they>, accessed 4 Feb. 2013.

¹⁰² See e.g. Barack Obama, 'Press conference by the President', Office of the Press Secretary, The White House, 6 March 2012, <http://www.whitehouse.gov/the-press-office/2012/03/06/press-conference-president>, accessed 4 Feb. 2013; and Barack Obama, 'State of the Union Address, 2011', United States Capitol, Washington DC, 25 Jan. 2011, <http://www.whitehouse.gov/the-press-office/2011/01/25/remarks-president-state-union-address>, accessed 4 Feb. 2013.

hard to detect undeclared WMD programmes and stockpiles in countries that are determined to conceal them. Despite Libya's apparently unprecedented cooperation—including a voluntary renunciation of WMD, revelations of previously undeclared facilities, and delivery of substantial amounts of equipment and materials—it was still able to conceal a stockpile of CW and delivery vehicles.

Beyond these intrinsic limitations on monitoring and verification, the Libyan case yields a perhaps surprising result. Despite Libya's cooperation and the non-proliferation successes that were achieved, there may have been clear instances where the *cooperation actually undercut effective monitoring and verification*—both by lowering the threshold for acceptable compliance and by providing cover for the undeclared CW facilities and stockpiles.

Given the hidden stockpile of CW and artillery shells that came to light after the Arab Spring, ad hoc verification groups and international monitoring organizations need to take more seriously the possibility that a voluntary rollback may not be sincere, even if the state appears to be cooperating. After all, the same people ruled Libya before and after the 19 December renunciation, and—despite what some scholars have argued—appeared to move rapidly to renounce their WMD programmes only after it was clear that their efforts to acquire nuclear weapons technologies via the A. Q. Khan network had been discovered.¹⁰³ The Libyan case suggests, therefore, that in future cases, both ad hoc disarmament teams and international inspectors should be more suspicious of such apparent sudden and complete changes of heart.

In retrospect, the international community, especially the US, the UK and the IAEA, did an incomplete job of verification of Libya's programmes, despite their apparent belief that 'Libya is done'. There were also few provisions for rigorous, long-term monitoring to ensure that these programmes were not restarted later. As Robert Joseph has indicated, there were clear and justifiable reasons for moving forward with the dismantlement and removal of equipment and materials from Libyan territory even before all the questions were completely answered about Libya's WMD programmes. In principle, verification isn't perfect, and political judgements (such as the need to move rapidly to undercut domestic opposition) will need to be considered. But even once the decision is made to move forward, there still is a need to have a *continuing* process to verify that the political judgements are sound.

Specifically, once the most sensitive equipment and technologies had been successfully removed, the ad hoc US- and British-led group should have insisted on a more sustained and rigorous verification process. It is indeed perplexing why US officials were in such an apparent rush to give Libya a clean bill of health. One possible reason is that the Bush administration may have decided it needed a clear non-proliferation success at a time when Iraq War controversies were simmering. A drawn-out verification process, while better serving long-term non-proliferation and disarmament goals, does not produce clear political victories in the short term.

¹⁰³ Joseph, *Countering WMD*, pp. 55–6.

Additional steps also need to be taken to ensure that the United Nations and the international community are better prepared to carry out rigorous, thorough and sustained verification, disarmament and monitoring in future cases of declared WMD rollback. This may point in the direction of creating a permanent body with a mandate and capabilities like those of UNSCOM or the later UNMOVIC, which carried out intensive inspections investigating Iraq's WMD programmes after the 1991 Iraq War.¹⁰⁴ Such a possibility has become less likely, however, since the formal disbandment of UNMOVIC in June 2007. At present it seems very unlikely that there will be any interest in repeating the UNSCOM/UNMOVIC experiment.

But the international community can take other steps in the right direction. In the short term, the major players in international non-proliferation efforts, including the permanent five (P5) members of the United Nations Security Council and organizations like the IAEA and OPCW, need to work more effectively together to improve technology-sharing, for example through performing joint exercises, to strengthen their abilities to monitor and disarm states in cases of declared rollback. However, it does not seem very likely that the P5 would agree on this, and it is not clear whether a P5 effort would be acceptable in the regions of concern.

In the longer term, the international community needs to work together to reduce the various cultural and technical constraints that have limited the effectiveness of monitoring and verification regimes. In this context, for example, it is quite troubling that the IAEA and the OPCW initially displayed similar inclinations to downplay the seriousness of Libya's violations when the nuclear programme came to light in 2003 and the undeclared CW stockpile came to light in 2011. The IAEA and OPCW also need to make more effective use of the authorities and technologies that they already have. To begin with, this means more effective use of 'complementary access' to undeclared and dual-use facilities and especially a cultural shift that allows for greater use of 'special' or 'challenge' inspections. States and international monitoring organizations also need to make better use of information-sharing in order to combine and make better use of national technical means and the direct information that is acquired on the ground by the monitoring organizations.

States can also work together with international verifying bodies to develop and implement technologies that can improve monitoring and verification and thus enable the IAEA and OPCW to carry out their authorities more effectively. In particular, states could intensify R&D efforts to develop new technologies to improve and expand capabilities for detecting undeclared facilities. As noted above, the AP gives the IAEA the authority to utilize WAES and satellite imagery, but neither of these tools has been effectively used. Although WAES techniques were used in the inspections in Iraq, owing to cost and other factors they have been under-used in traditional safeguards monitoring. Similarly, recent technical advances in satellite resolution and multi-spectrum imagery have improved

¹⁰⁴ Richard Butler, 'Don't kick the inspectors out of the UN', *New York Times*, 29 June 2007, p. A27.

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capabilities for detecting important changes at facilities, including construction activities, heat signatures and the release of chemicals into the atmosphere. There has been considerable resistance among the member states of international organizations to introduce these capabilities into the international monitoring and verification toolkit. However, if they could be developed and effectively implemented, verifying entities would be better able to detect clandestine facilities.¹⁰⁵

It was not inevitable that the monitoring and verification processes would leave so many unresolved questions and unrevealed capabilities in the Libyan case. Nor is it certain, however, even if the steps outlined above are taken, that the international community would be able to detect similar covert programmes in other cases of WMD rollback. But the long-term dangers of ineffective inspection and verification regimes cannot be overstated. International security depends, in part, upon organizations summoning up the political courage to make difficult decisions. Leveraging the IAEA and OPCW's existing authorities to advance non-proliferation efforts represents a good start.

¹⁰⁵ Pilat and Busch, 'WMD monitoring and verification regimes', p. 425.