



A.Q. Khan Nuclear Smuggling Network

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A.Q. Khan Nuclear Smuggling Network

Author Biography

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Abstract

Abdul Qadeer Khan, widely viewed as the father of Pakistan's nuclear weapons program, was arrested on January 31, 2004 for his key role in the black market sale of nuclear technology and equipment to Iran, North Korea, Libya, and possibly others. A.Q. Khan's nuclear smuggling network prospered throughout the 1980s and 1990s and was linked to middlemen and businesses in over 20 countries. The network offered buyers a menu of both technical expertise and materials with prices ranging from millions to hundreds of millions of dollars. The Khan network was ultimately exposed largely due to years of intelligence gathering by the United States and the United Kingdom. However, very few of the network's members have been successfully prosecuted and the demand for nuclear material by both state and non-state actors continues. The exposure of Khan's network confirmed that a non-state actor could procure and sell a turnkey nuclear weapons program to willing buyers.

Disclaimer

Editor's Note: This article forms part of a series of related case studies collected in this Special Issue and should be viewed in the context of the broader phenomenon of complex engineering by violent non-state actors. Readers are advised to consult the introductory and concluding papers for a full explanation and comparative analysis of the cases.

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Introduction

Abdul Qadeer Khan, widely viewed as the father of Pakistan's nuclear weapons program, was arrested on January 31, 2004 for his key role in the black market sale of nuclear technology and equipment to Iran, North Korea, Libya, and possibly others. A.Q. Khan's nuclear smuggling network prospered for nearly two decades (see Appendix A) and was linked to middlemen and businesses in over 20 countries.¹

Khan found that the key to subverting Western intelligence agencies was to buy component parts directly from suppliers through middlemen. His success was also the byproduct of commercial greed and the strategic importance of Pakistan after the 1979 Soviet invasion of Afghanistan. The A.Q. Khan network offered buyers a menu of both technical expertise and materials with prices ranging from millions to hundreds of millions of dollars.²

The Khan network was ultimately uncovered largely due to years of intelligence gathering by the United States and United Kingdom. In 2003, the network was exposed following a joint US-UK-Germany-Italy operation interdicted the BBC China, a German-registered vessel, bound for Libya with components for 1,000 centrifuges supplied by the Khan network.³ However, very few of the network's members have been successfully prosecuted and the demand for nuclear material by both state and non-state actors continues.

The exposure of Khan's network confirmed that a non-state actor could procure and sell a turnkey nuclear weapons program to willing buyers. Furthermore, it illustrates on a broader level the complexities of illicit supply chains and how violent non-state actors engaging in complex engineering tasks may be able to procure the expertise and equipment needed to succeed in their unlawful endeavors.

Establishment of the Network

Khan began his career as a nuclear smuggler in the 1970s, while working as a metallurgist for the European Uranium Enrichment Centrifuge Corporation

¹ The International Institute for Strategic Studies, *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks: A net assessment* (United Kingdom: Hastings Print, 2007), 7.

² *Ibid.*, 69.

³ *Ibid.*, 69 and 139.

(URENCO), a Netherlands-based uranium enrichment consortium.⁴ At URENCO, Khan gained crucial knowledge of centrifuge operations through his work translating designs of advanced G-1 and G-2 centrifuges from German to Dutch.⁵ Khan was able to learn not only how the centrifuges worked but also who supplied the component parts.⁶

In September 1974, just months after India's first nuclear weapons test, Khan wrote a letter to Pakistani Prime Minister Zulfikar Ali Bhutto, volunteering his services to help Pakistan develop fissile material for a nuclear weapon.⁷ Khan began supplying Pakistan with specifications and blueprints obtained from URENCO. By December 1975, Khan had begun to raise suspicions at URENCO and returned to Pakistan.⁸ URENCO officials have admitted that Khan stole the designs for almost every centrifuge on the drawing board.⁹

Upon his return to Pakistan, Khan began working for the Pakistani Atomic Energy Commission (PAEC). However, he quickly expressed dissatisfaction with the slow pace of the program headed by Munir Ahmad Khan. In response, Prime Minister Bhutto created the Engineering Research Laboratories (ERL) in July 1976, an independent entity under A.Q. Khan's leadership, which allowed A.Q. Khan to take control of the centrifuge project.¹⁰ By 1981, Khan announced the plant was "producing substantial quantities of uranium."¹¹ In recognition of his success, the plant was renamed Khan Research Laboratories (KRL) in May 1981.¹² In the mid-1980s, as A.Q. Khan began work on a second-generation centrifuge design, designated the P-2,¹³ he was left with a surplus inventory of P-1 centrifuges and related components. At the same time, other countries with nuclear weapons

⁴ URENCO is an international consortium founded in 1971 that consisted of UK, Germany, and the Netherlands; Corera, Gordon, *Shopping for Bombs: Nuclear Proliferation, Global Insecurity, and the Rise and Fall of the A.Q. Khan Network* (New York, NY: Oxford University Press, 2006), 7; Charles Feurguson, "On the Loose: The Market for Nuclear Weapons," *Harvard International Review* (Winter 2006): 40.

⁵ The International Institute for Strategic Studies, *Nuclear Black Markets*, 17; and Ferguson, "On the Loose," 52.

⁶ Corera, *Shopping for Bombs*, 7.

⁷ Ibid.; and The International Institute for Strategic Studies, *Nuclear Black Markets*, 17.

⁸ The International Institute for Strategic Studies, *Nuclear Black Markets*, 18.

⁹ Mark Hibbs, "Using Catch-all Rule, the Hague Blocked 20 Experts Since 1996," *Nuclear Fuel* (March 15, 2004); quoted in Corera, *Shopping for Bombs*, 15.

¹⁰ The International Institute for Strategic Studies, *Nuclear Black Markets*, 18.

¹¹ Corera, *Shopping for Bombs*, 41.

¹² Ibid.

¹³ The P-2 design had a rotor design made of maraging steel, which enabled it to spin at twice the speed of P-1 centrifuges and to enrich uranium more than twice as efficiently. The International Institute for Strategic Studies, *Nuclear Black Markets*, 66.

ambitions learned of Pakistan's efforts and reportedly enlisted its assistance.¹⁴ In 1987, Khan took his first step towards nuclear technology proliferation, offering Iran a disassembled sample of a P-1 centrifuge, drawings, descriptions, and specifications for production; drawings, specifications, and calculations for a complete plant; materials for 2,000 centrifuge machines; and auxiliary vacuum and electric drive equipment.¹⁵ Iran reportedly closed the deal for three million dollars in Dubai in 1987. Iran did not purchase everything on the list, opting instead to procure some of the items themselves from the supplier list Khan had provided.¹⁶

By the early 1990s, Pakistan's KRL was openly marketing nuclear technology, including one sales brochure with a drawing of a mushroom cloud (Figure 1).

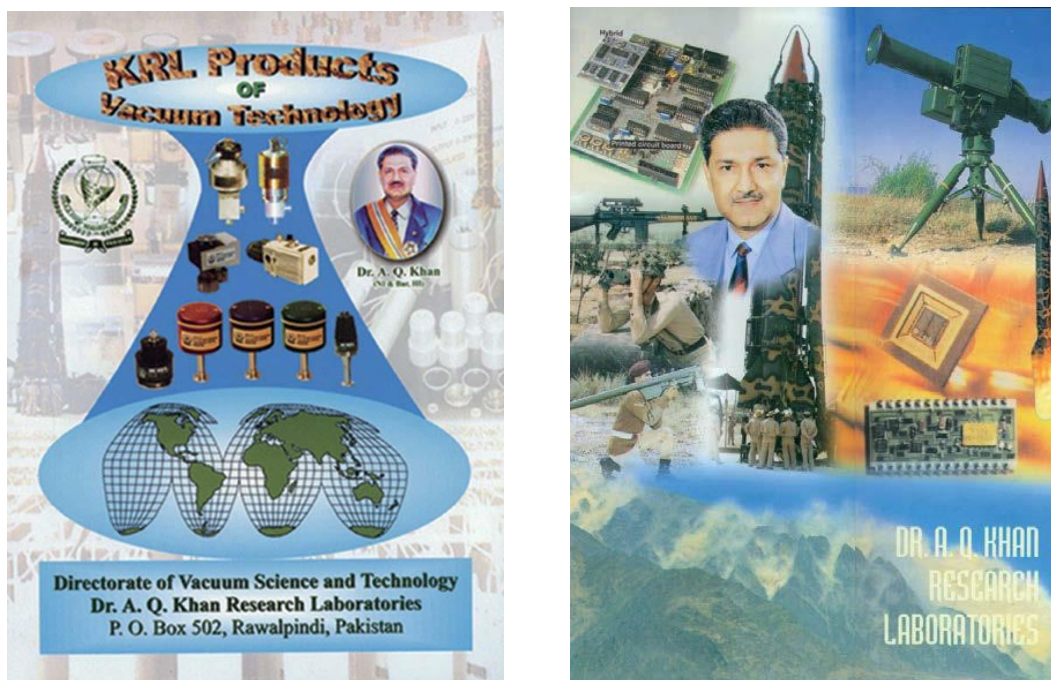


Figure 1: KRL Brochure distributed at 2000 Karachi arms fair (left) and KRL Brochure (right)

Source: The International Institute for Strategic Studies. 2007. *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks: A net assessment*. United Kingdom: Hastings Print, 82.

¹⁴ Ibid., 67.

¹⁵ Ibid., 69.

¹⁶ Linzer, Dafna, "Iran was Offered Nuclear Parts," *Washington Post*, February 27, 2005, available at: <http://www.washingtonpost.com/wp-dyn/articles/A56391-2005Feb26.html>; quoted in The International Institute for Strategic Studies, *Nuclear Black Markets*, 69.

Moreover, according to a May 2003 Congressional Research Service report, in 2000 the Pakistani government advertised nuclear gear for export including gas centrifuges that, it noted, “would be useful in a nuclear weapons program.”¹⁷ Based on this and other evidence discussed below, many analysts are skeptical of the Pakistani government’s claim that they had little knowledge of Khan’s nuclear proliferation activities.

A.Q. Khan’s nuclear network thus began as a collection of suppliers for Pakistan’s nuclear weapons program but evolved into a lucrative transnational business enterprise when Khan shifted from being an importer to an exporter of nuclear technology.¹⁸ In 1990, the Khan network approached Iraq with an offer to supply enrichment technology and project designs.¹⁹ A 1990 memo found by United Nations (UN) weapons inspectors details a meeting between Iraqi intelligence officers and an intermediary for A.Q. Khan. The memo lists an asking price of five million dollars for the network’s assistance plus an additional ten percent commission for all procurement.²⁰ There is currently no evidence to indicate the final outcome of the discussions, but experts suggest that procurement “would have been impossible after the initiation of Operation Desert Storm in January 1991 and the subsequent intrusive inspection operations by the UN.”²¹

In the late 1990s, Khan’s frequent international travel, particularly to multiple countries in Africa such as Kenya, Mali, Mauritania, Morocco, Niger, Nigeria, Sudan, and Tunisia began to raise suspicion by British and American intelligence officials.²² In March 2001, amid intense pressure from the United States, President Musharraf removed Khan as the head of KRL.²³ In response, Khan moved the base of his smuggling operations to Dubai. By this time Khan’s illicit network had evolved to become something of a virtual one-stop-shop for nuclear weapons design plans, centrifuge machines needed to produce fissile material, and technical expertise to run the facilities.²⁴ Khan’s

¹⁷ Squassoni, Sharon A. *Weapons of Mass Destruction: Trade Between North Korea and Pakistan*, CRS Report RL31900 (Washington, D.C., The Library of Congress, Congressional Research Service, 2003: 6; quoted in Sanger, David, “The Khan Network” *Conference on South Asia and the Nuclear Future*, Stanford University, San Jose, CA, June 4-5, 2004.

¹⁸ The International Institute for Strategic Studies, *Nuclear Black Markets*, 80.

¹⁹ *Ibid.*, 72.

²⁰ *Ibid.*

²¹ *Ibid.*

²² Corera, *Shopping for Bombs*, 132.

²³ *Ibid.*, 148.

²⁴ “Investigators suspect nuclear smuggling network is still alive,” *Jane’s Intelligence Review* (June 16, 2006): 2.

removal from KRL therefore seems to have had little effect on the continued operations of the network. At least thirty companies and middlemen located in Switzerland, the Netherlands, the United Kingdom, the United Arab Emirates (UAE), Turkey, South Africa, and Malaysia sold nuclear-related goods through the network.²⁵ The following sections briefly describe the network's members and activities in various regions:

Europe: Khan recruited several of his former European college friends and businessmen as buyers and suppliers for the network. Henk Slebos, a Dutch metallurgist and college friend became a Khan supplier. Slebos reportedly first travelled to Pakistan in 1976.²⁶ He started his own company whose website reportedly stated, “we find hard-to-get objects for customers all over the world.”²⁷ Slebos was once arrested when a US-made oscilloscope was found in his luggage at a Dutch airport, but he spent no time in jail and reportedly “business was never interrupted.”²⁸

Khan also recruited several individuals from Britain. Peter Griffin, a British engineer and businessman, supplied Khan with numerous items for twenty-five years. Griffin set up a Dubai-based company, Gulf Technical Industries (GTI) in 2000, but has maintained that his shipments always conformed to the export controls in place at the time.²⁹ In addition, Abu Siddiqui, a British businessman, received a twelve-month suspended sentence for exporting a number of nuclear-related items from KRL.³⁰ Over the years, Siddiqui supplied a five-ton crane, a twelve-ton furnace, and sophisticated measuring machines to Pakistan.³¹

Beginning in the 1970s, Khan and other Pakistanis made trips to Switzerland and Germany, offering huge sums of money (more than the sale price) to various manufacturers for component parts.³² It was at this time that Khan recruited Friedrich Tinner, a Swiss engineer. Tinner's company reportedly attempted to send fluoride-resistant valves for centrifuges to Iraq in the early 1990s. The items were intercepted in Jordan but Swiss authorities did not

²⁵ Douglas Frantz, “Vital Nuclear Parts are Missing,” *Los Angeles Times*, April 22, 2005; quoted in The International Institute for Strategic Studies, *Nuclear Black Markets*, 80; David Albright and Corey Hinderstien, “Unraveling the A.Q. Khan and Future Proliferation Networks,” *The Washington Quarterly* 28:2 (Spring 2005): 114.

²⁶ Corera, *Shopping for Bombs*, 25.

²⁷ *Ibid.*

²⁸ *Ibid.*

²⁹ The International Institute for Strategic Studies, *Nuclear Black Markets*, 27 and 80.

³⁰ *Ibid.*, 104.

³¹ Corera, *Shopping for Bombs*, 112.

³² *Ibid.*, 23.

charge Tinner.³³ Lastly, Gottard Lerch, a German national, was suspected of being one of Khan's main buyers for Libya's secret nuclear effort and one of the network's first contacts with Iran.³⁴

Middle East: Dubai was the site of the network's first substantial export deal with Iran in 1987.³⁵ Iranian officials reportedly met with S. Mohamed Farouq, an Indian-born businessman who owned a legitimate computer business but also allegedly assisted Khan with marketing P-1 centrifuge components.³⁶ Farouq's nephew, Buhary Syed Ali (B.S.A.) Tahir, a Sri Lankan national, was also present at the 1987 deal.³⁷ Tahir was later involved in numerous aspects of the network, including shipment of money and materials and recruitment of individuals and firms.³⁸

Following Khan's removal from Khan Research Laboratory (KRL) in 2001, Khan moved the main base of operations for the network to Dubai. Dubai also served as the network's central transshipment point.³⁹ Turkey acted as both an assembly point for centrifuge motors and frequency converters and a transfer point on to Dubai for subcomponents procured from European suppliers.⁴⁰

Asia: Malaysia served as the production point for centrifuge parts.⁴¹ Friedrich Tinner's sons, Urs and Marco, both Swiss nationals, helped establish production lines in Malaysia and modified centrifuge parts in Turkey.⁴² Urs consulted for the Scomi Precision Engineering (SCOPE) factory in Malaysia, which reportedly shipped fourteen types of centrifuge components to Dubai in 2003.⁴³ Several companies in South Korea and Japan also reportedly provided dual-use technology for the Libyan program.⁴⁴

Africa: The Khan network worked with companies and experts involved in South Africa's nuclear weapons program before it was abandoned in 1993.⁴⁵

³³ The International Institute for Strategic Studies, *Nuclear Black Markets*, 50.

³⁴ Ibid., 80.

³⁵ Corera, *Shopping for Bombs*, 59; The International Institute for Strategic Studies, *Nuclear Black Markets*, 67.

³⁶ The International Institute for Strategic Studies, *Nuclear Black Markets*, 69.

³⁷ Ibid.

³⁸ Corera, *Shopping for Bombs*, 110.

³⁹ The International Institute for Strategic Studies, *Nuclear Black Markets*, 80.

⁴⁰ Ibid., 81.

⁴¹ Sanger, David, "The Khan Network".

⁴² The International Institute for Strategic Studies, *Nuclear Black Markets*, 149.

⁴³ Ibid., 81.

⁴⁴ Ibid.

⁴⁵ Ibid., 80.

These included Gerhard Wisser, a German citizen who resided in South Africa and worked for South Africa's nuclear program. Wisser had supplied Pakistan with vacuum pumps and other equipment in the 1980s. Wisser later recruited Johan Meyer Daniel Geiges, an associate from South Africa's nuclear program, to "build a complex steel system to feed and withdraw UF₆ gas into a centrifuge cascade. The massive system filled eleven forty-foot shipping containers and was estimated to be worth thirty-three million dollars."⁴⁶

Network Interdiction

A.Q. Khan continually took steps to circumvent the international community's attempts to stem the sale of nuclear technology. In the wake of India's 1974 detonation of a 'peaceful nuclear device,' seven countries formed the Nuclear Supplier Group (NSG), originally called the London Club.⁴⁷ The group created guidelines, which restricted the export of items and technology specifically designed for nuclear use.⁴⁸ As a result, Khan could no longer acquire various dual-use devices and began purchasing component parts for enrichment plants directly from suppliers.⁴⁹ For example, when the UK denied Pakistan access to purchasing additional high-frequency inverters in the late 1970s, Pakistan simply began buying the parts with which to assemble the inverters themselves. The London club struggled to outpace the proliferators, forcing Britain to expand the control list twice in 1979.⁵⁰

To circumvent export bans on dual-use nuclear items, Khan assembled an extensive network of technical experts, companies, suppliers and workshops. According to Mohamed ElBaradei, director general of the IAEA, "Nuclear components designed in one country could be manufactured in another, shipped through a third (which may have appeared to be a legitimate user), assembled in a fourth, and designated for eventual turnkey use in a fifth."⁵¹

When the network began procuring parts for the Libyan program in the late 1990s, workshops would produce the parts and send them to Dubai under a

⁴⁶ Ibid., 81.

⁴⁷ Ibid., 10.

⁴⁸ Ibid.

⁴⁹ Corera, *Shopping for Bombs*, 22.

⁵⁰ Ibid., 26.

⁵¹ ElBaradei, Mohamed, "Nuclear Non-Proliferation: Global Security in a Rapidly Changing World," *Carnegie International Non-proliferation Conference*, Washington, D.C., June 21, 2004, available at: <http://www.ceip.org/files/projects/npp/resources/2004conference/speeches/ElBaradei.doc>; Albright and Hinderstien, "Unraveling the A.Q. Khan," 115.

false end-user certificate. In Dubai they were repackaged and sent to Libya.⁵² The Khan network intended to provide Libya with a turnkey gas-centrifuge facility capable of enriching enough uranium to produce roughly ten nuclear weapons annually.⁵³

Dubai was also the transshipment hub for components reportedly shipped to Iran. In addition to Khan's initial deal with Iran in 1987 mentioned above, Iran reportedly purchased P-1 designs, five hundred components for P-1 centrifuges, and drawings for the P-2 centrifuge from the Khan network in 1994.⁵⁴ The items were allegedly shipped in two containers from Dubai.⁵⁵ The Khan network's technical and procurement support to Iran reportedly continued until after 1996.⁵⁶ Analysts believe the Khan network's assistance enabled Iran to enrich uranium using gas centrifuges.⁵⁷

Moreover, Khan was agile in recovering from setbacks. When U.S. and French nonproliferation efforts blocked Pakistan's plutonium route to nuclear weapons, Khan brokered a deal with North Korea for an intermediate-range liquid-fuel ballistic missile, which provided Pakistan with an alternate nuclear weapons delivery option. Analysts believe Pakistan provided North Korea with centrifuge technology at least partly in exchange for the *No-dong* missiles.⁵⁸ Although neither Pakistan nor North Korea have been forthcoming regarding North Korea's procurement of nuclear technology from the Khan network, analysts claim that the Pakistani government knew of Khan's activities. The transfer of a number of gas centrifuges, materials, and technical assistance in the late 1990s was almost certainly sanctioned by the government.⁵⁹ In exchange, North Korea reportedly assisted in the development of Pakistan's Ghaury liquid-propellant missile in 1993. North Korea also supplied Pakistan with twelve to twenty-five *No-Dong* assembly kits between 1995 and 1996.⁶⁰

⁵² Albright and Hinderstien, "Unraveling the A.Q. Khan," 115.

⁵³ Ibid., 113.

⁵⁴ Corera, *Shopping for Bombs*, 69; The International Institute for Strategic Studies, *Nuclear Black Markets*, 71.

⁵⁵ Corera, *Shopping for Bombs*, 69.

⁵⁶ Ibid., 71.

⁵⁷ Albright and Hinderstien, "Unraveling the A.Q. Khan," 111.

⁵⁸ The International Institute for Strategic Studies, *Nuclear Black Markets*, 74.

⁵⁹ James Kitfield, "Nuclear Smuggler Still at Work, Expert Says," *National Journal*, March 12, 2010, available at: <http://www.nti.org/gsn/article/nuclear-smugglers-still-at-work-expert-says/>.

⁶⁰ The International Institute for Strategic Studies, *Nuclear Black Markets*, 31.

Several factors, including a new threat environment, concealment of end users, the desire for financial gain, and lack of political will contributed to the intelligence community's failure to detect the extent of Khan's illicit network for so long.

In the wake of the Cold War, the intelligence community faced major cuts in human intelligence (HUMINT) collection, which is a critical component for the disruption of illicit smuggling networks.⁶¹ At the same time, a new threat began to emerge—illicit transnational non-state networks⁶²—with which intelligence agencies did not have extensive experience. Analysts initially viewed Khan as an individual acting on behalf of the state rather than a non-state actor.⁶³

Western intelligence agencies also failed to recognize that KRL was placing orders for more items than what was needed for Pakistan's program.⁶⁴ Throughout the 1980s and 1990s, as head of KRL, Khan could ship components in and out of Pakistan with very little oversight from the Pakistani government.⁶⁵ The ultimate end users of the items purchased for Pakistan's nuclear program were not tracked.

Greed also caused suppliers to turn a blind eye to Pakistan's purchase of goods for more than the sale price.⁶⁶ In fact, according to Khan, as word got out about Pakistan's nuclear ambitions, suppliers began approaching him with details of machinery and drawings.⁶⁷ In other cases, countries such as Switzerland and Germany banned the export of complete centrifuges but component parts such as vacuum tubes and valve equipment required for an enrichment plant were permitted even though the final purpose was obvious.⁶⁸ Essentially, no European countries seemed to want to miss out on lucrative profits from the nuclear technology export market, irrespective of the proliferation dangers this posed.

Lastly, there was a general lack of political will to block Pakistan's nuclear ambitions. Although a series of mild sanctions were imposed against

⁶¹ Sanger, David, "The Khan Network," 3.

⁶² Kristen A. Lau and Kevin C. Desouza, "Intelligence and Nuclear Non-Proliferation Programs: The Achilles Heel," *Intelligence and National Security* 29:3 (2014): 406.

⁶³ *Ibid.*, 408.

⁶⁴ *Ibid.*

⁶⁵ The International Institute for Strategic Studies, *Nuclear Black Markets*, 76.

⁶⁶ Corera, *Shopping for Bombs*, 23.

⁶⁷ *Ibid.*, 27.

⁶⁸ *Ibid.*, 23.

Pakistan in the late 1970s and 1980s, other strategic policy priorities, namely the need for Pakistan's cooperation against the Soviets in Afghanistan, were placed ahead of limiting Pakistan's nuclear weapons program.⁶⁹

The precise role and/or knowledge of the Pakistani government in Khan's proliferation efforts is unknown. Various experts believe that the Pakistani government was aware of and possibly involved in Khan's onward proliferation of nuclear technology. Khan was reportedly first investigated by the Inter-Services Intelligence (ISI) Agency in the late 1980s, but top officials ignored the report.⁷⁰ Again, between 1998-1999, the ISI conducted an investigation of Khan's finances and uncovered eight million dollars in various bank accounts and multiple properties in Pakistan purchased with KRL funds.⁷¹ However, Pakistan has officially stated that the government did not know the true extent of Khan's illicit activities and they overlooked his reported domestic corruption due to his contributions to national security.⁷²

In the late 1990s intelligence agencies in the United States and the United Kingdom started to take notice of Khan's suspicious travel patterns.⁷³ During the subsequent decade, the United States and the United Kingdom slowly gathered intelligence until there was no denying that Khan was controlling a transnational nuclear proliferation network. Nevertheless, some argue that the intelligence community's failure to find any WMDs in Iraq in 2003 may have also contributed to the relatively lengthy lag time between the seizure of the *China BBC* and the ultimate dismantling of the network.⁷⁴ Although suspicions remain, it does not appear that the network provided direct assistance to Al Qaeda or other violent non-state actors (VNSAs) in pursuit of nuclear technology.⁷⁵

Amid pressure from the United States to disclose information pertaining to centrifuge shipments to North Korea, as well as Khan's suspicious foreign contacts and travel, Pakistan reluctantly removed Khan as head of KRL in 2001.⁷⁶ Khan was placed under house arrest in January 2004, when the network was exposed, but Khan was released in February 2009 as Pakistan

⁶⁹ Sanger, David, "The Khan Network," 4.

⁷⁰ Corera, *Shopping for Bombs*, 145.

⁷¹ *Ibid.*, 146.

⁷² The International Institute for Strategic Studies, *Nuclear Black Markets*, 93.

⁷³ *Ibid.*, 83.

⁷⁴ Sanger, David, "The Khan Network," 3.

⁷⁵ Albright and Hinderstien, "Unraveling the A.Q. Khan," 112.

⁷⁶ The International Institute for Strategic Studies, *Nuclear Black Markets*, 97.

announced the “the so-called A.Q. Khan affair is a closed chapter.”⁷⁷ Khan remains a popular figure in Pakistan, where many see him as a national hero.

Very few key players within the Khan network have been successfully prosecuted. One of Khan’s principal associates, B.S.A. Tahir, was arrested in Malaysia in 2004.⁷⁸ He was held without official charges until 2008, when Malaysian officials stated he was no longer a threat to national security.⁷⁹ Gotthard Lerch was arrested by Swiss authorities in 2004 and extradited to Germany in 2005. However, a report by the International Institute for Strategic Studies reports that in August 2006, Lerch’s trial was suspended on procedural grounds related to “evidence not being forwarded by Swiss authorities and defense being denied access to German intelligence material.”⁸⁰ When he was finally convicted in 2008 of minor charges, Lerch was sentenced to time served in pretrial detention and released.⁸¹ In 2012, Friedrich Tinner (seventy-five), and his sons Urs (forty-six) and Marcos (forty-three) were found guilty of aiding Libya’s Nuclear Weapons program. However, Friedrich received a suspended sentence and his sons were sentenced to prison terms shorter than the time they had already spent in investigative custody.⁸²

Analysis

The sophistication of A.Q. Khan’s nuclear smuggling ring and the attempted sale of a turnkey nuclear program to Libya were a wake-up call for the international community. Non-state actors in pursuit of tremendous profits were able to assemble and transfer dual-use and special-use nuclear equipment by purchasing component parts from both complicit and unwitting suppliers. The Khan network was able to then manufacture centrifuge

⁷⁷ Joby Warrick, “Nuclear Scientist A.Q. Khan Is Freed From House Arrest,” *Washington Post*, February 7, 2009, available at: <http://www.washingtonpost.com/wp-dyn/content/article/2009/02/06/AR2009020603730.html>.

⁷⁸ Associated Press, “Malaysia arrests alleged black market nuclear agent 2004,” *Taipei Times*, May 30, 2004, available at: <http://www.taipetimes.com/News/world/archives/2004/05/30/2003157524>.

⁷⁹ Associated Press, “Malaysia free Sri Lankan accused of nuclear link,” *Taipei Times*, June 24, 2008, available at: <http://www.taipetimes.com/News/world/archives/2008/06/24/2003415593>.

⁸⁰ The International Institute for Strategic Studies, *Nuclear Black Markets*, 138.

⁸¹ Eben Harrell, “Nuclear Proliferation: The Crime with No Punishment?” *Time Magazine*, September 16, 2011, available at: <http://content.time.com/time/world/article/0,8599,2092585,00.html>.

⁸² Associated Press, “Switzerland: 3 Found Guilty of Aiding Libya’s Nuclear Weapons Program,” *New York Times*, September 24 2012, available at: http://www.nytimes.com/2012/09/26/world/europe/switzerland-3-found-guilty-of-aiding-libyas-nuclear-weapons-program.html?ref=topics&_r=0.

technology utilizing their cache of stolen blueprints and component specifications.

Khan's network managed to stay one step ahead of international nonproliferation efforts by creating legitimate front companies and disguising end-user certificates. The network also repackaged equipment in transit hubs such as Turkey and the United Arab Emirates.⁸³ As non-state actors, proliferators may be able to mislead suppliers into believing that dual-use goods are destined for legitimate purposes.

Additionally, the Khan network illustrates that many suppliers of dual-use items will look the other way in pursuit of financial gains when approached by dubious buyers. A.Q. Khan was further shielded from suspicion due to his role in Pakistan's nuclear program. Gordon Corera, author of *Shopping for Bombs*, claims European countries were well aware that European citizens were supplying dual-use technology to Pakistan, but they did not realize Khan was selling goods on to other countries.⁸⁴

So could this happen again? Following the dismantling of the Khan network, the international community has actively pursued several new nonproliferation initiatives. For example, UN Security Council Resolution 1540 calls on all states to criminalize the proliferation of WMD, their means of delivery, and related materials to non-state actors.⁸⁵ The Proliferation Security Initiative (PSI) was launched by the Bush Administration in 2003, just prior to the interdiction of the Libya-bound *BBC China* and promotes greater cooperation among member states to interdict proliferators when treaties and export controls fail.⁸⁶ However, scholars such as David Albright argue that the United States continues to lack political will when combating nuclear proliferation. He asserts that the United States still does not place equal priority on unraveling the activities of Pakistani members of the Khan network as it does other foreign policy issues such as on maintaining Islamabad's support for capturing members of Al Qaeda.⁸⁷

Though the international community has taken some steps to stem the supply side of nuclear proliferation, the demand side from both states and non-state actors remains or may indeed be increasing. The link between transnational

⁸³ The International Institute for Strategic Studies, *Nuclear Black Markets*, 149 and 155.

⁸⁴ Corera, *Shopping for Bombs*, 111.

⁸⁵ Kristen A. Lau and Kevin C. Desouza, "Intelligence and Nuclear Non-Proliferation Programs: The Achilles Heel," *Intelligence and National Security* 29:3 (2014): 413.

⁸⁶ The International Institute for Strategic Studies, *Nuclear Black Markets*, 138.

⁸⁷ Albright and Hinderstien, "Unraveling the A.Q. Khan," 119.

illicit networks and nuclear proliferation thus remains central since most countries, and certainly most terrorist organizations, will depend for the foreseeable future on illicit nuclear trade for the acquisition of nuclear equipment, materials, and expertise.⁸⁸

On a broader level, this case illustrates the successful establishment of a multi-national smuggling ring that transferred highly controlled and sophisticated nuclear technology. Many, if not most, non-state actors who pursue complex engineering tasks are focused on technologies that are far less restricted and complex than nuclear technology. As a result, this case highlights the real danger posed by sophisticated transnational smuggling networks in terms of facilitating the efforts of violent non-state actors who endeavor to complete complex engineering tasks. Moreover, this case demonstrates both the willingness of manufactures to turn a blind eye to suspicious purchases in the pursuit of profit as well as the fact that the network (or non-state actor) can go farther and farther up the supply chain to obtain component parts they can then assemble themselves. Lastly, the Khan network illustrates the unique threat posed by countries that lack the political will or capacity to prevent or stop illicit behavior, in which non-state actors can flourish. Initial suspicions of A.Q. Khan in the late 1980s were reportedly brushed aside due to his status as a national hero.⁸⁹ Other non-state actors who have pursued complex engineering tasks such as the FARC and los Zetas have been successful despite efforts by national authorities to stop them.

⁸⁸ Albright David, Paul Brannan, and Andrea Scheel Stricker, "Detecting and Disrupting Illicit Nuclear Trade after A.Q. Khan," *The Washington Quarterly* 22:2 (2010): 85.

⁸⁹ Corera, *Shopping for Bombs*, 144.

Appendix A. Chronology of A.Q Khan Nuclear Smuggling Network

- 1972: May—Khan begins work at URENCO
- 1974: May—India conducts first nuclear test
- 1974 Khan assigned to translate G-1/ G-2 Centrifuge designs
- 1974: September—Khan offers his services to Z. A Bhutto
- 1975: December—Khan leaves the Netherlands
- 1976: Khan takes over control of Pakistan's enrichment program as head of Engineering Research Laboratories (ERL)
- 1978: Nuclear Suppliers Group published first export guidelines
- 1979: US cuts Pakistani economic and military assistance in response to construction of Kahuta enrichment facility
- 1978: ERL succeeds in enriching uranium
- 1981: ERL renamed Khan Research Laboratories (KRL) to honor Khan's successful uranium enrichment
- 1980s: Khan approached by unknown Arab country requesting nuclear assistance
- 1983: Khan convicted, in absentia in the Netherlands, of nuclear espionage (*conviction later overturned due to a technicality*)
- late 1980s: Khan network reportedly begins nuclear transfers to Iran
- 1988: Iranian scientists suspected of having received nuclear training in Pakistan
- 1989: Iran suspected of receiving its first centrifuge assemblies and components
- 1990: Khan offered to sell Iraq nuclear bomb design and guaranteed material support from Western Europe for uranium enrichment program
- 1992: Pakistan begins missile cooperation with North Korea
- 1997: Khan begins to transfer centrifuge components to Libya
- 1998: May 11 & 13—India detonates a total of five devices in nuclear tests
- 1998: May 28 & 30—Pakistan responds with six nuclear tests
- 2001: Libya receives blueprints for nuclear weapons plans. The plans are reported to be of Chinese origin with Chinese notes in the margins
- 2001: March—Khan removed from KRL
- 2003: October—*BBC China* intercepted en route to Libya
- 2004: January 31—Khan arrested
- 2004: February 4—Khan confesses his illegal nuclear dealings on Pakistani television (in English)
- 2009: February—Khan released from house arrest

- 2012: September—Urs Tinner (46), his brother Marco (43) and his father Friedrich (74) found guilty of aiding Libya's Nuclear Weapons Program