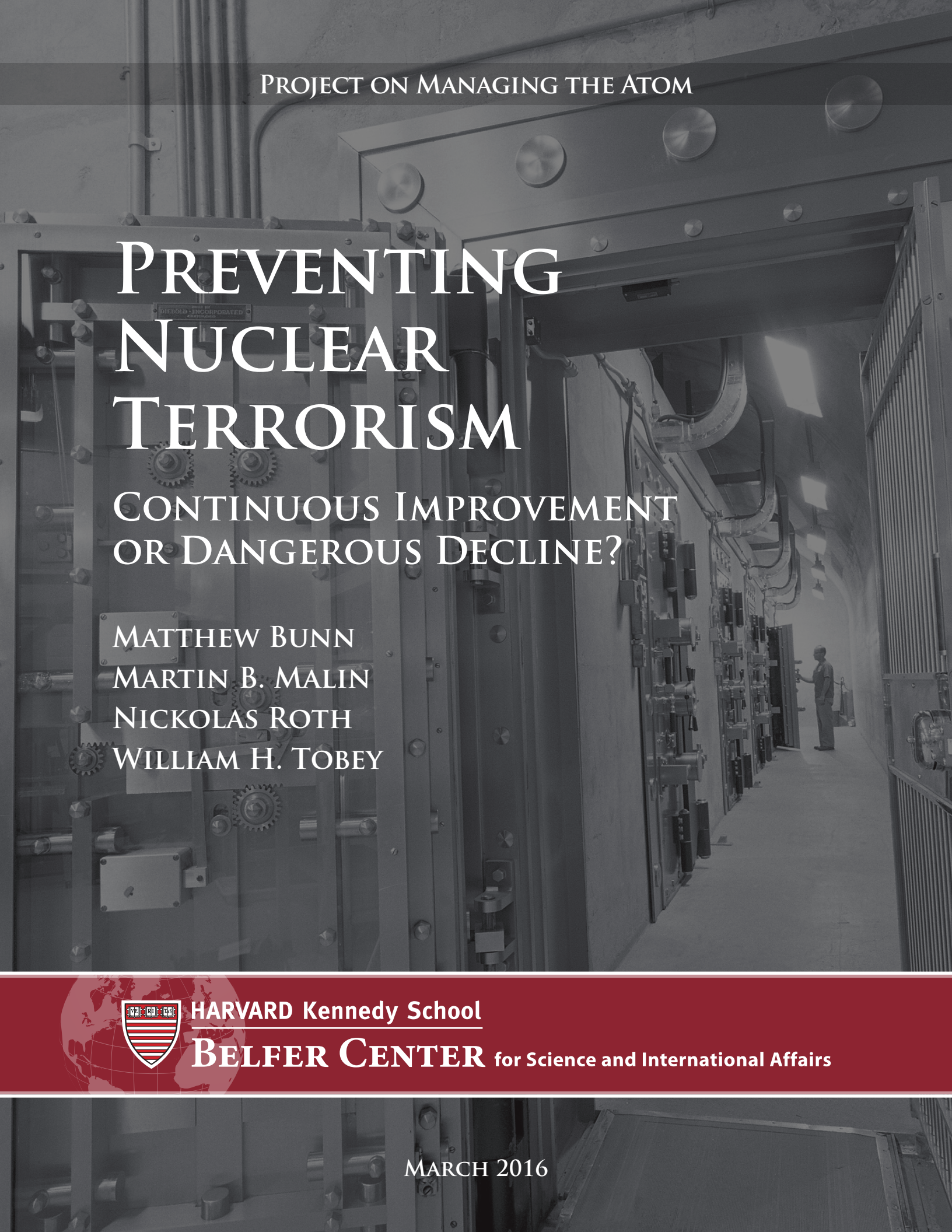

Project on Managing the Atom

Preventing Nuclear Terrorism

Continuous Improvement or Dangerous Decline?

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Project on Managing the Atom
Report

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Cover photo:
The "Tunnel Vault" nuclear materials storage facility at Technical Area 41, Los Alamos National Laboratory, as seen in October, 1964. (Los Alamos Archive).

3. The Evolving Threat of Nuclear Terrorism

Statesmen, intelligence analysts, and academics have all assessed the threat of nuclear terrorism in recent years. Today, Republican and Democratic Party leaders in the United States and the heads of state or government from dozens of countries in the international community—including Presidents Putin[6] and Obama[7]—recognize that the threat of nuclear terrorism is real, urgent, and commands action. Yukiya Amano, Director General of the International Atomic Energy Agency (IAEA) summarized the present danger, saying, "the threat of nuclear terrorism is real, and the global nuclear security system needs to be strengthened in order to counter that threat."[8] Director-General Amano's statement, made before the rise of the Islamic State (IS), is even truer today than it was when he made it in 2013.

Making a crude nuclear bomb would not be easy, but is potentially within the capabilities of a technically sophisticated terrorist group, as numerous government studies have confirmed.[9] The main barrier is getting hold of the needed nuclear material – but there are multiple cases in which kilogram quantities of plutonium or highly enriched uranium (HEU) have been stolen (see "Empirical Evidence of Insecure Nuclear Material," p. 24). The nuclear material for a bomb is small and difficult to detect, making it a major challenge to stop nuclear smuggling, or to recover nuclear material after it has been stolen.

Moreover, the potential consequences of successful nuclear terrorism would be immense. The heart of a major city could be reduced to a smoldering radioactive ruin, leaving tens

6 George W. Bush and Vladimir Putin, "Joint Statement by U.S. President George Bush and Russian Federation President V. V. Putin Announcing the Global Initiative to Combat Nuclear Terrorism" (Washington, D.C.: The White House, July 15, 2006), http://georgewbush-whitehouse.archives.gov/news/releases/2006/07/20060715-2.html (accessed February 6, 2016).

7 Obama, "Remarks in Prague."

8 Anthony Chibarirwe, "IAEA Chief Warns of the Threat of Nuclear Terrorism," *theTrumpet.com*, July 7, 2013, https://www.thetrumpet.com/article/10787.19.0.0/world/terrorism/iaea-chief-warns-of-threat-of-nuclear-terrorism (accessed February 16, 2016). There are many assessments of the nuclear terrorism threat in the public literature. For an updated U.S.-Russian assessment—which was the briefing on the threat provided to the Sherpas before the 2014 Nuclear Security Summit—see William H. Tobey and Pavel S. Zolotarev, "The Nuclear Terrorism Threat," paper presented at Meeting of the 2014 Nuclear Security Summit Sherpas, hosted by the Thai Ministry of Foreign Affairs Pattaya, Thailand, 2014, http://belfercenter.ksg.harvard.edu/publication/23879 (accessed February 9, 2016).

9 See Matthew Bunn and Anthony Wier, "Terrorist Nuclear Weapon Construction: How Difficult?," *Annals of the American Academy of Political and Social Science*, Vol. 607, September 2006, pp. 133–149.

or hundreds of thousands of people dead, and countless more injured.[10] Terrorists—either those who committed the attack or others—would probably claim they had more bombs already hidden in other cities (whether they did nor not), and the fear that this might be true could lead to panicked evacuations, creating widespread havoc and economic disruption. In what would inevitably be a desperate effort to prevent further attacks, traditional standards of civil liberties would likely be jettisoned, and the country attacked might well lash out militarily at whatever countries it thought might bear a portion of responsibility.[11] In 2005, then-UN Secretary-General Kofi Annan warned that the reverberating global economic effects would push "tens of millions of people into dire poverty," creating "a second death toll throughout the developing world."[12] Terrorist use of nuclear weapons may not be a high probability—but the consequences would be so severe that even a low probability should be enough to motivate an intense focus on steps such as nuclear security to reduce the risk.

As described in an appendix to this report, perceptions of the danger of nuclear terrorism have evolved during the nuclear age. In the 1970s and 1980s—long before the Internet, with the detailed information on nuclear weapons now available—intelligence agencies assessed that terrorists might well be able to make a crude nuclear bomb if they got the needed materials. But they also suggested that such large-scale violence would not serve terrorists' political objectives, and was therefore very unlikely.

The attacks of September 11, 2001, eliminated the complacent belief that terrorists would avoid mass slaughter, making clear—as the Japanese terror cult Aum Shinrikyo's nerve

10 There have been many assessments of the impact of such an attack, though they usually focus narrowly on the death and destruction the explosion itself would cause, rather than the reverberating economic and political aftershocks. In a 2003 report, the present author and two co-authors estimated that if terrorists detonated a 10-kiloton bomb (that is, one with the explosive power of 10,000 tons of TNT, somewhat smaller than the bomb that obliterated Hiroshima) at Grand Central Station in Manhattan on a typical workday, the attack could kill half a million people and cause roughly $1 trillion in direct economic damage. See Matthew Bunn, Anthony Wier, and John Holdren, *Controlling Nuclear Warheads and Materials: A Report Card and Action Plan* (Cambridge, MA, and Washington, D.C.: Project on Managing the Atom, Harvard University, and Nuclear Threat Initiative, 2003), http://www.nti.org/media/pdfs/controlling-nuclear-warheads-and-materials-2003.pdf?_=1322768605 (accessed February 9, 2016). This was a rough estimate based on a relatively crude analysis. For more detailed recent analyses (though often focusing on attacks in areas and times with much lower population density than Midtown Manhattan on a workday) see, for example, U.S. Homeland Security Council, *National Planning Scenarios: Final Version 21.3* (Washington, D.C.: U.S. Homeland Security Council, March, 2006), https://www.llis.dhs.gov/sites/default/files/NPS-LLIS.pdf (accessed July 19, 2014) ; Charles Meade and Roger C. Molander, *Considering the Effects of a Catastrophic Terrorist Attack* (Washington, D.C.: RAND, 2006), http://www.rand.org/pubs/technical_reports/2006/RAND_TR391.pdf (accessed July 7, 2015); Ira Helfand, Lachlan Forrow, and Jaya Tiwari, "Nuclear Terrorism," *British Medical Journal*, Vol. 324 (February 9, 2002), http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1122278/ (accessed May 27, 2015), pp. 356–358.

11 For a useful scenario of the swirl of decision-making in the immediate aftermath of such an attack, see Brian M. Jenkins, *Will Terrorists Go Nuclear?* (Amherst, N.Y.: Prometheus, 2008), pp. 323–353.

12 Kofi Annan, "A Global Strategy for Fighting Terrorism: Keynote Address to the Closing Plenary," *The International Summit on Democracy, Terrorism and Security* (Madrid: Club de Madrid, 2005), http://www.un.org/press/en/2005/sgsm9757.doc.htm (accessed February 9, 2016).

gas attack in the Tokyo subway had years before—that the world had entered an age of mass casualty terrorism, in which certain adversaries seek and have the capability to inflict maximum possible carnage to achieve their ends. Indeed, both al Qaeda and Aum Shinrikyo have made serious efforts to get nuclear weapons, and there is suggestive evidence of Chechen terrorist interest as well (including incidents of terrorist teams carrying out reconnaissance at Russian nuclear weapon storage sites).[13] Within weeks after the 9/11 attacks, the U.S. intelligence community was assessing that making a crude nuclear bomb was "well within" al Qaeda's capabilities if it could obtain the needed nuclear material—separated plutonium or HEU.[14] Over the next two years, a special CIA team evaluating al Qaeda's nuclear, chemical, and biological activities found that al Qaeda had a focused nuclear weapons program under the leadership of "nuclear CEO" Abdel Aziz al-Masri, which reported directly to Ayman al-Zawahiri (then the group's second-in-command, now its leader); that a Pakistani network that included leading Pakistani nuclear scientists and a former commander of Pakistan's feared Inter-Services Intelligence (ISI) spy agency had been working to assist al Qaeda's nuclear and biological efforts; that bin Laden and al-Zawahiri had met with two leading Pakistani nuclear weapons scientists to discuss nuclear weapons at length in the weeks leading up to the 9/11 attacks; and that al Qaeda's effort had proceeded as far as carrying out crude but sensible tests of conventional explosives for the nuclear weapons program in the Afghan desert.[15] In 2002–2003, long after the loss of their Afghan sanctuary, al Qaeda attempted to buy three objects it thought were Russian nuclear weapons in Saudi Arabia, and commissioned a *fatwa,* or religious ruling, authorizing the use of nuclear weapons against American civilians.[16]

Since then, core al Qaeda has suffered serious blows, including the death of Osama bin Laden, and the capture or killing of many of his subordinates. The organization has, however, proved resilient, and some of its regional affiliates have expanded their capabilities.

13 See discussion in Matthew Bunn, Yuri Morozov, Rolf Mowatt-Larssen, Simon Saradzhyan, William Tobey, Viktor I. Yesin, and Pavel S. Zolotarev, *The U.S.-Russia Joint Threat Assessment of Nuclear Terrorism* (Cambridge, MA: Belfer Center for Science and International Affairs, Harvard Kennedy School, and Institute for U.S. and Canadian Studies, 2011), http://belfercenter.ksg.harvard.edu/publication/21087/ (accessed February 9, 2016).

14 Commission on the Intelligence Capabilities of the United States Regarding Weapons of Mass Destruction, *Report to the President* (Washington, D.C.: WMD Commission, 2005), http://www.gpo.gov/fdsys/pkg/GPO-WMD/pdf/GPO-WMD.pdf (accessed February 9, 2016), pp. 272, 277.

15 For overviews of this intelligence, see Rolf Mowatt-Larssen, *Al Qaeda Weapons of Mass Destruction Threat: Hype or Reality* (Cambridge, MA: Belfer Center for Science and International Affairs, January 2010), http://belfercenter.ksg.harvard.edu/files/al-qaeda-wmd-threat.pdf (accessed February 9, 2016); George Tenet, *At the Center of the Storm: My Years at the CIA* (New York: HarperCollins, 2007), pp. 259–280; and Bunn et al., *The U.S.-Russia Joint Threat Assessment of Nuclear Terrorism*.

16 For accounts of this episode, see Tenet, *At the Center of the Storm*, p. 272; Mowatt-Larssen, *Al Qaeda WMD Threat*, pp. 22, 26–27.

With IS dominating the world's headlines, al Qaeda may feel pressure to carry out a spectacular attack to demonstrate that it is still at the forefront of the violent jihadist movement.

Will the Islamic State Pose a Nuclear Threat?

Even more important, perhaps, is the rise of the IS, out of the ashes of what was once al Qaeda in Iraq. In 2014 in particular, IS seized major portions of Iraq and Syria, including the cities of Mosul and Raqqa, and declared an Islamic caliphate.[17] IS now has substantial territory and access to financial assets and ongoing revenues in Iraq, Syria, and Libya.[18] Some 43 groups in Europe, Asia, or Africa have sworn allegiance or support for IS, multiplying its personnel and financial resources.[19] Though its gains in Syria and Iraq have been eroded in recent months, the group has demonstrated a penchant for carrying out or associating itself with operations outside of its core region. Since October 2015, IS attacks in Ankara, Beirut, Paris, Tunis, and on the Sinai Peninsula have killed over 500 people.[20]

The case of Ilyass Boughalab—who left his position working in the vital areas of a Belgian nuclear power plant to fight for terrorists in Syria—makes clear that the risk of IS inspiring individuals working at sensitive facilities is not hypothetical (see box, "Insider Sabotage and a Terrorist in a Belgian Nuclear Power Plant," p. 29). Russia too, may face a growing risk of IS-inspired threats. According to a recent report from the Carnegie Moscow Center, "The ethnic composition of the Ural region is changing as a result of an influx of migrants from Central Asia and the Caucasus, occasionally causing tensions between migrants and locals... A number of Muslims from the Ural Federal District have participated in terrorist acts in Central Asia and the Caucasus or have gone to fight for the

17 For IS's caliphate declaration—which is also a summary of the group's ideology and ambitions—see Islamic State, *This is the Promise of Allah* (Al Hayat Media Center, 2014), https://ia902505.us.archive.org/28/items/poa_25984/EN.pdf (accessed February 9, 2016). For a useful description of the group's ambitions and apocalyptic vision, see Graeme Wood, "What ISIS Really Wants," *The Atlantic,* March, 2015, http://www.theatlantic.com/features/archive/2015/02/what-isis-really-wants/384980/ (accessed February 9, 2016).

18 Sergio Pecanha and Derek Watkins, "ISIS' Territory Shrank in Syria and Iraq This Year," *The New York Times*, interactive display, December 22, 2015, http://www.nytimes.com/interactive/2015/12/18/world/middleeast/Where-ISIS-Gained-and-Lost-Territory-Islamic-State.html?_r=0 (accessed January 3, 2016).

19 "Islamic State's 43 Global Affiliates Interactive World Map," *IntelCenter*, http://intelcenter.com/maps/is-affiliates-map.html#gs.WvTOr0I (accessed December 15, 2015).

20 Beatrix Immenkamp, "ISIL/Daesh and Nonconventional Weapons of Terror" (Brussels: European Parliamentary Research Service, December 2015), p. 1.

self-proclaimed Islamic State in the Middle East."[21] Unlike the Caucasus region, the Ural Federal District encompasses some of Russia's largest nuclear weapons-related facilities.

IS's capabilities are substantial. If the group were to pursue nuclear weapons, it has more money, controls more territory and people, and enjoys a greater ability to recruit experts globally than al Qaeda at its strongest ever had. Moreover, unlike many terrorist groups, IS has demonstrated an ability to manage implementation of large-scale, long-term projects.[22]

IS's intentions with respect to nuclear terrorism remain more obscure. There is no publicly available evidence of a significant IS nuclear weapons effort. The group's apocalyptic ideology, however, envisions a final war between its forces and those of the United States and the West (the "Crusaders"), which the group expects ultimately to win. For taking on the world's leading superpower and its allies, nuclear weapons would surely be extremely useful. The group's documented indiscriminate mass casualty attacks and horrific individual acts of cruelty and mayhem demonstrate a significant willingness to inflict destruction on a wide scale and disregard for the Islamic prohibition on the slaughter of innocents.

In November 2015, Belgian police discovered that some IS operatives involved in the Paris attacks had taken hours of surveillance video at the home of a senior official of SKN-CEN, a Belgian nuclear research center with a substantial amount of HEU on-site. Investigators have not managed to confirm what the terrorists were seeking to accomplish through this monitoring. One possibility—and it is only a possibility—is that they envisioned kidnapping the official or his family in an effort to force him to help them gain access to the nuclear facility and its materials.[23] This focused, extended monitoring of a nuclear official at a sensitive site is the most worrying indicator of IS nuclear intent to date.

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21 Alexey Malashenko and Alexey Starostin, *The Rise of Nontraditional Islam in the Urals* (Moscow: Carnegie Moscow Center, September 30, 2015), http://carnegie.ru/2015/09/30/rise-of-nontraditional-islam-in-urals/iie6 (accessed January 3, 2016), p. 1.

22 For a discussion of how central this capability is to terrorist nuclear, chemical, or biological efforts, see Kathleen Vogel, *Looming Menace or Phantom Danger? A New Framework for Assessing Bioweapons Threats* (Baltimore: Johns Hopkins University Press, 2013). For a discussion of how difficult management challenges are for most terrorist groups, see Jacob N. Shapiro, *The Terrorist's Dilemma: Managing Violent Covert Organizations* (Princeton, N.J.: Princeton University Press, 2013).

23 See, for example, Milan Schreuer and Alissa J. Rubin, "Video Found in Belgium of Nuclear Official May Point to Bigger Plot," *New York Times,* February 18, 2016, http://www.nytimes.com/2016/02/19/world/europe/belgium-nuclear-official-video-paris-attacks.html (accessed March 11, 2016); Patrick Malone and R. Jeffrey Smith, "A Terrorist Group's Plot to Create a Radioactive 'Dirty Bomb'," *Center for Public Integrity,* February 29, 2018, http://www.publicintegrity.org/2016/02/29/19376/terrorist-group-s-plot-create-radioactive-dirty-bomb (accessed March 11, 2016); "140 Militairen Gaan Nucleaire Sites Bewaken," (in Dutch), *De Morgen,* March 4, 2016. Contrary to the Malone and Smith piece, there is no clear evidence one way or the other as to whether the monitoring related to a desire to obtain radiological materials for a "dirty bomb," get HEU for a nuclear explosive, sabotage the facility, or some other motive.

Other publicly available indicators of nuclear intent are little more than suggestions. In May of 2015, *Dabiq*—the IS English-language propaganda organ—published an article purportedly written by John Cantlie, a hostage who may have turned propagandist for the group, which had a paragraph fantasizing about the group buying a nuclear weapon from corrupt officials in Pakistan.[24] The article offered no evidence that such a plan existed or had been acted upon, much less that the weapons were available in Pakistan. The *New York Times* reported that IS was actively seeking to purchase "red mercury"—a mythical material believed by some to be useful in nuclear weapons, which has been the center of countless nuclear smuggling scams—over a period of more than a year.[25] That might be a signal of nuclear intent, but it is also a signal of a lack of any real nuclear expertise, at least on the part of those involved in that particular effort.

In short, while there is as yet no publicly available evidence of a focused IS nuclear effort of the kind al Qaeda once had, over the long term IS may be as motivated to carry out dramatic mass-casualty operations as al Qaeda, and may be more capable of pulling together the needed capabilities. The rise of IS clearly raises the threat of nuclear terrorism. The full magnitude of the increase in threat is uncertain. It can be mitigated by increased security, as well as by a range of efforts to degrade and defeat IS.

24 Heather Saul, "ISIS Claims it Could Buy Its First Nuclear Weapon from Pakistan Within a Year," *Independent*, May 22, 2015, http://www.independent.co.uk/news/world/middle-east/isis-claims-it-could-buy-its-first-nuclear-weapon-from-pakistan-within-12-months-10270525.html (accessed January 3, 2016).

25 C.J. Chivers, "The Doomsday Scam," *New York Times Magazine,* November 19, 2015, http://www.nytimes.com/2015/11/22/magazine/the-doomsday-scam.html?_r=0 (accessed March 5, 2016).

Growing Cyber Security Risks

Cyberattacks pose a growing threat to nuclear facilities and materials.[i] While the Stuxnet virus that damaged Iran's Natanz centrifuge facility is the best-known example, many other incidents have occurred, from the insider placement of a virus in the computers of the Ignalina nuclear power plant in 1992 to the December 2014 hacking of the computer systems of the South Korean nuclear plant operator (not including the reactor control systems).[ii] A number of incidents have taken place at U.S. nuclear power plants as well, including some that rendered systems important to safety inoperable for hours.[iii]

Three main forms of cyberattack are particularly significant for nuclear security. First, a cyberattack might be used to sabotage a nuclear facility, as Stuxnet reportedly did. Second, a cyberattack might contribute to a physical theft or sabotage attempt—for example, by confusing or disabling alarm and assessment systems, unlocking doors, or altering material accounting systems. Third, adversaries might use cyber weaknesses to get access to sensitive nuclear information. Beyond items such as the facility blueprints and employee personal data hacked in South Korea, cyber means could be used to gain information ranging from nuclear weapon designs to details on nuclear security systems and their weaknesses.

Several trends are increasing the risk of cyberattack in nuclear facilities. First, these facilities are in the process of replacing their analog technology with digital systems, which are more vulnerable to cyber intrusions. Second, not all of these new systems are designed with effective protections against cyber intrusions. Third, the inclusion of new technology linking systems together may reduce the effective level of backups and

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i Caroline Baylon, with Roger Brunt and David Livingstone, *Cyber Security at Civil Nuclear Facilities: Understanding the Risks* (London: Chatham House, September 2015), https://www.chathamhouse.org/sites/files/chathamhouse/field/field_document/20151005CyberSecurityNuclearBaylonBruntLivingstoneUpdate.pdf (accessed March 13, 2016).

ii For a description of these episodes, see, for example, Baylon, *Cyber Security at Civil Nuclear Facilities,* pp. 3–5. In the Ignalina case, the employee who introduced the virus reportedly did so to highlight the threat and be rewarded for detecting the malware. In the South Korean case, the South Korean government later accused North Korea of being behind the hacking. See "South Korea Accuses North of Cyber-attacks on Nuclear Plants," *Security Week,* March 17, 2015, http://www.securityweek.com/south-korea-accuses-north-cyber-attacks-nuclear-plants (accessed February 18, 2016); Sohee Kim and Meeyoung Cho, "South Korean Prosecutors Investigate Data Leak at Nuclear Power Plants," *Reuters,* December 21, 2014, http://www.reuters.com/article/us-southkorea-nuclear-idUSKBN0JZ05120141221 (accessed February 18, 2016).

iii Baylon, *Cyber Security at Civil Nuclear Facilities,* pp. 3–5.

redundancies. Fourth, nuclear security technology itself is increasingly digital, from alarm systems to access control. Fifth, while many systems at nuclear sites are "air-gapped"—not connected to the broader Internet—it is quite common for this air-gapping to be compromised by connecting laptops or other systems to them as part of equipment and software maintenance and testing.

The threat is not limited to civilian nuclear facilities. A 2013 Defense Science Board report warned that most U.S. nuclear command and control systems "have not been assessed (end-to-end)" against the most sophisticated potential state-level attacks.[iv] Then head of U.S. Strategic Command (STRATCOM) General C. Robert Kehler told a March 2013 Senate hearing that he was "very concerned with the potential of a cyber-related attack on our nuclear command and control and on the weapons systems themselves."[v] We do not know how vulnerable nuclear states with less advanced cyber capabilities may be.

More and more countries are addressing the cyber threat to nuclear facilities. The IAEA and the World Institute for Nuclear Security (WINS) have both published guidance on protecting against cyber threats to nuclear security.[vi] In 2015, the IAEA held a major international conference on cybersecurity for nuclear facilities, and has since launched a five-year plan to enhance understanding of cyber threats.[vii] Since 2012, at least 17 states have incorporated cybersecurity into their nuclear security laws and regulations. But the 2016 edition of the *NTI Nuclear Security Index* found no publicly available evidence that 15 of the 23 states with a kilogram or more of nuclear material had yet put requirements in place for their nuclear facilities to protect against cyberattacks.[viii]

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iv Defense Science Board, *Resilient Military Systems and the Advanced Cyber Threat* (Washington, D.C.: Department of Defense, Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, January, 2013), http://www.acq.osd.mil/dsb/reports/ResilientMilitarySystems.CyberThreat.pdf (accessed February 18, 2016).

v Timothy Farnsworth, "Study Sees Cyber Risk for U.S. Arsenal," *Arms Control Today,* April 2, 2013, https://www.armscontrol.org/act/2013_04/Study-Sees-Cyber-Risk-for-US-Arsenal (accessed February 18, 2016).

vi See *Effectively Integrating Physical and Cyber Security* (Vienna, Austria: World Institute for Nuclear Security, May 2015) and International Atomic Energy Agency, *Computer Security at Nuclear Facilities*, IAEA Nuclear Security Series No. 17 (Vienna: IAEA, 2011).

vii "International Conference on Computer Security in a Nuclear World: Expert Discussion and Exchange," Vienna, Austria, 1–5 June 2015.

viii Nuclear Threat Initiative and Economist Intelligence Unit, *NTI Nuclear Security Index: Building a Framework for Assurance, Accountability, and Action*, 3rd Edition (Washington, D.C.: NTI, January 2016), http://ntiindex.org/ (accessed March 11, 2016).

Growing International Consensus That the Threat is Real

In recent years, countries and international organizations around the world have joined in highlighting the importance of the nuclear terrorism threat. United Nations Secretary General Ban-Ki Moon, for example, has warned that, "Nuclear terrorism is one of the most serious threats of our time. Even one such attack could inflict mass casualties and create immense suffering and unwanted change in the world forever. This prospect should compel all of us to act to prevent such a catastrophe."[26] Two years later, Mohammed El Baradei, then Director General of the IAEA, described "an extremist group getting hold of nuclear weapons or materials" as "the gravest threat faced by the world." Classified government studies in several countries, including, among others, Russia, the United Kingdom, and Australia, have confirmed the conclusion of U.S. government studies that it is plausible that a sophisticated terrorist group could make a crude nuclear bomb if it possessed the necessary materials.

At the first Nuclear Security Summit in 2010, the assembled leaders agreed that, "nuclear terrorism is one of the most challenging threats to international security."[27] At that summit and subsequent ones, many heads of state have emphasized the threat in their remarks.

Russia, despite its decision not to participate in the 2016 Nuclear Security Summit, has clearly concluded that nuclear terrorism is a serious threat. Russia first proposed the International Convention on the Suppression of Acts of Nuclear Terrorism (ICSANT), with President Vladimir Putin warning in 2004 of the urgent need to avert "any attempts by terrorists to get hold of nuclear weapons or any other nuclear materials."[28] In 2005, Putin joined with U.S. President George W. Bush in the Bratislava nuclear security initiative, describing nuclear terrorism as "one of the gravest threats our two countries face."[29] In 2006, Bush and Putin joined in launching the GICNT, which the two countries continue to co-chair.

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26 Ban-Ki Moon, "Secretary General Welcomes Swift Entry Into Force of Nuclear Terrorism Convention, Calls on All States to Ratify Without Delay" (New York: United Nations, June 13, 2007), http://www.un.org/press/en/2007/sgsm11040.doc.htm (accessed January 17, 2016).

27 Communique of the Washington Nuclear Security Summit," The White House, Office of the Press Secretary, April 13, 2010, https://www.whitehouse.gov/the-press-office/communiqu-washington-nuclear-security-summit, (accessed February 9, 2016).

28 "Putin Eyes Nuclear Terrorism," *Moscow Times,* November 2, 2004, http://www.themoscowtimes.com/news/article/putin-eyes-nuclear-terrorism/227281.html (accessed January 17, 2016).

29 "Joint Statement by President George W. Bush and President Vladimir V. Putin: Nuclear Security Cooperation," February 24, 2005, https://www.gpo.gov/fdsys/pkg/WCPD-2005-02-28/pdf/WCPD-2005-02-28-Pg322.pdf (accessed February 9, 2016).

Senior Russian officials have offered even more alarming assessments of the threat. In 2001, for example, General Igor Valynkin, then commander of the force that guards Russia's nuclear weapons, confirmed two incidents of terrorist teams carrying out reconnaissance at nuclear weapon storage facilities (whose locations are a state secret in Russia).[30] The Russian state newspaper reported two additional incidents of terrorists carrying out reconnaissance on nuclear weapon transport trains.[31] In 2005, Russian Interior Minister Rashid Nurgaliev—in charge of the forces that guard most Russian nuclear facilities—announced that "international terrorists have planned attacks against nuclear and power industry installations" and intended to "seize nuclear materials and use them to build weapons of mass destruction for their own political ends."[32] In 2007, Anatoly Safonov, then Putin's special representative for counter-terrorism (and former deputy chief of the FSB, Russia's domestic security agency) warned that "we know for sure, with evidence and facts in hand, about this steady interest and a goal pursued by terrorists to obtain what is called nuclear weapons and nuclear components in any form."[33] In 2011, a joint report by U.S. and Russian experts summarized the threat in a way that is still relevant today:

> "Nuclear terrorism is a real and urgent threat. Urgent actions are required to reduce the risk. The risk is driven by the rise of terrorists who seek to inflict unlimited damage, many of whom have sought justification for their plans in radical interpretations of Islam; by increased availability of weapons-usable materials; and by globalization, which makes it easier to move people, technologies, and materials across the world.
>
> Making a crude nuclear bomb would not be easy, but is potentially within the capabilities of a technically sophisticated terrorist group, as numerous government studies have confirmed. Detonating a stolen nuclear weapon would likely be difficult for terrorists to accomplish, if the weapon was equipped with modern technical safeguards . . . Terrorists could, however, cut open a stolen nuclear weapon and make use of its nuclear material for a bomb of their own.

30 See, for example, Pavel Koryashkin, "Russian Nuclear Ammunition Depots Well Protected—Official," *ITAR-TASS*, October 25, 2001.

31 Vladimir Bogdanov, "Propusk K Beogolovkam Nashli U Terrorista," [A pass to warheads found on a terrorist], *Rossiskaya Gazeta*, November 1, 2002.

32 "Internal Troops To Make Russian State Facilities Less Vulnerable To Terrorists," *RIA-Novosti*, October 5, 2005.

33 "Russian Foreign Ministry Aware of Terrorist Attempts to Obtain Nuclear Weapons—Diplomat," *Interfax*, September 27, 2007.

Empirical Evidence of Insecure Nuclear Material

Assessments of the nuclear terrorism threat must include an element of imagination, as a terrorist attack with nuclear explosives has never occurred. One realm of hard, empirical data, however, is direct and empirical evidence of the risk that terrorists might be able to get weapons-usable nuclear material—incidents involving the seizure of such material outside of authorized control.

The IAEA tracks such incidents, and in 2015 the Agency reported:

> In the 1993-2014 period, group 1 [illegal possession, sale, or movement of nuclear material] confirmed incidents included highly enriched uranium (13), plutonium (3), and plutonium beryllium neutron sources (5). Some of these incidents involved attempts to sell or traffic these materials across international borders.
>
> A small number of these incidents involved seizures of kilogram quantities of potentially weapons usable material, but the majority involved gram quantities. In some of these cases, there were indications that the seized material was a sample from a larger unsecured stockpile.
>
> Incidents involving attempts to sell nuclear or other radioactive material indicate that there is a perceived demand for such material. The number of successful transactions is not known and therefore it is difficult to accurately characterize an 'illicit nuclear market'. Where information on motives is available, it indicates financial gain to be the principal incentive behind the majority of events. Many trafficking incidents could be characterized as 'amateur' in nature as demonstrated by ad-hoc planning and a lack of resources and technical proficiency. However, there are a few significant cases that appear more organized, better resourced, and that involved perpetrators with a track record in trafficking nuclear/radioactive material.[i]

Thus, the IAEA has reported on 16 cases, and others are known to have occurred.[ii] None of the reported seizures involved enough material to cause a nuclear detonation—though an attempted theft of 18.5 kilograms of HEU from a

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i "IAEA Incident and Tracking Data Base Fact Sheet" (Vienna: International Atomic Energy Agency, 2015) available at http://www-ns.iaea.org/downloads/security/itdb-fact-sheet.pdf (accessed February 12, 2016).

ii Bunn et al., *The Joint Threat Assessment of Nuclear Terrorism,* pp. 18–19. For a useful unclassified summary of the cases, see Lyudmilla Zaitseva, *Illicit Trafficking in Nuclear Materials: Assessing the Past Two Decades*, in Joseph F. Pilat and Nathan E. Busch, eds., Routledge Handbook of Nuclear Proliferation and Policy (New York: Routledge, 2015), pp. 440–454.

Russian nuclear facility in 1998 may have come close to that level, depending on its enrichment. Nonetheless, the incidents are important for three reasons. First, they are incontrovertible evidence of nuclear security failures. The material was found in a place where it was not supposed to be, in the possession of people who should not have had it. Second, until the details of each incident are fully understood—who stole the material? How was it removed? Where was it headed?—we cannot be confident that the leak has been plugged. Third, as noted by the IAEA, in some cases, the seized material was advertised as a sample of a larger cache for sale, which might still be outside of authorized control.

After an initial burst of activity in the 1990s, related to the parlous state of post-Soviet nuclear security, the number of incidents has remained fairly steady, with new seizures in 2003, 2006, 2010 (Georgia), and 2011 (Moldova). The Moldovan case was perhaps the most concerning of recent years, as there appears to have been a somewhat more organized criminal group involved; there was a real buyer from Sudan trying to purchase the material; the smugglers claimed to have nine kilograms of HEU for sale, and also access to plutonium; and documents at one of the smuggler's apartments listed a wide range of conventional arms for sale, from armored personnel carriers to helicopters. Moldovan police believe the ringleader, a retired Russian colonel, remains at large. The HEU appears to be very similar to the materials seized in Bulgaria in 1999 and Paris in 2001, suggesting that a stash of stolen HEU of unknown quantity has been in smuggler's hands since the 1990s.[iii]

The seizures of fissile material that have occurred are both empirical evidence of nuclear security vulnerabilities and key leads for investigating how best to redress them. Unfortunately, competing political interests among nation states—particularly between Russia, the United States, and countries where recent seizures have taken place—have so far hampered credible and comprehensive investigation of these incidents.

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iii Douglas Birch and R. Jeffrey Smith, "The Fuel for a Nuclear Bomb is in the Hands of an Unknown Black Marketeer From Russia, U.S. Officials Say," *Center for Public Integrity*, November 12, 2015, http://www.publicintegrity.org/2015/11/12/18850/fuel-nuclear-bomb-hands-unknown-black-marketeer-russia-us-officials-say (accessed March 15, 2016); Desmond Butler and Vadim Ghirda, "Nuclear Black Market Seeks IS Extremists," *Associated Press,* October 7, 2015.

> The nuclear material for a bomb is small and difficult to detect, making it a major challenge to stop nuclear smuggling, or to recover nuclear material after it has been stolen. Hence, a primary focus in reducing the risk must be to keep nuclear material and nuclear weapons from being stolen, by continuously improving their security . . ."[34]

One way to estimate the threat posed by nuclear terrorism is by thinking of it as the product of would-be perpetrators' intentions and capabilities, minus efforts by others to mitigate the danger:

> Threat = (Intentions × Capabilities) – Mitigating Actions

Today, both terrorist intentions and terrorist capabilities remain deeply worrisome. While a broad international coalition is working to defeat both IS and al Qaeda, the danger posed by large and sophisticated violent extremist organizations is likely to persist for years to come. As will be described in this report, great progress has been made in improving nuclear security, the most critical area of mitigating action. But given the scale of the threat, much more remains to be done.

34 Bunn, et al., *The U.S.-Russia Joint Threat Assessment of Nuclear Terrorism* (Cambridge, MA: Report for Belfer Center for Science and International Affairs, Harvard Kennedy School, Institute for U.S. and Canadian Studies, June 6, 2011), http://belfercenter.ksg.harvard.edu/files/Joint-Threat-Assessment%20ENG%2027%20May%202011.pdf (accessed March 13, 2016).

Appendix: Evolving Perceptions of the Threat of Nuclear Terrorism

While there is growing international agreement today that the threat of nuclear terrorism is real, this was not always the case. Both the nuclear terrorism threat and perceptions of it evolved over time and continue to evolve. Understanding how the threat and perceptions of it evolved clarifies the challenges faced by governments today.

Early Fears of Nuclear Terrorism

Fear that a small group of individuals might assemble and explode a nuclear device in a major city is not novel.[235] A year after the first atomic detonations, this dread manifested itself at a closed U.S. Senate hearing, when the Manhattan Project's director, J. Robert Oppenheimer, was asked, "whether three or four men couldn't smuggle units of an [atomic] bomb into New York and blow up the whole city." His answer was, "Of course it could be done, and people could destroy New York."[236] Oppenheimer was not alone in his opinion. In a 1946 essay, "The New Technique of Private War," physicist Edward U. Condon warned that a bomb equivalent to "twenty thousand tons of TNT can be kept under the counter of a candy store."[237]

In the 1940s and 1950s, however, the means to make nuclear weapons resided at the far horizon of technology, where they were bemisted by secrecy and comprehended only by cognoscenti backed by powerful states. Nuclear weapons were the province of governments, not individuals. Consequently, the prevalent scenario for a terrorist nuclear attack was that an enemy of the United States, i.e., the Soviet Union, could supply individuals with the means to conduct an unconventional nuclear strike. Of course, such an attack would be backed by the vast Soviet nuclear weapons enterprise, and would thus be the work of a few individuals only at the point of delivery.

235 As the United States has been the country most focused on the risk of nuclear terrorism and most open in releasing information about its intelligence assessments of the topic, much of the official analysis of the nuclear terrorism threat comes from an American perspective. Nonetheless, as will be discussed below, an international consensus has formed that it is plausible that terrorists could make crude nuclear bombs if they got the needed nuclear material, and that the consequences of nuclear terrorism would be global.

236 Kai Bird and Martin J. Sherwin, *American Prometheus: The Triumph and Tragedy of J. Robert Oppenheimer* (New York: Alfred A. Knopf, 2005), p. 349.

237 Edward U. Condon, "The New Technique of Private War," in Dexter Masters and Katharine Way, eds., *One World or None: A Report to the Public on the Full Meaning of the Atomic Bomb* (New York: Whittlesey House, 1946), p. 40.

Oppenheimer's and Condon's warnings provoked two efforts to assess U.S. vulnerabilities to smuggled nuclear weapons and how best to mitigate them—Projects Screwdriver and Doorstop—and a National Intelligence Estimate (NIE) titled *Soviet Capabilities for Clandestine Attack against the US with Weapons of Mass Destruction and the Vulnerability of the US to Such Attack (mid-1951 to mid-1952).* The NIE concluded that an atomic bomb could be disassembled into its requisite parts—including the nuclear material—and smuggled into the United States in stages. Each component could be packaged in a way that would avoid radiation detection and not draw undue attention. While reassembling the components into a bomb would be difficult, it would not be impossible.[238] The NIE also judged that such an attack would be unlikely because of its complexity and the number of individuals that would need to be involved.[239]

Nonetheless, by 1953, Committee B, or the Committee on Countermeasures, was formed within the U.S. government "to consider ways and means of safeguarding against the clandestine introduction of nuclear weapons."[240] It reported to the National Security Council until 1962, when President Kennedy transferred its oversight to the Attorney General.[241] This appears to reflect a lowering of the priority of the mission, or at least of attention to it by senior policy makers (which has not been fully recovered, even today). Thus, while efforts were made to detect clandestine movement of nuclear material, the threat was not judged to be a high priority, at least in relation to the nuclear weapons aimed at the United States and its allies by the Soviet Union using aircraft and missiles as delivery systems.

As late as 1970, U.S. intelligence analysts seemed to judge that the primary threat of a smuggled nuclear weapon emanated from states, in particular the Soviet Union and China. Further, they evinced confidence that this would not occur except under the direst of circumstances. An NIE from July concluded:

> "In considering the clandestine introduction of nuclear weapons into the U.S., leaders of any nation would have to weigh any possible advantages against the

238 *Soviet Capabilities for Clandestine Attack against the U.S. with Weapons of Mass Destruction and the Vulnerability of the U.S. to Such Attack (mid-1951 to mid-1952),* National Intelligence Estimate 31 (Washington, D.C.: Central Intelligence Agency, September 4, 1951), p. 4.

239 CIA, *Soviet Capabilities for Clandestine Attack,* p. 1.

240 Memorandum from the Joint Chiefs of Staff to Secretary of Defense McNamara, "Clandestine Introduction of Nuclear Weapons to the United States," JCSM-3-68, January 2, 1968, https://fas.org/irp/threat/jcs1968.pdf (accessed December 30, 2015).

241 Joint Chiefs of Staff, "Clandestine Introduction of Nuclear Weapons."

> grave consequences which would follow discovery. Despite all precautions there would always be risk of detection arising not only from US security measures, but also from the chance of US penetration of the clandestine apparatus, the defection of an agent, or sheer accident. The enemy leaders would almost certainly judge that use of this tactic would be regarded by the US as a warlike act, if not as a cause for war, and that it would precipitate an international political crisis of the first magnitude."[242]

The NIE concluded that no nation would consider introducing nuclear weapons into the United States through clandestine means unless it were planning an attack on the United States, deterring the United States, or as a means of framing a third party. Thus, policymakers could regard the nuclear terrorism threat as a lesser-included case addressed by their broader policies to deter nuclear war.

The 1960s and 1970s: Terrorists Could Make a Nuclear Bomb—But Would They Want To?

Elsewhere in the government, however, the late 1960s saw the first stirrings of genuine concern over the possibility that terrorists not directed by a government might be able to make and use a nuclear bomb. After the apparent loss of a large amount of HEU from the Nuclear Materials and Equipment Corporation (NUMEC) in Apollo, Pennsylvania in 1965, the U.S. Atomic Energy Commission (AEC) tasked an advisory group to review its security program, and in 1967 the group recommended major improvements in security and accounting, warning—apparently for the first time ever in a U.S. government report—that unless the AEC took action, terrorists might be able to get weapons-usable nuclear material and make a crude nuclear bomb.[243] The AEC centralized its nuclear security pro-

242 *The Clandestine Introduction of Nuclear Weapons into the U.S.,* National Intelligence Estimate 4-70 (Washington, D.C.: CIA, July 7, 1970), www.foia.cia.gov/sites/default/files/document_conversions/89801/DOC_0000273219.pdf (accessed December 30, 2015), p. 3.

243 See discussion of this report in William J. Desmond, Neil R. Zack, and James W. Tape, "The First Fifty Years: A Review of the Department of Energy Domestic Safeguards and Security Program," *Journal of Nuclear Materials Management*, Vol. 26, No. 2 (Spring 1998), pp. 17–22. The result of the review was published in March 1967 as Ralph F. Lumb, Francis P. Cotter, Gerald Charnoff, Paul Grady, Aston J. O'Donnell, Jr., Louis H. Roddis, and Fred H. Tingey, *Report to the Atomic Energy Commission by the Ad Hoc Advisory Panel on Safeguarding Special Nuclear Material* (Washington, D.C.: Atomic Energy Commission, 1967). The unclassified introduction and summary of recommendations are reproduced in U.S. Senate, Committee on Government Operations, *Peaceful Nuclear Exports and Weapons Proliferation: A Compendium* (Washington, D.C.: Government Printing Office, 1975), pp. 555–562. It is striking that this report was written *before* the rise of the modern era of international terrorism, beginning after the 1967 Arab-Israeli war. For a more recent account of the NUMEC affair, see Victor Gilinsky and Roger J. Mattson, "Revisiting the NUMEC Affair," *Bulletin of the Atomic Scientists*, March 1, 2010, http://thebulletin.org/2010/march/revisiting-numec-affair (accessed February 9, 2016).

gram and established the first-ever U.S. rules requiring private owners of weapons-usable nuclear material to provide security for it.[244]

By the 1970s and 1980s, terrorism—kidnappings, political murders, bombings, and hijackings—reemerged as a serious threat in Europe and North America. The Baader-Meinhof Group (aka the Red Army Faction), the Black September Organization, the Palestine Liberation Organization, Libyan government-sponsored terrorists, the Red Brigades, the Irish Republican Army, and the Weather Underground organization, among others (sometimes with training or support from the Soviet Union or its allies[245]) inflicted violent attacks on Europe and the United States. Guerilla attacks in Vietnam made it clear that even well defended sites such as U.S. airbases might be attacked. Moreover, according to Walter Laqueur, "During the 1970s, there were 175 cases of threatened violence at nuclear plant facilities."[246] Furthermore, just as the September 11, 2001 attacks would later galvanize concern that terrorists might turn to nuclear weapons, the assault on Israeli athletes at the 1972 Munich Olympics made clear that the possibility of a group of well-trained, well-armed terrorists striking in the heart of a major developed country was not a Hollywood fantasy, but a real possibility.

In response, President Richard Nixon appointed a Cabinet-level committee to combat terrorism, including addressing the nuclear issue.[247] Naturally, those with the responsibility to analyze and defend against current and emerging threats wondered if the merely vicious could become catastrophic—whether assassinations could turn to nuclear mass murder. James Schlesinger, then Chairman of the AEC, and later the leader of the CIA and the Defense and Energy Departments, raised questions about the plausibility of nuclear terrorism, but ultimately was reportedly insistent on the need to guard against armed terrorists stealing fissile material and fashioning it into a bomb.[248] The AEC established new and tougher rules for physical protection and material control and accounting, and

244 Previously, there had been literally *no rules at all* requiring security for plutonium or HEU in private hands. The philosophy was that the commercial value of the material would motivate companies to provide security for it in their own financial self-interest—ignoring the fact that the potential danger to society from a loss of such material was many orders of magnitude larger than the potential financial loss to the company. See, for example, U.S. Nuclear Regulatory Commission, *Rulemaking for Enhanced Security of Special Nuclear Material: Regulatory Basis Document*, 3150-AJ41 (Rockville, MD: NRC, 2015), http://pbadupws.nrc.gov/docs/ML1432/ML14321A007.pdf (accessed February 9, 2016), pp. 3–4. For an overview of the history of U.S. nuclear security policy and concerns about nuclear terrorism, see Matthew Bunn, "Beyond Crises: The Unending Challenge of Controlling Nuclear Weapons and Materials," in Henry D. Sokolski and Bruno Tertrais, ed., *Nuclear Weapons Security Crises: What Does History Teach?* (Carlisle, PA: U.S. Army Strategic Studies Institute, 2013).

245 Walter Laqueur, *The Age of Terrorism* (Boston: Little, Brown and Company), p. 270.

246 Laqueur, *The Age of Terrorism,* p. 314.

247 Ralph E. Lapp, "The Ultimate Blackmail," *New York Times Magazine*, February 4, 1973, p. 29; Jeffrey T. Richelson, *Defusing Armageddon: Inside NEST, America's Secret Nuclear Bomb Squad* (New York: W. W. Norton and Company, 2009), pp. 25–26.

248 Richelson, *Defusing Armageddon,* p. 25.

designated Sandia National Laboratory as the lead lab to develop new approaches to securing potential nuclear bomb material. Both Congress and the media became concerned, particularly given the projection that the United States would soon be operating scores or hundreds of plutonium-fueled reactors, requiring an industry in which tens of thousands of people would have direct access to plutonium.[249]

Concern about nuclear terrorism also broadened from Americans worried about Soviet attacks to a warning by the Soviet Union that independent actors might strike. In 1972 at the United Nations, a Soviet Foreign Ministry legal expert, Dmitri N. Kolesnik, debated a Saudi counterpart who had ridiculed the threat from terrorists, comparing them to the merry men of Sherwood Forest. Kolesnik argued, "Robin Hood was armed with bows and arrows, but modern terrorists prefer to have rifles and bombs, and tomorrow it's quite possible they will have death-carrying germs or maybe stolen atomic bombs. And with the help of these bombs, they can blackmail any government."[250]

Even before Kolesnik made his dramatic appeal, a U.S. AEC staffer addressed a symposium on preventing nuclear theft and offered the following scenario: a terrorist could send a note to the mayor of New York saying, "I've got two bird cages [specialized shipping containers] of plutonium and if you don't release all your prisoners and leave Vietnam, I'll blow up New York City."[251]

After positing that scenario in a 1973 *New York Times Magazine* article, Ralph Lapp, himself a nuclear physicist and Manhattan Project veteran, disclosed that, "I have visited one nuclear site, which will go unnamed, where I have concluded that a small force of armed men could in the future easily overpower unarmed guards and, with a little inside help, spirit away 100 pounds of plutonium without exposure to lethal radioactivity."[252] Lapp then detailed how a terrorist band he called "Group X" could plausibly fabricate a weapon from stolen plutonium.[253]

Theodore B. Taylor, one of the leading U.S. nuclear weapons designers, had been raising similar concerns both within the AEC and in public since the 1960s. But in December 1973, *The New Yorker* published an alarming series of articles by journalist John McPhee

249 See discussion in Bunn, "Beyond Crises."

250 Lapp, "The Ultimate Blackmail," p. 13.

251 Lapp, "The Ultimate Blackmail," p. 29.

252 Lapp, "The Ultimate Blackmail," p. 31.

253 Lapp, "The Ultimate Blackmail," pp. 31–32.

outlining the danger of nuclear terrorism, based on interviews with Taylor. These articles were later published as a book: *The Curve of Binding Energy: A Journey into the Awesome and Alarming World of Theodore B. Taylor.* In one scene that later seemed nearly prophetic, McPhee and Taylor sat at what was then the construction site for the towers of the World Trade Center while Taylor described how terrorists could make a crude nuclear bomb to kill everyone in them.[254]

Such concerns, coupled with relentless Congressional investigations—which revealed, among other things, walls protecting weapons-usable nuclear material areas so thin investigators cut them with a tin snip—led to a series of steps to further strengthen U.S. nuclear security regulations.[255] But there were others who thought the concern was overblown. In 1975, Brian Jenkins, a terrorism expert at the RAND Corporation, authored a short paper titled "Will Terrorists Go Nuclear?" While warning that his views were highly speculative and might be "dead wrong," Jenkins argued that terrorists "may try to take advantage of the fear that the word 'nuclear' generates without taking the risks or making the investment necessary to steal plutonium and build a working bomb. . . . While we cannot rule out the possibility of a 'large-scale Lod,' or holding a city for ransom with a nuclear weapon, the detonation of a nuclear bomb appears to be the least likely terrorist threat."[256] His conclusion was based on the premise that "Mass casualties simply may not serve the terrorists' goals and could alienate the population. You don't poison the city's water supply in the name of the popular front."[257] (Jenkins had previously coined the often-used aphorism that "terrorists want a lot of people watching, not a lot of people dead.")

Jenkins' analysis proved highly influential. In 1977, the U.S. Office of Technology Assessment, drawing on the advice of a distinguished advisory panel and acknowledging assistance from RAND, concluded, "On the basis of the historical record and the theory of terrorism, it is not clear that causing massive casualties is attractive to terrorists; indeed it could even be regarded

254 John McPhee, *The Curve of Binding Energy: A Journey into the Awesome and Alarming World of Theodore B. Taylor* (New York: Farrar, Strauss, and Giroux, 1974).

255 For a photo of the wall being cut with a tin snip, see U.S. Congress, General Accounting Office, *Improvements Needed in the Program for the Protection of Special Nuclear Material* (Washington, D.C.: GAO, November 7, 1973), http://www.gao.gov/assets/200/198750.pdf (accessed July 6, 2015), p. 18.

256 Jenkins' "large-scale Lod" refers to the May 1972 terrorist attack on what was then Israel's Lod airport (now Ben Gurion airport), where 26 people were killed and some 80 injured. See Brian Jenkins, "Will Terrorists Go Nuclear?" (Santa Monica: The Rand Corporation, 1975), https://www.rand.org/content/dam/rand/pubs/papers/2006/P5541.pdf (accessed December 30, 2015), p. 6.

257 Jenkins, "Will Terrorists Go Nuclear?" p. 5.

as counterproductive."[258] This conclusion was hedged by the caution that, "Nihilist groups may emerge."[259]

At the same time, however, the study warned that the job of making a crude terrorist nuclear bomb was not as difficult as it was often made to seem:

> A small group of people, none of whom have ever had access to the classified literature, could possibly design and build a crude nuclear explosive device… Only modest machine-shop facilities that could be contracted for without arousing suspicion would be required.[260]

In late 1985, the International Task Force on Prevention of Nuclear Terrorism convened 150 experts from 13 countries in Washington, and two years later published a report and background papers assessing terrorist motivations and capabilities, as well as measures that might be taken to defeat the threat.[261] The Task Force concluded that the probability of nuclear terrorism was "increasing . . . because of a confluence of factors:

- The growing incidence, sophistication, and lethality of conventional forms of terrorism, often to increase shock value.
- Apparent evidence of state support, even sponsorship, of terrorist groups.
- The storing and deploying of nuclear weapons in areas of intense terrorist activity.
- An increasing number of potential targets in civil nuclear programs—in particular facilities and shipments in which plutonium and uranium, in forms suitable for use in weapons, are present.
- Potential black and gray markets in nuclear equipment and materials."[262]

By 1986, both Jenkins' thesis that terrorists probably would not want to detonate a nuclear bomb and the conclusion that they might well have the technical capacity to do so if they got enough of the right kinds of nuclear material were accepted as the consensus view of the U.S. intelligence community. Elaborating on and largely consistent with an earlier

258 U.S. Congress, Office of Technology Assessment, *Nuclear Proliferation and Safeguards* (Washington, D.C.: OTA, June, 1977), pp. 26–27.

259 OTA, *Nuclear Proliferation and Safeguards,* p. 27.

260 OTA, *Nuclear Proliferation and Safeguards,* p. 140.

261 Paul Leventhal and Yonah Alexander, *Preventing Nuclear Terrorism* (Lexington, MA: Lexington Books, 1987), pp. x–xv.

262 Leventhal and Alexander, *Preventing Nuclear Terrorism,* p. 8.

Special NIE in 1978 and Memorandums to Holders in 1982, the 1986 National Intelligence Estimate found that:

- "High level terrorism [e.g., detonation of a nuclear device] may be within the capabilities of a few terrorist groups. The constraints that exist against it, therefore, probably are behavioral."
- "Most important, the fact that most terrorists place a high premium on the political consequences of their actions probably helps dissuade them from threatening terrorist acts that could lead to mass, indiscriminate casualties, because such a threat would alienate even those that they consider to be sympathizers among the affected public."[263]

For a decade and a half, this judgment held. In the best available, highly classified analyses used by the U.S. government, sophisticated terrorist groups were assessed to be capable of detonating a nuclear explosion if they were able to steal a weapon or sufficient nuclear material, but were also judged to be unlikely to do so, because it would defeat their political objectives.

Aum Shinrikyo and al Qaeda Change the Picture

By the late 1990s, U.S. government confidence that terrorists would restrain themselves from nuclear mass casualty attacks was dissipating. Aum Shinrikyo's nerve gas attack in the Tokyo subways in 1995 made clear that some terrorist groups *were* seeking to kill as many people as possible, and subsequent investigations made clear that Aum had actively pursued nuclear weapons.[264] Moreover, a new terrorist group was rising that called itself al Qaeda and appeared to be bent on committing mass casualty attacks against the United States and its allies.

Michael Scheuer, then head of the CIA team focused on bin Laden, reports that in 1996, "CIA's Bin Laden unit acquired detailed information about the careful, professional manner in which al-Qaeda was seeking to acquire nuclear weapons." He continued: "There could be no doubt after this date that al-Qaeda was in deadly earnest in seeking

263 *The Likelihood of Nuclear Acts by Terrorist Groups,* National Intelligence Estimate NIE 6-86 (Washington, D.C.: Central Intelligence Agency, April 1986), p. 1.

264 See, for example, Sara Daly, John Parachini, and William Rosenau, *Aum Shinrikyo, al Qaeda, and the Kinshasa Reactor: Implications of Three Case Studies for Combating Nuclear Terrorism* (Santa Monica, CA: RAND, 2005), http://www.rand.org/pubs/documented_briefings/2005/RAND_DB458.sum.pdf (accessed February 9, 2016).

nuclear weapons."[265] In January 1997, the CIA's Counterterrorist Center distributed a Top Secret commentary, "Terrorism: Usama Bin Ladin Trying to Develop WMD Capability?" The declassified version released to the public is heavily redacted, but refers to an "effort by Bin Ladin's agents in 1994 to purchase uranium." The memorandum also warns that, "Bin Ladin's stated intention to undertake hostile acts against the US presence in the Persian Gulf region—based as it is on an implacable antipathy toward the United States—could be abetted strongly by access to WMD material."[266] Importantly, the CIA assessed that al Qaeda was unbound by the political restraints against using nuclear weapons ascribed to earlier terrorist groups.[267]

Two years later, bin Laden would declare a "religious duty" to acquire weapons of mass destruction in an interview with *Time* magazine,[268] which followed an earlier fatwa urging his followers to kill Americans and their allies wherever they could be found, civilians and military alike.[269] That al Qaeda was seeking to cause such devastation to the United States and its friends and allies would remain largely unknown to the public until September 11, 2001, when nineteen men armed with box cutters killed almost 3,000 people.

That act, together with the horrific attack on a Russian school in Beslan in 2004, which killed nearly 400 children and parents, left no doubt that the rules had changed. The world had entered an age of mass casualty terrorism, in which certain groups sought to inflict maximum possible carnage to achieve their ends. Moreover, they were willing to commit suicide to do so. Were this motivation to be fused with a nuclear weapons capability, the results would be even more dire.

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265 Excerpts of the letter are reprinted in Anonymous [Michael Scheuer], *Through Our Enemies' Eyes: Osama bin Laden, Radical Islam, and the Future of America* (Washington, D.C.: Potomac Books, Inc., 2002). It is worth noting, however, that in his first book, Scheuer appears to take at face value a number of reports from this period that have since been called into question, including alleged al Qaeda cooperation with Iraqi intelligence on weapons of mass destruction. See Anonymous [Michael Scheuer], *Through Our Enemies' Eyes*, pp. 124–125, 189–193.

266 *Terrorism: Usama Bin Ladin Trying to Develop WMD Capability?* Counterterrorism Center Commentary, Central Intelligence Agency, January 6, 1997, pp. 2–3.

267 Unfortunately, this conclusion did not provoke a major effort to defeat the threat until after the 9/11 attacks. According to Rolf Mowatt-Larssen, "We were playing [a] frantic game of catch-up after 9/11 to find clues of activity that occurred years before 9/11. Had 9/11 not occurred, we would never have organized ourselves to go hunting for WMD terrorism programs; never have had the leadership attention and resources committed to the subject; and would never have had the means [provided by the aggressive response to 9/11]." Personal communication, January 2016.

268 Rahimullah Yusufzai, "Conversations with Terror," *Time,* January 11, 1999.

269 Rolf Mowatt-Larssen, *Al Qaeda Weapons of Mass Destruction Threat: Hype or Reality* (Cambridge, MA: Belfer Center for Science and International Affairs, January 2010), http://belfercenter.ksg.harvard.edu/files/al-qaeda-wmd-threat.pdf (accessed February 9, 2016), p. 13.

Post-9/11 Assessments

After the 9/11 attacks, U.S. intelligence focused intensely on al Qaeda's nuclear, chemical, and biological efforts. As noted in the main text, by October 2001, the U.S. intelligence community was assessing that making a crude nuclear bomb was "well within" al Qaeda's capabilities if it could obtain the needed nuclear material—separated plutonium or HEU.[270] In November, the CIA's Weapons Intelligence, Nonproliferation, and Arms Control Center and its Counterterrorist Center judged, in the words of a bipartisan commission that reviewed the intelligence, that al Qaeda "probably had access to nuclear expertise and facilities and that there was a real possibility of the group developing a crude nuclear device."[271]

Given these frightening conclusions—and similar fears about al Qaeda's biological and chemical efforts—the CIA established a team, led by long-time CIA officer Rolf Mowatt-Larssen, that focused specifically on learning everything possible about what al Qaeda had done in these fields. Following up on items seized in Afghanistan and other leads, this team made a series of alarming discoveries, as discussed in the main text, from senior Pakistani nuclear scientists working to help al Qaeda to conventional explosives tests for the nuclear program in the Afghan desert. The bipartisan commission that reviewed U.S. intelligence on weapons of mass destruction after the Iraq fiasco concluded that these new discoveries after the overthrow of the Taliban "brought to light detailed and revealing information about the direction and progress of al-Qa'ida's radiological and nuclear ambitions," which had not been available when the earlier judgments were made. The commission reported that U.S. intelligence analysts concluded that al Qaeda in Afghanistan had made "meaningful progress on its nuclear agenda."[272]

Al Qaeda's nuclear ambitions did not end with the loss of their Afghan sanctuary. Beginning in late 2002, U.S. intelligence detected efforts by al Qaeda's cell in Saudi Arabia to purchase three objects it believed were Russian nuclear bombs. The cell reportedly received instructions from al Qaeda leaders under loose house arrest in Iran—including Sayf al-Adl, recently released from Iran, and Abdel Aziz al-Masri, al Qaeda's nuclear chief,

270 Commission on the Intelligence Capabilities of the United States Regarding Weapons of Mass Destruction, *Report to the President* (Washington, D.C.: WMD Commission, 2005), http://www.gpo.gov/fdsys/pkg/GPO-WMD/pdf/GPO-WMD.pdf (accessed February 9, 2016), pp. 272, 277.

271 Commission on U.S. WMD Intelligence Capabilities, *Report to the President*, p. 271.

272 Commission on U.S. WMD Intelligence Capabilities, *Report to the President*, pp. 267, 271, 292.

whose whereabouts today are unknown—to go ahead and make the purchase, if the Pakistani expert with his equipment confirmed the items were authentic. As far as the authors are aware, U.S. intelligence has never managed to identify the Pakistani expert in whom al Qaeda had such confidence; he remains at large. At the same time, al Qaeda commissioned a fatwa, or religious ruling, from a radical Saudi cleric—Nasir bin Hamad al-Fahd, the "constant companion" of Abu Bakr, the cell leader negotiating to buy the weapons—authorizing the use of nuclear weapons against American civilians. Saudi Arabia moved to disrupt the Saudi cell, arresting both the cell leader and al-Fahd.[273]

Since then, as noted in the main text, core al Qaeda has suffered serious blows, and the IS has risen to the forefront of the violent jihadist movement. What impact this will have on the evolving threat of nuclear terrorism remains unknown.

273 For accounts of this episode, see Tenet, *At the Center of the Storm*, p. 272; Mowatt-Larssen, *Al Qaeda WMD Threat*, pp. 22, 26–27.