SAFETY OF PAKISTAN'S NUCLEAR WEAPONS: THREAT PRECEPTIONS AND RESPONSE, 2000-2010

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DECLARATION

I declare that the dissertation entitled **"Safety of Pakistan's Nuclear Weapons: Threat Perceptions and Response, 2000-2010"** submitted by me in partial fulfillment for the award of the degree of **Master of Philosophy** of Jawaharlal Nehru University is my own work. The dissertation has not been submitted for any degree of this university or any other university.

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CERTIFICATE

We recommend that this dissertation be placed before the examiners for evaluation.

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CONTENTS

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ABBREVIATIONS

CBS	Columbia Broadcasting System
C^4I^2SR	Communications, and Computerization, Intelligence and Information, and Surveillance and Reconnaissance
CIA	Central Intelligence Agency
CJCSC	Joint Chief of Staff Committee
CNS	Centre of Nuclear Studies
CPPNM	Convention on the Physical Protection of Nuclear Material
CRS	Congressional Research Service
CSI	Container Security Initiative
CTBT	Comprehensive Test Ban Treaty
DCC	Deployment Control Committee
DG	Director General
DSIN	Nuclear Installation Safety Directorate of France
ECC	Employment Control Committee
ERL	Engineering Research Laboratories
EU	European Union
FATA	Federally Administered Tribal Areas
FDO	Fysisch Dynamisch Onderzoek
FEP	Fuel Enrichment Plant
HEU	Highly enriched uranium, enriched up to 20% U-235
HM	Hizbul Mujahideen
HuM	Harkat-ul-Mujahideen
IAEA	International Atomic Energy Agency
ICSANT	International Convention for the Suppression of Acts of Nuclear Terrorism
IND	Improvised nuclear device
IPFM	International Panel on Fissile Materials
ISI	Pakistan's Directorate for Inter-Services Intelligence
IT	Information Technology

JeT	Jaish-e-Mohammad
KANUPP	Karachi Nuclear Power Plant
KRL	Khan Research Laboratories
L-1, L-2	Libyan centrifuge, first and second generation
LeJ	Lashkar-e-Jhangvi
LeT	Leshkar-e-Tayyiba
MMA	Muttahida Majilis-e-Amal
MTCR	Missile Technology Control Regime
NAB	National Accountability Bureau
NCA	National Command Authority
NCL	Nuclear Control List
NDC	National Defence Complex
NNCA	National Nuclear Command Authority
NPT	Nuclear Non-proliferation Treaty
NSAP	National Security Action Plan
NSSTC	Nuclear Safety and Security Training Centre
NuSECC	Nuclear Security Emergency Coordination Centre
NWFP	North West Frontier Province
OECD	Organisation for Economic Cooperation and Development
P-1, P-2	Pakistani centrifuge, first and second generation
PAF	Pakistan Air Force
PALs	Permissive Action Links
PAEC	Pakistan Atomic Energy Commission
PFEP	Pilot Fuel Enrichment Plant
PNRA	Pakistan Nuclear Regulatory Authority
PNT	Pakistani Neo-Taliban
PRP	Personnel Reliability Programme
RDD	Radiological dispersion device
RED	Radiation emission device
Retd.	Retired
SECDIV	Strategic Export Control Division

SIPRI	Stockholm International Peace Research Institute
SPD	Strategic Plans Division
SRO	Statutory Regulatory Order
TTP	Tehrik-e-Taliban Pakistan
TTPs	Tactics, techniques, and procedures
UCN	Ultra Centrifuge Nederland
UF_6	Uranium hexafluoride
UNSC	United Nations Security Council
URENCO	Uranium-enrichment consortium
U.S.	United States
UTN	Ummah Tameer-e-Nau
WINS	World Institute for Nuclear Security

PREFACE

As the threat of nuclear terrorism intensified after the 9/11 terror attacks in the U.S., there was an urgency to ensure nuclear safety and security around the world, especially in vulnerable states with nuclear weapons and materials. Pakistan came to be seen as a state from where extremists could possibly acquire nuclear weapons and materials for perpetration of nuclear terrorism. The threat perceptions that include the risks of theft and sabotage of Pakistan's nuclear assets under different scenarios were based on the underlining factors in Pakistan such as growing number of Pakistan's nuclear weapons and materials, nuclear black marketing, political instability, growing Islamic radicalism and increasing trend of incidents of terror attacks. The threat perceptions have put Pakistan on the defensive and the debate about whether Pakistan's nuclear weapons are safe or not ensued. The dissertation enquires into how Pakistan fared in the area of nuclear safety and security in the past decade, 2000-2010. The dissertation has five chapters.

Chapter one deals with the conceptual aspects of nuclear safety and security and introduces the issue of nuclear terrorism and the case of Pakistan.

Chapter two gives an overview of Pakistan's nuclear programme, its nuclear capabilities and Pakistan's nuclear command and control.

Chapter three analyses nuclear black marketing that came out of Pakistan by taking three cases: assistance to Iran, North Korea and Libya. It also looks into how much Pakistani state was responsible in the nuclear black market and also traces the implications.

Chapter four deal with the debate about safety and security of Pakistan's nuclear assets. It will look into factors that threaten nuclear safety and security in Pakistan, the threat perceptions, measures adopted by Pakistan and U.S. assistance to Pakistan in this regard.

Chapter five, which is the concluding chapter, will summarize the important findings of the study.

CHAPTER 1
INTRODUCTION

Nuclear weapons require special safety consideration because of their political and military importance, their destructive power, and the potential consequences of a nuclear weapon accident or unauthorized act.[1] While they are valued for the purposes of ensuring national security and enhancing national and international identity,[2] the consequences of accidents or misuse of nuclear weapons could be disastrous. Therefore, it is extremely important that nuclear weapons be protected against any risks and threats both in times of peace and conflict. Apart from risks of nuclear weapons accidents, threats to safety of nuclear weapons include theft, sabotage and unauthorized use of nuclear weapons by state-actors, non-state actors or collaboration between them (also referred to as insider, outsider and insider-outsider threat, respectively). Safety of nuclear weapons encompasses not just safety of the nuclear warhead but also of nuclear materials, delivery system, personnel and sensitive nuclear technology and information. The aim of ensuring nuclear weapons safety is to predict, prevent and respond to the risks, if they ever should occur. For this purpose, measures such as the following are adopted: keeping nuclear weapons de-mated or disassembled, use of Permissive Action Links (PALs) with limited re-try feature, use of "two-man rule," "insensitive high explosives," "fire-resistance pits," Personnel Reliability Programme (PRP), etc.[3] The main objective of this safety measures is to ensure that nuclear weapons are used in no circumstances, except under proper authorization. To secure nuclear weapons, it is

[1] Smith, Herold P. Jr. (1996), "DoD Nuclear Weapon System Safety Program Manual", Assistant to the Secretary of Defense for Nuclear and Chemical and Biological Defense Programs, Pentagon, Washington, DC, p.1. [Online: Web] Accessed August 16, 2011, URL: http://www.fas.org/nuke/guide/usa/doctrine/dod/3150-2m/index.html

[2] Sagan, Scott D. (1996-1997), "Why do States Build Nuclear Weapons?: Three Models in Search of a Bomb", *International Security*, Vol. 21, No. 3, Winter, p.55.

[3] The US Office of the Assistant Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs (2011), *The Nuclear Matters Handbook: Expanded Edition*, p.66-76. [Online: Web] Accessed September 23, 2011, URL: http://www.acq.osd.mil/ncbdp/nm/nm_book_5_11/docs/NMHB2011.pdf. The Handbook gives a good description about various nuclear weapons safety measures – technical and procedural.

essential that safety of nuclear weapons be considered as early as possible during weapon development and continues to be considered throughout the life-cycle of the weapons.[4]

Safety of Nuclear Weapons: Meaning

Ensuring safety of nuclear weapons entails adoption of measures that ensure nuclear safety and security. Nuclear safety and nuclear security are two distinct but closely related issues that help us to understand what safety of nuclear weapons refers to. While, in general sense, the terms: safety and security could be used interchangeably, where one could mean the other and *vice versa*, to the point of meaning the same, the terms become distinct when we talk in terms of type of measures adopted. When it comes to the question of keeping nuclear weapons safe, it is important to understand the distinction and the linkage between nuclear safety and nuclear security. They are distinct but linked in such a way that while measures to ensure one could also enforce the other – positive overlap – or might come in the way of the other – negative overlap. So it is also important that chances of negative overlap be reduced to minimum.

The World Institute for Nuclear Security (WINS) gives separate and comprehensive definitions of nuclear safety and nuclear security as it states, "Nuclear safety deals with the creation and application of excellent management, design and operation to protect people and the environment from accidents, plant malfunctions and human error."[5] Further, it states, "Nuclear security deals with any activity or system that contributes to the protection of nuclear and high hazard radioactive materials from unauthorized access, theft, diversion or sabotage, including *inter alia* guarding, physical protection, facility design, personnel vetting, IT security, technical measures, etc."[6]

Similarly, the International Atomic Energy Agency (IAEA) defines nuclear safety as, "the achievement of proper operating conditions, prevention of accidents or mitigation of accident consequences, resulting in protection of workers, the public and the

[4] Smith, Herold P. Jr. (1996), "DoD Nuclear Weapon System Safety Program Manual", Assistant to the Secretary of Defense for Nuclear and Chemical and Biological Defense Programs, Pentagon, Washington, DC, p.1. [Online: Web] Accessed August 16, 2011, URL: http://www.fas.org/nuke/guide/usa/doctrine/dod/3150-2m/index.html

[5] WINS (2011), "An Integrated Approach to Nuclear Safety and Nuclear Security", A WINS International Best Practice Guide for your Organization, Revision 1.1, p.3.

[6] Ibid.

environment from undue radiation hazards."[7] It defines nuclear security as "the prevention and detection, and response to, theft, sabotage, unauthorized access, illegal transfer or other malicious acts involving nuclear material, other radioactive substances, or their associated facilities."[8]

According to the definitions, it appears that nuclear safety is mainly associated with measures to prevent inadvertent acts like "accidents, malfunctions and human errors," and nuclear security is related mainly with measures to prevent intentional acts like "unauthorized access, theft, diversion or sabotage." It should be noted here that it is possible for malicious individuals to intentionally act to cause accidents and make it appear as unintentional. This aspect is taken into consideration by the definition given by the Nuclear Installation Safety Directorate of France.

The Nuclear Installation Safety Directorate of France (DSIN) says, "Nuclear safety implies the prevention of accidents – including those induced with malicious intent – and the mitigation of their effects. It also encompasses the technical provision made to ensure the normal operation of facilities, without excessive exposure of workers, by optimizing the production and management of radioactive waste and effluents."[9] Making a connection between nuclear safety and security, it observes, "Its (nuclear safety) scope falls within that of nuclear security, a wider concept, aimed at ensuring the overall protection of people and property against dangers, harmful effects and any forms of inconvenience which could result from the construction, operation and decommissioning of fixed or mobile nuclear installations, as well as from the storage, transport, use or transformation of natural or artificial radioactive substances."[10]

Just as Gianni Petrangeli points out that the objective of ensuring nuclear safety is the endeavor "to protect individuals, society and the environment from harm by establishing and maintaining effective defenses against radiological hazards in nuclear

[7] IAEA (2010), "The Interface Between Safety and Security at Nuclear Power Plants," A report by the International Nuclear Safety Group, INSAG-24, p.3, [Online: Web] Accessed March 16, 2011, URL: http://www-pub.iaea.org/MTCD/publications/PDF/Pub1472_web.pdf
[8] Report by the Director General (2009), "Nuclear Security Plan 2010-2013," IAEA, GOV/2009/54-GC (53)/18, August 17, p.1, [Online: Web] Accessed June 15, 2011, URL: http://www.iaea.org/About/Policy/GC/GC53/GC53Documents/English/gc53-18_en.pdf
[9] Libman, Jacques (1996) *Elements Of Nuclear Safety*, English translation by Jean Mary Dalens, Institut De Protection et de Surete Nucleaire, les editions de physique, France: Les Editions de Physique, p.20.
[10] Ibid., p.21.

installations,"[11] the above definitions, establishes the objective of ensuring nuclear safety and nuclear security as protection of people by protecting the radiological materials and nuclear installations at all times by adopting various measures. Thus, both have a common purpose i.e., protection of people from nuclear detonation or radiation due to accidents or malicious acts.

The critical point here seems to be about maintaining 'control' over what should and should not occur. This is aspired in the face of the possibility that things may not always go as planned. Therefore, ensuring safety and security requires a backup plan to mitigate failure of control. When it comes specifically to nuclear weapons, it is not so much as to protect people per se but protect people from undesirable harm (as nuclear weapons are made in the first place to cause desired harm to adversaries or aimed at causing this effect) by taking measures to prevent conditions like accidents or unauthorized nuclear detonation or release of radiological materials. This aim runs in parallel with the goal of ensuring that nuclear safety measures do not impair the reliability of nuclear weapons – the ability of nuclear weapons to operate optimally when required.[12]

The United States (U.S.) Office of the Assistant Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs' handbook, *The Nuclear Matters Handbook* states, "Nuclear weapons system safety refers to the collection of positive measures designed to minimize the possibility of a nuclear detonation[13] because of accidents, inadvertent errors, or acts of nature… Nuclear safety also encompasses design features and actions to reduce the potential for dispersal of radioactive materials in the event of an

[11] Petrangeli, Gianni (2006) *Nuclear Safety,* Amsterdam: Elsevier Butterworth-Heinemann, p.1.

[12] The US Office of the Assistant Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs (2011), *The Nuclear Matters Handbook: Expanded Edition,* pp.64-65. [Online: Web] Accessed September 23, 2011, URL: http://www.acq.osd.mil/ncbdp/nm/nm_book_5_11/docs/NMHB2011.pdf ; Garwin, L. Richard (2010), "The Reliability and Safety of U.S. Nuclear Weapons" Thomas J. Watson Research Center, New York. p.3. [Online: Web] Accessed August 16, 2011, URL: http://www.fas.org/rlg/Reliability%20and%20Safety%20of%20US%20Nuclear%20Weapons%2001_28_2010.pdf

[13] The *Handbook* states that for safety purposes, a nuclear detonation is defined as an instantaneous release of energy from nuclear events i.e., fission or fusion exceeding the energy released from an explosion of four pounds of TNT. See, The US Office of the Assistant Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs (2011), *The Nuclear Matters Handbook: Expanded Edition,* p.3, [Online: Web] Accessed September 23, 2011, URL: http://www.acq.osd.mil/ncbdp/nm/nm_book_5_11/docs/NMHB2011.pdf

accident."[14] It continues to state that it refers to integration of policy, organisational responsibilities, and the conduct of safety-related activities to ensure that nuclear detonation is prevented under all circumstances (peace, crisis or wartime environments), except under proper authorization. On nuclear weapons security, the handbook states, "nuclear weapons security refers to the range of active and passive measures employed to protect a weapon from access by unauthorized personnel and prevent loss or damage."[15] For this purpose, security measures include creation of "nuclear security policy; security forces; equipment; technology; tactics, techniques, and procedures (TTPs); and personnel security standards."[16] The safety and security measures are to be maintained throughout the life-cycle of a nuclear weapon system.[17]

On what constitute nuclear weapon accident, Plummer and Greenwood states accident involving a nuclear weapon as "any unexpected event that results in any of the following: accidental or unauthorized launching, firing, or use of a nuclear-capable weapon system which could create the risk of an outbreak of war; nuclear detonation; non-nuclear detonation, burning of nuclear material; radioactive contamination; seizure, theft, or loss of a nuclear weapon; or any actual or implied public hazard."[18]

Giving a broader aspect of ensuring safety of nuclear weapons, Garwin states that nuclear weapon system implies not just the nuclear warhead but also the delivery vehicle, personnel, command and control, and the like,[19] and that safety of nuclear weapons is not limited to these aspects but also include securing sensitive/classified information relating to nuclear programme.[20]

In gist, ensuring safety of nuclear weapons is a broad issue which refers to the collection of measures, technical and procedural, designed to minimize the possibility of

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[14] Ibid., p.63.
[15] Ibid., p.70.
[16] Ibid.
[17] Ibid., pp.63-64 &70.
[18] Plummer, David W. and Greenwood, William H. (1998 Declassified), "The History of Nuclear Weapons Safety Devices", Sandia National Laboratories, Albuquerque, p.1, [Online: Web] Accessed August 16, 2011, URL: http://navynucweps.com/History/historynwsafdev.pdf
[19] Garwin, L. Richard (2010), "The Reliability and Safety of U.S. Nuclear Weapons" Thomas J. Watson Research Center, New York. p.1. [Online: Web] Accessed August 16, 2011, URL: http://www.fas.org/rlg/Reliability%20and%20Safety%20of%20US%20Nuclear%20Weapons%2001_28_2010.pdf
[20] Ibid., p.6; Davis, Zachary S. (1999) "DOE Security: Protecting Nuclear Material and Information," *CRS Report for Congress*, July 23. p.3-5. [Online: Web] Accessed August 16, 2011, URL: http://digital.library.unt.edu/ark:/67531/metacrs988/m1/1/high_res_d/RS20243_1999Jul23.pdf

nuclear accidents, theft, sabotage or unauthorized use of not just nuclear warheads but also of nuclear materials at all time. This take in two aspects: nuclear safety and nuclear security. Nuclear safety deals with safety issues regarding nuclear weapons and fissile materials, issues of which are more intimate like the prevention of accidents and errors that could cause inadvertent or unauthorized nuclear detonation or nuclear radiation. Nuclear security deals with physical safeguard of nuclear sites or sources that aim at warding off malicious acts like intrusion and prevention of illegal transfer of nuclear weapons or materials. While being distinct, they are also closely related having positive and negative correlation between them and a common objective of safe nuclear custody (relation between nuclear safety and nuclear security will be discussed below). Ensuring safety of nuclear weapons encompasses measures to ensure the safety and security of nuclear installations, nuclear weapons delivery system, personnel, command and control and whole lot of other measures including protection of sensitive information relating to nuclear weapons.

Features of Safety of Nuclear Weapons

From the above, the following features of safety of nuclear weapons can be drawn:

i. *Safety of nuclear weapons means two things, i.e., nuclear safety and nuclear security:*

As stated earlier, nuclear safety, as defined by WINS, is "the creation and application of excellent management, design and operation to protect people and the environment from accidents, plant malfunctions and human error." It deals mainly with prevention of nuclear accidents and errors, a more intimate undertaking, that aim at reducing the chances of accidental or inadvertent nuclear detonation, or radiation. On the other hand, nuclear security deals mainly with physical security around nuclear sites or sources that aim at prevention of malicious acts like intrusion and prevention of illegal transfer of nuclear weapons or materials, as IAEA defines it as "the prevention and detection, and response to, theft, sabotage, unauthorized access, illegal transfer or other malicious acts involving nuclear material, other radioactive

substances, or their associated facilities." This requires adoption of various measures like 'physical protection, facility design, personnel vetting, information technology (IT) security, technical measures, etc.'

Both nuclear safety and nuclear security do consider the risks of intentional and inadvertent events that could threaten safe nuclear custody, but 'nuclear security places additional emphasis on deliberate acts that are intended to cause harm.'[21]

ii. *Though nuclear safety and nuclear security are distinct, they are closely related:*

Firstly, they both aim at protecting people against unplanned nuclear detonation or radiation – the former does so by ensuring that safety measures are properly put in place to prevent nuclear accidents and errors, while the later, by ensuring that individuals are prevented from indulging in malicious acts; secondly, measures taken to ensure nuclear safety can enhance nuclear security and *vice versa*, which can be termed as positive overlap. This would augment the overall safety. For instance, the application of nuclear safety design in nuclear warhead like that of *stronglinks* and *weaklinks*[22] not only prevent nuclear detonation in abnormal circumstances like lightning strike, aircraft accidents, etc., but also protects the warhead from detonation in case of terrorist attack. Also, restricting access to vital areas not only limits exposure of competent personnel to radiations but also prevent access to intruders.[23] Concomitantly, application of security system like deployment of closed-circuit television and security personnel not only helps in deterring adversaries from intrusion but also help in detecting and also alleviating safety hazards emanating from accidents and human errors.

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[21] IAEA (2008), "Nuclear Security Culture," Implementing Guide, IAEA Nuclear Security Series No,7, Vienna, p.5, [Online: Web] Accessed June 15, 2012, URL: http://www-pub.iaea.org/MTCD/publications/PDF/Pub1347_web.pdf

[22] *Stronglinks* and *weaklinks* prevent firing set stimulus from reaching the detonators in case of abnormal circumstances. These are two critical elements in the concept of enhanced nuclear detonation safety (ENDS). The US Office of the Assistant Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs (2011), *The Nuclear Matters Handbook: Expanded Edition,* pp.66-67, [Online: Web] Accessed September 23, 2011, URL: http://www.acq.osd.mil/ncbdp/nm/nm_book_5_11/docs/NMHB2011.pdf

[23] Khripunov, Igor (2012), "Nuclear and Radiological Security Culture: A Post-Seoul Summit Agenda," Report of the workshop "In Search of Sustainable CBRN Security Culture," held in Athens, GA, USA, Feb.6-8, 2012, Center for International Trade & Security, The University of Gerogia, p.17, [Online: Web] Accessed June 15, 2012, URL: http://cits.uga.edu/events/workshop/report1.pdf

Secondly, there is, however, a down-side to it – a negative overlap – in which measures to ensure nuclear safety could come in the way of nuclear security and *vice versa*. For instance, the deployment of barriers for security reasons could hamper swift response to safety events and also impede emergency evacuation. Also, the manner in which the security personnel position themselves during an attack will also pose a threat to safety if the nuclear warhead or other elements critical to safety come in the line of fire.[24]

There are also some areas, where they are mutually exclusive, in the sense that some nuclear safety issues have no security implications and *vice versa*. For instance, nuclear safety issues relating to reactor pressure vessel operating conditions have no security implications. Also, some security issues relating to theft or loss of nuclear information such as theft of Intellectual Property have no safety implications.[25] This area of exclusivity is, however, minute.

Because measures relating to nuclear safety and nuclear security affect each other in both positive and negative ways, for a robust system to protect people and environment, an integrated approach to nuclear safety and nuclear security is essential. Emphasizing this, the IAEA document, "The Physical Protection of Nuclear Material and Nuclear Facilities," states that safety specialists and physical protection specialists should cooperate and coordinate with each other so that "potential conflicting requirements, resulting from safety and physical protection considerations, should be carefully analyzed to ensure that they do not jeopardize nuclear safety, including during emergency conditions."[26] Also, the Communiqué of the 2012 Seoul Nuclear Security Summit stated that "nuclear security and nuclear safety measures should be designed, implemented and managed in nuclear facilities in a coherent and synergistic manner… so that neither security nor safety is compromised."[27]

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[24] Ibid., p.17.
[25] WINS (2011), "An Integrated Approach to Nuclear Safety and Nuclear Security", Revision 1.1, A WINS International Best Practice Guide for your Organization, p.3.
[26] *The Physical Protection of Nuclear Material and Nuclear Facilities*, (1999), IAEA, INFCIRC/225/Rev.4, Vienna, Section 7.1.5, [Online: Web] Accessed February 22, 2012, URL: http://www.iaea.org/Publications/Documents/Infcircs/1999/infcirc225r4c.pdf
[27] *Seoul Communiqué*, Nuclear Security Summit, Seoul 2012, p.4. [Online: Web] Accessed June 15, 2012, URL: http://www.thenuclearsecuritysummit.org/userfiles/Seoul%20Communique_FINAL.pdf

iii. *Ensuring safety of nuclear weapons means more than just safety and security of nuclear warheads:*

It is much broader as it includes safety and security of nuclear materials, nuclear installation, personnel, command and control, nuclear weapon delivery systems, sensitive information relating to nuclear matter, etc.

iv. *The objective of nuclear safety and nuclear security is to protect people and environment from inadvertent or purposeful acts that could cause nuclear detonation or nuclear radiation*:

Towards this end, securing all nuclear sources is most vital. The Convention on the Physical Protection of Nuclear Material (CPPNM) 1980, as amended in 2005, underscores the need for protection of nuclear materials in the state of 'use, storage and transport' to 'prevent unlawful taking and use of nuclear material.'[28] (In this dissertation, to avoid monotony, the term safety will be referred to mean both safety and security, if not stated otherwise).

Nuclear Security Culture and Nuclear Safety Culture

In order to ensure a persisting endeavor for a robust system for ensuring safety of nuclear weapons, there are two other aspects that need to be adopted, namely, the inculcation of *nuclear security culture* and *nuclear safety culture*. The IAEA defines nuclear security culture as "the assembly of characteristics, attitudes and behaviour of individuals, organisations and institutions which serves as a means to support and enhance nuclear security."[29] While nuclear safety culture is defined as, "that assembly of characteristics and attitudes in organisations and individuals which establishes that, as an overriding priority, protection and safety issues receive the attention warranted by their significance"[30] Both nuclear security culture and safety culture deals with the human

[28] *Convention on the Physical Protection of Nuclear Material* (2005), United Nations Organisation, [Online: Web] Accessed October 11, 2012, URL: http://www.nti.org/e_research/official_docs/inventory/pdfs/aptcppnm.pdf

[29] IAEA (2008), "Nuclear Security Culture," IAEA Nuclear Security Series No. 7, p.3, [Online: Web] Accessed June 15, 2012, URL: http://www-pub.iaea.org/MTCD/publications/PDF/Pub1347_web.pdf

[30] Ibid., p.5.

dimension of beliefs and motivations in determining what constitute nuclear threats or risks and how best to deal with them. This is achieved through a sustained accumulation of knowledge and practices over a period of time. Development of nuclear security and safety culture helps states, organisations and institutions to constantly assess security and safety systems, predict their performance against changing scenarios, and stay ahead of the threats.[31]

Emphasizing the need for a sustained endeavor towards ensuring nuclear safety and security, in 2008, the IAEA brought out a an implementation guide titled, "Nuclear Security Culture," which accentuated the need for enhancing nuclear security culture and nuclear safety culture so that individuals, organisations and institutions persists in following best practices to prevent and combat nuclear threats. The 2010 Nuclear Security Summit held in Washington, DC, also underscored the human dimension of nuclear security by emphasizing 'the importance of culture as a critical contributing factor to nuclear security.'[32] The 2012 Seoul Nuclear Security Summit has taken forward the significance of this issue and encouraged States, organisations and institutions to share best practices to promote and sustain a strong security culture.[33]

The Theoretical Debate

The theoretical discourse on the issue of nuclear safety can be inferred from the debate between optimists and pessimists on the safety and reliability of high technology systems – the normal accident theory and high reliability theory, respectively, both of which are organisation theories. The "high reliability theory" which represents the optimistic view, asserts that operation of complex technology can be extremely safe if appropriate organisational design and management techniques are followed.[34] On the

[31] Khripunov, Igor (2012), "Nuclear and Radiological Security Culture: A Post-Seoul Summit Agenda," Report of the workshop "In Search of Sustainable CBRN Security Culture," held in Athens, GA, USA, Feb.6-8, 2012, Center for International Trade & Security, The University of Gerogia, p.5. [Online: Web] Accessed June 15, 2012, URL: http://cits.uga.edu/events/workshop/report1.pdf
[32] Ibid., p.5.
[33] "Seoul Communiqué," Nuclear Security Summit, Seoul 2012, p.5. [Online: Web] Accessed June 15, 2012, URL: http://www.thenuclearsecuritysummit.org/userfiles/Seoul%20Communique_FINAL.pdf
[34] Mishra, Sitakanta (2011), "Contours of India's Nuclear Safety", *AIR POWER Journal,* Vol.6, No. 2, Summer (April-June), p.82.

other hand, the pessimistic view represented by "normal accident theory" asserts that serious accidents are inevitable in high technology system because of the inherent complexity associated with it. While high reliability theory appeals to the rationality of men and organisational capabilities, normal accident theory appeals to the unpredictability and imperfection of men and machine.

High-Reliability Theory

Proponents of high-reliability theory believe in the professionalism and rational aspect of organisations that run high technology systems. They believe that, while accidents may be normal, serious ones can be prevented by implementing certain organisational practices. Weick and Sutcliffe suggests that high-reliability organisations like power grid dispatching centers, air traffic control systems, nuclear aircraft carriers, nuclear power plants, etc, implement expert business processes into the organisation, enabling them to be highly alert to prospects of unexpected outcomes like accidents, thus creating condition for high reliability.[35] Analyzing U.S. aircraft carrier operations at sea, Rochlin, La Porte and Roberts finds that operating under most extreme conditions in the least stable environment in which failure could be disastrous, the U.S. Navy managed to perform daily a number of highly complex technical tasks through long training, careful selection, task and team stability, and cumulative experience. They suggest that higher risks instill the need for greater alertness and adoption of better operational practices in which ensuring redundancy is a critical aspect. This organisational structure was based on a decentralized system, where tasks and authority was broken down internally to facilitate efficient and coordinated operations.[36]

Underlining belief in human creativity, Joseph Marone and Edward Woodhouse asserts that despite challenges posed by modern technologies associated with toxic chemicals, nuclear power, etc., safety record has been surprisingly good largely because of deliberate human innovations by which organisational processes and strategies are

[35] Weick KE, Sutcliffe KM. (2001), *Managing the Unexpected: Assured High Performance in an Age of Complexity.* San Francisco: Jossey-Bass, p.3-4.
[36] Rochlin, Gene I. et al. (2005), "The Self-Designing High-Reliability Organization: Aircraft Carrier Flight Operations at Sea," *The CEO Refresher,* p.1-3. [Online: Web] Accessed August 16, 2011, URL: www.caso-db.uvek.admin.ch/Documents/MTh_SM_22.pdf

created and maintained to monitor, evaluate and reduce risks.[37] In a similar fashion, Aaron Wildavsky's states in his book *Searching for Safety* that the entrepreneurship has contributed to safety of complex systems in contemporary society by shifting "from a passive prevention or harm to a more active search for safety," which meant anticipating and preventing potential risks and readiness in dealing with untoward incidents. He asserts that "trial-and-error risk taking" and increasing the pool of general resources, such as wealth and knowledge are important part of the strategy for securing safety. [38]

Todd La Porte and Paula Consolini appeals to rationality of organisations as they points out that high-reliability organisations are also called "closed rational systems" as they have highly formalized structures oriented toward the achievement of clear and consistent goals. For this they (organisations) go to great efforts to minimize the effects that actors and the environment outside the organisation have on the achievement of such objectives. Such organisations maintain the goal of avoiding altogether serious operational failures so as to maintain high-reliability operations.[39]

Scott D. Sagan summarizes high-reliability theory to four essential elements for it to be successful: (a) high management priority on safety and reliability; (b) redundancy and backup for people and equipment; (c) decentralized organisation with strong culture and commitment to training; and (d) organisational learning through trial and error, supported by anticipation and simulation. The theory holds that adoption of these elements will substantially limit accidents and failures and simultaneously result in high performance of complex systems. He, however, argues that the success of high-reliability theory will be restricted for several reasons, which includes: ambiguity about incident causation; the politicized environment in which incident investigation takes place; the human tendency to cover up mistakes, and the secrecy both within and between

[37] Sagan, Scott D. (1993), *The Limits of Safety: Organizations, Accidents, and Nuclear Weapons,* New Jersey: Princeton University Press, p.14.
[38] Wildavsky, Aaron (1988), *Searching for Safety*, Transaction Books, N.J.: New Brunswick, p.2.
[39] Todd R. La Porte (1988), "The United Air Traffic System: Increasing Reliability in the Midst of Rapid Growth", in Renate Mayntz and Thomas P. Hughes, eds., *The Development of Large Technical Sysems,* Boulder, Colo: Westview Press, p.224.

competing organisations.[40] The theory, thus, seem to have ignored an important aspect, that of the interactions between organisations within a politicized environment.

Thus, the common assumption of the high reliability theorists is not a simple belief in the ability of human beings to behave with perfect rationality but rather, it is the belief that organisations, if properly designed and managed, can compensate for well-known human frailties and can therefore be significantly more rational and effective than can individuals.[41] Drawing from the high reliability theory's optimistic conclusion, it can be inferred that high technology system like nuclear weapons system and nuclear command and control system will largely be safe because of the inherent tendency of organisations to take appropriate steps to predict, prevent and respond to potential risks. The question remains as to how it will fare in a politicized and secrecy environment.

Normal Accident Theory

The normal accident theory presents its pessimistic forecast about the inevitability of accidents by basing the argument on the imperfection and unpredictability of men and organisations dealing with high technology systems. Questioning the consistency and rationalism of organisations, Scott D. Sagan presents the perspective on "organized anarchies" developed by Cohen, March and Olsen,[42] which asserts that complex organisations are not entirely rational entity as it makes decisions under conditions of anarchy characterized by: problematic preferences marked by inconsistencies and ill-defined preferences or goals; unclear technology, which means that the processes are not understood by its members and it operates on trial-and-error procedures; and fluid participation, meaning that participants vary in ability and dedication to the organisation and is subject to constant changes. By pointing out the inherent irrationality and

[40] Cooke, David L. and Rohleder,Thomas R. (2006), "Learning from incidents: from normal accidents to high reliability", *System Dynamics Review,* Vol. 22, No. 3., Fall, p.216, [Online: Web] Accessed August 9, 2012, URL: https://edit.ethz.ch/er/teaching/Incident_catastrophes_learning_prediction.pdf
[41] Sagan, Scott D. (1993), *The Limits of Safety: Organizations, Accidents, and Nuclear Weapons,* New Jersey: Princeton University Press, p.16.
[42] Cohen, Michael D. et al. (1972), "A Garbage Can Model of Organizational Choice," *Administrative Science Quarterly,* Vol. 17, No. 1, March, p. 1, [Online: Web] Accessed August 9, 2011, URL: http://almaweb.unibo.it/cio/0.pdf

imperfections that indicate the propensity of conflicting interests and uncertainty within the organisation, it offered an alternative approach to organisation theory.[43]

The foundations of normal accident theory were laid by Charles Perrow (1984). The basic foundation of this theory is that any systems that human design, build and run, can never be perfect and more so for high technology or complex systems like nuclear power plants, weapons systems, air transport system, traffic control, etc. This is because in complex technology systems, there are too many variables which make control and predictions about every potential error impossible. Therefore, Perrow states, "Serious accidents are inevitable, no matter how hard we try to avoid them."[44] He illustrates the reason for inevitability of accidents in high technology system by identifying two basic characteristics of such systems: the *interactive complexity* and *tight coupling* of components. According to him it is these features that make accidents inevitable.[45] By *interactive complexity* he refers to the sophisticated interactions between parts, components and operators in a high technology system which leads to unfamiliar or unplanned and unexpected sequences of events in a system that is either not visible or not immediately comprehensible. A tightly coupled system is referred to one that is highly interdependent, in which, each part of the system is closely connected to many other parts and therefore a change in one part can rapidly affect the status of other parts.[46] While this is so designed for efficient performance of targeted task, in case of error in one part, a chain of errors takes place. This leads to accidents with disastrous consequence. Citing the example of the accident at Three Mile Island in which a combination of technical and human error caused America's worst nuclear accident, he comes to this conclusion that their could be many reasons for accidents to happen in spite of all good intent: failure on the part of builders, components, technicians or operators.[47] Thus, unpredictability and highly interdependent and complex operational sequences makes accidents inevitable. On the other hand, a loosely coupled or decoupled system is less tightly linked between parts

[43] Sagan, Scott D. (1993), *The Limits of Safety: Organizations, Accidents, and Nuclear Weapons,* New Jersey: Princeton University Press, p.29-30.
[44] Perrow, Charles (1984), *Normal Accidents: Living with High-Risk Technologies,* New York: Basic Books, p.3.
[45] Ibid., p.5.
[46] Ibid.
[47] Ibid., p.15-29.

and therefore is able to absorb failures or unplanned behavior, thus preventing deadly consequences.[48]

Sagan D Scott agrees with Perrow as he analyses nuclear power plants in which critical components are designed to be kept in close proximity in a complex order, necessitating highly time-dependent and very precise process within a containment building, increasing the possibility of unplanned interactions leading to hazardous accidents.[49] He agrees that while organisations managing hazardous technologies may be rare, they are inevitable over time.

In contrast to high reliability theory, the normal theory, thus, holds that high technology systems with interactive complexity and tight coupling will invariably experience accidents that cannot be foreseen or prevented.[50] In this system, independent failure events can interact in ways that cannot be predicted by the designers and operators of the system. As such, apparently trivial incidents/mishap can lead to cascading of effects that can quickly spiral out of control before operators are able to comprehend the situation and perform appropriate corrective actions.[51] The main argument put forth is that the efforts to improve safety in interactively complex, tightly coupled systems involve increasing complexity and therefore only render accidents more likely.

Critically examining both the theories, Marais, Dulac and Leveson says that high reliability theory oversimplifies the problems faced by engineers and organisations building critical safety systems, overemphasizes faith in redundancy and does not take enough consideration of uncertainty. Normal accident theory, on the other hand, does recognize the difficulties involved but is too pessimistic about effectively dealing with risks.[52] They say that both only concentrate on the limited narrow traditional conception of accidents as chain-of-events, which fail to take a broader view of causality of accidents

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[48] Marais, Karen et al. (2004), "Beyond Normal Accidents and High Reliability Organizations: The Need for an Alternative Approach to Safety in Complex Systems", March 25, p.1, [Online: Web] Accessed August 16, 2011, URL: http://esd.mit.edu/symposium/pdfs/papers/marais-b.pdf

[49] Sagan, Scott D. (1993), *The Limits of Safety: Organizations, Accidents, and Nuclear Weapons,* New Jersey: Princeton University Press, pp.32 & 35.

[50] Cooke, David L. and Rohleder, Thomas R. (2006), "Learning from incidents: from normal accidents to high reliability", *System Dynamics Review,* Vol. 22, No. 3., Fall, p.215, [Online: Web] Accessed August 9, 2012, URL: https://edit.ethz.ch/er/teaching/Incident_catastrophes_learning_prediction.pdf

[51] Marais, Karen et al. (2004), "Beyond Normal Accidents and High Reliability Organizations: The Need for an Alternative Approach to Safety in Complex Systems", March 25, p.2., [Online: Web] Accessed August 16, 2011, URL: http://esd.mit.edu/symposium/pdfs/papers/marais-b.pdf

[52] Ibid., p.1.

in complex system. Given the limitations, they propose an alternative systems approach to safety which "considers accidents as arising from the interactions among system components, including people, societal and organisational structures, engineering activities, and physical system components."[53] This approach, thus, claim to take into consideration the broad socio-technical system in ensuring safety. The approach is largely a new one, and has not developed into a distinct alternative theory to normal accident and high reliability theory.

A comparison of the two theoretical perspective shows that both the theories gives equally compelling logic regarding the safety of high technology system. It seems that the conclusions of the high reliability theory is largely accepted as nuclear safety programme around the world shares the belief that "isolation away from society, intense socialization, and strict discipline of organisation members," like that of an ideal military model can enhance reliability and safety.[54] Taking a cue from normal accident theory, it will be pertinent for analysts and policy makers to look into safety of high technology systems like nuclear weapons system and command and control from a skeptical view-point and at the same time believe in the high reliability theory's optimism that maximum safety can be ensured by following a robust organisational design and management. While uncertainty is the basic problem, redundancy and continuous vigilance and training will go a long way in ensuring safety.

Like other countries, Pakistan seems to have agreed to the logical conclusion of high reliability theory and has established an all encompassing nuclear command and control system, the National Command Authority, in February, 2000, charged with the management of all issues relating to nuclear matters. The critical question is: How efficient is this organisation that manage nuclear weapons capabilities? The organisational structure and measures put in place for safety and reliability of nuclear weapons system will be discussed in Chapter 2.

[53] Ibid., pp.13-14.
[54] Mishra, Sitakanta (2011), "Contours of India's Nuclear Safety", *AIR POWER Journal,* Vol.6, No. 2, Summer (April-June), p.84.

Taking Stock of Threats to Safety of Nuclear Weapons

Nuclear weapon system – which include nuclear warhead, nuclear materials, personnel associated with nuclear matters, delivery system and sensitive nuclear technology and information – faces threats from possible accidents, theft, sabotage, inadvertent or unauthorized use. Threats could come from various aspects such as threat from technical errors or procedural failure, or from individuals or groups with nefarious intent like terrorists/extremists.

The nuclear accidents of Three Miles Island (Pennsylvania) on March 28, 1979 and Chernobyl (Ukraine) on April 26, 1986, introduced to the world the harmful effects of nuclear mishaps. The Chernobyl nuclear accident was by far the most severe as the radiation caused serious health hazards which eventually killed thousands of people, forced the evacuation and resettlement of over 350,000 people, and caused an estimated $300 billion of economic loss.[55] In 1996, Jacques Libmann estimated that radiation would in the long run cause 500 deaths from leukemia and 6000 from cancer.[56] The accident at Three Miles Island exposed two million people in the vicinity to small dose of radiation, and thousands had to be evacuated.[57] Though there has not been a single nuclear detonation recorded since the last bombs were dropped by U.S. on Hiroshima and Nagasaki in August 1945, which killed at least 340,000 people,[58] there have been nuclear weapons accidents which did not result in nuclear detonation but led to dispersal of nuclear materials. Between 1950 and 1980, U.S. nuclear weapons were involved in 32 accidents, of which, only two accidents, those at Palomares, Spain, and Thule, Greenland, resulted in dispersal of nuclear materials.[59] While this point to relative safety of nuclear weapons, it also shows the associate proneness of accidents, of which, a single failure of safety system could be grievous.

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[55] Greenpeace Nuclear Campaign, as cited in Allison, Graham (2004), *Nuclear Terrorism: The Ultimate Preventable Catastrophe,* New York: Times Books Henry Holt and Company, p.7.
[56] Libmann, Jacques (1996), *Elements of Nuclear Safety,* English translation by Jean Mary Dalens, Institut De Protection et de Surete Nucleaire, France: les editions de physique, p.291.
[57] Allison, Graham (2004), *Nuclear Terrorism: The Ultimate Preventable Catastrophe,* New York: Times Books Henry Holt and Company, p.54.
[58] Ibid., p.51.
[59] Plummer, David W. and Greenwood, William H. (1998 Declassified), "The History of Nuclear Weapons Safety Devices", Sandia National Laboratories, Albuquerque, p.1, [Online: Web] Accessed August 16, 2011, URL: http://navynucweps.com/History/historynwsafdev.pdf

The threat of nuclear terrorism has placed the issue of safety of nuclear weapons in the forefront. While the issue of loose nuclear weapons and fissile materials that emerged in the 1990s following the disintegration of Soviet Union brought the threat of nuclear terrorism to prominence, the 9/11 terror attack showed that the possibility of nuclear terrorism is real. Nuclear terrorism is attractive option for terrorists because apart from potential for mass destruction, it has the feature of achieving a unique type to public fear and trauma because of the negative societal association with almost anything nuclear. So, nuclear terrorism of any type could be an obvious means to achieve one goal common to all terrorism – causing a psychological reaction within the target community.[60] Matthew Bunn and Anthony Wier points out that though a nuclear attack might be a very difficult missions for terrorist group could hope to try, given the complicated nature on nuclear technology, if a highly capable group acquired a stolen nuclear bomb or sufficient fissile material to make one, they could most likely use it.[61]

While it is true that so far no terrorist groups has successfully exercised the nuclear option, the growing lethality of terrorist attacks and the fact that terrorist groups have revealed their interests in taking the nuclear path is a cause for deep concern. Among the most notorious was Aum Shinrikyo, known for Tokyo sarin gas attack in 1995. The terror group went as far as purchasing a sheep farm in Australia thought to be rich in uranium deposits.[62] Al Qaeda has been the most active among terrorist groups seeking to acquire nuclear weapons and weapons-grade unclear materials. Their efforts in this regard dates as far back as 1992. It tried unsuccessfully to purchase uranium in Khartoum, Sudan between 1993 and 1994 but continued its efforts to acquire uranium and nuclear warheads through out the 1990s. Its efforts took a significant turn when, in August 2001, Bin Laden and Mullah Omar (Taliban's leader) met with two former Pakistani nuclear scientists, Sultan Bahsir-ud-din Mahmood and Chaudhry Abdul Majid in Kandahar and discussed on nuclear matters.[63] The fear is that the scientists could have

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[60] Ferguson, Charles D. (2004), *The Four Faces of Nuclear Terrorism*, Monterey Institute - Centre for Nonproliferation Studies, Nuclear Threat Initiative, California, p.27.
[61] Bunn, Matthew and Wier, Anthony (2006), "Terrorist Nuclear Weapon Construction: How Difficult?" *Annals of the American Academy of Political and Social Science*, Vol. 607, September, p.133, [Online: Web] Accessed August 16, 2011, URL: http://ann.sagepub.com/content/607/1/133.full.pdf+html
[62] Blair, Charles P. (2009) "Jihadist and Nuclear Weapons" in Gary Ackerman and Jeremy Tamsett (eds.) *Jihadists and Weapons of Mass Destruction*, Boca Raton: CRC Press Taylor & Francis Group, p.198.
[63] Ibid., p.213.

given Al-Qaeda or Taliban classified information on producing nuclear weapons or probably conversed on facilitating access to Pakistani nuclear weapons.[64]

Huge global stock of nuclear weapons and fissile materials,[65] some of which are poorly secured means that they remain vulnerable to misuse. As observed by Charles D. Ferguson, there are essentially four ways by which terrorists exploit military and civilian nuclear assets around the globe to serve their destructive ends:

i. The theft and detonation of an intact nuclear weapon
ii. The theft or purchase of fissile material leading to the fabrication and detonation of a crude nuclear weapon – an improvised nuclear device (IND)
iii. Attacks against and sabotage of nuclear facilities, in particular nuclear power plants, causing the release of large amounts of radioactivity
iv. The unauthorized acquisition of radioactive materials contributing to the fabrication and detonation of a radiological dispersion device (RDD) – a "dirty bomb" – or radiation emission device (RED).[66]

The Case of Pakistan

In the post-9/11 terror attack, Pakistan came to be seen as the potential ground for terrorist to obtain nuclear capabilities because it has nuclear weapons and extensive civil and military nuclear infrastructure but provide little information about the security of its nuclear capabilities.[67] International concerns about safety of Pakistan's nuclear weapons rise mainly due to factors like evidences of nuclear black-marketing emanating from

[64] Albright, David (2002), "Al Qaeda's Nuclear Program: Through the Window of Seized Documents," [Online: Web] Accessed August 16, 2011, URL: www.ippnw-students.org/.../Al%20Qaeda's%20nuclear%20program.doc

[65] IPFM report of 2010 projects that global stockpile of highly enriched uranium (HEU) was about 1475 tons, enough for more than 60,000 simple fission weapons and the global stockpile of separated plutonium was about 485 tons. The nine nuclear weapons states: US, Russia, the United Kingdom, France, China, Israel, India, Pakistan and North Korea are estimated to have nuclear warhead stock of about 20540. See, International Penal on Fissile Materials (2010), *Global Fissile Material Report 2010,* [Online: Web] Accessed September 23, 2011, URL: http //fissilematerials.org/library/gfmr10.pdf; SIPRI Report of 2011 put the global stock of nuclear warhead at 20530. See, *SIPRI Report 2011,* [Online: Web] Accessed September 23, 2011, URL: http://www.sipri.org/yearbook/2011/07

[66] Ferguson, Charles D. (2004), *The Four Faces of Nuclear Terrorism,* Monterey Institute - Centre for Nonproliferation Studies, California: Nuclear Threat Initiative, p.3.

[67] Warrick, Joby (2007), "Pakistan Nuclear Security Questioned: Lack of Knowledge About Arsenal May Limit U.S. Options," *Washington Post,* November 11, [Online: Web] Accessed August 16, 2011, URL: http://www.washingtonpost.com/wp-dyn/content/story/2007/11/10/ST2007111001833.html

Pakistan in the form of Abdul Qadeer Khan's (A.Q. Khan) clandestine network, cooperation of former Pakistani nuclear scientists with al-Qaeda and Taliban,[68] the endemic Islamic radicalism and terrorists activities in Pakistan, political instability, high alert state of nuclear posture and low technical capability and infrastructure. Also, factors like the linkages between Pakistan's military and Pakistan's Directorate for Inter-Services Intelligence (ISI) with terrorist groups increase these concerns. The assassination attempts on former President Pervez Musharraf and controversies surrounding the arrest of suspected mastermind of September 9/11, Khaled Sheikh Muhammed, shows dangerous collusion between the military, intelligence and terrorist groups.[69] It is feared that safety of Pakistan's nuclear weapons and materials could be victim to 'insider', 'outsider' and 'insider-outsider' cooperation/conspiracy threats. Due to these factors, it has been viewed that Pakistan's nuclear weapons are under constant threat. In response to these kinds of threats U.S. Secretary Condoleezza Rice has stated in 2005 that the U.S. has "contingency plans" in place to deal with the possibility of Pakistani nuclear weapons falling into unauthorized hands. It was speculated that U.S. may have plans either to destroy *in situ* or to take physical possession of Pakistan's nuclear weapons.[70] Such negative speculations, though invariably prodded Pakistan to adopt nuclear weapons safety measures, seem to have degraded confidence in Pakistan's ability to secure its nuclear weapons.

Pakistan seems to have taken significant steps to secure its nuclear capabilities. Coming under international pressure, which came in the form of direct communication from prominent leaders or threat perceptions that appeared in the literatures, to secure its nuclear capabilities, Pakistan established the National Command Authority (NCA) on

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[68] Former Pakistani Scientists Sultan Bashir-ud-din Mahmood and Abdul Majid met Osama Bin Laden and Mullah Omar in August, 2001. See, Blair, Charles P. (2009) "Jihadist and Nuclear Weapons" in Gary Ackerman and Jeremy Tamsett (eds.) *Jihadists and Weapons of Mass Destruction*, CRC Press Taylor & Francis Group, Boca Raton, p.213.

[69] Luongo, Kenneth N. and Salik, Naeem (2007), "Building Confidence in Pakistan's Nuclear Security," *Arms Control Today*, December, [Online: Web] Accessed August 16, 2011, URL: http://www.armscontrol.org/act/2007_12/Luongo; Blair, Charles P. (2009) "Jihadist and Nuclear Weapons" in Gary Ackerman and Jeremy Tamsett (eds.) *Jihadists and Weapons of Mass Destruction*, Boca Raton: CRC Press Taylor & Francis Group, pp.207-209; and Singh, Garima (2006), *Pakistan's Nuclear Disorder: Weapons, Proliferation, and Safety*, New Delhi: Lancer Publishers & Distributors, pp.35-40.

[70] United Press International (2005), "U.S. Contingency Plan for Pakistani Nukes", Washington, January 19, [Online: Web] Accessed August 16, 2011, URL: http://www.spacedaily.com/news/nuclear-blackmarket-05d.html

February 7, 2000, charged with the governance of its nuclear capabilities. The safety of nuclear weapons is one of its important objectives. This system was put into effect in 2001. In 2007, President Pervez Musharraf transformed the ordinance establishing the system into a law. In terms of authority in policy and strategy making, the military continue to play a greater role. Though in November 2009, President Asif Ali Zardari relinquished nuclear responsibility to Prime Minister Syed Yousuf Raza Gilani,[71] this did not indicate greater civilian control over the military's nuclear control. The chairmanship of the NCA was formally bestowed on the Prime Minister by the National Command Authority Act of 2010.[72] According to various estimates, Pakistan is believed to have 90-110 nuclear warheads[73] and an impressive delivery system with varying capability and is continuing to enhance this, quantitatively and qualitatively. As the numbers of nuclear weapons increase in Pakistan, the concern about their safety increases.

To enhance international confidence in safety of its nuclear capabilities it has joined nuclear safety regimes. Pakistan is a state party to the CPPNM 1980, the Convention on Nuclear Safety, adheres to UNSC Resolution – 1540 and all safeguarded facilities are inspected by IAEA regularly.[74] The adoption of Export Control Act 2004, that controls export of materials, equipments and services relating to nuclear and biological weapons and delivery system, has been the recent most significant initiative taken by Pakistan.[75] Pakistan claims that it has elaborate safety and security measures for its nuclear weapons like installation of indigenous PALs-like safety mechanism in nuclear arsenal, "two-men" or/and "three-men" rule for any nuclear operation, separation of nuclear components, Personnel Reliability Programme and layers of high physical

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[71] Akhtar, Rabia and Hussain, Nazir (2010), "Safety and Security of Pakistan's Nuclear Assets", in Usama Butt and N Elahi (eds.), *Pakistan's Quagmire: Security, Strategy, and the Future of the Islamic-nuclear Nation*, New York: Continuum International Publishing Group, pp.178-179; and Krepon, Michael (2009), "Whose Hand Is On The Nuclear Button In South Asia?" December 03, [Online: Web] Accessed August 16, 2011, URL: http://www.stimson.org/spotlight/whose-hand-is-on-the-nuclear-button-in-south-asia/

[72] *National Command Authority Act 2010*, The Gazzette of Pakistan, [Online: Web] Accessed September 23, 2011, URL: www.na.gov.pk/uploads/documents/1300934560_193.pdf

[73] *SIPRI Report 2011*, [Online: Web] Accessed September 23, 2011, URL: http://www.sipri.org/yearbook/2011/07

[74] Ali, Zafar (2007), "Pakistan's Nuclear Assets and Threats of Terrorism: How Grave is the Danger?" The Henry L. Stimson Center, July, p.17, [Online: Web] Accessed August 16, 2011, URL: www.stimson.org

[75] Luongo, Kenneth N. and Salik, Naeem (2007), "Building Confidence in Pakistan's Nuclear Security," *Arms Control Today*, December, [Online: Web] Accessed August 16, 2011, URL: http://www.armscontrol.org/act/2007_12/Luongo

security measures apart from other measures.[76] While secrecy is an important part of Pakistan's nuclear safety measures,[77] interestingly, it is this secrecy that increases international concerns about safety of its nuclear weapons. Since 2001, the U.S. has been assisting Pakistan with nuclear safety measures though Pakistan seems to have declined technology transfers perceived to be intrusive or likely to compromise programme secrecy.[78] Such assistance is also controversial as this is also viewed as going against non-proliferation principle: some see it as reward to nuclear proliferator, Pakistan, who is not a member of Nuclear Nonproliferation Treaty (NPT). On the other hand, some see it as a pragmatic step; as such assistance will strengthen nuclear security in Pakistan and actually help prevent further proliferation.

Opinions regarding safety of Pakistan's nuclear weapons vary between the pessimists and optimists. While the pessimists see eminent danger to safety of Pakistan's nuclear weapons the optimists downplays such fears. Among the pessimists, the tardy Pakistan's nuclear proliferation record, rise in Islamic fundamentalism, political and social instability and economic backwardness are seen as major reasons for concern about the safety of Pakistan's nuclear assets. Analyzing the predicament of nuclear Pakistan, a new nuclear weapon state in the "second nuclear age," Bhumitra Chakma writes in his book *Pakistan's Nuclear Weapons* that the efficacy of Pakistan's nuclear command and control structure is questionable. Given, financial and technological constraints, political instability, rise of Islamist influence, most likely delegative control system and built-in structural weaknesses in Pakistan's nuclear control structure – of which the A.Q. Khan's proliferation network is a case in point – Pakistan remains vulnerable when it comes to ensuring the safety of nuclear weapons and prevention of accidental use of nuclear weapons.[79] He is of the opinion that unless Pakistan becomes politically and economically stable, the concerns about safety of its nuclear assets will remain. On a

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[76] Clary, Christopher (2010), "Thinking about Pakistan's Nuclear Security in Peacetime, Crisis and War," IDSA Occasional Paper No. 12, September, pp.15-16, [Online: Web] Accessed August 16, 2011, URL: www.idsa.in/system/files/OP_PakistansNuclearSecurity.pdf

[77] Ibid.

[78] Luongo, Kenneth N. and Salik, Naeem (2007), "Building Confidence in Pakistan's Nuclear Security," *Arms Control Today*, December, [Online: Web] Accessed August 16, 2011, URL: http://www.armscontrol.org/act/2007_12/Luongo

[79] Chakma, Bhumitra (2009), *Pakistan's Nuclear Weapons,* Routledge, London and New York, pp. 78, 79, 122 & 124.

similar note, in her book, *Pakistan's Nuclear Disorder: Weapons, Proliferation, and Safety,* Garima Singh opines that Islamic extremism, political instability, nuclear black marketing, inadequate safety measures and delegated authority system pose serious threat to safety of Pakistan's nuclear weapons and materials.[80]

A study brought out by The International Institute for Strategic Studies titled *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,* investigates A.Q. Khan's proliferation networks that spun for some 16 years with linkages to at least 20 countries[81] and observes that it did the greatest damage to Pakistan's credibility in ensuring safety of its nuclear weapons and technology. In fact, meting out of lenient penalties by Pakistan to guilty perpetrators, many of whom remain free, does not exactly deter future proliferation networks.[82] It also observes that while Pakistan seems to have set up a robust command and control system, international confidence about safety and security of Pakistan's nuclear weapons will also depend on its (Pakistan's) political stability, social and economic development and containment of Islamic fundamentalism.[83] Likewise, Paul K. Kerr & Mary Beth Nikitin observes in their article, "Pakistan's Nuclear Weapons: Proliferation and Security Issues", that political instability and future conflict between India and Pakistan would seriously pose a great threat to safety of Pakistan's nuclear weapons.[84]

In his article, "The Security of Nuclear Weapons in Pakistan", Shaun Gregory analyses safeguards adopted by Pakistan to secure its nuclear weapons and finds that the greatest threat comes from insider-outsider threat, given the rise of Islamism in Pakistan.[85] In a Congressional Testimony titled "U.S.-Pakistan Relations: Assassination, Instability, and the Future of U.S. Policy," Ashley J. Tellis believed that possible fissure within Pakistani military and the rising tide of Islamization in Pakistan poses the greatest

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[80] Singh, Garima (2006), *Pakistan's Nuclear Disorder: Weapons, Proliferation, and Safety,* Lancer Publishers and Distributors, New Delhi, pp. 35-43.
[81] IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment*, The Internationl Institute for Strategic Studies, p.7.
[82] Ibid., p.105.
[83] Ibid., p.117.
[84]Kerr, Paul K. and Nikitin, Mary Beth (2011), "Pakistan's Nuclear Weapons: Proliferation and Security Issues", CRS Report for Congress, July 20, pp.13-15, [Online: Web] Accessed September 23, 2011, URL: http://www.fas.org/sgp/crs/nuke/RL34248.pdf
[85] Gregory, Shaun (2007), *The Security of Nuclear Weapons in Pakistan*, Pakistan Security Research Unit, Department of Peace Studies of University of Bradford, pp.7,8&10, [Online: Web] Accessed September 23, 2011, URL: http://spaces.brad.ac.uk:8080/download/attachments/748/Brief_22finalised.pdf

danger to security of Pakistan's nuclear weapons.[86] Also, Bremmer and Kuusisto, in their article "Pakistan's Nuclear Command and Control: Perception Matters," identifies two main threats to safety of Pakistan's nuclear weapons: Islamist takeover of the government or the military, and the assassination or elimination of key individuals in the command and control system.[87]

In the report, "Anatomizing Non-State Threats to Pakistan's Nuclear Infrastructure: The Pakistani Neo-Taliban," Charles P. Blair observes that the greatest threat to Pakistan's nuclear assets comes from jihadists.[88] Pointing out the lack of substantive studies about motivation and capability of specific terror groups that could potentially threaten safety and security of Pakistan's nuclear assets, he looks into the position of Pakistani Neo-Taliban (PNT) and other affiliated groups, and analyses how seriously they threaten the security of Pakistan's nuclear assets. He observes that the growth of PNT has been the result of Pakistan's faulty policies and the long-standing grievances against Pakistani government. The report suggests that while Pakistan is unlikely to lose control of its nuclear weapons or materials, that situation is worsening in Pakistan is a case for grave concern.

On the positive side, optimists claim that much of pessimists' observations are alarmist in nature and does not give due emphasis on the steps taken by Pakistan to ensure safety of its nuclear weapons. Instances of the establishment of command and control system, adoption of PRP, PALs, maintenance of high secrecy about sensitive knowledge about its nuclear weapons, adherence to various international instruments on nuclear safety and security and the fact that so far no untoward incident has taken place in the nuclear sphere in Pakistan are taken as proof that the concerns about threat to nuclear safety in Pakistan is overstated. While doing so, they also cautions against complacency.

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[86] Tellis, Ashley J, (2008), "U.S.-Pakistan Relations: Assassination, Instability, and the Future of U.S. Policy", Carnegie Endowment For International Peace, p.10, [Online: Web] Accessed November 13, 2011, URL: http://www.carnegieendowment.org/files/0116_tellis_Pakistantestimony.pdf

[87] Bremmer, Ian and Kuusisto, Maria (2008), "Pakistan's Nuclear Command and Control: Perception Matters" SASSI Research Report – 15, May, London, pp.11-12, [Online: Web] Accessed September 23, 2011, URL: http://www.sassi.org/html/Pakistan%20Nuclear%20Command%20and%20Control%20Final.pdf

[88] Blair, Charles P. (2011), "Anatomizing Non-State Threats to Pakistan's Nuclear Infrastructure: The Pakistani Neo-Taliban," Terrorism Analysis Report 1, Federation of American Scientists, June, p.i, [Online: Web] Accessed September 23, 2011, URL: http://www.fas.org/pubs/_docs/Terrorism_Analysis_Report_1-lowres.pdf

In his article, "Thinking about Pakistan's Nuclear Security in Peacetime, Crisis and War", Christopher Clary observes that while there are factors that threatens security of nuclear weapons, Pakistan has taken up vital steps to secure its nuclear assets like setting up a robust command and control system with close military protection, adopted stringent safety measures and high secrecy which are important measures against any threats. He believes that threats about the likelihood of state collapse, Islamists takeover of government and internal coup by Islamist officers are minimal.[89] The fact that Pakistan's nuclear weapons have remained secure in peace and crises so far serves as proof of safety. He also cites that ensuring safety of Pakistan's nuclear weapons is closely related to ensuring political stability in Pakistan.[90]

In the article, "Safety and Security of Pakistan's Nuclear Assets" Rabia Akhtar & Nazir Hussain (2010) contends that apprehensions about safety of Pakistan's nuclear weapons are overstated. They say that the fact that Pakistan has set up a robust nuclear command and control, adheres to strict safeguards of its nuclear weapons and materials and already is a part to various international instruments on nuclear safety and security, the view that Pakistan's nuclear weapons are in eminent danger is grossly incorrect. That there has not been any records of trafficking of fissile materials, no records of nuclear accidents and has maintained clean record of nuclear safety proves that concerns about safety of Pakistan's nuclear weapons are grossly misguided. They are of the view that, if anything, "Pakistan's nuclear weapons are as vulnerable or as safe as any other country with such capabilities".[91]

In addition, Rabia Akhtar reasons in her article, "Pakistan's Nuclear Assets: Safe and Secure" that Pakistan's assertive command and control system protects against accidental or unauthorized use and is "fail-safe" compared to the delegative system which is "fail-deadly". On the issue of nuclear proliferation, she says that it belongs to the time when Pakistan's programme was covert and this problem has been addressed with firm institutionalized command and control and adherence to various international nuclear

[89] Clary, Christopher (2010), "Thinking about Pakistan's Nuclear Security in Peacetime, Crisis and War" IDSA Occasional Paper No. 12, September, pp.28-30, [Online: Web] Accessed August 16, 2011, URL: www.idsa.in/system/files/OP_PakistansNuclearSecurity.pdf
[90] Ibid., p.34.
[91] Akhtar, Rabia and Hussain, Nazir (2010), "Safety and Security of Pakistan's Nuclear Assets", in Usama Butt and N Elahi (eds.), *Pakistan's Quagmire: Security, Strategy, and the Future of the Islamic-nuclear Nation*, New York: Continuum International Publishing Group, p.192.

safety norms. As such, concerns about threats to safety of Pakistan's nuclear weapons are mere speculations and that "alienating Pakistan in this regard would be counterproductive to international non-proliferation, counter proliferation and counter terrorism efforts."[92] Again, in his article, "Pakistan's Nuclear Assets and Threats of Terrorism: How Grave is the Danger?" Zafar Ali asserts that the views that nuclear weapons in Pakistan are extremely vulnerable to terrorists' or extremists control are deliberate effort to undermine credibility of Pakistan's command and control.[93] Elaborating on how Pakistan has adopted strict rules and procedures and applied safety measures to its nuclear weapons, and adhere to various international safeguards, the concerns about eminent danger to its security of its nuclear assets are unfounded. He holds that cooperation between Pakistan and U.S. in the field of better practices in nuclear safety has increased Pakistan's capability in the crucial area of ensuring nuclear weapons safety.[94]

Zafar Iqbal Cheema, in the article "Pakistan", examines Pakistan's approach to possession and governance of its nuclear weapons. Looking into Pakistan's nuclear infrastructure, including nuclear command and control, the regulatory framework for nuclear safety and institutional mechanism developed by Pakistan to ensure safety of nuclear weapons, materials and related technology, Cheema acknowledges the dominant role of Pakistan's military and believes that this serve as a stabilizing force and guarantee to control of nuclear weapons.[95]

While opinion about whether Pakistan's nuclear weapons are safe or not differ, looking back to the past decade, since the National Command Authority was established, an enquiry into series of questions will determine how Pakistan has fared in ensuring safety of its nuclear capabilities: What are the threats to safety of Pakistan's nuclear weapons? What impact did A.Q Khan's proliferation network have on Pakistan? Were

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[92] Akhtar, Rabia (2009), "Pakistan's Nuclear Assets: Safe and Secure", CBRN South Asia Brief, June, Issue No.13, p.4, [Online: Web] Accessed August 16, 2011, URL: http://www.ipcs.org/pdf_file/issue/CBRNIB13-Rabia-PakNukes.pdf

[93] Ali, Zafar (2007), "Pakistan's Nuclear Assets and Threats of Terrorism: How Grave is the Danger?" The Henry L. Stimson Center, July, p.5, [Online: Web] Accessed August 16, 2011, URL: http://www.stimson.org/images/uploads/research-pdfs/PakistanNuclearAssets-070607-ZafarAli-FINAL.pdf

[94] Ibid., pp.16&17.

[95] Cheema, Zafar Iqbal (2010) "Pakistan", in Hans Born et al. (eds.), *Governing the Bomb: Civilian Control and Democratic Accountability of Nuclear Weapons,* SIPRI, Oxford University Press, New York, pp.212 & 214.

the international concerns about threats to safety of Pakistan's nuclear weapons justified or exaggerated? What steps did Pakistan take to instill confidence in safety of its nuclear weapon capabilities? How far has it been successful?

CHAPTER 2
PAKISTAN'S NUCLEAR WEAPONS AND ITS COMMAND AND CONTROL STRUCTURE

The development of Pakistan's nuclear weapons is predominantly security driven and, in this direction, specifically India-centric. A nuclear dream that developed initially as a peaceful endeavor in mid-1950s, two events, namely the 1971 war with India and the subsequent defeat and lose of East Pakistan; and the 1974 India's so called "peaceful nuclear explosion," triggered Pakistan's earnest quest for nuclear weapons. Being a late entrant in the race for nuclear weapons, as compared to India, Pakistan had to bear the brunt of stricter non-proliferation environment post-India's 1974 nuclear test.[1] After much hardship and political resolve, Pakistan became a nuclear state when, in a "tit-for-tat" gesture, it conducted six nuclear tests on May 28 and 30, 1998, responding to India's five nuclear tests of May 11 and 13, 1998.[2]

From a few nuclear warheads since the 1998 nuclear test, Pakistan has enormously increased its nuclear capability. As reported by Stockholm International Peace Research Institute (SIPRI), for the year 2010, Pakistan's nuclear warhead stockpile ranged between 70 and 90. After realizing the nuclear dream, it became extremely important that, like other nuclear weapon states, a robust nuclear command and control be set up to govern the development and use of nuclear capabilities. On February 2, 2000, the establishment of a National Command Authority (NCA) was announced by the National Security of Pakistan.[3] The NCA was charged with the development, employment and deployment and use of nuclear capabilities in Pakistan. The NCA was headed by the President until November 2009, when President Asif Ali Zardari ceded command of country's nuclear arsenal to Prime Minister Yousaf Raza Gilani.[4] Since the establishment of the NCA Pakistan has taken significant technical and procedural steps in the area of management and security of country's nuclear capabilities. Though the

[1] Salik, Naeem (2009), *The Genesis of South Asian Nuclear Deterrence: Pakistan's Perspective*, New York: Oxford University Press, pp. 68 & 82.
[2] Chakma, Bhumitra (2009), *Pakistan's Nuclear Weapons,* London and New York: Routledge, p.36.
[3] Ibid. p.75.
[4] Hussain, Zahid (2009), "Zardari Cedes Power to Pakistani Premier", *Wall Street Journal*, November 30, [Online: Web] Accessed September 23, 2011, URL: http://online.wsj.com/article/SB125946684948768203.html

ultimate test of robustness of nuclear command and control could be observed only in an actual nuclear battle, certain events, like that of the AQ Khan's proliferation network and Islamic fundamentalist elements in Pakistan has called into question the effectiveness of Pakistan's NCA.

Overview of Development of Pakistan's Nuclear Weapons Programme

For a convenient understanding of the history of Pakistan's nuclear development, different authors have divided the development process into phases, among which Bhumitra Chakmas' three phases in his book, *Pakistan's Nuclear Weapons*, gives a better picture. Taking a cue from him, the history of Pakistan's nuclear development can be divided into three phases: (1) 1954-1971 – the peaceful nuclear programme; (2) 1971-1989 – towards nuclear weapons; (3) 1990-1998 – post-Cold War hardships and the Bomb.

Phase I (1954-1971)

This phase is marked by the peaceful nature of Pakistan's nuclear programme in the initial stage. Following President Eisenhower's 'Atoms for Peace' programme that touched down on Pakistan, in October 1954 Pakistan announced the plan to set up a national atomic research facility. As recommended by the 12-member Atomic Energy Committee, headed by Dr. Nazir Ahmad, the Atomic Energy Council (AEC), which consisted of two organs; a governing body and Pakistan Atomic Energy Commission (PAEC), was set up in March 1956.[5] The PAEC was charged with the objectives of planning and developing peaceful uses of atomic energy. Although plans for establishment of atomic research and development were made in 1958, due to financial constraints, administrative bottlenecks and lack of skilled manpower, nothing much was done until 1960.[6] Budgetary allocation of funds for nuclear research was meager; it increased from Rs.2.5 million for the year 1955-56 to Rs.5 million in 1956-57, while the

[5] Chakma, Bhumitra (2009), *Pakistan's Nuclear Weapons*, London and New York: Routledge, p.11
[6] Ibid. p.11&12

allocation for the 'First Five Year Plan' for the period 1956-60 came up to Rs.23.5 million.[7]

Ishrat Usmani replaced Nazir Ahmad as the Chairperson of the PAEC in 1960. With support from member of President's cabinet, Z.A. Bhutto, and the President Ayub Khan, a much needed impetus to progress of the nuclear energy programme was made. This was evident in the increased allocation of funds for nuclear development programme in the second national five-year plan for the period 1960-65 amounting to Rs. 46.5 million. From 1960-68, the Pakistani government cumulatively spent Rs. 324 million for the development of nuclear technology. As a result of new initiatives, by the beginning of 1965 eight medical and agricultural centers were established and some 350 nuclear scientists and engineers were trained.[8] The Pakistan Institute of Nuclear Science and Technology (PINSTECH) was established at Nalore, under the IAEA safeguards, in 1963 with assistance from the U.S.[9] The agreement with Canada for construction of a 137 MW heavy-water reactor Karachi Nuclear Power Plant (KANUPP), negotiation of which was started in 1962, was signed in 1965.[10] The reactor was finally completed in 1971. A significant step was the establishment of the Centre of Nuclear Studies (CNS) in 1969, as this served as a powerhouse for the steady supply of trained nuclear scientists and engineers from within the country.[11]

Despite the peaceful character of its nuclear programme in the 1960s, Pakistan's perceptions regarding its nuclear goals began to change as concerns about the real intentions of India's nuclear activities grew. Two reasons pushed Pakistan to think about bringing in a military dimension to its nuclear programme – these were firstly, the Indo-Pak War of 1965 highlighted the conventional military weakness of Pakistan vis-à-vis India, and secondly, the nuclear cooperation between India and Canada and commissioning of a plutonium-reprocessing plant in 1965 increased Pakistan's fears

[7] Salik, Naeem (2009), *The Genesis of South Asian Nuclear Deterrence: Pakistan's Perspective*, New York: Oxford University Press, pp.73&74.
[8] Chakma, Bhumitra (2009), *Pakistan's Nuclear Weapons*, London and New York: Routledge, p.12.
[9] Ibid. p.13; Singh, Garima (2006), *Pakistan's Nuclear Disorder: Weapons, Proliferation and Safety*, Observer Research Foundation, New Delhi: Lancer Publishers and Distributors, p.4.
[10] Salik, Naeem (2009), *The Genesis of South Asian Nuclear Deterrence: Pakistan's Perspective*, New York: Oxford University Press, p.76; Chakma, Bhumitra (2009), *Pakistan's Nuclear Weapons*, London and New York: Routledge, p.13.
[11] Chakma, Bhumitra (2009), *Pakistan's Nuclear Weapons*, London and New York: Routledge, p.13

about India's nuclear intention.[12] Evidently, in 1965, Zulfikar Ali Bhutto announced: "If India developed an atomic bomb, we too will develop one, even if we have to eat grass or leaves and remain hungry, because there is no conventional alternative to the atomic bomb."[13] Thus, the first phase made a humble beginning, which laid foundation for things to come in the future.

Phase II (1971-1989)

During this period, two events played a significant part in bringing about a decisive shift of direction in Pakistan's nuclear development activities. The first was the outbreak of civil war and dismemberment of Pakistan in 1971. While the war reminded Pakistan of its conventional military weakness vis-à-vis India, it reinforced their deepest fear that India was bent on destruction of Pakistan and as such, Pakistan was convinced that rather than relying on international alliances – which completely failed to rescue Pakistan during the 1971 war – it has to ensure its own security. The second event was the detonation of nuclear device by India on May 18, 1974, at Pokhran. This event made Pakistan to vigorously pursue the aim of development of nuclear weapons as soon as possible to keep pace with India.[14]

Significantly, on January 20, 1972, President Zulfikar Ali Bhutto assembled Pakistani scientists and emphatically called for the development of nuclear device at the earliest. Negotiation with France for purchase of a plutonium-reprocessing plant began secretly in February 1973, the agreement of which was signed in 1976 but was abrogated in 1979 due to intense pressure from U.S.[15] By March 1974, even before the Indian nuclear test, a body called the 'Wah group,' code-named simply as 'Research' was established with the intention of development of nuclear weapon.[16] The uranium-enrichment programme code-named Project-706 was started as early as late 1974.[17] A

[12] Ibid. pp.13-16.
[13] Quoted in Singh, Garima (2006), *Pakistan's Nuclear Disorder: Weapons, Proliferation and Safety*, Observer Research Foundation, New Delhi: Lancer Publishers and Distributors, p.4.
[14] Chakma, Bhumitra (2009), *Pakistan's Nuclear Weapons*, London and New York: Routledge, pp.21-22.
[15] Ibid. p.24
[16] Ibid. pp.20-21
[17] Ibid. p.24

uranium-enrichment unit name Kahuta Research Laboratories, independent of PAEC, was finally established under the leadership of A.Q. Khan in 1976.[18]

Following General Zia-ul Haq's military coup on July 5, 1977, Pakistan had to face major constraints in the field of nuclear development as U.S. began to pressurize Pakistan to abandon the nuclear weapons project. Tighter restrictions imposed by Western countries as a result of Indian nuclear test of 1974 made it more difficult for Pakistan. To dissuade Pakistan from going ahead with nuclear weapons project, in 1977 and in 1979, U.S. stopped economic and military aid to Pakistan invoking the Glenn-Symington Amendment.[19] Situation, however, changed for the better when Soviet Union invaded Afghanistan in 1979. As Pakistan's geopolitical significance turned out to be vital for the U.S., Pakistan made the best out of it. More economic and financial aid from U.S. began to pore into Pakistan. Most significantly, U.S. lowered its non-proliferation pressure on Pakistan. In fact, U.S. bypassed application of three non-proliferation legislation: the Glenn-Symington Amendment, Solarz Amendment and the Pressler Amendment (the later two were enacted by the Congress in 1985).[20] As reported by U.S. State Department in 1983, Pakistan began to get assistance from China. This facilitated quicker progress of Pakistan's nuclear weapons project. During 1983-84, Pakistan is said to have cold tested a number of nuclear designs and by 1987, it was believed that Pakistan already possess the nuclear bomb.[21]

Phase III (1989-1998)

The end of Cold War meant the Pakistan lost its geopolitical importance to the U.S. The immediate effect was that economic sanctions against Pakistan were reemployed by U.S. under the Pressler Amendment to press Pakistan to abandon its nuclear weapons programme. The 1990 Kashmir Crisis revealed semblance of a nuclear weapons capable state of Pakistan. There were reports that during the crisis, Pakistan assembled components of nuclear weapons and also modified F-16 fighter planes to

[18] Singh, Garima (2006), *Pakistan's Nuclear Disorder: Weapons, Proliferation and Safety*, Observer Research Foundation, New Delhi: Lancer Publishers and Distributors, pp.7-8.
[19] Chakma, Bhumitra (2009), *Pakistan's Nuclear Weapons*, London and New York: Routledge, p.25.
[20] Ibid. pp.26-27.
[21] Singh, Garima (2006), *Pakistan's Nuclear Disorder: Weapons, Proliferation and Safety*, Observer Research Foundation, New Delhi: Lancer Publishers and Distributors, pp.9-10.

deliver the bomb. On August 23, 1994, former Prime Minister Nawaz Sharif stated that Pakistan has nuclear weapon. More pressure built up on Pakistan as U.S. President Bill Clinton announced in 1993 a South Asia specific non-proliferation initiative to 'cap, reduce and finally eliminate' nuclear weapons and ballistic missile system from the region. Again, in 1995 the Nuclear Non-proliferation Treaty (NPT) was extended permanently and in 1996 the Comprehensive Test Ban Treaty (CTBT) was enacted which sought to discourage nuclear weapons programme. Following detection by U.S. about India's preparation for a nuclear test in Pokhran in December 1995, Pakistan began to prepare for its own nuclear test at Chagai.[22]

Finally, following five Indian nuclear tests of May 11 and 13, 1998, Pakistan conducted six nuclear tests on May 28 and 30, 1998. While this announced the arrival of Pakistan into the nuclear weapons club, it most importantly served as a deterrent against India.[23]

Pakistan's Nuclear Weapons Capability

Soon after the May 1998 nuclear test, Pakistan declared that it would adopt a minimum nuclear deterrence policy. This, however, gave only a vague idea about the quantity and quality of nuclear arsenal required to maintain minimum nuclear deterrence. It is reported unlike India that used plutonium for the nuclear test, Pakistan used simple weapon design based on enriched uranium. AQ Khan, the head of Pakistan's nuclear programme confirmed that the tests were not thermonuclear.[24] Pakistan hugely relied on foreign technology for the test, especially from China, from whom Pakistan obtained technology and components for development of a nuclear device.[25] For its first nuclear warhead, Pakistan used an implosion design with a solid core of highly enriched uranium

[22] Chakma, Bhumitra (2009), *Pakistan's Nuclear Weapons*, London and New York: Routledge, pp.35-36.
[23] Ibid. p.35.
[24] CRS Report (1998), "India-Pakistan Nuclear Tests and U.S. Response", Updated November 24, p.13, [Online: Web] Accessed August 16, 2011, URL: http://wlstorage.net/file/crs/98-570.pdf
[25] Weiner, Tim (1998), "U.S. and China Helped Pakistan Build Its Bomb", *New York Times*, June 1. [Online: Web] Accessed September 23, 2011, URL: http://partners.nytimes.com/library/world/asia/060198pakistan-nuke-history.html?scp=1&sq=us%20and%20China%20helped%20Pakistan%20build%20its%20bomb&st=cse

(HEU), requiring 15-20 kilogram of HEU per warhead.[26] The estimates about nuclear yield of the tests of May 28 and 30 vary. While A.Q. Khan reported of May 28 test yield of 30 to 35 kiloton, Samar Mokbarik Mand placed the yield of the May 28 tests at 49 to 45 kilotons, and May 30 test at 15 to 18 kilotons. Other estimates put the nuclear yield at much lower range: as reported in the *New York Times* by William Board on May 31, seismic data placed the yield of May 28 tests at between 8 and 15 kilotons; R. Jeffrey Smith reported in the *Washington Post* that U.S. officials estimated the yield at between 2-12 kilotons; John Kifner reported in *New York Times* that the Central Intelligence Agency (CIA) estimated the yield between 1 and 5 kilotons; and seismologist Terry Wallace estimated the May 28 nuclear test yield at 9-12 kiloton and that of May 30 at 4-6 kiloton.[27] Despite varying estimates about the yield, the actual explosion of a nuclear device was not disputed. If the yield were not at par with expectations in Pakistan, in time technology could be perfected to give greater nuclear yield.

Though it is difficult to pinpoint the number of nuclear warheads required to maintain nuclear deterrence, there is a general belief within Pakistan that certain number of nuclear warheads could suffice. For instance, Samar Mubarakmand, a prominent scientist who was part of the 1998 test, asserted that 60-70 nuclear warheads would be sufficient for Pakistan. Similarly, Brigadier (Retd) Naeem Ahmad Salik, viewed that for Pakistan to achieve a minimum nuclear deterrence capability, 68-70 nuclear warheads are necessary.[28] The U.S. Defense Intelligence Agency estimated in 1999 that Pakistan had in its possession 25-35 nuclear warheads.[29] While David Albright observed that by 2003 Pakistan has produced 40 kilograms of plutonium and 1,100 kilograms of HEU, sufficient for about 60 warheads.[30] Robert S. Norris and Hans M. Kristensen agree with Albright's estimation of 60 warheads by 2003.[31] International Panel on Fissile Materials (IPFM) for

[26] Norris, Robert S. and Kristensen, Hans M. (2007), "Pakistan's Nuclear Forces, 2007," *Bulletin of the Atomic Scientists*, Vol.63, No.3, p.71.
[27] CRS Report (1998), "India-Pakistan Nuclear Tests and U.S. Response", Updated on November 24, p.14, [Online: Web] Accessed August 16, 2011, URL: http://wlstorage.net/file/crs/98-570.pdf
[28] Chakma, Bhumitra (2009), *Pakistan's Nuclear Weapons*, Routledge, Oxford. p.59.
[29] Norris, Robert S. and Kristensen, Hans M. (2007), "Pakistan's Nuclear Forces, 2007", *Bulletin of the Atomic Scientists*, Vol.63, No.3, p.71.
[30] Ibid..
[31] Ibid., p.72.

the first time reported in 2006 that Pakistan has about 50 nuclear warheads[32] (see Table 1). IPFM estimates that as of now, Pakistan has two operating plutonium production reactors Khushab-I, which began operation in 1998, and Khushab II which started in late

Table 1: Estimate of Pakistan's nuclear warheads by International Panel on Fissile Materials (IPFM) since the first publication of Global Fissile Material Reports

Year	Number of Nuclear Warheads
2006	c.50
2007	c. 60
2008	c. 60
2009	70-90
2010	70-90

Source: Reports of IPFM 2006-2010

Table 2: Estimate of Pakistan's nuclear warheads by Stockholm International Peace Research Institute (SIPRI) since its first publication of global stockpile of nuclear warheads

Year	**Number of Nuclear Warheads**
2005	30-50
2006	c.60
2007	c.60
2008	60
2009	60
2010	70-90

Source: SIPRI Year Books 2005-2010

[32] International Panel on Fissile Materials (2006), "Global Fissile Material Report 2006," First Report, p.13, [Online: Web] Accessed September 23, 2011, URL: http://fissilematerials.org/library/gfmr06.pdf

2009 or early 2010. With two more reactors under construction at the same site, which bring the cumulative production capacity at 25-50 kg of plutonium per year. It estimates that Pakistan has about 100 kg stockpile of plutonium, which would suffice for 25 warheads. On the HEU front, Pakistan seems to have the capacity to produce 10-15 HEU based warheads and that HEU stockpile is estimated to be about 2.6 tons, sufficient for about 170 warheads. This puts Pakistan at a position where it is capable of producing 200 weapons and could produce material for about 12-21 weapons per year.[33] The IPFM[34] and SIPRI reports of 2010 estimates that Pakistan has about 70-90 nuclear warheads (see Table 1 and Table 2). Both the reports show a steady rise in Pakistan's stockpile of nuclear warheads from about 50 to 90 nuclear warheads within a five year period.

In the *Bulletin of the Atomic Scientists*, in 2011, Hans M. Kristensen and Robert S. Norris give a larger estimate about Pakistan's nuclear weapons as they estimates that Pakistan has increased its nuclear weapons stockpile of 70-90 warheads in 2009 to 90-110 nuclear warheads by 2010.[35] They also estimates that going by the IPFM's late 2010 estimates of 2,600 kg of HEU and around 100 kg of weapon-grade plutonium, assuming that Pakistan uses either 12-18 kg of HEU or 4-6 kg of plutonium for each warheads, potentially, Pakistan has enough fissile materials for 160-240 nuclear warheads.[36] Given that Pakistan continues to increase its capacity to produce more fissile materials, substantial increase can be expected.[37] As of 2010, Pakistan is believed to have at least three uranium mines: Qabul Khel, Nanganai and Taunsa urnaium mines, where mining started in 1992, 1996 and 2002, respectively.[38] The Baghalchore mine almost exhausted by 1998 and was closed in 1999. Now it is used as a dumping ground for radioactive waste.[39] The OECD/IAEA *Red Book* estimates that from 1980-2009, Pakistan may have

[33] International Panel on Fissile Materials (2012) "Countries: Pakistan," [Online: Web] Accessed March 28, 2012, URL: http://fissilematerials.org/countries/pakistan.html
[34] International Panel on Fissile Materials (2010), *Global Fissile Material Report 2010*, Fifth Annual Report, p.10, [Online: Web] Accessed September 23, 2011, URL: http //fissilematerials.org/library/gfmr10.pdf
[35] Kristensen, Hans M. and Norris, Robert S. (2011), "Pakistan's nuclear forces, 2011", *Bulletin of the Atomic Scientists*, Vol.67, No.4, p.91.
[36] Ibid., p.92.
[37] International Panel on Fissile Materials, (2010), *Global Fissile Material Report 2010*, Fifth Annual Report, p.131, [Online: Web] Accessed September 23, 2011, URL: http //fissilematerials.org/library/gfmr10.pdf
[38] Ibid., p.127.
[39] Ibid., p.127.

produced 791 tons, assuming 40 tons of annual production.[40] By late 2010, Pakistan has been producing plutonium in its Khushab-I (operation in 1998) and Khushab-II (operation in late 2009 or early 2010) reactors and the new Khushab-III reactor in the process of being completed.[41] Uranium enrichment facilities are at Kahuta and Gadwal,[42] and reprocessing plants at Nilore and Chasma.[43]

Apart from nuclear warheads, Pakistan has also paid great emphasis on delivery systems. As reported in the *Bulletin of the Atomic Scientists,* by 2001 Pakistan Air Force, Pakistan has three types of aircraft that could be used for delivery of nuclear weapons: the U.S. manufactured F-16s, Mirage V and Chinese produce A-5[44] (see Table 3). The F-16A/B and Mirage V aircrafts were acquired from the U.S. and France respectively, and it is believed that Pakistan might have made appropriate modifications to these aircraft to match their requirements for nuclear mission.[45] Among these options, F-16s were likely to be most effective. Apart from this, in its effort to balance India in the conventional forces front, Pakistan declared in February 2010 that it has inducted the first squadron of JF-17 Thunder multi-role combat aircraft which were jointly developed with China.[46] On the missile front, Pakistan has been developing ballistic and cruise missiles of Hatf series 2 to 9 (some of which are in development stage) to increase its delivery power. Figure 3 show that of the nuclear capable missiles, only Ghaznavi, Shaheen-1 and Ghauri are been introduced so far.

As Pakistan continues to expand its fissile material production capacity, the potential for increasing the stock of nuclear warheads becomes apparent. At the current rate, it is estimated that in the next ten years, Pakistan's stockpile of nuclear warheads will potentially reach 150-200 warheads.[47]

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[40] Ibid., p.131.
[41] International Panel on Fissile Materials, (2010), *Global Fissile Material Report 2010,* Fifth Annual Repoert, p.131, Annual Report, p.131, [Online: Web] Accessed September 23, 2011, URL: http //fissilematerials.org/library/gfmr10.pdf
[42] Ibid., pp.25&129.
[43] Ibid., p.26.
[44] Norris, Robert S. et al. (2002), "Pakistan's Nuclear Forces", *Bulletin of the Atomic Scientists,* Vol.58, No.1, p.70.
[45] IDSA Task Force (2010), *Whither Pakistan? Growing Instability and Implications for India,* Institute for Defence Studies and Analyses, New Delhi, p.113, [Online: Web] Accessed August 16, 2011, URL:http://www.idsa.in/sites/default/files/book_WhitherPakistan.pdf
[46] Ibid.
[47] Ibid., p.94.

Table 3: Pakistan's Nuclear Delivery System, 2011

Type	Range (Kilometers)	Year Introduced	Payload (Kilograms)
Aircraft			
F-16A/B	1,600	1998	1 bomb (4,500)[48]
Mirage V	2,100	1998	1 bomb (4,500)[49]
Ballistic Missiles			
Abdali (Hatf-2)	180	(2012)	Conventional or nuclear
Ghaznavi (Hatf-3)	c. 400	2004	Conventional or nuclear (500)
Shaheen-1 (Hatf-4)	450+	2003	Conventional or nuclear (1,000)
Ghauri (Hatf-5)	1.200+	2003	Conventional or nuclear (1,000)
Shaheen-2 (Hatf-6)	2,000 +	(2011)	Conventional or nuclear (1,000)
Nasr (Hatf-9)	60	(2014)	Conventional or nuclear
Cruise Missiles			
Babur (Hatf-7)	600	(2011)	Conventional or nuclear
Ra'ad (Haft-8)	350+	(2013)	Conventional or nuclear

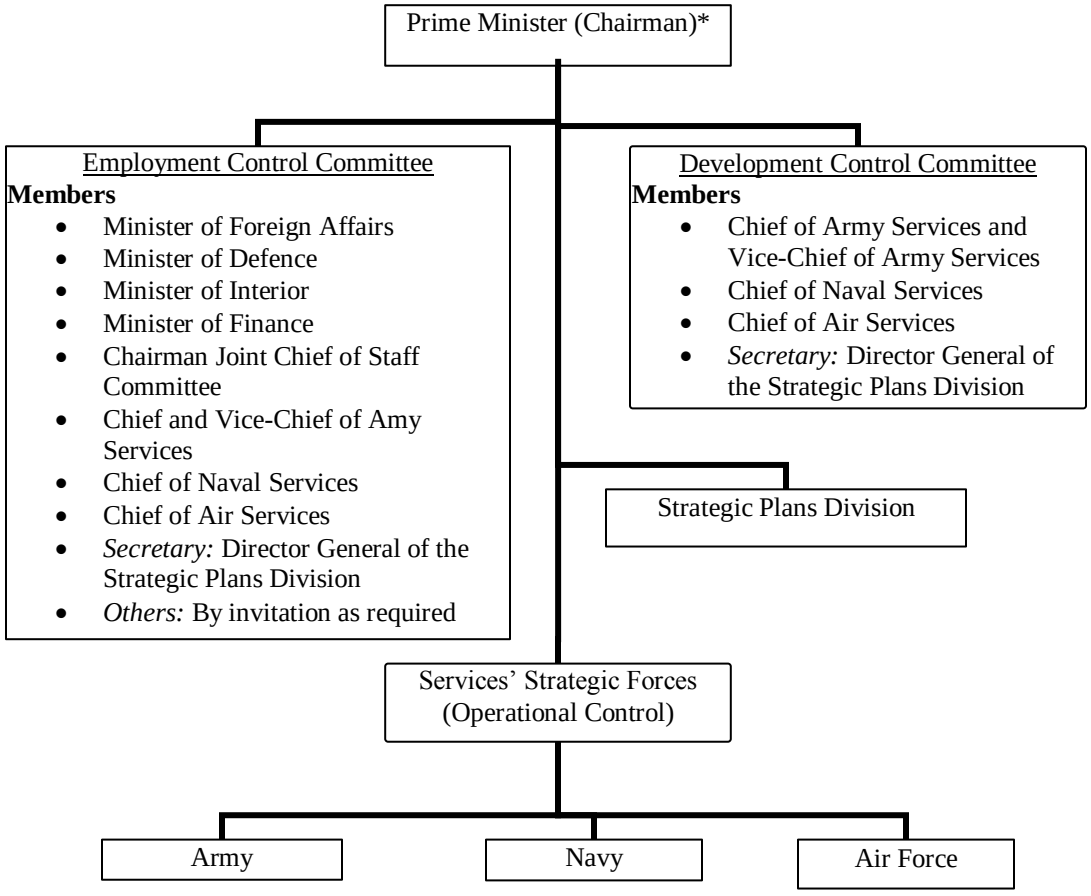
Source: Bulletin of the Atomic Scientists 2011[50]

[48] Norris, Robert S. and Kristensen, Hans, (2009), "Pakistani Nuclear Forces, 2009," *Bulletin of the Atomic Scientists,* Vol.65, No.5, p.84.
[49] Ibid.
[50] Kristensen, Hans M. and Norris, Robert S. (2011), "Pakistan's nuclear forces, 2011", *Bulletin of the Atomic Scientists,* Vol.67, No.4, p.93.

Pakistan's Nuclear Command and Control Structure

Soon after the 1998 nuclear test, Pakistan focused on the creation of an institutional structure that would be responsible fro nuclear command and control. On February 2, 2000, Pakistan's National Security Council, chaired by General Pervez Musharraf announced the creation of the National Command Authority (NCA), a body

Diagram 1: Structure of Pakistan's Nuclear Command and Control



Source: Kenneth N. Luongo & Gen. (Ret.) Naeem Salik (2007)[51]

* The Chairmanship of the NCA was shifted from the President to the Prime Minister in 2009.

[51] Luongo, Kenneth N. and Salik, Naeem (2007), "Building Confidence in Pakistan's Nuclear Security", *Arms Control Today,* December, [Online: Web] Accessed August 16, 2011, URL: http://www.armscontrol.org/act/2007_12/Luongo

comprised of both military and civilian representatives charged with all issues regarding nuclear weapons, which included the management and coordination of nuclear weapons development.[52] Prior to this, since 1975, Pakistan's nuclear weapon programme was controlled by the National Nuclear Command Authority (NNCA), where representatives from both the civilian government and the military are included. Though the exact composition of the NNCA is not known, it likely had six members which include the president, the prime minister, and the chief of army staff.[53] In December 2007, President Pervez Musharraf sanctioned the creation of the NCA through an ordinance, thus creating a formal legal standing, which stated that the president will be the chairman and the prime minister its vice-chairman, and authorised the NCA to "ensure security and safety of nuclear establishments, nuclear materials" and to safeguard all "information and technology related to the security and safety of the Strategic Organization."[54]

The NCA is a three-tiered structure headed by the President until 2009, when the helm was passed over to the Prime Minister.[55] Apart from the Prime Minister, who is the chairman of the NCA, the other civilian representatives in the NCA included the defence minister, foreign minister, finance minister and the interior minister; and the representation from the military, members include, the Joint Chiefs of Staff, three service chiefs and the Director General (DG) of Strategic Plans Division (SPD).[56] Thus, the top echelon of the NCA comprises of ten members. As reported by Seymour M. Hersh, the final authority to order a nuclear strike requires consensus within the NCA's high-

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[52] Cheema, Zafar Iqbal (2010) "Pakistan", in Hans Born, Bates Gill and Heiner Hanggi (eds.), *Governing the Bomb: Civilian Control and Democratic Accountability of Nuclear Weapons*, SIPRI, New York: Oxford University Press, p.203.

[53] Bremmer, Ian and Kuusisto, Maria (2008), "Pakistan's Nuclear Command and Control: Perception Matters" SASSI Research Report – 15, May. London, p.8, [Online: Web] Accessed September 23, 2011, URL: http://www.sassi.org/html/Pakistan%20Nuclear%20Command%20and%20Control%20Final.pdf

[54]Associate Press of Pakistan (2007), "President to head Command Authority," *Dawn*, Islamabad, December 13, [Online: Web] Accessed August 16, 2011, URL: http://archives.dawn.com/2007/12/14/top7.htm

[55] Cheema, Zafar Iqbal (2010) "Pakistan", in Hans Born, Bates Gill and Heiner Hanggi (eds.), *Governing the Bomb: Civilian Control and Democratic Accountability of Nuclear Weapons*, SIPRI, New York: Oxford University Press, p.204.

[56] *National Command Authority Act, 2010*, The Gazzette of Pakistan, Para. 3-4, [Online: Web] September 23, 2011, URL: www.na.gov.pk/uploads/documents/1300934560_193.pdf; IDSA Task Force (2010), *Whither Pakistan? Growing Instability and Implications for India*, Institute for Defence Studies and Analyses, New Delhi, p.110, [Online: Web] Accessed August 16, 2011, URL:http://www.idsa.in/sites/default/files/book_WhitherPakistan.pdf

powered ten members, with the chairman – by statute under provision 2(b) of the National Command Authority Act 2010, the Prime Minister[57] – likely holds the deciding vote, just as the president – who was the chairmen prior to 2009 transfer of power to the prime minister –had the deciding vote.[58]

The three-tier consisted of the two committees, the Employment Control Committee (ECC) and the Development Control Committee (DCC), constituting one tier; the SPD; and the strategic forces commands of each of the three services[59] – the Army, Navy and the Air Force (see Diagram 1). The responsibility of the NCA include formulating policies, deploying the strategic forces, coordinating the activities of all strategic organization connected with nuclear sphere, controlling nuclear export and import, and safeguarding critical nuclear assets and sites.[60]

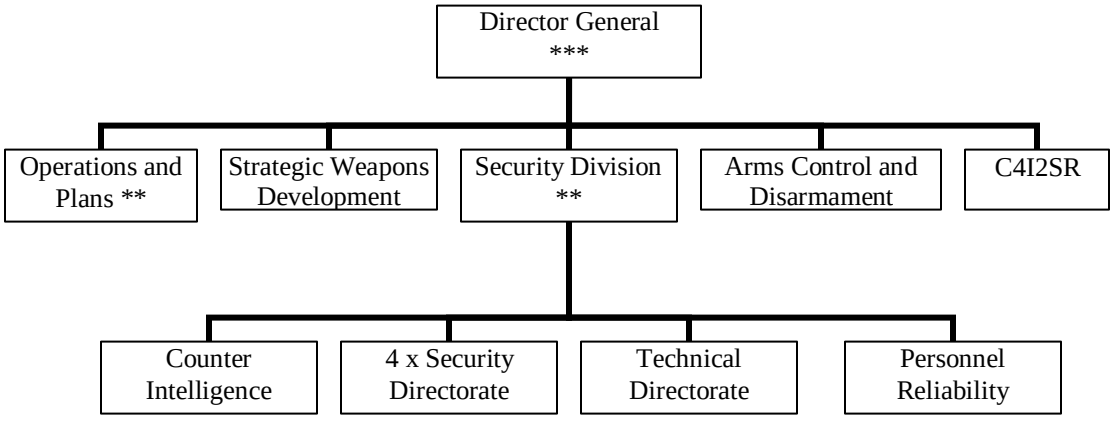
The Strategic Plans Division (SPD)

The SPD serves as the secretariat of the NCA as its duties encompasses the whole area of development and management of all dimensions relating to Pakistan's nuclear assets, including operational planning, weapon development, arms control and disarmament, command and control, storage, safety and budgets.[61] The SPD is headed by the Director General, who is usually a three-star general, appointed by the chair of the NCA. The DG of SPD is the ex officio member-secretary of the NCA. It comprises of about 70 staffs officers from the three branches of the armed forces. There are four main directorates in the SPD: the Operations and Planning, headed by two-star general, which is tasked with the responsibility of carrying out operational planning; Command, Control, Communications, and Computerization, Intelligence and Information, and Surveillance

[57] *National Command Authority Act, 2010*, The Gazzette of Pakistan, Para.3, [Online: Web] September 23, 2011, URL: www.na.gov.pk/uploads/documents/1300934560_193.pdf
[58] Hersh, Seymour M. (2009), "Defending the Arsenal: In an unstable Pakistan, can nuclear warheads be kept safe?" *Newyorker*, November 16, [Online: Web] Accessed February 18, 2012, URL: http://www.newyorker.com/reporting/2009/11/16/091116fa_fact_hersh?currentPage=all
[59] Luongo, Kenneth N. and Salik, Naeem (2007), "Building Confidence in Pakistan's Nuclear Security", *Arms Control Today*, December, [Online: Web] Accessed August 16, 2011, URL: http://www.armscontrol.org/act/2007_12/Luongo
[60] *National Command Authority Act, 2010*, The Gazzette of Pakistan, Para.7, [Online: Web] Accessed September 23, 2011, URL: www.na.gov.pk/uploads/documents/1300934560_193.pdf
[61] Akhtar, Rabia and Hussain, Nazir (2010), "Safety and Security of Pakistan's Nuclear Assets", in Usama Butt and N Elahi (eds.), *Pakistan's Quagmire: Security, Strategy, and the Future of the Islamic-nuclear Nation*, New York: Continuum International Publishing Group, pp.204-205.

and Reconnaissance (C^4I^2SR), which is responsible for the development and maintenance of all strategic command and communication links; Strategic Weapons Development carries out liaison with the strategic organizations, scrutinizes budgetary demands, carryout audits of funds; and Arms Control and Disarmament Affairs gives policy recommendations on issues pertaining to arms control and disarmament and represents the NCA at bilateral and multilateral nonproliferation discussions[62] (see Diagram 2).

Diagram 2: Structure of Pakistan's Strategic Plans Division



Source: Christopher Clary (2010) & IDSA Task Force (2010)[63]

The Security Division, headed by a two-star general, also comes under the SPD. The Security Division comprises of about 10,000 military personnel in charge of providing safety and security of nuclear assets and sites. It has four directorates: Security, Technical, Counter Intelligence and Personal Reliability Programme. It plays one of the most vital parts of the NCA as it is tasked with the job of ensuring safety and security of Pakistan's nuclear capabilities.

[62] Ibid. p.205; Luongo, Kenneth N. and Salik, Naeem (2007), "Building Confidence in Pakistan's Nuclear Security", *Arms Control Today,* December, [Online: Web] Accessed August 16, 2011, URL: http://www.armscontrol.org/act/2007_12/Luongo

[63] Clary, Christopher (2010), "Thinking about Pakistan's Nuclear Security in Peacetime, Crisis and War" IDSA Occassional Paper No. 12, September, p.12, [Online: Web] Accessed August 16, 2011, URL: www.idsa.in/system/files/OP_PakistansNuclearSecurity.pdf; IDSA Task Force (2010), *Whither Pakistan? Growing Instability and Implications for India,* Institute for Defence Studies and Analyses, New Delhi, p.111, [Online: Web] Accessed August 16, 2011, URL:http://www.idsa.in/sites/default/files/book_WhitherPakistan.pdf

Though, in 2009, political power was nominally passed on to civilian government the military and the Strategic Plans Division continue to exercise major power. Though, Organizations such as the Pakistan Atomic Energy Commission (PAEC), the National Defence Complex (NDC), and the Khan Research Laboratories (KRL), are responsible for the production of nuclear components, all the necessary components of nuclear weapons are with the army and the air force.[64] Apart from this, the delivery vehicles are under the custody of service Strategic Forces Command.[65] The overall operational control is maintained by the SPD.

The Committees of the NCA

There are two committees of the NCA, namely the ECC and the DCC. As the name suggest, they are charged with the employment and development of strategic assets, respectively.

The main task of the ECC is policymaking regarding nuclear strategy of Pakistan. It makes assessment of threats to national interest and security and makes appropriate policy direction in peacetime and in war. For this purpose the ECC co-ordinates with the SPD. After the chairmanship of the NCA was taken over by the Prime Minister in 2009, it is likely the he chairs the ECC. The members of ECC include the Ministers of Foreign Affairs, Defence, Interior, Finance, Chairman of Joint Chief of Staff Committee, Chief and Vice-Chief of Army Services, Chief of Naval Services, Chief of Air Services and the Director General of the SPD serves as the Secretary (see Diagram 1).

As the name suggests, the DCC is responsible for developing and upgrading of Pakistan's nuclear forces in accordance with the plans and policies formulated by the ECC.[66] It exercises overall control of administrative policy relating to development of nuclear arsenal, missile systems, related infrastructure and technologies. The technical development of Pakistan's nuclear weapons system largely depends on the effectiveness of the DCC. It is also responsible for controlling all strategic organizations in Pakistan. Like the ECC, it is most likely that the Prime Minister chairs the DCC. The Chief and

[64] Narang, Vipin (2009/10), "Posturing for Peace? Pakistan's Nuclear Postures and South Asian Stability," *International Security,* Vol. 34, No. 3, Winter, p.65.
[65] Ibid.
[66] Chakma, Bhumitra (2009), *Pakistan's Nuclear Weapons*, London and New York: Routledge, p.76.

Vice-Chief of the Army Services and the Chiefs of the Navy and the Air Force are the members of the DCC, while the Director General of the SPD serves as the Secretary of the DCC. The heads of various major scientific organizations are also members (like the KRL, PAEC, etc.) of the DCC.[67]

The Strategic Forces Command

Each of the three military services of Pakistan: the Army, Naval and Air Force have their own Strategic Force Command. The services maintain control over its strategic forces with regard to training, technical and administrative functions but the operational plans are controlled by the NCA under the military direction of the chairman of the Joint Chief of Staff Committee (CJCSC), and the SPD coordinates with the services headquarters. The most important responsibility of the strategic forces command is to ensure that strategic forces are kept well trained and technically up to-date to serve effectively when called upon.

Being a new nuclear state, there has been speculation that Pakistan's nuclear command and control is not robust enough. Some analysts have expressed apprehensions regarding the effectiveness of Pakistan's nuclear command and control citing political instability and extremisms, infrastructural, financial and technical constraints in Pakistan.[68] And there are also concerns about Pakistan's nuclear posture and the danger it could impose. Given geographical proximity, Pakistan is believed to have dispersed its nuclear weapons to various locations and adopted a delegative system of authority which brings with it the dangers of unauthorised or accidental nuclear use.[69] While this is an unavoidable problem, we can only expect that Pakistan is wise enough to take appropriate measures to prevent such untoward event from happening. Pakistan is believed to have put in place indigenously designed Permissive Action Links (PALs) on its nuclear weapons and that it has applied "two-man rule" or "three-man rule" for any procedure regarding nuclear weapons to ensure that arsenals could be used only under proper

[67] Akhtar, Rabia and Hussain, Nazir (2010), "Safety and Security of Pakistan's Nuclear Assets", in Usama Butt and N Elahi (eds.), *Pakistan's Quagmire: Security, Strategy, and the Future of the Islamic-nuclear Nation*, New York: Continuum International Publishing Group, p.206.
[68] Chakma, Bhumitra (2009), *Pakistan's Nuclear Weapons*, London and New York: Routledge, p.78.
[69] Ibid, p.79.

authorization.[70] An assessment of Pakistan's nuclear command and control system show that the military plays a major role. It is only natural to believe that the professionalism of Pakistani military which works as a stabilizing force in Pakistan will also ensure the effective control over its nuclear assets.[71]

The A.Q Khan episode seriously damaged the credibility of Pakistan's nuclear command and control. But since then, Pakistan has taken serious steps to ensure airtight control so as to prevent any negative eventualities. The episode actually strengthened Pakistani command and control system in ways Pakistani policymakers could not have predicted. It enhanced the provision of security and introduced counter intelligence. The introduction of Personnel Reliability Programme (PRP) that aimed at rooting out potential personnel that could pose a danger to safety and security of its nuclear assets, was a significant step. Following the Khan episode the strategic scientific organizations were placed under greater control with the enactment of the 2004 Export Control Act.[72]

[70] Cotta-Ramusino, P. and Martellini, M. (2002), "Nuclear safety, nuclear stability and nuclear strategy in Pakistan: A concise report of a visit by Landau Network – Centro Volta," *Landau Network-Centro Volta,* Como, Italy, Janurary 14, [Online: Web] Accessed September 5, 2011, URL: http://www.pugwash.org/september11/pakistan-nuclear.htm; Akhtar, Rabia and Hussain, Nazir (2010), "Safety and Security of Pakistan's Nuclear Assets", in Usama Butt and N Elahi (eds.), *Pakistan's Quagmire: Security, Strategy, and the Future of the Islamic-nuclear Nation,* New York: Continuum International Publishing Group, p.184; Clary, Christopher (2010), "Thinking about Pakistan's Nuclear Security in Peacetime, Crisis and War" IDSA Occassional Paper No. 12, September, p.15, [Online: Web] Accessed August 16, 2011, URL: www.idsa.in/system/files/OP_PakistansNuclearSecurity.pdf

[71] Cheema, Zafar Iqbal (2010) "Pakistan", in Hans Born, Bates Gill and Heiner Hanggi (eds.), Governing the Bomb: Civilian Control and Democratic Accountability of Nuclear Weapons, SIPRI, New York: Oxford University Press, p.212.

[72] Luongo, Kenneth N. and Salik, Naeem (2007), "Building Confidence in Pakistan's Nuclear Security", *Arms Control Today,* December, [Online: Web] Accessed August 16, 2011, URL: http://www.armscontrol.org/act/2007_12/Luongo

CHAPTER 3

NUCLEAR BLACK MARKETING AND PAKISTAN

While Pakistan is not the only country to resort to black markets in the pursuit of nuclear weapons programme, the emergence of the Dr. Abdul Qadeer Khan aka A. Q. Khan network of nuclear proliferation did the greatest damage to nuclear non-proliferation efforts. It also exposed the weakness of Pakistani state-oversight and resultant dangerous shift from state-centric proliferation to non-state/network specific nuclear proliferation and possible intertwining between them.[1] This seriously brought into question Pakistan's ability to safeguard its critical nuclear capabilities. Born out of Pakistan's nuclear programme, which began in the 1970s, Khan's network is believed to have begun from 1987 and went on till 2003,[2] during which period, Khan converted the import linkages into an intricate export venture.[3] The network, which involved at least 20 countries,[4] several companies and about 50 actively involved individuals[5] serviced clients like Iran, North Korea and Libya and offered nuclear technology to Iraq and possibly other clients.[6] While his success in development of nuclear programme earned him name and fame at home, elsewhere, he was vociferously condemned. Castigating Khan for his role in the damage that was done by the network to non-proliferation, former CIA

[1] IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,* The International Institute for Strategic Studies, London, p.43; Chakma, Bhumitra (2009), *Pakistan's Nuclear Weapons,* London and New York: Routledge, p.121.
[2] Clary, Christopher O. (2005), *The A.Q. Khan Network: Causes and Implications*, Master's Thesis, Monterey: Naval Postgraduate School, p.3, [Online: Web] Accessed August 17, 2011, URL: http://www.fas.org/irp/eprint/clary.pdf
[3] IISS Strategic Dossier(2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,* The International Institute for Strategic Studies, London, p.65; Clary, Christopher O. (2005), *The A.Q. Khan Network: Causes and Implications*, Master's Thesis, Monterey: Naval Postgraduate School, pp.1&35, [Online: Web] Accessed August 17, 2011, URL: http://www.fas.org/irp/eprint/clary.pdf; Corera, Gordon (2006), *Shopping For Bombs: Nuclear Proliferation, Global Insecurity, and the Rise and Fall of the A.Q. Khan Network,* New York: Oxford University Press, p.xiii.
[4] IISS Strategic Dossier(2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,* The International Institute for Strategic Studies, London,p.7.
[5] Tertrais, Bruno (2008), "Khan's Nuclear Exports: Was There a State Strategy?" in Henry D. Sokolski (ed.), *Pakistan's Nuclear Future: Worries Beyond War,* Strategic Studies Institute, January, p.13.
[6]IISS Strategic Dossier(2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,* The International Institute for Strategic Studies, London, p.7.

Director George Tenet described Khan as "at least as dangerous as Osama bin Laden,"[7] and also termed him as "the Merchant of Death."[8]As far back as 1987, an Indian magazine described Khan as a cross between Dr. Strangelove and "an Islamic James Bond."[9] The network exported two different things: know-how on uranium enrichment and weapons design, and centrifuge technology,[10] until finally exposed in 2003 with the interception of German-registered ship *BBC China* which was laden with sensitive equipments relating to uranium enrichment bound for Libya.[11] Though, on February 4 2004, A. Q. Khan made a televised confession and claimed sole responsibility for his proliferation activities,[12] serious questions were raised regarding the innocence of the state in the whole affair. Khan was let off leniently and the case officially declared as closed in May 2006.[13] Following the revelation of the network, serious questions arose: How was Khan able to setup the network and managed to run it for so long? How extensive was the network? Who were its clients? What was/were traded by the network? How damaging was the dealings of the network to non-proliferation and especially for Pakistan? To what extent does Pakistani government bear responsibility for Khan's network?

A.Q. Khan: The Roots

Born in Bhopal in 1936,[14] A.Q. Khan had witnessed the bloody partition of 1947 which left a deep scar on him. In August 1952, he left for Pakistan to join his brothers

[7] As quoted in Corera, Gordon (2006), *Shopping For Bombs: Nuclear Proliferation, Global Insecurity, and the Rise and Fall of the A.Q. Khan Network,* New York: Oxford University Press, p.xiii.
[8] As quoted in Salik, Naeem (2009), *The Genesis of South Asian Nuclear Deterrence: Pakistan's Perspective,* New York: Oxford University Press, p.277.
[9] "Pakistan's Nuclear Bombshell," *India Today,* quoted in Clary, Christopher O. (2005), *The A.Q. Khan Network: Causes and Implications,* Master's Thesis, Monterey: Naval Postgraduate School, pp.21-22, [Online: Web] Accessed August 17, 2011, URL: http://www.fas.org/irp/eprint/clary.pdf
[10] Tertrais, Bruno (2008), "Khan's Nuclear Exports: Was There a State Strategy?" in Henry D. Sokolski (ed.), *Pakistan's Nuclear Future: Worries Beyond War,* Strategic Studies Institute, January, p.13.
[11] IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,* The International Institute for Strategic Studies, London, p.7.
[12] Chakma, Bhumitra (2009), *Pakistan's Nuclear Weapons,* London and New York: Routledge, p.104.
[13] Ibid.
[14] Levy, Adreian and Catherine, Scott-Clark (2007), *Deception: Pakistan, The United States And The Global Nuclear Weapons Conspiracy,* New Delhi: Penguin Books, p.21.

and sister in Karachi.[15] He obtained a science degree from Karachi University in 1960[16] and soon left for Europe for further studies. He first landed in Holland in 1961 where, in January 1962, he met Hendrina Donkers for the first time and later married her in early 1964.[17] In September 1962, he attended a series of lectures in metallurgy from West Berlin Technische Universität.[18] After which, he came back to Netherlands in September 1963 and completed his Master's degree in metallurgy from Delft University in 1967.[19] During his stint at the Delft University, he met his fellow student, Henk Slebos for the first time in 1964.[20] Slebos went on to play a crucial part in Khan's proliferation network. In 1968 he secured a research scholarship to the Catholic University of Leuven in Flanders, Belgium.[21] Under the guidance of Professor Martin Bravers, he completed his PhD from the university in early 1972 and was offered a job at Fysisch Dynamisch Onderzoek (FDO), a Dutch engineering firm based in Amsterdam. The FDO supplied parts and expertise to Ultra Centrifuge Nederland (UCN), a partner in the secretive URENCO uranium-enrichment consortium.[22]

While working at the URENCO Almelo plant from 1973 to 1975,[23] where his job included translation of German reports on centrifuge technology (G1 and G2 centrifuge models), he gained critical knowledge about centrifuge operations by bypassing top-secret security clearance. During this period he managed to collect classified design plans and lists of specialist firms that supply components for the URENCO project. On 17 September 1974, he wrote a letter to the then Pakistan Prime Minister Zulfikar Ali Bhutto, offering his services to help Pakistan with the enrichment route to developing fissile material for a nuclear bomb. This offer is believed to have been influenced by the

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[15] Ibid.
[16] Ibid., p.22.
[17] Ibid. p.23.
[18] Ibid.
[19] Ibid.
[20] Ibid., p.24.
[21] Ibid., p.25; Naeem Salik go by the account that A.Q. Khan earned the scholarship in 1971. See Salik, Naeem (2009), *The Genesis of South Asian Nuclear Deterrence: Pakistan's Perspective,* New York: Oxford University Press, pp.257-258.
[22]IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,* The International Institute for Strategic Studies, London, p.17; Levy, Adreian and Catherine, Scott-Clark (2007), *Deception: Pakistan, The United States And The Global Nuclear Weapons Conspiracy*, New Delhi: Penguin Books, p.28.
[23]IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,* The International Institute for Strategic Studies, London, p.17.

1971 defeat and partitions of Pakistan under the hands of India, and the May 1974 India's nuclear test.[24] Bhutto responded positively, and as suspicion regarding Khan's illegal activities began to stir up in Netherlands, Khan left for Karachi in December 1975, bringing with him the stolen centrifuge design and other valuable information.

Back in Pakistan, he started working on the uranium enrichment programme under the supervision of the chairman of Pakistan Atomic Energy Commission (PAEC), Munir Ahmed Khan and Sultan Bashiruddin Mahmood, director of the early pilot enrichment program at Sihala.[25] As friction emerged between him and Munir Khan, he expressed dissatisfaction over the slow pace and lack of freedom and he strongly appealed to Bhutto for more autonomy. On July 31, 1976, A.Q. Khan was authorised to set up his own enrichment facility to be called the Engineering Research Laboratories (ERL), also code named: Project 796[26] – the facility was set up at Kahuta. Khan was to report directly to the Prime Minister. Bhutto created a team of three members to oversee Khan's project – among them was Defense Minister Ghulam Ishaq Khan, a close supporter of Khan.

At ERL, Khan worked with the enrichment design and technology which he brought from Netherland – which included the G1 and G2 designs. For crucial information, components and parts that were needed for the construction of centrifuge cascade, he sought the help of former colleagues. After Zia came to power in 1977, he reinforced ERL's autonomy. By April 1978, as claimed by Khan, ERL succeeded in enriching uranium.[27] Zia renamed ERL as Khan Research Laboratories (KRL) in May 1981, in honor of Khan. By 1992, Kahuta was apparently operating some 3,000 centrifuges, mostly P-2 designs, capable of producing 45-75 kg of highly enriched

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[24] Ibid., p.17; Levy, Adreian and Catherine, Scott-Clark (2007), *Deception: Pakistan, The United States And The Global Nuclear Weapons Conspiracy,* New Delhi: Penguin Books, pp.26 &28; Salik, Naeem (2009), *The Genesis of South Asian Nuclear Deterrence: Pakistan's Perspective,* New York: Oxford University Press, pp.258&259; Corera, Gordon (2006), *Shopping For Bombs: Nuclear Proliferation, Global Insecurity, and the Rise and Fall of the A.Q. Khan Network,* New York: Oxford University Press, p.14.

[25] Corera, Gordon (2006), *Shopping For Bombs: Nuclear Proliferation, Global Insecurity, and the Rise and Fall of the A.Q. Khan Network,* New York: Oxford University Press, p.17.

[26] Levy, Adreian and Catherine, Scott-Clark (2007), *Deception: Pakistan, The United States And The Global Nuclear Weapons Conspiracy,* New Delhi: Penguin Books, pp.34 & 35.

[27] IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,* The International Institute for Strategic Studies, London, p.20.

uranium (HEU) per year.[28] He, thus, scripted the uranium path to nuclear bomb for Pakistan which was finally showcased by the nuclear tests of May 1998.

Starting 1987, A.Q. Khan established an illicit nuclear supply network, which apparently bypassed Pakistani state-oversight. There are, however, reasons that does not indemnify Pakistan state complicity in the scandal. The network flourished until the 2003 interdiction of the ship *BBC China*, which was leaving for Libya, laden with uranium enrichment components. From 1987 to 2003, its clients included Iran, North Korea, Libya, and Iraq and probably others. Through the following case studies, the various dimension of the network will be analyzed and also see how far Pakistani state is responsible for the scandal. There are various motivations that explains the many deals made by the Khan network, these motives includes pure ego, profit motive, sense of nationalism and Islamic identity. Before going into the case studies, it would be beneficial to look into the factors that aided or eased A.Q. Khan's illicit nuclear proliferation network.

Factors that Aided the A.Q. Khan Clandestine Network

A combination of factors seems to have aided or otherwise eased Khan clandestine nuclear proliferation network.

Firstly, the covert nature of Pakistan's nuclear programme made it easy for Khan to run the clandestine nuclear network. Because Pakistan pursued nuclear weapons under hardening global nonproliferation regime, potential U.S. sanctions and threat from India, maintaining secrecy was on the highest priority list. There are three explanations regarding how this enabled Khan network - either the state did not know about the clandestine activities of Khan; or it knew but chose not to act, fearing that scrutiny would blow the secrecy of the nuclear weapons programme;[29] or the state or important functionaries of the state were accomplices. In any case, the secret nature of Pakistan's

[28] Ibid.

[29] Though the existence of the Pakistani nuclear weapons program was an open secret by 1980s, the leadership did not acknowledge publicly until 1998. See Clary, Christopher O. (2005), *The A.Q. Khan Network: Causes and Implications,* Master's Thesis, Monterey: Naval Postgraduate School, p.15, [Online: Web] Accessed August 17, 2011, URL: http://www.fas.org/irp/eprint/clary.pdf

nuclear weapons programme eased the clandestine nuclear proliferation network. In the nuclear domain it is unlikely that the state did not know about it.

Secondly, there is a view that the high degree of autonomy bestowed upon Khan in running the programme at KRL put aside all aspect of nuclear regulation and that absence of scrutiny helped in maintaining secrecy about the whole affair. Apparently, three factors ensured that he got a high degree of autonomy: he demanded for it, the sensitive nature of his work made autonomy essential and he was able to achieve concrete results faster than PAEC, the rival scientific organization.[30] Naeem Salik wrote that "his financial transactions were not subjected to audit and the consignments of equipment imported by KRL could not be inspected by customs officials in the interest of maintaining secrecy."[31] He asserts that because Khan enjoyed enormous autonomy, including financial and administrative autonomy, he managed to run the clandestine nuclear network. This view is debatable: firstly, because Pakistani military keeps a close watch over the nuclear programme, it is highly doubtful that Khan enjoyed so much autonomy that the military did not know about the nuclear scandal; secondly, for the same reason, it is more likely that the military supervised his activities and it allowed Khan to do what he was doing.

Thirdly, another view holds that the sense of urgency and the failure to look into the future also contributed to emergence of Khan network. The urgency was to develop a nuclear deterrence against India as quickly as possible. According to this view, given the urgency, Pakistan paid less attention to regulation, but eyed at quick results – which Khan provided. Christopher Clary opines that Pakistani elites may have focused on the present threat rather so much that they failed to see or downplayed potential future risks. It is said that while the oversight institutions lacked institutional capacity to look into risks, the sense of urgency meant that they "were overly reliant on the organizations they were supposed to regulate."[32] While the sense of urgency may have led to the emergence of the nuclear black market, the account that the network emerged because Pakistan failed to

[30] IISS Strategic Dossier(2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,* The International Institute for Strategic Studies, London, p.65.
[31] Salik, Naeem (2009), *The Genesis of South Asian Nuclear Deterrence: Pakistan's Perspective,* New York: Oxford University Press, pp.261-262.
[32] Clary, Christopher O. (2005), *The A.Q. Khan Network: Causes and Implications,* Master's Thesis, Monterey: Naval Postgraduate School, p.17, [Online: Web] Accessed August 17, 2011, URL: http://www.fas.org/irp/eprint/clary.pdf

"regulate" as it was "overly reliant," seems unlikely because it was Pakistani military that exercised monopolistic control and supervised the nuclear programme – the military was the boss. So, it is more likely that Khan network emerged not because the military was under constraints of being dependent on anyone but either because it made it happen or let it happen. In this respect, Clary also points out that the ability of Pakistani elites to learn from experience was constrained because no precedence existed from which lessons could be drawn.[33]

Fourthly, another view holds that the unhealthy rivalry between KRL and PAEC made Khan to adopt even greater secrecy and opaque business practices. In order to establish his credibility, he adopted unconventional methods to further his programme. In doing so, he went beyond his mandate but this was not questioned by officials because they believed that in order to circumvent foreign export control, improvisations were needed.[34] As a result, under Khan, KRL was designing bombs, developing trigger mechanisms, reducing uranium gas into metal and working on design assembly itself.[35] As the leadership was focused on results, Khan was allowed to run activities parallel to PAEC. The rivalry stimulated Khan to conduct "his procurement and production activities in extreme secrecy" so that PAEC did not know what it was up to.[36] Increased secrecy combined with greater autonomy created apt condition for the scandal to flourish.

Fifthly, the weak international nuclear non-proliferation regime also eased Khan network. After India's nuclear test in 1974, the NPT and the London Group, later named Nuclear Suppliers Group, came into existence.[37] The Missile Technology Control Regime (MTCR) came into being in 1987.[38] The global non-proliferation regimes were based on the supply-side of proliferation which believed that horizontal nuclear proliferation could be stopped by coordinating the policies of suppliers and controlling the supply of nuclear technology and know-how.[39] The supply-side approach, however, ran into trouble as it was deficient in dealing with onward proliferation when nuclear technology and know-

[33] Ibid., p.18.
[34] IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,* The International Institute for Strategic Studies, London, p.65.
[35] Ibid.
[36] Ibid., pp.65-66.
[37] Chakma, Bhumitra (2009), *Pakistan's Nuclear Weapons,* London and New York: Routledge, p.106.
[38] Ibid.
[39] Ibid.

how were diffused as new states and non-state proliferators emerged.[40] Though a number of sensitive components and materials were included in the 'trigger list', most components could be traded in parts, rather than in full components and also by modifications to finished product.[41]

Sixthly, the weak institutions and political instability was also a factor for the emergence and growth of Khan network. Most of Khan's deals were made during Pakistan's troubled political life, i.e., between the period 1988 and 1999 – the time from Zia's death and the coup of Pervez Musharraf.[42] The centre of authority was diffused as power was unevenly distributed between three centers: the president, the army and the prime minister. Civilian leaders may not have been involved in the nuclear matters, and as democratic institutions were weak, policymaking was personalized.[43] In this scenario, possibilities were also created for some to seize the opportunity for aggrandizement. There was effectively no institution to act as nuclear over-sight. It was only after the creation of Strategic Plans Division (SPD) in 1999, post-nuclear test of May 1998, and the subsequent creation of National Command Authority in 2000 that institutional control emerged.[44]

The Khan Clandestine Network

The development of Pakistan's nuclear weapons required a clandestine programme. The Khan clandestine network was an offshoot of this Pakistani clandestine nuclear programme, in general. The secret procurement route for the country's nuclear weapons programme was used for this covert nuclear proliferation. Also, the network of brokers, financers and front companies that were created to supply Pakistan's enrichment programme were extensively used and enlarged. This network has been called by

[40] Ibid.
[41] Corera, Gordon (2006), *Shopping For Bombs: Nuclear Proliferation, Global Insecurity, and the Rise and Fall of the A.Q. Khan Network*, New York: Oxford University Press, p.22.
[42] IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment*, The International Institute for Strategic Studies, London, p.66.
[43] Ibid.
[44] Clary, Christopher O. (2005), *The A.Q. Khan Network: Causes and Implications*, Master's Thesis, Monterey: Naval Postgraduate School, pp.16&17, [Online: Web] Accessed August 17, 2011, URL: http://www.fas.org/irp/eprint/clary.pdf

different names: nuclear 'Walmart of private-sector proliferation'[45], a "one-stop shopping"[46] for any country, an "import-export" enterprise or simply "nuclear enterprise."[47] Given the extensive autonomy and immunity bestowed upon Khan by Pakistani government, much of the dealings were kept out of public view due to absence of scrutiny. As such, the complete story of the network has not been revealed. Observers and analysts blame Pakistan's non-cooperation on this account. The clandestine network is believed to have started from the mid-1980s. The network had its operations in Malaysia, Singapore, Turkey, South Africa, Switzerland, South Korea, Dubai, and other countries.[48] Examination of three cases of the Khan's assistance: Iran, North Korea and Libya will reveal the various dimension of the proliferation problem arising from Pakistan. The main debate about Khan's network is whether Khan acted alone or was the Pakistani state involved.

Khan network's assistance to Iran

The link between Khan network and Tehran began during Zia's regime in the mid-1980s. After being approached by Tehran in February 1986 for nuclear cooperation, Zia responded positively but was apparently cautious not to let out sensitive knowledge as he instructed his nuclear aides "to play around (with Iran) but not to yield anything substantial, at any cost."[49] In 1987, a formal agreement on peaceful nuclear cooperation was secretly signed between Pakistan and Iran.[50] Following the initiation of government-to-government cooperation, A.Q. Khan made close contact with Iranian counterparts. A series of secret contacts were made between the network and Iranian officials to make

[45] Mohammed El-Baradei, as quoted in Corera, Gordon (2006), *Shopping For Bombs: Nuclear Proliferation, Global Insecurity, and the Rise and Fall of the A.Q. Khan Network,* New York: Oxford University Press, p.xiv.
[46] Ibid.
[47] Clary, Christopher O. (2005), *The A.Q. Khan Network: Causes and Implications,* Master's Thesis, Monterey: Naval Postgraduate School, p.35, [Online: Web] Accessed August 17, 2011, URL: http://www.fas.org/irp/eprint/clary.pdf
[48] Salama, Sammy and Hunter, Cameron (2005), "Companies Reported to Have Sold or Attempted to Sell Libya Gas Centrifuge Components", March 1, [Online: Web] Accessed August 16, 2011, URL: http://www.nti.org/analysis/articles/companies-sold-libya-gas-centrifuge/
[49] Lancaster, John and Khan, Kamran (2004), "Pakistanis Say Nuclear Scientists Aided Iran: Iran Nuclear Effort Said Aided in Secret '80s Deal", *Washington Post,* 24 January, http://nuclearno.com/text.asp?7603
[50]Tertrais, Bruno (2008), "Khan's Nuclear Exports: Was There a State Strategy?" in Henry D. Sokolski (ed.), *Pakistan's Nuclear Future: Worries Beyond War,* Strategic Studies Institute, January, p.17.

deals. The first link between Tehran and Khan network was established in 1987.[51] It is note worthy that in early 1987 KRL scientists advertised its technical capabilities by openly publishing papers on construction of nuclear centrifuge and this was noticed by interested foreign actors.[52] Though it is not clear who initiated the contacts, in early 1987, in Switzerland, the Khan network – possibly through Khan's long-time associate and regular supplier, German engineer Gotthard Lerch[53] – provided the Iranians with a one-page document – "an item-by-item price list."[54] Later, in January 2005, Iran disclosed to the IAEA this document, without naming the source but stating that they have received the offer from "foreign intermediary" – the copy of which was submitted to the Agency on October 9, 2007.[55] The network offered Iran: "a disassembled sample of P-1 centrifuge machines; drawings, descriptions and specifications for production; drawings, specifications and calculations for a complete plant; materials for two thousand centrifuge machines; and auxiliary vacuum and electric drive equipment."[56] Following this, a substantial deal was made in 1987 in Dubai. There, a deal worth around $3 million was made between Iranian officials – among whom Mohammad Eslami was a key interlocutor[57] – and Indian-born businessman S. Mohamed Farouq, head of the computer import-export company SMB Group, and his Sri Lankan nephew Buhary Syed Ali Tahir. In the 1987 Dubai meeting, German engineer Heinz Mebus (who died in 1992), a long-time friend and supplier of Khan, was also present.[58] In that meeting, the network also provided a 15-page document relating to procedures for the re-conversion and casting of

[51] Clary, Christopher O. (2005), *The A.Q. Khan Network: Causes and Implications,* Master's Thesis, Monterey: Naval Postgraduate School, p.39, [Online: Web] Accessed August 17, 2011, URL: http://www.fas.org/irp/eprint/clary.pdf
[52] Ibid., p.38.
[53] IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,* The International Institute for Strategic Studies, London, p.67.
[54] Corera, Gordon (2006), *Shopping For Bombs: Nuclear Proliferation, Global Insecurity, and the Rise and Fall of the A.Q. Khan Network,* New York: Oxford University Press, p.59.
[55] Report by Director General of IAEA (2007), "Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions 1737 (2006) and 1747 (2007) in the Islamic Republic of Iran", GOV/2007/58, November 15, p.3, [Online: Web] Accessed February 6, 2012, URL: http://www.iaea.org/Publications/Documents/Board/2007/gov2007-58.pdf
[56] IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,* The International Institute for Strategic Studies, London, p.69.
[57] Ibid.
[58] Ibid.

uranium metal hemispheres, critical for construction of nuclear weapons.[59]Though it is not known as to how much was acquired by Iran from the items offered by the network, "Iran maintains that only some component of two disassembled centrifuges, plus supporting drawings and specifications, were delivered in 1987 by the network".[60]

Following the death of Zia in 1988, General Mirza Aslam Beg became the new chief of army staff and unlike Zia's discreet method, Beg openly supported nuclear cooperation with Iran. Like Zia, he was a strong Islamist and had strong anti-West feelings.[61] His support to Iran was part of his appeal for "democratizing" the global nuclear non-proliferation order and establishment of a multi-polar world order, as opposed to domination by the US and its Western allies, the idea that Khan shared.[62] He is suspected of being guilty of direct involvement in the Khan network or at least awareness about it. As stated by Robert Oakley, US ambassador to Pakistan during Beg's time as general, and Henry Rowen, Assistant Secretary of Defense, 'Beg threatened to transfer nuclear technology to Iran if Washington cut off arms sales to Pakistan'.[63] In his 13-page confession, a letter to his wife, Khan opined that General Beg, in 1989/1990, promised Iran centrifuge parts and drawings, and also few weapons and technology.[64] In 1989, Iranian President Hashemi Rafsanjani reportedly approached Pakistani PM Benazir Bhutto for the approval of the transfer of nuclear technology, stating that her generals had previously offered such transfer on a purely military-to-military basis.[65] Bhutto objected

[59] Ibid.; Report by Director General of IAEA (2007), "Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions 1737 (2006) and 1747 (2007) in the Islamic Republic of Iran", GOV/2007/58, November 15, p.3, [Online: Web] Accessed February 6, 2012, URL: http://www.iaea.org/Publications/Documents/Board/2007/gov2007-58.pdf

[60] Report by Director General of IAEA (2007), "Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions 1737 (2006) and 1747 (2007) in the Islamic Republic of Iran", GOV/2007/58, November 15, p.3, [Online: Web] Accessed February 6, 2012, URL: http://www.iaea.org/Publications/Documents/Board/2007/gov2007-58.pdf

[61] Corera, Gordon (2006), *Shopping For Bombs: Nuclear Proliferation, Global Insecurity, and the Rise and Fall of the A.Q. Khan Network,* New York: Oxford University Press, p.75.

[62] Ibid., p.74.

[63] IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,* The International Institute for Strategic Studies, London, p.69.

[64]FoxNews (2011), "A.Q. Khan's Thirteen-Page Confession," September 15, 2011. [Online: Web] Accessed March 11, 2012, URL: http://www.foxnews.com/world/2011/09/15/aq-khans-thirteen-page-confession/; Agencies (2011), "New AQ Khan docs reveal 'Pak cashed in on n-weapon technology,'" Washington, September 17, [Online: Web] Accessed March 11, 2012, URL: http://www.indianexpress.com/news/new-aq-khan-docs-reveal-pak-cashed-in-on-n/847991/

[65] Corera, Gordon (2006), *Shopping For Bombs: Nuclear Proliferation, Global Insecurity, and the Rise and Fall of the A.Q. Khan Network,* New York: Oxford University Press, p.76.

and prevented it. In August 1990, she was out of power and her tussle with the military on the nuclear issue was cited as partly the reason for her ouster.[66] Similar proposals were made during the term of Nawaz Sharif as prime minister. In fact, the then President, G. I. Khan sought Sharif's approval for a nuclear weapons deal with Iran.[67]

In 1991, it was reported that an agreement was reached for nuclear cooperation in return for conventional weapons and Iranian oil.[68] This agreement was, however, not implemented, as confirmed by Ambassador Oakley, purportedly due to pressure from the US against it.[69] In December 1994, it was reported that around 1992, ISI chief, Lieutenant General Durrani received an offer of $3.2 billion from Iran for nuclear technology.[70] Major General Imtiaz Ali, who was Benazir Bhutto's security affairs adviser, also encouraged Khan to deal with Iran. In fact, Khan himself confessed that General Imtiaz Ali advised him to pack old and incomplete P-1 machines and drawings to be sent to Iran.[71] These were apparently sent to Iran by Dr. M.Z. Naizi, "a confidante of Benazir Bhutto and Gen. Imtiaz."[72] In 1994/1995, Khan was also requested by Dr. Niazi to meet Iranian scientist in Karachi to discuss about centrifuge technology.[73] This evidence suggests that Pakistani military was an accomplice and the civilian leaders knew about it but were powerless to take any meaningful action.

The next big deal occurred between mid-1993-1994. In mid-1993, Tahir reportedly offered to supply Iran with P-1 designs and components for five hundred P-1 machines, and also provided drawings for the P-2 centrifuges.[74] The deal was made in October 1994, and the first shipment of goods was made that year, with initial payment

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[66] Ibid., p.53.
[67] Tertrais, Bruno (2008), "Khan's Nuclear Exports: Was There a State Strategy?" in Henry D. Sokolski (ed.), *Pakistan's Nuclear Future: Worries Beyond War,* Strategic Studies Institute, January, p.21.
[68] Ibid.; IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,* The International Institute for Strategic Studies, London, p.70
[69]Tertrais, Bruno (2008), "Khan's Nuclear Exports: Was There a State Strategy?" in Henry D. Sokolski (ed.), *Pakistan's Nuclear Future: Worries Beyond War,* Strategic Studies Institute, January, p.21.
[70] Corera, Gordon (2006), *Shopping For Bombs: Nuclear Proliferation, Global Insecurity, and the Rise and Fall of the A.Q. Khan Network,* New York: Oxford University Press, p.76.
[71] FoxNews (2011), "A.Q. Khan's Thirteen-Page Confession," September 15, 2011, [Online: Web] Accessed March 11, 2012, URL: Available at http://www.foxnews.com/world/2011/09/15/aq-khans-thirteen-page-confession/
[72] Ibid.
[73] Ibid.
[74] IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,* The International Institute for Strategic Studies, London, p.70.

amounting to $3 million.[75] Iran, however, complained about the low quality of the components supplied by the network. From 1994 to 1996, the network is said to have supplied to Iran duplicate set of P-1 designs and components for five hundred centrifuges, due to which Khan's network had to replace certain components at least once in 1997.[76] Between 1994 and 1999, Iran admitted that it met with people of the network for 13 times.[77] It is not known as to who received the money and, while Iran definitely received designs and centrifuge components, it is not known exactly how much of the components offered by the network were actually obtained by Iran. It is reported that some deliveries were made after 1995, and even as late as 2000.[78] While Iran maintains, initially, that it received no P-2 centrifuges from foreign source, in 2007, it admitted to have recieved P-2 designs from 'the network' – the Khan network – at a meeting in Dubai in 1996 and that the work on P-2 design never began until 2002.[79] In 2006, Tahir revealed to the IAEA, during an interview that in 1997, three complete P-2 centrifuges were sent to Iran.[80]

The services rendered by the Khan network in the form of supply of designs, components and full centrifuge machines eased development of Iran's uranium enrichment programme. It is believed that Iran could have used the documents provided by Khan as a shopping list for obtaining components and technology from other sources,[81] and also used the components and centrifuge provided by the network as

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[75] Tertrais, Bruno (2008), "Khan's Nuclear Exports: Was There a State Strategy?" in Henry D. Sokolski (ed.), *Pakistan's Nuclear Future: Worries Beyond War,* Strategic Studies Institute, January, p.22; IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment*, The International Institute for Strategic Studies, London, p.70.

[76] Clary, Christopher O. (2005), *The A.Q. Khan Network: Causes and Implications*, Mater's Thesis, Monterey: Naval Postgraduate School, p.41, [Online: Web] Accessed August 17, 2011, URL: http://www.fas.org/irp/eprint/clary.pdf

[77] Tertrais, Bruno (2008), "Khan's Nuclear Exports: Was There a State Strategy?" in Henry D. Sokolski (ed.), *Pakistan's Nuclear Future: Worries Beyond War,* Strategic Studies Institute, January, p.22.

[78] Broad, William J. and Sanger, David E. (2006) "Iran Claims Nuclear Steps in New Worry," *The New York Times*, April 17, [Online: Web] Accessed February 16, 2012, URL: http://www.nytimes.com/2006/04/17/world/middleeast/17nuke.html?_r=1&hp&ex=1145332800&en=f1828e012e1d168b&ei=5094&partner=homepage

[79] Report by Director General of IAEA (2007), "Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions 1737 (2006) and 1747 (2007) in the Islamic Republic of Iran", GOV/2007/58, November 15, p.4, [Online: Web] Accessed February 6, 2012, URL: http://www.iaea.org/Publications/Documents/Board/2007/gov2007-58.pdf

[80] IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment*, The International Institute for Strategic Studies, London, p.71

[81] Clary, Christopher O. (2005), *The A.Q. Khan Network: Causes and Implications*, Master's Thesis, Monterey: Naval Postgraduate School, p.40, [Online: Web] Accessed August 17, 2011, URL: http://www.fas.org/irp/eprint/clary.pdf

models for indigenous production. As time passed Iran got more experience and by 2007, Iran had already established at least two facilities in Natanz – a Fuel Enrichment Plant (FEP) and a Pilot Fuel Enrichment Plant (PFEP)[82] and was operating about 370 centrifuges in the pilot plant.[83] By 2010, Iran was operating the FEP and PFEP at Natanz, where at the FEP, from February 2007 to October 2010, a total of 3183 kg of low enriched uranium hexafluoride (UF_6) was produced at enrichment level of 3.37%, and the PFEP, which became operational in October 2003, was processing UF_6 which was enriched up to 20% U-235.[84]

There was a clear difference of interests within the centers of authority in Pakistan, marked by diffusion of power among the president, prime minister and army chief – each trying to undermine the other. The military, nevertheless, had the upper hand. The military dictated on the nuclear matter. Not much evidence is available to determine Zia's involvement but it logically follows that his Islamists ideology and his decision to fiddle with Iran on nuclear issue certainly makes him responsible for making the initial inroads to nuclear black marketing. The encouragement given by certain individuals like Zia, General Beg, General G.I. Khan and Major General Imtiaz Ali for a nuclear cooperation with Iran shows that important officials of the state were certainly involved and it was a state policy as often stated overtly. Khan's 13-page confession to his wife, corroborate their complicity.

As for Khan, apart from the motivation and support given by important policy makers, it is also believed that he might also have been motivated to conduct illegal nuclear trade with Iran for money and also due to his ideological stance. Khan is believed to have benefitted hugely through the trade. Tahir stated that Khan was paid at least $3

[82] Report by Director General of IAEA (2007), "Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions 1737 (2006) and 1747 (2007) in the Islamic Republic of Iran", GOV/2007/58, November 15, p.6, [Online: Web] Accessed February 6, 2012, URL: http://www.iaea.org/Publications/Documents/Board/2007/gov2007-58.pdf

[83] IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment*, The International Institute for Strategic Studies, London, p.71.

[84] Report by Director General of IAEA (2010), "Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions in the Islamic Republic of Iran", GOV/2010/62, 23 November, pp.2, 3 & 9, [Online: Web] Accessed February 6, 2012, URL: http://www.iaea.org/Publications/Documents/Board/2010/gov2010-62.pdf

million for a particular deal in Dubai.[85] Khan's lavish home, regular foreign travel and generous charitable contributions show that he did earn much more than what the government paid him.[86] Ideologically, he was inclined towards defiance of western domination in the field of nuclear technology, an idea that was shared by General Beg, and he called for a collective effort of Muslim countries to develop nuclear weapons. In fact, in 1995, Khan strongly criticized Western countries for curtailing technological development in the Muslim World.[87] Some believe that it is most probable that some state officials authorised nuclear deal with Iran and Khan went overboard, extending to more than what was mandated, to setup secret nuclear trade with Iran.[88]

Assistance to North Korea

Like the Iran case, the deal with North Korea was built upon the relationship that Pakistani government had established earlier. This relationship with North Korea began in the early 1970s.[89] This began during Gen. Yahya Khan's era when, in 1971, during the period of crisis with India, Zulfiqar Ali Bhutto, the then Foreign Minister, visited North Korea looking for supply of conventional arms.[90] An agreement for supply of North Korean-made conventional weapons to Pakistan was signed on September 18, 1971.[91] Since then, Pakistan developed a close friendship with North Korea. There was regular trade in conventional armaments for over thirty years and during the Iran-Iraq War (1980-1988), in which both the countries assisted Iran, a closer bond was made.[92] The clandestine deals with North Korea is said to have begun in the late 1990s.[93] This followed the government-to-government deal that Pakistan had established with North

[85] Clary, Christopher O. (2005), *The A.Q. Khan Network: Causes and Implications*, Master's Thesis, Monterey: Naval Postgraduate School, p.46, [Online: Web] Accessed August 17, 2011, URL: http://www.fas.org/irp/eprint/clary.pdf
[86] Ibid., p.47
[87] Ibid.
[88] Ibid., p.46
[89] IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment*, The International Institute for Strategic Studies, London, p.74.
[90] Raman, B. (2009), "Nuclear Wal-Mart: US as Guilty of Cover-up as Pakistan," July, 5, [Online: Web] Accessed February 7, 2012, URL: http://www.southasiaanalysis.org/%5Cpapers28%5Cpaper2759.html
[91] Ibid.
[92] Squassoni, Sharon A. (2006), "Weapons of Mass Destruction: Trade Between North Korea and Pakistan", *CRS Report for Congress*, Order Code RL31900, Updated November 28, p.3.
[93] Clary, Christopher O. (2005), *The A.Q. Khan Network: Causes and Implications*, Master's Thesis, Monterey: Naval Postgraduate School, p.54, [Online: Web] Accessed August 17, 2011, URL: http://www.fas.org/irp/eprint/clary.pdf

Korea beginning in early 1990s. Serious government-to-government cooperation in missile technology between the two countries, for which negotiation started in 1992, seems to have started in 1993 following Benazir Bhutto's visit to Pyongyang that year.[94]

There were at least two compelling reasons for Pakistan to seek missile cooperation with North Korea.[95] Firstly, Pakistan's efforts at procurement of reliable nuclear delivery system, to balance India's growing capabilities in this area, was stymied by the imposition of sanctions on Pakistan under Pressler Amendment by Washington in October 1990. As European suppliers were reluctant to provide Pakistan with the requirements, Pakistan was forced to look towards other source. Secondly, following military crisis over Kashmir in 1990, India rapidly developed its ballistic missile capabilities. India's short range *Prithvi* ballistic missile was tested in February 1988 and was put into service in the Army in 1994. India had also begun test flight of intermediate-range *Agni-1* ballistic missile from 1994 onwards. Moreover, the Missile Technology Control Regime (MTCR), established in 1987 increased Pakistan's woes as European suppliers were not forthcoming.[96] Given this conditions, Pakistan sought to capitalize on North Korea's expertise in missile technology.

Apparently, a deal for twelve to twenty-five *No-dong* missiles and at least one mobile erector launcher was struck between Pakistan and North Korea in November 1995.[97] The delivery is believed to have begun in 1996.[98] There are three versions about the execution of the transaction which distorts the truth about the manner in which the deal was carried out, and so makes it difficult to prove without doubt that Pakistan government did not supply uranium centrifuge technology to North Korea. The first version is that North Korea's *No-dong* missiles were actually swapped for Pakistan's uranium centrifuge technology and the authorization was given by top officials in Pakistan – which points towards government's approval. This version is severely contested by Pakistan. In 1997, a high-ranking defector from North Korea, Hwang Jang-yop, who was a close aide to Kim Il-Sung revealed that a deal to trade long-range

[94] Squassoni, Sharon A. (2006), "Weapons of Mass Destruction: Trade Between North Korea and Pakistan", *CRS Report for Congress*, Order Code RL31900, Updated November 28, p.10.
[95] IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment*, The International Institute for Strategic Studies, London, p.74
[96] Ibid.
[97] Ibid.
[98] Ibid.

missiles in return for uranium enrichment technology with Pakistan was struck after technical delegation from Pakistan visited North Korea.[99] In 2004, *Washington Post* reported that Khan stated that former chief of staffs, namely Gen. Mirza Aslam Beg (1988-1991), Gen. Jehangir Karamat (1996-1998) and Gen. Parvez Musharraf (1998-2007) were aware of his assistance to North Korea with design and equipment for uranium enrichment.[100] Khan also admitted in his 13-page confession that Gen. Jehangir Karamat gave him the "go-ahead" for the sale of twenty outdated P-1 machines and four P-2 machines to North Korea for $3 million.[101] Khan also claimed that some time in 1993-1994, Korean team was "officially allowed to stay at Kahuta," where they were likely briefed on centrifuge technology[102] – Gen. Parvez Musharraf wrote that he ordered that this Korean team be sent back, as soon as he discovered in 1999.[103] These statements do not prove without doubt that the swab was actually made, because apart from statements, there is no solid evidence to show that such a barter deal was made between Pakistan and North Korea.

Opposing this version, the second version which Pakistani government, beginning with Benazir Bhutto, have strongly maintained is that the ballistic missile cooperation with North Korea was based on cash payment and was never a missile-for-enrichment technology swap deal. Pakistan maintains that it paid a total of $210 million to North Korea for purchase of missiles and technology transfer.[104] Examining this claim, the

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[99] Nilksch, Larry A.(2006), "North Korea's Nuclear Weapons Program," Congressional Research Service, Order Code RL33590, updated October 5, p.12, [Online: Web] Accessed September 4, 2011, URL: http://assets.opencrs.com/rpts/RL33590_20061005.pdf

[100] Lancaster, John and Khan, Kamran (2004), "Musharraf named in Pakistan nuclear probe: Top scientist says senior officials OK'd help for North Korea," *Washington Post*, February 3, [Online: Web] Accessed March 11, 2012, URL: http://www.chron.com/news/nation-world/article/Musharraf-named-in-Pakistan-nuclear-probe-1485673.php

[101] FoxNews (2011), "A.Q. Khan's Thirteen-Page Confession," September 15, [Online: Web] Accessed March 11, 2012, URL: http://www.foxnews.com/world/2011/09/15/aq-khans-thirteen-page-confession/; Agencies (2011) "New AQ Khan docs reveal 'Pak cashed in on n-weapon technology,'" Washington, September 17, [Online: Web] Accessed March 11, 2012, URL: http://www.indianexpress.com/news/new-aq-khan-docs-reveal-pak-cashed-in-on-n/847991/

[102] FoxNews (2011), "A.Q. Khan's Thirteen-Page Confession," September 15, [Online: Web] Accessed March 11, 2012, URL: http://www.foxnews.com/world/2011/09/15/aq-khans-thirteen-page-confession/

[103] IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment*, The International Institute for Strategic Studies, London, p.72.

[104] Statement made by Pakistan Strategic Plans Division officials at the Naval Postgraduate School, Monterey, (2006), quoted in IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment*, The International Institute for Strategic Studies, London, p.75

dossier brought out by *The International Institute for Strategic Studies* in 2007, observes that in spite of the severe economic crisis that Pakistan faced in mid-1990s, Pakistan could have managed to pay the North Korean in cash. It construed that since Pakistan spent about $819 million for arms import during 1995-1996, and the overall defence budget in mid-1990s stood at around $3 billion annually, it is most likely that Pakistan did make the purchase as claimed.[105] However, because Pakistani government has neither revealed documents relating to government purchase of missiles nor evidence of payment made by North Korea to Khan for the centrifuge technology, Pakistani government's claim that the nuclear deal with North Korea was made clandestinely by Khan alone is highly untenable.

The third version holds that supply of centrifuge technology to North Korea was the handiwork of Khan and that Pakistani government never authorised transfer of centrifuge technology to North Korea. In a signed statement, A.Q. Khan reportedly accepted sole responsibility for "supplying old and discarded centrifuge and enrichment machines together with sets of drawings, sketches, technical data and depleted Hexaflouride (UF6) gas to North Korea."[106] In his autobiography, Gen. Parvez Musharraf stated that "A.Q. Khan transferred nearly two dozen P-1 and P-2 centrifuges to North Korea. He also provided North Korea with a flow meter, some special oils for centrifuges, and coaching on centrifuge technology, including visits to top-secret centrifuge plants."[107] Though the exact number of centrifuges supplied to North Korea is not known, the centrifuges seems to have been delivered to North Korea between 1997 and 1999, Khan is also believed to have provided a "shopping list" of equipment needed

[105] IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment*, The International Institute for Strategic Studies, London, p.75
[106] Staff Reporter (2004), "Re-imposition of sanctions feared: US aid my be jeopardized - official," *Dawn*, Febraury 4, [Online: Web] Accessed March 14, 2012, URL: http://archives.dawn.com/2004/02/05/top5.htm; Lancaster, John and Khan, Kamran (2004), "Musharraf named in Pakistan nuclear probe: Top scientist says senior officials OK'd help for North Korea," *Washington Post*, February 3, [Online: Web] Accessed March 11, 2012, URL: http://www.chron.com/news/nation-world/article/Musharraf-named-in-Pakistan-nuclear-probe-1485673.php
[107] Musharraf, Pervez (2006), *In the Line of Fire: A Memoir*, New Delhi: Free Press, p.296.

for construction of uranium gas centrifuge machine.[108] The list enabled North Korea to obtain components from other foreign sources in Europe and Asia.[109]

While Pakistan try to mark Khan being the main culprit in the supply of gas centrifuge technology and components to North Korea, skeptics say that if Pakistani state did not officially authorise transfer of centrifuge technology to North Korea, Khan did act at the behest of important policy-makers, especially from the army, pretending they were not unaware of the Khan's clandestine dealing with North Korea. Firstly, skeptics question the claim that because Khan had a high degree of autonomy in carrying out his operations, he could have easily shipped out components required by North Korea without being detected. It is suspected that the components were transported to North Korea using U.S. supplied C-130s[110] transport aircraft belonging to the Pakistani air force or to charter companies connected to the air forces – this premise is backed by Central Intelligence Agency's (CIA) imagery analysis of unmarked containers that were loaded on the C-130 transport aircraft.[111] Given that the military kept close tract of developments in nuclear sphere since Zia's regime, since late 1970s,[112] the shipments could not have been carried out without the involvement or at least awareness of the key officials in the military.[113] In fact, Khan himself has admitted that key officials were actually involved – he specifically admitted that Gen. Jehangir Karamat gave him the "go-ahead" for the sale of twenty outdated P-1 machines and four P-2 machines to North Korea for $3 million.[114]

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[108] Sanger, David E. (2004), "Pakistani Says He Saw North Korean Nuclear Devices," *New York Times,* April 13, [Online: Web] Accessed March 11, 2012, URL: http://www.nytimes.com/2004/04/13/world/pakistani-says-he-saw-north-korean-nuclear-devices.html?pagewanted=all&src=pm

[109] Clary, Christopher O. (2005), *The A.Q. Khan Network: Causes and Implications,* Master's Thesis, Monterey: Naval Postgraduate School, pp.54 & 88, [Online: Web] Accessed August 17, 2011, URL: http://www.fas.org/irp/eprint/clary.pdf; IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,* The International Institute for Strategic Studies, London, p.73.

[110] Chakma, Bhumitra (2009), *Pakistan's Nuclear Weapons,* London and New York: Routledge, p.120.

[111] IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,* The International Institute for Strategic Studies, London, p.74.

[112] Ibid., p.75.

[113] Ibid.; Clary, Christopher O. (2005), *The A.Q. Khan Network: Causes and Implications*, Master's Thesis, Monterey: Naval Postgraduate School, p.63, [Online: Web] Accessed August 17, 2011, URL: http://www.fas.org/irp/eprint/clary.pdf

[114] FoxNews (2011), "A.Q. Khan's Thirteen-Page Confession," September 15, [Online: Web] Accessed March 11, 2012, URL: http://www.foxnews.com/world/2011/09/15/aq-khans-thirteen-page-confession/; Agencies (2011), "New AQ Khan docs reveal 'Pak cashed in on n-weapon technology,'" Washington,

Also, the presence of North Korean team "officially allowed to stay at Kahuta" since 1993/1994 – who were briefed on centrifuge technology, according to Khan,[115] and whose presence was corroborated by Musharraf when he stated that he ordered this Korean team to be sent back, as soon as he discovered in 1999,[116] prove otherwise and raise a curious case. Firstly, given military's authoritative supervision of Pakistan's nuclear programme, it is hard to believe that the military was unaware of the presence of the North Korean team for five to six years. Secondly, the presence could not have been without authorization from the military. Going by Khan's confession, this was officially sanctioned.

Secondly, it is also viewed that because of institutional competition between PAEC and KRL, Khan might have resorted to transfer of centrifuge technology to gain prominence over rival PAEC. PAEC was running the Chinese M-9 & M-11 missile deal and apparently, Khan wanted to develop his own rival missile system for reasons of prestige, status and funds.[117] This view asserts that because missile development was strategically vital for Pakistan, Khan might have manipulated the military and civilian authorities to agree to a swap agreement with North Korea, and once such deal was condoned by certain sections of state authority Khan probably ran the transactions alone and perhaps the government were not aware of it or were aware but not the full extent of his dealings with North Korea.[118] This version says that Khan's strategy of manipulation would explain how Khan was able to quickly test the 1500 km *Ghauri-1* missile, which resembled North Korea's *No-dong* missile, on April 6, 1998 and managed to establish his true value by beating PAEC on the race for long range missiles.[119] PAEC first flight tested the 600 km *Hatf-IV*¸ which resembled Chinese M-9 on April 14, 1999, a year

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September 17, [Online: Web] Accessed March 11, 2012, URL: http://www.indianexpress.com/news/new-aq-khan-docs-reveal-pak-cashed-in-on-n/847991/

[115] FoxNews (2011), "A.Q. Khan's Thirteen-Page Confession," September 15, [Online: Web] Accessed March 11, 2012, URL: http://www.foxnews.com/world/2011/09/15/aq-khans-thirteen-page-confession/

[116] IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,* The International Institute for Strategic Studies, London, p.72.

[117] Corera, Gordon (2006), *Shopping For Bombs: Nuclear Proliferation, Global Insecurity, and the Rise and Fall of the A.Q. Khan Network,* New York: Oxford University Press, p.89

[118] Chakma, Bhumitra (2009), *Pakistan's Nuclear Weapons,* London and New York: Routledge, p.119.

[119] Corera, Gordon (2006), *Shopping For Bombs: Nuclear Proliferation, Global Insecurity, and the Rise and Fall of the A.Q. Khan Network,* New York: Oxford University Press, p.90; Clary, Christopher O. (2005), *The A.Q. Khan Network: Causes and Implications,* Master's Thesis, Monterey: Naval Postgraduate School, p.61, [Online: Web] Accessed August 17, 2011, URL: http://www.fas.org/irp/eprint/clary.pdf

behind KRL.[120] This version also does not establish that the military was not complicit in the scandal. The reasons for doubt in the foregoing paragraph still apply. Khan might have manipulated but the military, in all probability, was acquiescent, aware and by Khan's account, authorised the transfers.[121]

Thirdly, the export of uranium hexafluoride to North Korea by Khan, which President Musharraf has confirmed, seems to show that KRL was not alone in dealing with North Korea. In fact, the KRL did not have the capability to convert uranium into uranium hexafluoride, but it was within the capability of the PAEC. As such it can be logically concluded that PAEC was involved in the transactions and that collaboration between Pakistan and North Korea was broad based, which involved more than just Khan.[122]

Though there is paucity of solid evidence, factors such as: (a) the intersection of Pakistan and North Korea's strategic interests – Pakistan wanted the missile technology and North Korea, the enrichment technology; (d) absence of evidence/documentary proof to show government to government missile-for-cash transfer; (b) the likely transfer of uranium enrichment components and materials from the C-130 Pakistani military transport plane; (c) the presence of North Korean team at the KRL, Kahuta for at least five years, apparently briefed on enrichment technology; (d) the non-involvement of the usual foreign players of the nuclear black marketing network; and (e) Khan's 13-page letter confession to his wife that explicitly named officials involved in the North Korean case, are reasons that does not rule out Pakistani state complicity in the case of nuclear technology transfer to North Korea. Lack of transparency about decision-making on nuclear issues and absence of system of accountability in Pakistan makes it hard to establish the truth about nuclear assistance from Pakistan to North Korea. The confession by Khan (13-page letter to his wife) supports assertion of state complicity. And notably,

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[120] Clary, Christopher O. (2005), *The A.Q. Khan Network: Causes and Implications,* Master's Thesis, Monterey: Naval Postgraduate School, p.61, [Online: Web] Accessed August 17, 2011, URL: http://www.fas.org/irp/eprint/clary.pdf

[121] FoxNews (2011), "A.Q. Khan's Thirteen-Page Confession," September 15, [Online: Web] Accessed March 11, 2012, URL: http://www.foxnews.com/world/2011/09/15/aq-khans-thirteen-page-confession/; Agencies (2011), "New AQ Khan docs reveal 'Pak cashed in on n-weapon technology,'" Washington, September 17, [Online: Web] Accessed March 11, 2012, URL: http://www.indianexpress.com/news/new-aq-khan-docs-reveal-pak-cashed-in-on-n/847991/

[122] Chakma, Bhumitra (2009), *Pakistan's Nuclear Weapons,* London and New York: Routledge, p.120.

the North Korea case did not involve the foreign network of supply chain that were part of the Iran deal but it was the handiwork of Khan himself and some Pakistani associates.[123]

Capitalizing on the technology that it acquired from Pakistan, by mid-2009, North Korea had made substantial progress in its uranium enrichment programme as it declared for the first time that it has a uranium enrichment programme and that enough success has been achieved in this direction.[124] North Korea also indicated that it will enrich uranium on a significant scale in the near future. The extent of North Korea's capacity to produce HEU is, however, only a matter of speculation. Significantly, North Korea demonstrated its capability by conducting a nuclear test in May 2009.[125]

Assistance to Libya

Cooperation between Khan network and Libya began in 1997 after the Libyan intelligence agency head Matooq Mohammed Matooq met with A.Q. Khan and B.S.A. Tahir in Istanbul to strike a deal with Khan for supply of centrifuge units to Libya.[126] That year, Khan network supplied twenty complete L-1 aluminum centrifuges (renamed P-1 as L-1 for 'Libya 1'), along with most of the components for and additional two hundred L-1 centrifuges.[127] However, for reasons unknown, the aluminum rotors and magnets were missing from the consignment sent. In 2000, Libya imported two test L-2 (P-2 renamed as L-2), maraging steel centrifuges from Pakistan.[128] These centrifuges were contaminated with HEU particles and were apparently used in the Pakistani nuclear programme. Following this, Libya placed an order for 10,000 additional L-2 centrifuges, and the first deliveries were made in December 2002.[129] Libya also imported from the network two small cylinders containing UF_6 in September 2000, containing 25kg each of

[123] IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,* The International Institute for Strategic Studies, London, p.72.
[124] Albright, David and Brannan, Paul (2010), "Taking Stock: North Korea's Uranium Enrichment Program," The Institute for Science and International Security, October 8, p.1. [Online: Web] Accessed February 6, 2012, URL: http://isis-online.org/uploads/isis-reports/documents/ISIS_DPRK_UEP.pdf
[125] Ibid.
[126] IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,* The International Institute for Strategic Studies, London, p.76.
[127] Ibid., p.77.
[128] Ibid.
[129] Ibid.

unenriched UF_6 in one, and the other depleted uranium.[130] One large cylinder containing 1,700kg of UF_6 enriched to 1% was imported in February 2001.[131] It is not clear whether the UF_6 came from North Korea or Pakistan.[132] From the network, Libya also received compact disks containing a full set of L-1 and L-2 centrifuge drawings along with assembly and instruction manual for testing.[133]

Between 2001 and 2002, Libya received documentation relating to nuclear weapons design and fabrication from Khan network.[134] Such documents were not supplied to Iran and North Korea. The documentation provided assembly drawings and instruction for manufacturing components for the bomb: explosive parts, detonator and fissile materials. Details of some parts were, however, not provided: including associated electronics, cabling and firing sets.[135]The designs were apparently for a ten-kiloton implosion device similar to late 1960s Chinese design and the documents were described as copies of copies, meaning that there was a plurality in the number of people who had access to the documents.[136]

The uniqueness of the Libyan case rests in the fact that unlike Iran and North Korea, Libya had no prior experience in nuclear field. In Libya's case, Khan network provide a 'turnkey' programme where it would simply have to assemble.[137] This meant that Khan had to expand his operation and adopt a more sophisticated operation involving establishment of a number of front companies, and setting them up in carefully selected

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[130] Ibid., p.78.
[131]Report by the Director General (2004), "Implementation of the NPT Safeguards Agreement of the Socialist People's Libyan Arab Jamahiriya," International Atomic Energy Agency, GOV/2004/12, February 20, p.4-5, [Online: Web] Accessed February 6, 2012, URL: http://www.fas.org/nuke/guide/libya/iaea0204.pdf; IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,* The International Institute for Strategic Studies, London, p.78.
[132] IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,* The International Institute for Strategic Studies, London, p.78.
[133] Ibid.
[134] Report by the Director General (2004), "Implementation of the NPT Safeguards Agreement of the Socialist People's Libyan Arab Jamahiriya," International Atomic Energy Agency, GOV/2004/12, February 20, p.6, [Online: Web] Accessed February 6, 2012, URL: http://www.fas.org/nuke/guide/libya/iaea0204.pdf
[135] IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,*The International Institute for Strategic Studies, London, p.79.
[136] Ibid.
[137] Corera, Gordon (2006), *Shopping For Bombs: Nuclear Proliferation, Global Insecurity, and the Rise and Fall of the A.Q. Khan Network,* New York: Oxford University Press, p.109.

locations where possibilities of detection by preying eyes are minimal.[138] These companies were setup in countries like Dubai, Malaysia, South Africa, Turkey, Netherlands, and Switzerland.[139] From Pakistan, Khan was the head of the network. It is estimated that up to thirty companies in twelve countries were involved in the deal with Libya, with about half a dozen workshops spread over three continents.[140] Khan also decided to setup workshop code named *Project Machine Shop 1001* at Janzour, Libya to manufacture components difficult to procure elsewhere and also to facilitate repair of centrifuges.[141]

Dubai became the hub of the network: raw material were bought in one country, manufactured or assembled in another, and finally taken to Dubai for shipping to final destination.[142] This was accomplished by maneuvering through the loopholes in the existing export control regime and using various techniques: using false end-user certificate and other means of deception.[143] It was during one of such sophisticated operation in 2003 that the German-registered ship *BBC China,* laden with uranium enrichment equipment bound for Libya was intercepted by joint effort of CIA and MI6 that the dissolution of Khan's network ensued. On its part, Libya announced on December 19, 2003 its decision "eliminate… materials, equipments and programmes which lead to the production of internationally proscribed weapons."[144]

Even in the Libya case, there are reasons to believe that Pakistani state was complicit in the nuclear scandal. First of all, the network was built on the government-to-government nuclear deal that began during the time of Zulfikar Ali Bhutto, who was

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[138] Ibid., p.113.
[139] Ibid., pp.113-119.
[140] Salama, Sammy and Hunter, Cameron (2005), "Companies Reported to Have Sold or Attempted to Sell Libya Gas Centrifuge Components", March 1, [Online: Web] Accessed August 16, 2011 URL: http://www.nti.org/analysis/articles/companies-sold-libya-gas-centrifuge/
[141] Clary, Christopher O. (2005), *The A.Q. Khan Network: Causes and Implications,* Master's Thesis, Monterey: Naval Postgraduate School, p.79, [Online: Web] Accessed August 17, 2011, URL: http://www.fas.org/irp/eprint/clary.pdf; IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,* The International Institute for Strategic Studies, London, p.78.
[142] Corera, Gordon (2006), *Shopping For Bombs: Nuclear Proliferation, Global Insecurity, and the Rise and Fall of the A.Q. Khan Network,* New York: Oxford University Press, p.117.
[143] Ibib., p.118.
[144] Report by the Director General (2004), "Implementation of the NPT Safeguards Agreement of the Socialist People's Libyan Arab Jamahiriya," International Atomic Energy Agency, GOV/2004/12, February 20, p.2, [Online: Web] Accessed February 6, 2012, URL: http://www.fas.org/nuke/guide/libya/iaea0204.pdf

desperate for a Pakistani nuclear test to match India's 1974 nuclear test.[145] In response to Bhutto's appeal for nuclear bomb for Islamic state, President Gadhafi, who was also earnestly seeking nuclear weapons, provided financial help of $100-$500 million, and 450 tons of yellowcake to Pakistan during 1973-82.[146] After receiving so much support from Libya, Pakistan may have felt it appropriate to "payback" in kind by supplying nuclear technology to Libya.[147] Secondly, because of the fact that the military keeps a very close eye on the nuclear issue, it is highly unlikely that Khan ran the nuclear racket without the knowledge of Pakistan's military. Thirdly, in the Libya case, participants had more money to gain. Libya was willing to pay huge sum of money for nuclear technology from Pakistan, and when nuclear technology was already being exported from Pakistan to Iran and North Korea, Libya could have been easily accommodated. It is estimated that at least $100 million[148] was spent by Libya on the nuclear enrichment programme and that the network offered figures between $85 million and $140 million for nuclear technology.[149] Fourthly, Khan himself confessed that the deal with Libya was cleared at the highest state authority.[150] This is supported by the revelation of an anonymous former senior Pakistani military officer, associated with the nuclear oversight, who admitted to journalist Douglas Frantz in May 2005 that "The military knew that Khan' orders came from the very top."[151]

Assistance to Other Clients?

It is also speculated that Khan network might have had other clients. It is believed that an offer was made by Khan network in 1990 to Iraq to provide uranium enrichment technology and designs for nuclear weapon. The Iraqi government, however, feared that

[145] IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,* The International Institute for Strategic Studies, London, p.76.
[146] Ibid.
[147] Tertrais, Bruno (2008), "Khan's Nuclear Exports: Was There a State Strategy?" in Henry D. Sokolski (ed.), *Pakistan's Nuclear Future: Worries Beyond War,* Strategic Studies Institute, January, p.37.
[148] Frantz, Douglas (2005), "Pakistan's Role in Scientist's Nuclear Trafficking Debated," May 16, [Online: Web] Accessed June 15, 2012, URL: http://articles.latimes.com/2005/may/16/world/fg-khan16
[149] Corera, Gordon (2006), *Shopping For Bombs: Nuclear Proliferation, Global Insecurity, and the Rise and Fall of the A.Q. Khan Network,* New York: Oxford University Press, pp.120-121.
[150] FoxNews (2011), "A.Q. Khan's Thirteen-Page Confession," September 15, 2011. [Online: Web] Accessed March 11, 2012, URL: http://www.foxnews.com/world/2011/09/15/aq-khans-thirteen-page-confession/
[151] Frantz, Douglas (2005), "Pakistan's Role in Scientist's Nuclear Trafficking Debated," May 16, [Online: Web] Accessed June 15, 2012, URL: http://articles.latimes.com/2005/may/16/world/fg-khan16

it might be a sting operation.[152]Saudi Arabia could have been a potential customer given the long standing close relationship with Pakistan. In 1990, Saudi Arabia reportedly sought Pakistani nuclear weapons for its CSS-2 missiles but Pakistan declined fearing political risks. Frequent visits by A.Q. Khan to Saudi Arabia and corresponding visits by officials of Saudi Arabia to witness *Ghauri* missile test launches in 2002 and 2004, visits to Pakistani nuclear installations and financial assistance to KRL[153] raises suspicion that there is lot more going on between Khan and Saudi Arabia. Interestingly, in 2003, there were reports about a 'nukes for oil' barter agreement between Pakistan and Saudi Arabia. There is, however, no evidence of nuclear transfer to Saudi Arabia. Apart from these countries, Syria, Egypt, South Africa, Brazil and Turkey were reportedly offered nuclear technology.[154] Given Khan's extensive travels to at least 18 countries prior to his arrest in 2004, it is suspected that more countries may have been offered nuclear technology by the state.

Implications

The Khan network affected both at national and international level. At both levels, the working of the Khan network exposed serious problems and deficiencies:

Firstly, analysis of Khan network suggests Pakistani state complicity so much that it would be logical to term Khan network as Pakistan network. Other than the reasons already stated in the preceding sections, there are additional reasons to suspect as such. The action taken by Pakistan government was half-hearted and was more like a face-saving endeavor that made Khan a "scape-goat"[155] to save the state against major embarrassment. Criticizing Pakistan on this account, in 2004, Robert Einhorn, U.S. Assistant Secretary of State for Nonproliferation reportedly told the had of Pakistan's SPD, Lt. Gen. Khalid Kidwai, "Either you are not on top of this or you are complicit.

[152] Tertrais, Bruno (2008), "Khan's Nuclear Exports: Was There a State Strategy?" in Henry D. Sokolski (ed.), *Pakistan's Nuclear Future: Worries Beyond War,* Strategic Studies Institute, January, p.23.
[153] Ibid., pp.27-28.
[154] Ibid., pp.29-30.
[155]Chakma, Bhumitra (2009), *Pakistan's Nuclear Weapons,* London and New York: Routledge, p.105.

Either one is disturbing."[156] Khan stated in a phone interview in April, 2008, "I saved the country for the first time when I made Pakistan nuclear nation and saved it again when I confessed and took the whole blame on myself."[157] He also stated during another phone interview with *The Guardian*, later in May, 2008, that his televised confession in 2004 was made under duress, as he stated, "It was not my own free will. It was handed into my hand."[158] Khan was definitely guilty for his role in the scandal but important state officials were part of the scandal and this buttresses suspicion about state complicity. In May 2005, Douglas Frantz, *Times* Staff Writer, quoted an anonymous former senior Pakistani military officer who was associated with the nuclear oversight as saying, "The military knew that Khan's orders came from the very top and that it was state policy to get the bomb, by hook or by crook."[159]

If at all, action against Khan could diminish state complicity, Pakistan has not done much in this sphere either. Only light action was taken against Khan – house arrest, admonition, public confession and removal from the job is too light a punishment to capture the seriousness about the issue. This light retribution only supports the view that Pakistan wanted to save the state from major embarrassment by burying the case with Khan. In fact, Khan remained Special Adviser to the Chief Executive on Strategic and KRL Affairs even after his dismissal shows state complicity, and he held this title until the NCA stripped the title on January 31, 2004.[160] Also, Pakistan refused to let international agencies question Khan. Naeem Salik underlines three reasons for investigation of Khan being "unreasonable and unjustified": that it would be an infringement of Pakistan's sovereignty; allowing such enquiry will have grave domestic political consequences; and that even if Pakistan allows, it would not fetch more results

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[156] Clary, Christopher O. (2005), *The A.Q. Khan Network: Causes and Implications,* Master's Thesis, Monterey: Naval Postgraduate School, p.75, [Online: Web] Accessed August 17, 2011, URL: http://www.fas.org/irp/eprint/clary.pdf

[157] Agencies (2008), "Nuclear scientist says he confessed to 'save' Pakistan," April 7, [Online: Web] Accessed June 15, 2012, URL: http://articles.economictimes.indiatimes.com/2008-04-07/news/27725309_1_north-korea-and-libya-abdul-qadeer-khan-nuclear-scientist

[158] Agencies (2008), "Pakistan nuclear scientist 'confessed under duress': report," May 30, [Online: Web] Accessed June 15, 2012, URL: http://articles.economictimes.indiatimes.com/2008-05-30/news/27704774_1_nuclear-watchdog-international-atomic-energy-agency-nuclear-scientist

[159] Frantz, Douglas (2005), "Pakistan's Role in Scientist's Nuclear Trafficking Debated," May 16, [Online: Web] Accessed June 15, 2012, URL: http://articles.latimes.com/2005/may/16/world/fg-khan16

[160] Tertrais, Bruno (2008), "Khan's Nuclear Exports: Was There a State Strategy?" in Henry D. Sokolski (ed.), *Pakistan's Nuclear Future: Worries Beyond War,* Strategic Studies Institute, January, p.33.

than what Pakistani investigators have already did.[161] Khan's scandal had international linkage; it is more than just Pakistan. By assisting three countries, possibly more, with nuclear technology the scandal made the world a more dangerous place. In the light of the threat of nuclear terrorism, it is crucial to let a nonbiased body to enquire into the scandal and get to the bottom of the issue. To rest on sovereignty issue is to be patriotic but miss out on the dangerous implications of the scandal. To blame it on possible domestic political consequence is to shy away from the truth. It only reinforces the suspicion that since a number of important officials are involved, hard enquiry into the matter could have domestic political consequences. An independent and unbiased investigation could clear the air of suspicion about Pakistan and pave the way towards a responsible nuclear state.

Secondly, for Pakistan, it demonstrated lack of state-oversight over various aspects of nuclear programme. While Khan, as a national asset, was protected by the state, there was no one to supervise and regulate Khan's activities. Instead important policy makers were involved. In such case, where state officials are involved, the issue of state-oversight becomes a futile consideration. There is a view that the Khan case brings to light the dilemma posed to state in choosing between secrecy and scrutiny as Christopher Clary observed, "A state will often have to balance very concrete security concerns against hypothetical nuclear safety" and that "the state will probably want to keep information about nuclear weapons program very tightly held and compartmentalized, to prevent secret information from reaching the adversary and other interested outsiders."[162] Pakistan was left with the option to choose between scrutinizing, which could bring secret nuclear programme under public gaze; or keeping the secrecy by choosing to do nothing but face international criticism and distrust. Obviously Pakistan did not want to let outsiders know what was going on and so scrutiny was out of the question.

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[161] Salik, Naeem (2009), *The Genesis of South Asian Nuclear Deterrence: Pakistan's Perspective,* New York: Oxford University Press, p.275.

[162] Clary, Christopher O. (2005), *The A.Q. Khan Network: Causes and Implications,* Master's Thesis, Monterey: Naval Postgraduate School, pp.91-92, [Online: Web] Accessed August 17, 2011, URL: http://www.fas.org/irp/eprint/clary.pdf

Pakistan authorities chose not to act when complaint came from the ISI for the first time in 1989 regarding Khan's meeting with suspicious characters in Dubai.[163] Between 1998 and 2000, for at least three times Washington officially raised concerns about Khan's proliferation activities with Pakistan, but Pakistan responded by either saying that it was unaware of such activities or that evidence were not sufficient to go by.[164]Khan began to be questioned starting 1998, based on the information given by Washington,[165] but nothing noteworthy was achieved. In 2000, the National Accountability Bureau, an organization created by Musharraf brought out a 700-page document on Khan's illicit wealth but no action followed.[166] The ISI raid, in 2000/2001, on an aircraft charted by KRL failed, apparently because some senior military officials warned Khan ahead of "the raid."[167]

It is worth mentioning that this scrutiny began after the 1998 nuclear tests and this intensified after the creation of NCA and establishment of National Accountability Bureau (NAB) in 2000.[168] Perhaps this might be because Khan's elevated position began to erode after the nuclear tests. However, establishment of a nuclear over-sight and agency for public accountability provided a purpose of direction to take some sort of corrective action against Khan. In response to vehement international criticisms, following the Khan episode, that questioned Pakistan's capability in securing its nuclear assets, Pakistan began to take significant steps to allay threat perceptions about safety and security of its nuclear assets.

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[163] Corera, Gordon (2006), *Shopping For Bombs: Nuclear Proliferation, Global Insecurity, and the Rise and Fall of the A.Q. Khan Network,* New York: Oxford University Press, p.96; The IISS report states that the Directorate of Inter-Services Intelligence (ISI) started to investigate Khan's activities in the 1980s, but since they only had the mandate to protect the nuclear programme and prevent foreign espionage and not the mandate to report about onward proliferation or investigate him, they did not raise the concerns. See IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,* The International Institute for Strategic Studies, London, p.94.

[164] Corera, Gordon (2006), *Shopping For Bombs: Nuclear Proliferation, Global Insecurity, and the Rise and Fall of the A.Q. Khan Network,* New York: Oxford University Press, pp.138-141.

[165] Ibid., p.145.

[166] Clary, Christopher O. (2005), *The A.Q. Khan Network: Causes and Implications,* Master's Thesis, Monterey: Naval Postgraduate School, p.74, [Online: Web] Accessed August 17, 2011, URL: http://www.fas.org/irp/eprint/clary.pdf

[167] Ibid.

[168] Corera, Gordon (2006), *Shopping For Bombs: Nuclear Proliferation, Global Insecurity, and the Rise and Fall of the A.Q. Khan Network,* New York: Oxford University Press, pp.144&145.

Thirdly, the story of Khan network also reveal that the exclusiveness of existing non-proliferation is a weakness in itself as it inspires a culture of nuclear defiance[169] through nuclear proliferation. Khan believed, just as Zia and Beg did, that spread of nuclear technology would be a blow on the face of exclusionary nuclear regime. On a similar plane, they nurtured the idea of nuclear technology for Islamic countries. In a way, this idea of defiance gives reason, an alibi, for nuclear proliferators to proliferate. It is also argued that by proliferating, Pakistan managed to distribute the strain of international non-proliferation regime more broadly while at the same time undermining it.[170] Taking a cue from this, there is a need for a revision of existing nuclear regimes to explore the possibility of softening the exclusionary feature.

Fourthly, the Khan network revealed a global failure of dealing with nuclear black marketing. It exposed the deficiency of existing global nonproliferation regime and mechanisms to prevent proliferation of nuclear weapons. It also exposed the limits of supply-side approach of global non-proliferation efforts, which failed as soon as Western countries lost the monopoly of nuclear technology.[171] Lack of effective nuclear export control and global coordination allowed Khan's network to maneuver through loopholes in the nonproliferation system. It also manifested lack of urgency and coordination in combating nuclear proliferation. Though US knew about Khan's clandestine proliferation activities since the late 1980s, instead of swiftly acting to prevent, it chose to wait and watch, apparently to find out more about the network and also hoping to get information about Pakistan's nuclear programme. By the time it took up the issue with Pakistani authorities in late 1990s, much damage was already done by Khan network, and Pakistan had already become a nuclear state. U.S. The reason for U.S. laid-back attitude in the late 1980s, was perhaps because its attention was focused on countering Russian invasion of Afghanistan, in which Pakistan became a crucial partner of the U.S. Again after 2001, because Pakistan became a partner in "war on terror," U.S. seems to have given concessions to Pakistan in Khan's case by not insisting too much on digging into the

[169] Clary, Christopher O. (2005), *The A.Q. Khan Network: Causes and Implications*, Master's Thesis, Monterey: Naval Postgraduate School, p.14, [Online: Web] Accessed August 17, 2011, URL: http://www.fas.org/irp/eprint/clary.pdf
[170] Corera, Gordon (2006), *Shopping For Bombs: Nuclear Proliferation, Global Insecurity, and the Rise and Fall of the A.Q. Khan Network*, New York: Oxford University Press, p.122.
[171] Chakma, Bhumitra (2009), *Pakistan's Nuclear Weapons,* London and New York: Routledge, p.106.

scandal. Given the compelling issues at hand, U.S. compromised on the issue of nuclear black marketing that emerged from Pakistan.

The immediate response to activities of Khan network was a call for a wide set of reforms in the existing nonproliferation system. Speaking at the National Defense University in Washington, D.C. in February 2004, President George W. Bush summed up the urgency in this respect by calling for a broad strategy to strengthen domestic and international nonproliferation efforts which would include expansion of the Proliferation Security Initiative, enacting strict export controls and securing sensitive materials and denying enrichment and reprocessing technology to new states.[172]

Fifthly, though Khan network sold deficient and incomplete components to customers, by freely selling enrichment equipments and designs, and designs for nuclear weapons, Khan significantly lowered the technical barriers to nuclear weapons development.[173] This cut significant amount of time and resources that go into research and development of its clients.

Sixthly, following the Khan episode, Pakistan's capability to safeguard its nuclear assets was seriously questioned. Given weak institutional control and lack of transparency, it came to be seen as the state from where terrorists could possibly obtain nuclear weapons or materials to perpetrate nuclear terrorism. If it gives some consolation, apparently, Khan network has directly passed nuclear technology to states only. From the information available, as of now, there is no evidence that Khan network has supplied to non-state actors. However, there are reasons to believe that, if Khan network has not already supplied to non-state actors, motivated non-state might be able to get hold of the critical documents on uranium enrichment and bomb designs and even components that the network supplied to its state customers. Albright and Hinderstein opine that Khan's travels to Afghanistan between 1997 and 2003 are reasons for concern that he or his associates may have offered nuclear aid to terrorist organizations, such as al Qaeda.[174]

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[172] Albright, David and Hinderstein, Corey (2006), "The A.Q. Khan Illicit Nuclear Trade Network and Implications for Nonproliferation Efforts," *Strategic Insights*, Vol V, Issue 6, July, [Online: Web] Accessed February 7, 2012, URL: http://www.nps.edu/Academics/centers/ccc/publications/OnlineJournal/2006/Jul/albrightJul06.html

[173] IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment*, The International Institute for Strategic Studies, London, pp.86&89.

[174] Albright, David and Hinderstein, Corey (2006), "The A.Q. Khan Illicit Nuclear Trade Network and Implications for Nonproliferation Efforts," *Strategic Insights*, Vol V, Issue 6, July, [Online: Web] Accessed

The fear is that there might be more customers who might have already got assistance from Khan network but not currently known, and that others might possibly manage to acquire in the near future.

February 7, 2012, URL:
http://www.nps.edu/Academics/centers/ccc/publications/OnlineJournal/2006/Jul/albrightJul06.html

CHAPTER 4
SAFETY OF NUCLEAR WEAPONS IN PAKISTAN

In the post-9/11 terror attacks in the U.S., there was a renewed fear of nuclear terrorism. Just as Pakistan became U.S. strategic partner in the fight against terror, compelling factors combined to make Pakistan a suspect nation from where terrorist could possibly manage to get hold of nuclear weapons and fissile materials. The concerns about safety and security of Pakistan's nuclear weapons were more daunting because of the fear that if this falls in the hands of extremists, they could perpetrate nuclear terrorism not just in Pakistan but also, and most probably, elsewhere. Factors like political instability, growing Islamic radicalism and terrorist attacks, nuclear proliferation and black marketing, etc., has been cited by pessimists to back their premise about the imminent dangers to Pakistan's nuclear weapons. Much of the concerns came from Western countries, especially the U.S., and India. In 2002, Frank von Hippel summed up the general fear that Pakistan "under the pressure of being used as a base for a United States Campaign against terrorists in Afghanistan, could be taken over by fundamentalists as Iran was – potentially turning it into an 'Afghanistan with Nukes.'"[1]Likewise, David Albright wrote that same year that "Instability in Pakistan could make its nuclear weapons and stocks of nuclear explosive material dangerously vulnerable to theft."[2]

Lewis A. Dunn also wrote about the threat to Pakistan's nuclear weapons and materials in different scenarios of political instability that would be induced by Islamic radicalism, and explored the possible steps that U.S. could take.[3] In 2003, Subodh Atal

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[1] Hippel, Frank von (2002), "Security of Nuclear Matters and Pakistan's Nuclear Weapons," in Taina Susiluoto (ed.) *Tactical Nuclear Weapons: Time for Control*, United Nations Institute for Disarmament Research, UNIDIR/2002/11, Geneva, Switzerland, p.26, [Online: Web] Accessed January 20, 2011, URL: http://www.unidir.org/pdf/ouvrages/pdf-1-92-9045-143-2-en.pdf

[2] Albright, David (2002), "Securing Pakistan's Nuclear Infrastructure," in Lee Fienstein et. al (eds.), *A New Equation: U.S. Policy towards India and Pakistan after September 11*, Non-Proliferation Project, Global Policy Program, Carnegie Endowment for International Peace, No.27, May, p.33, [Online: Web] Accessed January 20, 2011, URL: http://www.carnegieendowment.org/2002/05/31/new-equation-u.s.-policy.../8gb

[3] Dunn, Lewis A. (2002), "Balancing Nuclear Security and Nonproliferation in South Asia," in Lee Fienstein et. al (eds.), *A New Equation: U.S. Policy towards India and Pakistan after September 11*, Non-Proliferation Project, Global Policy Program, Carnegie Endowment for International Peace, No.27, May, pp.31-32, [Online: Web] Accessed January 20, 2012, URL: http://www.carnegieendowment.org/2002/05/31/new-equation-u.s.-policy.../8gb

also wrote in *Policy Analysis*, "A nation that is penetrated by Islamic radicals and that possesses dozens of nuclear weapons and proliferates them to other dictatorial countries poses a tangible and immediate problem."[4] In 2004, in a Congressional Research Service report to the Congress, Jonathan Medalia also expressed concerns about growing "Islamic fundamentalism" and political instability in Pakistan and the danger it posed to safety and security of Pakistan's nuclear weapons and materials.[5]Such was the perception of an imminent threat that in January 2005, Condoleezza Rice reportedly revealed that "the U.S. maintains a contingency plan to prevent Pakistani nuclear weapons from falling into the hands of Islamist fundamentalists if they came to power."[6] The consistency about the threats was associated more with growing Islamic radicalism in Pakistan. The A.Q. Khan episode and the tardy handling of the issue: light punishment to perpetrators and refusal to let international investigators to speak to A.Q. Khan, only validated the view of Pakistan as being untrustworthy. Criticizing Pakistan on this account, in 2004, Leonard Weiss stated, "Pakistan lied, stole, and conned its way to becoming a nuclear weapons power. Now it's doing the same as a nuclear broker."[7] In 2009, Bruce Riedel made threat connectivity between terrorism and growing nuclear proliferation in Pakistan when he stated, "It has more terrorists per square mile than any place else on earth, and it has a nuclear weapons programme that is growing faster than any place else on earth" and observed, "The possibility is now real that we will see a jihadist state emerge in Pakistan."[8]In September 2009, Mariot Leslie, a senior British Foreign Office official told

[4] Atal, Subodh (2003), "Extremist, Nuclear Pakistan: An Emerging Threat?" *Policy Analysis*, No. 472, March 5, p.1, [Online: Web] Accessed September 2, 2011, URL: http://www.cato.org/pubs/pas/pa472.pdf
[5] Medalia, Jonathan (2004), "Nuclear Terrorism: A Brief Review of Threats and Responses," *Congressional Research Report for Congress*, Order Code RL32595, September 22, p.3, [Online: Web] Accessed September 2, 2011, URL: http://www.fas.org/irp/crs/RL32595.pdf
[6] United Press International (2005), "U.S. Contingency Plan for Pakistani Nukes," Washington DC, January 19. [Online: Web] Accessed August 16, 2011, URL: http://www.spacedaily.com/news/nuclear-blackmarket-05d.html
[7] Weiss, Leonard (2004), "Pakistan: It's Déjà vu All over Again," *Bulletin of the Atomic Scientists*, Vol.60, No.3, p.52.
[8] Bruce Riedel as quoted in Clary, Christopher (2010), "Thinking about Pakistan's Nuclear Security in Peacetime, Crisis and War," IDSA Occasional Paper No. 12, September, p.3, [Online: Web] Accessed August 16, 2011, URL: www.idsa.in/system/files/OP_PakistansNuclearSecurity.pdf

U.S. diplomats, "The UK has deep concerns about the safety and security of Pakistan's nuclear weapons."[9]

Though Pakistan established the National Command Authority in 2000 and claimed that various measures taken by them were adequate to secure its nuclear weapons and materials, suspicions lingered. In the late 2000, however, there were better reviews about safety and security of Pakistan's nuclear weapons and materials from the official circle. Such optimism, however, were often tinged with hint of caution. At a Pentagon news conference in November 2007, Admiral Mike Mullen, chairman of the Joint Chiefs of Staff, expressed confidence in security of Pakistan's nuclear arsenal as he stated, "I don't see any indication right now that security of those weapons is in jeopardy, but clearly we are very watchful, as we should be." On April 29, 2009, at his 100th-day press briefing, President Obama, stated that U.S. had huge national security interests in stability of Pakistan to ensure that it does not turn into a "nuclear-armed militant state" and added, "I feel confident that nuclear arsenal will remain out of militant hands."[10] On May 4, 2009, Admiral Michael Mullen stated "I remain comfortable that the nuclear weapons in Pakistan are secure, that the Pakistani leadership and in particular the military is very focused on this." He continued to point out that he is very satisfied with progress of U.S. assistance to Pakistan in improving security and that though there is no imminent danger, the concern about "those nuclear weapons come(ing) under the control of terrorist … is a strategic concern that we all share."[11] On January 21, 2010, in a TV interview, U.S. Secretary of Defence, Robert M. Gates stated "We are very comfortable with the security of Pakistan's nuclear weapons."[12] This chapter will look into how Pakistan fared in the area of ensuring nuclear safety and security in the midst of grave concerns about the safety and security of its nuclear assets.

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[9] Leigh, David (2010), "Wikileaks cable expose Pakistan nuclear fears," *Guardian*, November 30, [Online: Web] Accessed February 18, 2012, URL:http://www.guardian.co.uk/world/2010/nov/30/wikileaks-cables-pakistan-nuclear-fears

[10] Transcript of Press Briefing (2009), "President Obama's 100th-Day Press Briefing," April 29, [Online: Web] Accessed April 14, 2012, URL: http://www.nytimes.com/2009/04/29/us/politics/29text-obama.html?pagewanted=all

[11] Transcript of news briefing (2009), "DoD News Briefing with Adm. Mullen from the Pentagon Briefing Room," Arlington, Va., May 4, [Online: Web] Accessed April 14, 2012, URL: http://www.defense.gov/transcripts/transcript.aspx?transcriptid=4413

[12] Transcript of TV interview (2010), "Secretary of Defense Robert Gates Express TV Interview Updates," January 21, [Online: Web] Accessed April 14, 2012, URL: http://www.defense.gov/transcripts/transcript.aspx?transcriptid=4542

Threats Perceptions about Safety of Pakistan's Nuclear Weapons

The threat perceptions about the safety of nuclear weapons and fissile materials in Pakistan are built upon various factors and threat or risk scenarios under which Pakistan's nuclear arsenals or nuclear materials could land in the wrong hands. The factors reflected the prevailing ambience of security condition in Pakistan. The risk scenarios that try to give some visualization of possible outcome were drawn from the premises of underlining factors.

Factors that Threaten Safety of Nuclear Weapons in Pakistan

Various factors have been cited by scholars, writers and eminent people regarding threats to Pakistan's nuclear weapons and materials. Among them, five chief factors stand out: increase in nuclear weapons capability, nuclear black market, political instability, growing Islamic radicalism and incidents of terrors attacks and Pakistan's nuclear posture.

i. Increasing Nuclear Arsenals and Fissile Materials:

As examined previously in Chapter 2, there has been a substantial increase in the number of nuclear arsenals and stock of fissile materials in Pakistan, and it continues to accumulate. In less than a decade, Pakistan has increased its nuclear arsenals to about 110 warheads[13] and is projected to increase substantially in the near future. By late 2010, Pakistan is believed to have stocked about 2,600 kg of HEU and about 100 kg of weapon-grade Plutonium according to International Panel on Fissile Materials report of 2010[14] and it continues to grow. Pakistan plans to construct and operate more facilities for enrichment of nuclear materials – two plutonium production reactors are already operational at Khushab and a third is on line, it has reprocessing facilities in Kahuta, Gadwal, Nilore and Chasma (under construction as of 2010).[15] As the number of nuclear arsenals and the stock of fissile materials increase, the stress on providing protection also

[13] Kristensen, Hans M. and Norris, Robert S. (2011), "Pakistan's nuclear forces, 2011", *Bulletin of the Atomic Scientists,* Vol.67, No.4, p.91.
[14] International Panel on Fissile Materials (2010), *Global Fissile Material Report 2010*, Fifth Annual Report, pp.14&21, Accessed September 23, 2011, URL: http://fissilematerials.org/library/gfmr10.pdf
[15] Ibid., pp.29, 128-129, 131.

increases, so too the chances of these falling into the wrong hands and mishaps.[16] In terms of protection, there is more concern with regard to HEU because, unlike plutonium, it is more convenient for terrorists to use this in a simpler gun-type nuclear device,[17]and Pakistan has more of this fissile material. Moreover, as much of Pakistan's nuclear infrastructures are located in the more volatile western and north-western regions of Pakistan, there is more risk of terrorist attack.[18]

ii. Nuclear Black Marketing:

In Chapter 3, it has been shown how A.Q. Khan passed nuclear technology with such impunity to clients like Iran, North Korea, Libya and possibly more. The more concerning thing about the whole affair is the involvement of eminent state officials in the nuclear black marketing racket, which points towards possible state complicity and culpability.[19] The fact that Pakistani government did not allow international agencies to talk to Khan and that he was let off lightly, are reasons for suspicion that Pakistani government had lots to hide. This episode justifiably shattered international faith in Pakistan's capability and sincerity about keeping its nuclear capabilities under control. As a result, there are concerns that similar nuclear racket might ensue. Moreover, there are apprehensions that as the nuclear black market racket was not brought to a proper closure, Khan's network might not be fully deactivated after all.[20]

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[16] Clary, Christopher (2010), "Thinking about Pakistan's Nuclear Security in Peacetime, Crisis and War," IDSA Occasional Paper No. 12, September, pp.5&33, [Online: Web] Accessed August 16, 2011, URL: www.idsa.in/system/files/OP_PakistansNuclearSecurity.pdf; Rothman, Alexander H. and Korb, Lawrence J. (2011), "Pakistan doubles its nuclear arsenal: Is it time to start worrying?" February 11, [Online: Web] Accessed June 10, 2012, URL: http://www.thebulletin.org/web-edition/features/pakistan-doubles-its-nuclear-arsenal-it-time-to-start-worrying

[17] Kazi, Reshmi (2009), "Pakistan's HEU-based Nuclear Weapons Programme and Nuclear Terrorism: A Reality Check," *Strategic Analysis*, Vol. 33, No. 6, November, pp.861-862; Hippel, Frank von (2002), "Security of Nuclear Matters and Pakistan's Nuclear Weapons," in Taina Susiluoto (ed.) *Tactical Nuclear Weapons: Time for Control*, United Nations Institute for Disarmament Research, UNIDIR/2002/11, Geneva, Switzerland, p.27, [Online: Web] Accessed January 20, 2011, URL: http://www.unidir.org/pdf/ouvrages/pdf-1-92-9045-143-2-en.pdf

[18] Gregory, Shaun (2007), *The Security of Nuclear Weapons in Pakistan*, Pakistan Security Research Unit, Department of Peace Studies of University of Bradford, p.7, [Online: Web] Accessed September 2, 2011, URL: http://spaces.brad.ac.uk:8080/download/attachments/748/Brief_22finalised.pdf

[19] Chakma, Bhumitra (2009), *Pakistan's Nuclear Weapons*, London and New York: Routledge, p.105.

[20] Albright, David (2006), "AQ Khan Network – the Case is not Closed," Full text of prepared Testimony to the U.S. Subcommittee on International Terrorism on International Relations on May 25, 2006, *Daily Times*, May 27, [Online: Web] Accessed February 18, 2012, URL: http://www.dailytimes.com.pak/default.asp?page=2006%5C05%5C27%5Cstory_27-5-2006_pg7_37

iii. Political Instability in Pakistan:

Problems like frequent military coups, unhealthy competition between the military and civilian leaders, differences between the Judiciary and the political powers that be, separatism in Pakistan as seen in North West Frontier Province (NWFP), Baluchistan and Sind, combined to create a complex situation of lurking instability. Since 1958, there have been as many as three military coups: Gen. Ayub Khan in 1958, Gen. Zia-ul-Haq in 1977, and Gen. Musharraf in 1999 and there was continuous tussle between the military and the civilian leaders and since 1970 successive civilian governments were never voted out of power but removed by the army.[21] Frequent tussle between the civilian and military leaders and displacement of civilian governments did not inspire confidence in the government in tackling important issues effectively. In addition separatist movement based on identity and protest over economic deprivation in NWFP, Baluchistan and Sindh has worsened domestic instability.[22] In the later half of 2000, beginning with the dismissal of Chief Justice Iftikar, a struggle between the Judiciary and the Executive ensued, which also threatened political stability. Though the troika of prime minister, president and army chief has been replaced by a quartet with the emergence of judiciary, a "hyper-active judiciary" which tends to encroach upon matters in the executive sphere causes more trouble to political stability.[23] The consequence is that each crisis usually was followed by alarmist projection of imminent danger to survival of the state[24]and concurrently danger to safety and security of Pakistan's nuclear weapons.

[21] Kronstadt, K. Alan (2005), "Pakistan's Domestic Political Developments," *Congressional Research Service Report for the Congress,* Order Code RL32615, pp.8-9, [Online: Web] Accessed February 4, 2012, URL: http://fpc.state.gov/documents/organization/54312.pdf
[22] Thakar, Milind (2008), "Examining Pakistan's Democratic Deficit," *Strategic Analysis,* Vol.32, No.2, March, p.288.
[23] IDSA Task Force (2010), *Whither Pakistan? Growing Instability and Implications for India,* Institute for Defence Studies and Analyses, New Delhi, p.15, [Online: Web] Accessed August 16, 2011, URL:http://www.idsa.in/sites/default/files/book_WhitherPakistan.pdf
[24] Thakar, Milind (2008), "Examining Pakistan's Democratic Deficit," *Strategic Analysis,* Vol.32, No.2, March, p.294.

iv. Growing Islamic Radicalism and Terror Attacks in Pakistan:

The patronage given by the state in the Afghanistan war in the 1980s created Islamic extremists with inspired motivation for *Jihad* in Pakistan and elsewhere. After Zia encouraged the establishment of madrassas, a huge number of them have come up in Pakistan and have turned out to be centers of recruitment for terrorist groups.[25] Religious parties, mainstream parties and the military have, since the 1950s, used religion as a tool to secure public support and gain legitimacy for their regimes.[26] This has encouraged and helped the spread of Islamic radicalism in Pakistan. Zia-ul-Haq, in whose regime (1977-1988) Islamisation of Pakistan spread rapidly, forged an alliance with *Jamat-e-Islami*, and Pervez Musharraf set up an alliance with the *Muttahida Majilis-e-Amal* (MMA), a conglomeration of six Islamic political parties, in 2002.[27] That the MMA, which reportedly had strong connection with various terrorist groups, was able to secure power in NWFP and Baluchistan in 2002 general election by getting critical support from Pervez Musharraf and the ISI, showed a dangerous linkage between state authority and radical Islamists. [28]

Growth of radical Islamism in Pakistan is also believed to be the result of Pakistan's alliance with the U.S. in the 'war on terror' following 9/11 terror attack in New York, as this has inspired anti-U.S. or anti-West sentiments, and because Pakistan was part of it, Islamic militants also turned against Pakistani government.[29] The military operations carried out by Pakistani military between 2003 and 2006 to flush out Taliban and al-Qaeda militants in Waziristan did not end well, because besides huge losses that Pakistani military faced, the military operations resulted in excess use of force which resulted in growth of Islamic militancy in the region. In order to end the conflict, Pakistani government signed a peace agreement in September 2006, with pro-Taliban

[25] Bahadur, Kalim (2006), "Regional Implications of the Rise of Islamic Fundamentalism in Pakistan," *Strategic Analysis,* Vol.30, No. 1, January-March, p.15.
[26] Misra, Ashutosh (2003), "Rise of Religious Parties in Pakistan: Causes and Prospects," *Strategic Analysis,* Vol. 27, No. 2, April-June, p.188.
[27] Hashmi, Arshi Saleem (2009), "Pakistan Politics, Religion & Extremism," IPCS Research Paper, Institute of Peace and Conflict Studies, New Delhi, May, p.9, [Online: Web] Accessed February 7, 2012, URL: http://www.ipcs.org/pdf_file/issue/RP20-Arshi-Pakistan.pdf
[28] Misra, Ashutosh (2003), "Rise of Religious Parties in Pakistan: Causes and Prospects," *Strategic Analysis,* Vol. 27, No. 2, April-June, pp.190-191.
[29] Wonacott, Peter, (2007), "Inside Pakistan's Drive to Guard It's A-Bombs," Rawalpindi, November 29, [Online: Web] Accessed February 18, 2012, URL: http://online.wsj.com/public/article...095207239.html

tribal leaders and militants in North Waziristan where Pakistan agreed to pull troops out of the region. Similar peace deal was also made with militants in Bajaur in March 2007. However, these peace agreements backfired as it only helped Taliban and al Qaeda to expand its influence in other regions of Pakistan, especially in NWFP.[30] In a testimony before a subcommittee of U.S. Committee on Homeland Security and Governmental Affairs, on June 17, 2008, Lisa Curtis stated that the within two months of the 2006 peace deal, cross-border attacks against coalition forces increased by 200 percent.[31] U.S. blamed Pakistan for allowing militants to built stronghold in the region. The successful military crackdown at Red Mosque in 2007 triggered a new wave of extremism that engulfed not just NWFP and the Federally Administered Tribal Areas (FATA) but also other parts Pakistan.[32]

As a result, Pakistan has witnessed the rise of Pakistani Neo-Taliban (PNT). This was also partly a result of deliberate policy of Pakistani military and ISI to create a 'Talibanized belt' in the FATA so that after the U.S. retreat from Afghanistan, Pakistan could exercise influence over Afghanistan and also that the belt could serve as a buffer between Afghan and Pakistani Pashtuns.[33] This was a serious miscalculated strategy because, now, Pakistan had to face the wrath of terrorist attacks perpetrated by PNT.[34] The connections of the military and the ISI with terrorist groups is now an open book. In his book, *Frontline Pakistan: The Struggle with Militant Islam*, Zahid Hussain wrote, "State patronage, in the form of an 'unholy alliance' between the military and the mullahs, resulted in an unprecedented rise of radical Islam … That unholy alliance has

[30] Lunn, Jon, et. al. (2007), "Pakistan's Political and Security Challenges," Research Paper 07/68, House of Common Library, September 13, pp. 23-24, [Online: Web] Accessed September 12, 2011, URL: www.parliament.uk/briefing-papers/RP07-68.pdf
[31] Curtis, Lisa (2008), "U.S.-Pakistan Strategic Relationship," Text of Testimony, June 17, [Online: Web] Accessed February 16, 2012, URL: http://www.heritage.org/research/testimony/us-pakistan-strategic-relationship
[32] Lunn, Jon, et. al. (2007), "Pakistan's Political and Security Challenges," Research Paper 07/68, House of Common Library, September 13, pp. 23-24, [Online: Web] Accessed September 12, 2011, URL: www.parliament.uk/briefing-papers/RP07-68.pdf
[33] Blair, Charles P. (2011), "Anatomizing Non-State Threats to Pakistan's Nuclear Infrastructure: The Pakistani Neo-Taliban," Terrorism Analysis Report 1, Federation of American Scientists, June, p.4, [Online: Web] Accessed September 23, 2011, URL: http://www.fas.org/pubs/_docs/Terrorism_Analysis_Report_1-lowres.pdf
[34] Ibid., pp.4-9.

been a major factor in the country's drift to Islamic fundamentalism."[35] Also, in the testimony to the U.S. Congress on March 11, 2010, Ashley J. Tellis stated, "Leshkar e-Tayyiba (LeT) remains primarily Pakistani in its composition, uses Pakistani territory as its primary base of operation, and continues to be supported extensively by the Pakistani state, especially the Pakistani Army and its Directorate, Inter-Services Intelligence (ISI)."[36]

A particular case for concern was the greater inroads made by *Jamat-e-Islami* in Pakistan's political arena. The *Jamat-e-Islami,* which supported Pakistani nuclear programme with a belief in the 'Islamic bomb,' has a history of association with Islamic extremism since the 1980s, aim at gaining state control and nurtures strong sentiments for global *ummah.*[37] As such, three basic concerns emerges: that it aims at using Pakistan's nuclear weapons to attack states that are seen as anti-Muslim; it could have intentions to provide Pakistan's nuclear assets to other Muslim states; and that, as a show of religious solidarity, it might intend to use Pakistan's nuclear weapons as a nuclear umbrella to other Islamic countries.[38]

There has been a phenomenal increase in the incidents of terrorist attacks in Pakistan. Charles P. Blair reported in 2011 that between 2001 and 2010, terrorist incidents in Pakistan has increased by almost a fifty-fold.[39] With only 30 incidents in 2001, it increased to 1916 in 2008 and declined to 1331 in 2010 (see Chart 1). The Report also showed that an incident of suicide attacks has also increase from 7 in 2006 to 54 the next year, peaking at 76 in 2009 and declined to 49 in 2010 (see Chart 2). While the general increase in number of terrorist attacks invariably indicated growing Islamic extremism and resolve in committing acts of terrorism, the increase in the number of

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[35] Hussain, Zahid (2007), *Frontline Pakistan: The Struggle with Militant Islam,"* London and New York: I.B. Tauris, p.13.

[36] Tellis, Ashley J. (2011), "Bad Company – Laskar e-Tayyiba and the Growing Ambition of Islamist Militancy in Pakistan," Congressional Testimony, Carnegie Endowment for International Peace, p.2, [Online: Web] Accessed February 18, 2012, URL: http://foreignaffairs.house.gov/111/tel031110.pdf

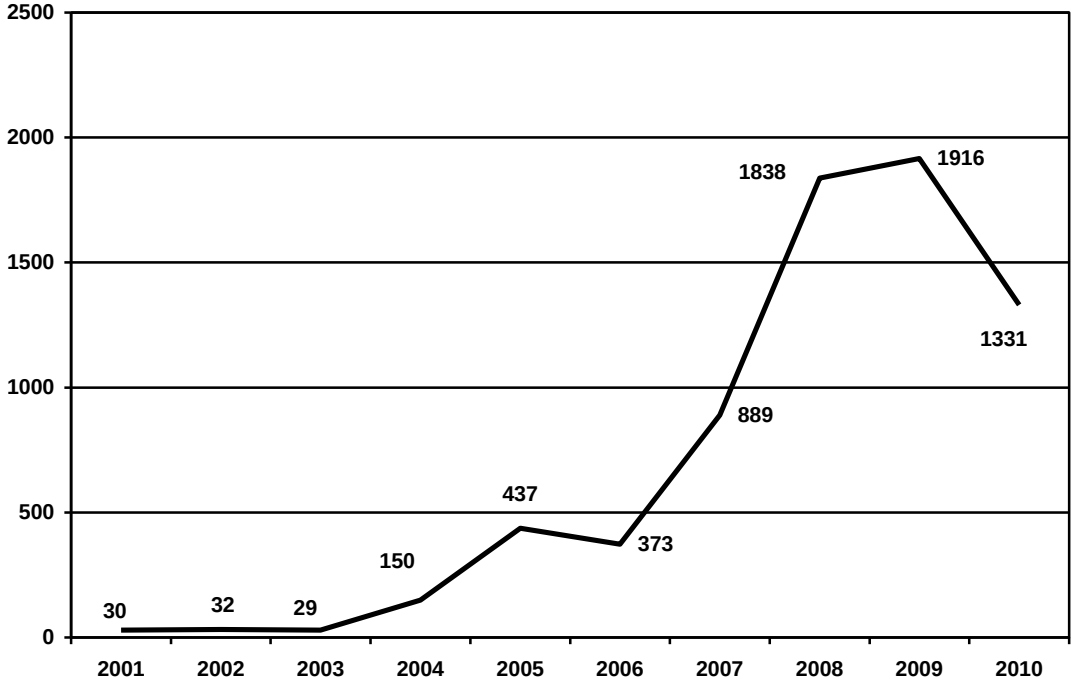
[37] Bashir, Omar S. (2009), *Explaining Islamist Pressures on State Behavior: The Jamaat-I Islami and Pakistani Foreign Policy,* Thesis submitted to the Department of Politics and International Relations, Master of Philosophy in International Relations, University of Oxford, pp.2 &71, [Online: Web] Accessed January 18, 2012, URL: http://www.princeton.edu/~obashir/bashir_thesis_2009.pdf

[38] Ibid., pp.2-3.

[39] Blair, Charles P. (2011), "Anatomizing Non-State Threats to Pakistan's Nuclear Infrastructure: The Pakistani Neo-Taliban," Terrorism Analysis Report 1, Federation of American Scientists, June, p.13, [Online: Web] Accessed September 23, 2011, URL: http://www.fas.org/pubs/_docs/Terrorism_Analysis_Report_1-lowres.pdf

suicide attacks reveals growth of a more lethal breed of Islamic radicalism. There were more reasons to be concerned because some of the terror attacks have some nuclear ramifications.

Chart 1: Incidents of Reported Terrorism in Pakistan 2001-2010



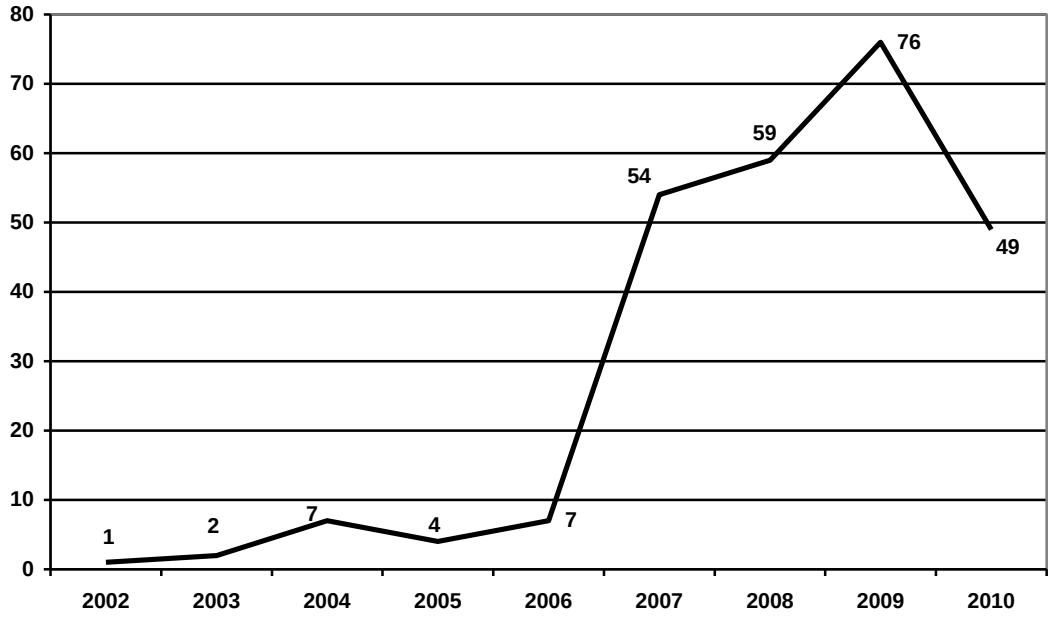
Source: Terrorism Analysis Report No.1, Federation of American Scientists, June 2011[40]

The terror attacks that are believed to have had nuclear ramifications are: the November 1, 2007 suicide bomb attack on a Pakistan Air Force (PAF) bus at airbase, which killed seven airmen and three civilians, and wounded 40 – the airbase is believed to house surface-to-surface missiles and nuclear warheads for F-16s aircrafts that are based there; the suicide bombing near Kamra Airbase on December 10, 2007, that injured nine civilian – the airbase is one of Pakistan's chief sites where nuclear weapons are assembled; and the lethal dual suicide bombing at Pakistan's Wah Ordinance Factory on August 20, 2008, that killed at least 70 people and more that 100 injured – the factory is

[40] Ibid., p.12.

the Pakistan's primary arms and ammunition producing facility and is believed that it handles nuclear arsenals. [41]

Figure 7: Incidents of Suicide Attacks in Pakistan 2002-2010



Source: Terrorism Analysis Report No.1, Federation of American Scientists, June 2011[42]

Other daring attacks include the two assassination attempts on Musharraf: the first, in December 2003 and the next in September 2006 – attacks were linked to al-Qaeda, PNT and also suspected involvement of military personnel;[43] the attempted assassination of Benazir Bhutto on October 18, 2007, in Karachi that killed 139 and injured at least 450 – though the perpetrators were not known, it was suspected to have

[41] Ibid. pp.135,136&141.
[42] Blair, Charles P. (2011), "Anatomizing Non-State Threats to Pakistan's Nuclear Infrastructure: The Pakistani Neo-Taliban," Terrorism Analysis Report 1, Federation of American Scientists, June, p.47, [Online: Web] Accessed September 23, 2011, URL: http://www.fas.org/pubs/_docs/Terrorism_Analysis_Report_1-lowres.pdf
[43]Gregory, Shaun (2007), *The Security of Nuclear Weapons in Pakistan,* Pakistan Security Research Unit, Department of Peace Studies of University of Bradford, p.8, [Online: Web] Accessed September 2, 2011, URL: http://spaces.brad.ac.uk:8080/download/attachments/748/Brief_22finalised.pdf; Clary, Christopher (2010), "Thinking about Pakistan's Nuclear Security in Peacetime, Crisis and War," IDSA Occasional Paper No. 12, September, p.24, [Online: Web] Accessed August 16, 2011, URL: www.idsa.in/system/files/OP_PakistansNuclearSecurity.pdf; Blair, Charles P. (2011), "Anatomizing Non-State Threats to Pakistan's Nuclear Infrastructure: The Pakistani Neo-Taliban," Terrorism Analysis Report 1, Federation of American Scientists, June, p.37, [Online: Web] Accessed September 23, 2011, URL: http://www.fas.org/pubs/_docs/Terrorism_Analysis_Report_1-lowres.pdf

been the handiwork of Taliban, al-Qaeda, and Pakistani Taliban.[44] She was assassinated on December 27, 2007 in Rawalpindi – multiple parties were suspected in this case as well: the Tehrik-e-Taliban Pakistan (TTP - Movement of the Pakistani Taliban), al-Qaeda; Lashkar-e-Jhangvi (LeJ – Army of Jhang); ISI – alone or under the direction of Musharraf.[45] The growing Islamic radicalism, and the support of the military and the ISI to terrorists groups, and increasing incidents of terror attacks, thus, gave reasons for fear about the security of nuclear weapons and materials in Pakistan. The 2008 report of the Commission on the Prevention of Weapons of Mass Destruction Proliferation and Terrorism, *World At Risk,* ardently sums up the precarious crossroads between terrorism and proliferation, and the threat of nuclear terrorism as it observes, "Were one to map terrorism and weapons of mass destruction today all roads would intersect in Pakistan."[46]

v. Pakistan's Nuclear Posture:

Pakistan's nuclear posture is Indo-centric, follows a nuclear 'first-use' policy[47] and is believed to have adopted a dispersed and delegated system of nuclear posture.[48] This strategy is pragmatic, considering the factors like: lack of 'strategic depth' due to smaller landmass vis a vis India and geographical proximity between Pakistan and India that debilitate early warning system (as the missile flight time is only about five minutes from say Agra to Lahore, or Sargodha to Delhi at a distance of about 600 km, it poses serious technical difficulties for effective detection and response and a likely predisposition towards a "launch on warning posture");[49] India's conventional forces

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[44] Blair, Charles P. (2011), "Anatomizing Non-State Threats to Pakistan's Nuclear Infrastructure: The Pakistani Neo-Taliban," Terrorism Analysis Report 1, Federation of American Scientists, June, p.134, [Online: Web] Accessed September 23, 2011, URL: http://www.fas.org/pubs/_docs/Terrorism_Analysis_Report_1-lowres.pdf

[45] Ibid., p.137.

[46] Graham, Bob et. al. (2008), *World At Risk: The Report of the Commission on the Prevention of Weapons of Mass Destruction Proliferation and Terrorism*, First Edition, New York: Vintage Books, p.xxii.

[47] Cotta-Ramusino, P. and Martellini, M. (2002), "Nuclear safety, nuclear stability and nuclear strategy in Pakistan: A concise report of a visit by Landau Network – Centro Volta," *Landau Network-Centro Volta,* Como, Italy, Janurary 14, [Online: Web] Accessed September 5, 2011, URL: http://www.pugwash.org/september11/pakistan-nuclear.htm

[48] Chakma, Bhumitra (2009), *Pakistan's Nuclear Weapons*, London and New York: Routledge, pp.78-79.

[49] Lavoy, Peter R. and Smith, Stephen A. (2003), "The Risk of Inadvertent Nuclear Use Between India and Pakistan," Naval Postgraduate School, Centre for Contemporary Conflict, Monterey, CA, February 3, [Online: Web] Accessed September 14, 2011, URL: http://www.isn.ethz.ch/isn/Digital-Library/Publications/Detail/?ord633=grp1&ots591=eb06339b-2726-928e-0216-

superiority and the 'Cold Start' strategy that India announced in 2004, which aim at inflicting significant damage to Pakistan forces through a swift and integrated response by the Army, Air Force and Navy.[50] The fear of a decapitating attack from India also seems to have prompted Pakistan to adopt a dispersed (nuclear weapons were reported to have been dispersed after the post-11 September attack as Pakistan feared preemptive action from U.S.)[51]and delegated system of nuclear posture. [52] In this regard, Timothy D. Hoyt wrote, "It is apparent that Pakistan's C2 procedures are delegative, lean heavily toward the always side of the always/never divide, and probably include both devolution and possibly pre-delegation in order to ensure the use of weapons."[53] As the degree of alertness increases during crisis, the dispersed and delegated system of nuclear control increases the risks of accidental or unauthorised nuclear use.[54]

Threat Scenarios

Threat to Pakistan's nuclear weapons and materials are perceived in the light of the general concerns about nuclear terrorism. There could be a number of ways by which terrorists could come to possess nuclear weapons or materials. In the book, *The Four Faces of Nuclear Terrorism*, Charles D. Ferguson et al. writes that there could be four ways by which terrorists could acquire military and civilian nuclear assets around the world to perpetrate nuclear terrorism: "the theft and detonation of an intact nuclear weapon; the theft or purchase of fissile material leading to the fabrication and detonation

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1b3f15392dd8&lng=en&id=34429; Ramana, M.V. et al. (2004), "Nuclear Early Warning in South Asia: Problem and Issues," *Economic and Political Weekly*, Vol. 39, No. 3, January 17-23, pp.280 & 283.

[50] Ladwig III, Walter C. (2007/8), "A Cold Start for Hot Wars? The Indian Army's New Limited War Doctrine," *International Security*, Vol. 32, No. 3, Winter 2007/08, pp.158, 164-165; Narang, Vipin (2009/10), "Posturing for Peace? Pakistan's Nuclear Postures and South Asian Stability," *International Security*, Vol. 34, No. 3, pp.56-57; Lavoy, Peter R. (2007), "Pakistan's Nuclear Posture: Security and Survivability," p.4, [Online: Web] Accessed February 18, 2012, URL: http://www.npolicy.org/files/20070121-Lavoy-PakistanNuclearPosture.pdf

[51] Iqbal, Anwar (2007), "Impact of U.S. wargames on Pakistan N-arms 'negative,'" *Dawn*, Washington, December 2, [Online: Web] Accessed March 28, 2012, URL: http://archives.dawn.com/2007/12/03/top7.htm

[52] Lavoy, Peter R. (2007), "Pakistan's Nuclear Posture: Security and Survivability," p.11, [Online: Web] Accessed February 18, 2012, URL: http://www.npolicy.org/files/20070121-Lavoy-PakistanNuclearPosture.pdf; Narang, Vipin (2009/10), "Posturing for Peace? Pakistan's Nuclear Postures and South Asian Stability," *International Security*, Vol. 34, No. 3, p.73.

[53] Hoyt, Timothy D. (2001), "Pakistani Nuclear Doctrine and The Dangers of Strategic Myopia," *Asian Survey*, Vol. 41, No. 6, p.966.

[54] Narang, Vipin (2009/10), "Posturing for Peace? Pakistan's Nuclear Postures and South Asian Stability," *International Security*, Vol. 34, No. 3, pp.73 & 77.

of a crude nuclear weapon – an improvised nuclear device (IND); attacks against and sabotage of nuclear facilities, in particular nuclear power plants, causing the release of large amounts of radioactivity; and the unauthorised acquisition of radioactive materials contributing to the fabrication and detonation of a radiological dispersion device (RDD) – a "dirty bomb" – or radiation emission device (RED)."[55] It observes that the assistance from "insider," who could be sympathisers or coerced, could ease the efforts of terrorists.[56] Pakistan faces similar threat scenarios.

In a Congressional Research Service (CRS) report September 2004, Jonathan Medalia observed that terrorists might get hold of nuclear weapons or materials from Pakistan under three scenarios: "Islamists in the armed services might provide such assistance covertly under the current government; if that government were overthrown by fundamentalists, the new government might make weapons available to terrorists; or such weapons might become available if chaos, rather than a government, followed the overthrow."[57]. According to Christopher Clary, "In addition to routine accident, during periods of relative normalcy Pakistani nuclear technology faces threats from outsiders attempting to penetrate security and seize sensitive nuclear materials or technology or insiders that seek to steal such items."[58] He opines that the "insider" threat is probably the most critical threat to Pakistani nuclear weapons and materials.[59] Clary also makes an assessment of five scenarios in which Pakistan's nuclear security could be threatened: takeover of the state by radical Islamists; an internal coup within the Pakistan Army where Islamist officers would overthrow the more moderate current Army leadership; an internal coup attempt or fracture induced by Islamist bent or ethnic sentiments within the Pakistani officer corp.; loss of territory to separatist or Islamist movement in the unstable regions of Baluchistan or NWFP or loss of control in that regions; and state collapse.[60]

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[55] Ferguson, Charles D. et. al. (2004), *The Four Faces of Nuclear Terrorism,* Center for Nonproliferation Studies, Monterey Institute of International Studies, California, p.3.
[56] Ibid., pp.10, 35 & 37.
[57] Medalia, Jonathan (2004), "Nuclear Terrorism: A Brief Review of Threats and Responses," *Congressional Research Report for Congress,* Order Code RL32595, September 22, p.3, [Online: Web] Accessed September 2, 2011, URL: http://www.fas.org/irp/crs/RL32595.pdf
[58] Clary, Christopher (2010), "Thinking about Pakistan's Nuclear Security in Peacetime, Crisis and War," IDSA Occasional Paper No. 12, September, p.18, [Online: Web] Accessed August 16, 2011, URL: www.idsa.in/system/files/OP_PakistansNuclearSecurity.pdf
[59] Ibid., p.24.
[60] Ibid., pp.29-30.

Lewis A. Dunn considers the possible scenario of a takeover of power by a radical Islamic regime or Islamic elements in which Pakistan's nuclear assets would come under serious threat.[61] He particularly assesses ways and means by which U.S. can help Pakistan secure it nuclear assets against radical elements. The 2008 report of the Commission on the Prevention of Weapons of Mass Destruction Proliferation and Terrorism, *World At Risk*, observes that in view of Khan's episode, there might be other Pakistani scientist who would be willing to work with other countries or terrorist to help them acquire nuclear weapons, and asserts that in Pakistan "the risk that radical Islamist – al Qaeda or Taliban – may gain access to nuclear material is real" and that "should the Pakistani government become weaker, and the Pakistani nuclear arsenal grow, that risk will increase."[62] In this respect, it reports that in a 2007 *Foreign Policy Magazine* poll of 117 nongovernmental terrorism experts, 74 percent viewed Pakistan as the most likely country to transfer nuclear technology to terrorists in the next three to five years.[63]

Subodh Atal, an independent foreign affairs analyst based in Washington, D.C., observes that threat to security of Pakistan's nuclear assets might come from collaboration between "terrorists and their sympathisers within Pakistan's military and nuclear establishments" and that possible scenario arise in a situation of a coup or change of regime or government where Pakistani establishments could knowingly pass nuclear assets to other nation or to nonstate actor.[64] Similarly, in 2004, Director of the Institute for Communitarian Policy Studies, George Washington University, Amitai Etzioni wrote, "Among failing states, Pakistan ranks high as a state from which terrorists are most likely to be able to obtain ready-made nuclear weapons either by toppling its government, by

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[61] Dunn, Lewis A. (2002), "Balancing Nuclear Security and Nonproliferation in South Asia," in Lee Fienstein et. al (eds.), *A New Equation: U.S. Policy towards India and Pakistan after September 11*, Non-Proliferation Project, Global Policy Program, Carnegie Endowment for International Peace, No.27, May, pp. 31-32, [Online: Web] Accessed January 20, 2012, URL: http://www.carnegieendowment.org/2002/05/31/new-equation-u.s.-policy.../8gb

[62] Graham, Bob et. al. (2008), *World At Risk: The Report of the Commission on the Prevention of Weapons of Mass Destruction Proliferation and Terrorism*, First Edition, New York: Vintage Books, p.67.

[63] Ibid.

[64] Atal, Subodh (2003), "Extremist, Nuclear Pakistan: An Emerging Threat?" *Policy Analysis*, No. 472, March 5, p.3, [Online: Web] Accessed September 2, 2011, URL: http://www.cato.org/pubs/pas/pa472.pdf

cooperating with certain dangerous elements of the government, or by corrupting the guardians of the bombs."[65]

Rolf Mowatt-Larssen, a senior fellow at Harvard University's Belfer Centre for Science and International Affairs, who also headed the U.S. Department of Energy's intelligence and counterintelligence office and also serve as CIA officer for 23 years, wrote in 2009 that three troublesome factors – growing extremism, expansion of Pakistan's nuclear weapons program, and growing instability – gives reason to suspect nuclear threat scenarios in Pakistan like collaboration between 'insider' and 'outsider' to gain access to Pakistan's nuclear weapons, materials, or facilities, and the worst case scenario where a coup could lead to seizure of Pakistan's nuclear assets by radical elements.[66] Also B. Raman, Additional Secretary (retd.), Cabinet Secretariat, Govt. of India, envisages three possible scenarios: sabotage of nuclear facilities by terrorists and their sympathisers; terrorists' acquisition of nuclear materials from ill-guarded nuclear establishments; and possible leakage of nuclear technology by sympathetic scientists to terrorists.[67]

While the danger emerging from state failure as envisioned by Amitai Etzioni is quite far fetched, threats from dangerous collaboration or conspiracy between radical elements and sympathisers seem to be the most critical and consistent in threat perception about danger to security of nuclear assets in Pakistan. In all scenarios of threat perceptions about nuclear safety and security in Pakistan, any of the three elements listed as under, comes into play:

i. Outsider threat.
ii. Insider threat.

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[65] Etzioni, Amitai (2004), "Pre-empting Nuclear Terrorism in a New Global Order," The Foreign Policy Centre, London, p.12, [Online: Web] Accessed September 4, 2011, URL: http://fpc.org.uk/fsblob/314.pdf
[66] Mowatt-Larssen, Rolf (2009), "Nuclear Security in Pakistan: Reducing the Risks of Nuclear Terrorism," *Arms Control Today*, July/August, [Online: Web] Accessed September 23, 2011, URL: http://www.armscontrol.org/act/2009_07-08/Mowatt-Larssen
[67] Raman, B. (2011), "How to Ward off Threats to Pak Nuclear Arsenal?" Paper no. 4504, May 25, [Online: Web] Accessed February 18, 2012, URL: http://www.southasiaanalysis.org/papers46/paper4504.html

iii. Insider/Outsider threat (collaboration or conspiracy between the insider and outsider).[68]

While the tactics or strategy by which terrorists could come into possession of Pakistan's nuclear assets could vary, such venture would involve outright physical attack, blackmail, or indoctrinations of people associated with sensitive nuclear programme or possibly voluntary aid from sympathisers.[69] The general threat scenarios about danger to safety and security of Pakistan's nuclear weapons and materials can be condensed to a list as follows:

- Attack and acquisition of intact nuclear weapons or nuclear materials by terrorist, with or without the help of 'insider(s)' under duress or voluntarily.
- Takeover of state power by radical Islamists or loss of control in certain unstable regions like Baluchistan and NWFP.
- Military coup or internal coup within the army that might result in passing of nuclear assets to terrorists by head of the regime or certain army officers who sympathize with radical Islamists.
- Leakage of sensitive information or nuclear assets to terrorists by rogue scientists.

Apart from these, threats to Pakistan's nuclear weapons might come from accidents and inadvertent or unauthorised launch of nuclear weapons in which terrorists will have no part. The threat from accidents emerges from prevailing possibilities of technical or human failure. It is feared that in times of tensed relation or crisis between Pakistan and India, the chances of inadvertent or unauthorised launch increases.[70]

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[68] Ali, Zafar (2007), "Pakistan's Nuclear Assets and Threats of Terrorism: How Grave is the Danger?" The Henry L. Stimson Center, Washington, D.C, p.8, [Online: Web] Accessed August 16, 2011, URL: http://www.stimson.org/images/uploads/research-pdfs/PakistanNuclearAssets-070607-ZafarAli-FINAL.pdf

[69] Clary, Christopher (2010), "Thinking about Pakistan's Nuclear Security in Peacetime, Crisis and War," IDSA Occasional Paper No. 12, September, p.24. [Online: Web] Accessed August 16, 2011, URL: www.idsa.in/system/files/OP_PakistansNuclearSecurity.pdf

[70] Chakma, Bhumitra (2009), *Pakistan's Nuclear Weapons,* London and New York: Routledge, p.79.

Weighing the Threat Perceptions

As stated earlier, Pakistan has given enough reasons for observers and security analysts to have doubts about the safety and security of its nuclear assets. Much of the threat to safety and security of Pakistan's nuclear assets revolves around instability and growing Islamic radicalism, which further lead to the serious threats coming from "insiders." The question is if these threat perceptions or the envisioning of threat scenarios were justified or largely overstated, considering what has come about in the past decade, 2000-2010.

First of all, the fears about acquisition of Pakistan's nuclear weapons or nuclear materials by terrorists with or without the help of 'insiders' under duress or voluntary assistance, have been proved wrong, precariously so, because so far success in this regard has not been reported. Observers have cited incidents in which terrorists have demonstrated their keenness to launch daring attacks that targeted sensitive sites, including nuclear-related facilities and personnel. Daring assassination attempts on Musharraf in 2003 and 2006, and assassination attempt and assassination of Benazir Bhutto by terrorists in 2007, in which the involvement of military personnel were suspected, seems to have demonstrated possible terrorist's tactics in eliminating key persons that might disturb command and control. The two terrorist attack in 2007, one on November 1, attack on a bus carrying air force personnel at Sargodha Air Force and the second, December 10 suicide attack of a school bus carrying children of air force personnel outside Kamra Air Force[71] base were interpreted as having nuclear implications as the two air force bases are believed to have inventory of nuclear arsenals and materials. [72] The suicide bomb attacks at the gates of Pakistan's Wah Ordinance Factory on August 20, 2008, where 70 people were killed and more than 100 injured has been analyzed as having a potential nuclear risk as the factory is believed to be engaged in 'nuclear warhead production and disassembly and disarmament,' apart from being the

[71] Blair, Charles P. (2011), "Anatomizing Non-State Threats to Pakistan's Nuclear Infrastructure: The Pakistani Neo-Taliban," Terrorism Analysis Report 1, Federation of American Scientists, June, pp.135-136, [Online: Web] Accessed September 23, 2011, URL: http://www.fas.org/pubs/_docs/Terrorism_Analysis_Report_1-lowres.pdf

[72] Clary, Christopher (2010), "Thinking about Pakistan's Nuclear Security in Peacetime, Crisis and War," IDSA Occasional Paper No. 12, September, p.19, [Online: Web] Accessed August 16, 2011, URL: www.idsa.in/system/files/OP_PakistansNuclearSecurity.pdf

country's primary arms and ammunition production facility.[73] Also, the July 2009 suicide bomb attack of a bus carrying personnel of Khan Research Laboratories that injured thirty workers is seen as having a nuclear ramification as the laboratory is the prime facility for uranium enrichment.[74] There is, however, a view that because the attacks took place outside of the strategic bases, the attacks cannot strictly be inferred as attacks on the bases.[75] This view of whether it was or was not a direct attack is moot because it can easily be understood that terrorists will keep the plan of attack to themselves. Terrorists' intention to acquire weapons of mass destruction has already been made known. Since the early 1990s[76] Al Qaeda, the front terror organization, has been trying to acquire these weapons. Osama bin Laden has already declared in December 1998, that acquiring these weapons "for the defense of Muslims is a religious duty" and that "It would be a sin for Muslims not to try to possess the weapons that would prevent the infidels from inflicting harm on Muslims."[77] The fact that these attacks occurred at sites that are believed to have nuclear weapons are reasons for grave concerns.

Christopher Clary analyses two incidents[78] of attacks by Baluch militants on suspected PAEC facilities at Dera Ghazi Khan. The first on April 26, 2003, where an attack was launched on a PAEC's Salary Camp, purportedly to pressure PAEC authorities to hire more local staff. The second attack came on May 15, 2006, where Baluch militants attacked a site thought to be a nuclear material dumping site near Baghalchur Uranium Mine in Dera Ghazi Khan. Though Pakistan claimed that the site was closed in 1999, the Institute for Science and International Security (ISIS) satellite imagery from 2004 and 2008 showed some kind of nuclear activity in facilities around

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[73] Blair, Charles P. (2011), "Anatomizing Non-State Threats to Pakistan's Nuclear Infrastructure: The Pakistani Neo-Taliban," Terrorism Analysis Report 1, Federation of American Scientists, June, p.141, [Online: Web] Accessed September 23, 2011, URL: http://www.fas.org/pubs/_docs/Terrorism_Analysis_Report_1-lowres.pdf

[74] Clary, Christopher (2010), "Thinking about Pakistan's Nuclear Security in Peacetime, Crisis and War," IDSA Occasional Paper No. 12, September, p.20, [Online: Web] Accessed August 16, 2011, URL: www.idsa.in/system/files/OP_PakistansNuclearSecurity.pdf

[75] Clary, Christopher (2010), "Thinking about Pakistan's Nuclear Security in Peacetime, Crisis and War," IDSA Occasional Paper No. 12, September, p.19, [Online: Web] Accessed August 16, 2011, URL: www.idsa.in/system/files/OP_PakistansNuclearSecurity.pdf

[76] Allison, Graham (2004), *Nuclear Terrorism: The Ultimate Preventable Catastrophe*, New York: Times Books Henry Holt and Company, p.3.

[77] Ferguson, Charles D. et. al. (2004), *The Four Faces of Nuclear Terrorism*, Center for Nonproliferation Studies, Monterey Institute of International Studies, California, p.31.

[78] Ibid., p.21.

Dera Ghazi Khan. The hazy evidence surrounding these incidents makes it hard to deduce the implications.[79]

Terrorists have demonstrated their capability to penetrate security perimeter around sensitive locations in Pakistan. In the incident of the ten-man militant attack on the Pakistan Army General Headquarters in Rawalpindi, on October 10, 2009, disguised as soldiers, five terrorists managed to breach the perimeter security and took hostages inside for about 18 hours until they were killed by Pakistani commandos. This incident did not have direct nuclear implications but it showed terrorists' resoluteness of purpose and tactics. Clary observes that secrecy surrounding nuclear storage sites serves as "the most important bulwark against attacks on Pakistan's nuclear facilities."[80] Though this may be true, the question is how long this will remain a secret. Moreover, the issue of secrecy as a defence mechanism is belittled when rampant terrorist attacks occur in Pakistan – the concern is that one of these numerous terror attacks could just hit the nuclear jackpot and the consequences would be disastrous.

Secondly, in the case of the correlation between the threat perception about takeover of state power by Islamist party or loss of control in unstable region, and the danger to safety and security of Pakistan's nuclear assets, some analysts have used the electoral perspective to say that the Pakistani state has not faced such situation till date, where there was imminent danger of being overpowered by Islamic political parties. Talking to CBS News in March 2007, Michael Krepon stated, "Pakistan has not been a revolutionary state to date, and the mullahs have not made deep inroads in the political life of the country."[81] This perspective holds that so far no Islamic parties have never captured more than 12 percent of votes in elections – this was achieved in 1988 election[82] and in the 2002 general elections, the coalition of Islamic parties, the MMA managed to secure only 11.1 percent of the vote,[83] which fall short of setting up a bargaining position

[79] Clary, Christopher (2010), "Thinking about Pakistan's Nuclear Security in Peacetime, Crisis and War," IDSA Occasional Paper No. 12, September, p.21, [Online: Web] Accessed August 16, 2011, URL: www.idsa.in/system/files/OP_PakistansNuclearSecurity.pdf
[80] Ibid., pp.21-22.
[81] CBS News (2007), Text of Michael Krepon's talk with CBS News, [Online: Web] Accessed February 7, 2012, URL: http://www.stimson.org/print.cfm?pub=1&ID=401
[82] Grare, Frederic (2006), "Pakistan: The Myth of an Islamist Peril," Policy Brief, Carnegie Endowment for International Peace, February, p.2, [Online: Web] Accessed February 18, 2012, URL: http://carnegieendowment.org/files/45.grare.final.pdf
[83] Ibid., p.2.

where they could garner effective political control at the centre, let alone state takeover. The view also says that this showcases the low mass appeal of majority of Pakistani people towards Islamic parties. While this may be true, this view has a serious deficiency: it fails to consider that capture of state-power by Islamic radical elements will not necessarily be through elections but it would most likely be through direct take-over by force.

The dominant position of the army is seen as a stabilizing force in securing Pakistan's nuclear assets. Frederic Grare, a visiting Scholar of Carnegie Endowment for International Peace, corroborate this line of opinion as he writes that while there is a direct nexus between Islamic political parties and jihadi groups, "no Islamic organizations has ever been in a position to politically or militarily challenge the role of the one and only center of power in Pakistan: the army."[84] He observes that the Army has used politico-religious organizations to prevent unrest. The local power gained by the MMA in Baluchistan and NWFP, in fact served "as a vessel to receive and channel popular dissatisfaction" thus avoiding political instability in the region. He, however, cautions that while Pakistani Army has used Islamic organizations for its purpose, and maintains control, "some of the militants have turned against the army because of Pakistan's 'betrayal' of the Taliban and cooperation with the United States in Afghanistan and in the 'war on terror.'"[85] In April 2009, assistant director of the Atlantic Council's programme on international security, Jeff Lightfoot, and director of the Nonproliferation Program at the Carnegie Endowment for International Peace, George Perkovich, also stated that under the army's current system of safeguards, there is less chance of militants obtaining Pakistan's nuclear weapons.[86] Likewise, U.S. President Obama, stated in May 2009 interview with Jon Meacham of *Newsweek Magazine,* "I don't want to engage in hypothethicals around Pakistan, other than to say we have confidence that Pakistan's nuclear arsenal is safe; that the Pakistani military is equipped

[84] Ibid., p.1.
[85] Ibid., p.2.
[86] Synovitz, Ron (2009), "Rising Tide of Militancy Feeds Fears About Pakistan's Nukes," [Online: Web] Accessed November 13, 2011, URL: http://www.rferl.org/content/Rising_Tide_Of_Militancy_Feeds_Fears_About_Pakistans_Nukes/1615403.html

to prevent extremists from taking over those arsenals."[87] There is, thus, a general agreement that Pakistani military is the stable force that garners confidence about the safety and security of Pakistan's nuclear assets. Considering what has come to past, the threat perception about imminent radical Islamists takeover of power may have been overstated. Those who perceived imminent danger, in this respect, failed to consider the special position of Pakistani military. Growing radicalism is, however, a case for concern and this will continue to be a factor for consistent threat perceptions in Pakistan.

Thirdly, the concerns about imminent danger of military coup or internal coup within the army that would result in a situation where the new regime, who sympathize with the cause of radical Islamists would pass nuclear weapons or materials to terrorists group may have been overstated but such concerns were not without reasons. It is true that the last coup happened in 1999, in which Musharraf took over power from civilian government, and he ruled until he resigned in 2008. And the transition in government in 2008 following Musharraf's resignation was peaceful. Since the last coup in 1999 to the point of writing, there has not been any such incident of coup as envisaged above. The assassination attempts on Musharraf on December 14, 2003 and September 2006, in which involvement of a number of low-ranking personnel from the Air Force and the Army[88]are cases for concern but fall short at being called a mutiny.

There were, however, reasons for concerns. In the light of growing radicalization in Pakistani society and the increase in recruitment, in recent times, of army personnel in the northern Punjab, NWFP, and other insurgency infested areas, the presence of personnel sympathetic to radical cause could not be pushed aside.[89] Here, the kinship relation, which induces typical familial sympathies, was a cause for concern.[90] Moreover, the ISI, which has enormous powers in Pakistan, is known to have links with radical Islamists since the 1980s and has sponsored Islamic militancy. Zahid Hussain wrote in *Frontline Pakistan,* about the might of ISI thus, "It is powerful, ubiquitous and has

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[87] Meacham, Jon (2009), "A Highly Logical Approach," *Newsweek Magazine*, May 15, Transcript of the Interview with President Obama, [Online: Web] Accessed May 14, 2012, URL: http://www.thedailybeast.com/newsweek/2009/05/15/a-highly-logical-approach.html

[88] Clary, Christopher (2010), "Thinking about Pakistan's Nuclear Security in Peacetime, Crisis and War," IDSA Occasional Paper No. 12, September, p.24, [Online: Web] Accessed August 16, 2011, URL: www.idsa.in/system/files/OP_PakistansNuclearSecurity.pdf

[89] Ibid., p.22.

[90] Ibid., pp.22-23.

functioned with so much autonomy from the central government that it has almost become a state within a state" and also stated "the ISI had helped to create much of the Islamic militancy and religious extremism that Musharraf was confronted with."[91]

ISI falls directly within Pakistan's military chain of command and majority of the ISI officers are recruited from the military on the basis of rotation or fixed tenure.[92]As such, elements of radical Islamic sympathisers abound both in the military and the ISI. The case of two former ISI chief – General Hamid Gul (1987-1998) and General Javed Nasir (1992-1993) – who were actively involved with Islamic radical movements symbolizes such sympathies.[93] October 7, 2001, Musharraf sacked General Mahmood Ahmed, appointed in 1999 as chief of ISI, reportedly sidelined three other top generals for reasons of hard-line Islamic views, and appointed General Aziz.[94] This did not, however, change much as many officers remained anti-American and did not make a clean break with decades of association with militant Islamists.[95] The nexus between the military and ISI, and radical Islamic groups thus continue to bother observers and security analysts who are interested in safety and security of Pakistan's nuclear assets.

However, Donald Kerr, Principal Deputy Director of National Intelligence, expressed more optimism on May 29, 2008, that control of nuclear weapons by Pakistani military is "a good thing because that's an institution in Pakistan that has, in fact, withstood many of the political changes over the years."[96] Ashley J. Tellis writes that considering the fact that Pakistani military has a special interest in protecting its "nuclear weapons, which are the crown jewels of its capability," the military will not part with them lightly. He further states that "the first-order challenge of protecting the Pakistani nuclear arsenal is, in a sense, met, because the Pakistani army has strong incentives to protect its nuclear weaponry irrespective of what the United States and the international

[91] Hussain, Zahid (2007), *Frontline Pakistan: The Struggle with Militant Islam,"* London and New York: I.B. Tauris, p.12-13.
[92] Ibid., p.13.
[93] Ibid., pp.21-27.
[94] Ibid., p.45.
[95] Ibid., p.46.
[96] Kerr, Paul K. and Nikitin, Mary Beth (2011), "Pakistan's Nuclear Weapons: Proliferation and Security Issues," Congressional Research Service Report for Congress, RL34248, October 5, p.15, [Online: Web] Accessed February 7, 2012, URL: http://fpc.state.gov/documents/organization/175899.pdf

communities do."[97] He observes that as long as Pakistan remains stable under moderate political forces, there is less danger to Pakistan's nuclear assets but in the long-run, as extremist forces begin to gain access in the government, the military and other state institutions the risk will increase.[98] Between 2000 and 2010, there were no incidents of military coup or internal coup which could be cited as instances where such events posed an imminent threat to safety and security of Pakistan's nuclear weapons. Therefore, while concerns were understandable, given the instances of military-Islamic extremist nexus, it may have been an overstatement to say that Pakistan's nuclear weapons are under imminent threat from military coup and internal coup.

Fourthly, the fear of leakage of sensitive information regarding Pakistan's nuclear assets became a key concern after the revelation of A.Q. Khan's network, which is known to have supplied nuclear technology and materials to Iran, Libya, and North Korea, and probably other clients. Available evidence suggests that Khan probably received sanctions from vital state functionaries. In this regard, C. Christine et al. wrote in *Pakistan: Can the United States Secure an Insecure State?* "The possibility that Khan had the sanction, official or unofficial, of his government to sell nuclear materials and technologies on behalf of the Pakistan state cannot be ruled out."[99] It is believed that nuclear technologies or materials were not provided to nonstate actor by Khan network, but given the murkiness about his dealings, doubts remains.

A serious concern about leakage of Pakistan's nuclear assets to nonstate actors emerged in August 2001, when Sultan Bahirudeen Mahmood, the former chief designer and director of Khushab Atomic Reactor and also former director of PAEC until 1999, and Chaudiri Abdul Majid, a retired Pakistani nuclear scientist, met representatives from al Qaeda, including direct contact with Osama bin Laden and Ayman al-Zawahiri, in Afghanistan, where they discussed issues relating to development of nuclear weapons

[97] Tellis, Ashley J. (2011), "Managing Frenemies: What should the United States do about Pakistan?" CERI Strategy Papers, SciencesPo., October 24, p.3, [Online: Web] Accessed January 27, 2012, URL:http://fpc.state.gov/documents/organization/175899.pdf
[98] Ibid., p.4.
[99] Fair, Christine C. et. al. (2010), *Pakistan: Can the United States Secure an Insecure State?"* RAND Corporation, Santa Monica, p.28, [Online: Web] Accessed February 7, 2012, URL: http://www.rand.org/pubs/monographs/2010/RAND_MG910.pdf

infrastructure, nuclear bomb design and fabrication of radiological dispersal devices.[100] Mahmood was running the Ummah Tameer-e-Nau (UTN) organization,[101] purportedly a charity organization but believed to be associated with dealings in weapons of mass destruction, since he was demoted as director of PAEC in 1999 for reasons including his bend towards radicalism.[102] Pakistan government took action against them after the United States reported about this activity to Pakistani authority in late 2001.[103] Through the interrogations on Mahmood and searches in Afghanistan, it was learnt that UTN worked with al-Qaeda on biological and basic nuclear weapons technology. They were put under house arrest in 2002 but the Pakistani government did not press criminal charges on them.[104]

The Mahmood-Majid and Khan scandals raised serious questions about the insider threat to security of Pakistan's nuclear assets and Pakistani government began to take significant steps (which will be discussed below) to ensure that such incidents does not arise in the future. While screening processes were conducted since 2001 to root out potential insider threat, Pakistan introduced a better screening system, Personnel Reliability Programme (PRP), model after the U.S. PRP, in 2005. Pakistan takes consolation in the fact that Khan's episode was a thing of the past when nuclear programme was a covert operation and that post-Khan episode there has not been any reported case of nuclear transfer.[105] Echoing this view, in December, 2010, speaking to the media, Foreign Office spokesman Abdul Basit stated that the "fears are misplaced and

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[100] Kerr, Paul K. and Nikitin, Mary Beth (2011), "Pakistan's Nuclear Weapons: Proliferation and Security Issues," Congressional Research Service Report for Congress, RL34248, October 5, p.22, [Online: Web] Accessed February 7, 2012, URL: http://fpc.state.gov/documents/organization/175899.pdf; Fair, Christine C. et. al. (2010), *Pakistan: Can the United States Secure an Insecure State?"* RAND Corporation, Santa Monica, p.29, [Online: Web] Accessed February 7, 2012, URL: http://www.rand.org/pubs/monographs/2010/RAND_MG910.pdf

[101] Hussain, Zahid (2007), *Frontline Pakistan: The Struggle with Militant Islam,"* London and New York: I.B. Tauris, p.154.

[102] Kerr, Paul K. and Nikitin, Mary Beth (2011), "Pakistan's Nuclear Weapons: Proliferation and Security Issues," Congressional Research Service Report for Congress, RL34248, October 5, p.22, [Online: Web] Accessed February 7, 2012, URL: http://fpc.state.gov/documents/organization/175899.pdf

[103] Ibid., p.22.

[104] Ibid.

[105] Akhtar, Rabia (2009), "Pakistan's Nuclear Assets: Safe and Secure", CBRN South Asia Brief, June, Issue No.13, p.4, [Online: Web] Accessed August 16, 2011, URL: http://www.ipcs.org/pdf_file/issue/CBRNIB13-Rabia-PakNukes.pdf; Ali, Zafar (2007), "Pakistan's Nuclear Assets and Threats of Terrorism: How Grave is the Danger?" The Henry L. Stimson Center, Washington, D.C, p.10, [Online: Web] Accessed August 16, 2011, URL: http://www.stimson.org/images/uploads/research-pdfs/PakistanNuclearAssets-070607-ZafarAli-FINAL.pdf

doubtless fall in the realm of condescension. There has not been a single incident involving our fissile material which clearly reflects how strong our controls and mechanisms are."[106] Though this may be true, the preceding cases did not inspire confidence that such incidents will not happen again. In an environment of growing radicalism in Pakistan, the perception about "insider threat" persists.

Pakistan has taken some significant measures to strengthen its capability to ensure nuclear safety and security. These measures will be discussed below.

Pakistan's Response: Measures Taken to Augment Nuclear Safety and Security

After the creation of the NCA in 2000, which was a significant step towards better control over its nuclear assets, Pakistan has taken significant steps to allay general threat perceptions about the safety and security of its nuclear assets. Much of the measures were adopted following international pressures on Pakistan after serious scandals were reported by the U.S.: the case of Khan's network was reported by U.S. to Pakistani authorities in the late 1990s[107] and pressure to take corrective measures persisted even beyond 2004 when Khan was detained; the case of Mahmood–Majid meeting with al Qaeda members was also raised by U.S. at highest level of Pakistani authority in late 2001[108] and following this significant measures were adopted; and time and again pressures and offers of assistance were made between 2000 and 2010. This response to general threat perceptions and pressures came in the form of practical measures, which included taking calculated assistance from foreign sources, and spirited assurances about the well being of its nuclear weapons and materials. The measures included revamp of physical protection, export regulation, screening of personnel working in nuclear complex, adoption of nuclear weapons safety technology and strengthening nuclear

[106] PTI (2010), "Pak dismisses fears over safety of its nuke weapons," *The Hindu,* Islamabad, December 2, [Online: Web] Accessed February 7, 2012, URL: http://www.thehindu.com/news/international/article927186.ece

[107] Corera, Gordon (2006), *Shopping For Bombs: Nuclear Proliferation, Global Insecurity, and the Rise and Fall of the A.Q. Khan Network,* Oxford University Press, New York, pp.138.

[108] Kerr, Paul K. and Nikitin, Mary Beth (2011), "Pakistan's Nuclear Weapons: Proliferation and Security Issues," Congressional Research Service Report for Congress, RL34248, October 5, p.22, [Online: Web] Accessed February 7, 2012, URL: http://fpc.state.gov/documents/organization/175899.pdf

operation protocol with the objectives of countering the 'insider' and 'outsider' threats to nuclear assets, prevent accidents and inadvertent or unauthorised use of nuclear weapons.

Physical Protection of Nuclear Facilities

Maintaining a robust physical protection of nuclear facilities – both civilian and military – by use of men; weapons; hardened barriers, such as retaining walls and fences; use of technologies, such as surveillance cameras and motion detectors; etc., is a vital aspect of ensuring nuclear safety and security. Pakistan maintains an elaborate system of physical security or perimeter security around nuclear facilities, applied to both civilian and military facilities. The SPD controls between 8000-10,000 security personnel involved in providing security in strategic areas and from among this, a special unit, about 1000 strong, commanded by a two-star general, is responsible for providing nuclear security in Pakistan.[109] The SPD is responsible for perimeter security. It runs a three-tier security perimeter that makes use of men, gun, and technology. They are: (a) the inner perimeter: prior to A.Q. Khan scandal, it was the responsibility of the respective strategic organizations to provide inner perimeter security. As the scandal revealed serious deficiencies in the system where the head of the organization was in charge of inner perimeter security, such responsibility was stripped off and the SPD's security division was given the charge of the inner perimeter security.[110] Consisting of specially trained personnel, the forces operate on a permanent basis and are headed by a two-star general. Selected facilities are designated as no-fly zone and are protected by the air force;[111] (b) the outer perimeter: this is the second level of security perimeter and here measures such as fencing, hardened retaining wall, electronic sensors, cameras, and security personnel are used;[112] (c) the third tier: counter-intelligence constitute the third tier. Its main

[109]IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment*, The International Institute for Strategic Studies, London, p.112.
[110] Clary, Christopher (2010), "Thinking about Pakistan's Nuclear Security in Peacetime, Crisis and War," IDSA Occasional Paper No. 12, September, p.13, [Online: Web] Accessed August 16, 2011, URL: www.idsa.in/system/files/OP_PakistansNuclearSecurity.pdf
[111] Luongo, Kenneth N. and Salik, Naeem (2007), "Building Confidence in Pakistan's Nuclear Security," *Arms Control Today*, December, [Online: Web] Accessed August 16, 2011, URL: http://www.armscontrol.org/act/2007_12/Luongo
[112] Clary, Christopher (2010), "Thinking about Pakistan's Nuclear Security in Peacetime, Crisis and War," IDSA Occasional Paper No. 12, September, p.13, [Online: Web] Accessed August 16, 2011, URL: www.idsa.in/system/files/OP_PakistansNuclearSecurity.pdf; Luongo, Kenneth N. and Salik, Naeem

responsibility is to identify external threats to facilities. Headed by a one-star SPD Brigadier General, the counter-intelligence organization coordinates with other intelligence agencies, including the ISI, to identify external threats.[113] Though the ISI director general is not a formal member of the NCA, it remains a critical partner, as the ISI works closely with the security division.[114]

Export Control

Ensuring nuclear safety and security entails enactment and implementation of strict laws that control export of all items relating to nuclear technology. Prior to 2004 export control regime, Pakistan's nuclear export was governed by the three Statutory Regulatory Orders (SROs) issued in July 1998, February 1999 and August 1999, ordinances and acts that empowered regulations by the Ministry of Commerce.[115] The July 1998 SRO completely prohibited the export of nuclear material but the other two SROs provided for issue of a "no objection certificate" by the PAEC for export of nuclear material or nuclear energy-related equipments.[116] In July 2000, confusion emerged after a public notice was published by Pakistan's Ministry of Commerce, which gave a detailed guidelines for export of nuclear-related items and listed procedures for obtaining PAEC's "no objection certificate."[117] This caused confusion as the validity of this notice was question due to contradiction in the July 1998 SRO, and the other two SROs. The Ministry of Commerce, however, retracted the public notice on July 26, 2000,[118] and clarified that the procedure for export of nuclear-related materials and equipment are yet to be finalized. The ministry also stated that Pakistan is working with the U.S. to

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(2007), "Building Confidence in Pakistan's Nuclear Security," *Arms Control Today*, December, [Online: Web] Accessed August 16, 2011, URL: http://www.armscontrol.org/act/2007_12/Luongo

[113] Clary, Christopher (2010), "Thinking about Pakistan's Nuclear Security in Peacetime, Crisis and War," IDSA Occasional Paper No. 12, September, p.14, [Online: Web] Accessed August 16, 2011, URL: www.idsa.in/system/files/OP_PakistansNuclearSecurity.pdf

[114] Ibid., p.14.

[115]Wagner, Alex and Brugger, Seth (2000), "Pakistan Clarifies Nuclear Export Control Guidelines," *Arms Control Today*, September, [Online: Web] Accessed September 23, 2011, URL: http://www.armscontrol.org/act/2000_09/pakistansept00; Luongo, Kenneth N. and Salik, Naeem (2007), "Building Confidence in Pakistan's Nuclear Security," *Arms Control Today*, December, [Online: Web] Accessed August 16, 2011, URL: http://www.armscontrol.org/act/2007_12/Luongo

[116] Wagner, Alex and Brugger, Seth (2000), "Pakistan Clarifies Nuclear Export Control Guidelines," *Arms Control Today*, September, [Online: Web] Accessed September 23, 2011, URL: http://www.armscontrol.org/act/2000_09/pakistansept00

[117] Ibid.

[118] Ibid.

strengthen export controls, for which purpose discussions were held with U.S. in June, 2000.[119] Prior to 2004 Act, given the legal weakness, organizations were able to act independently, which raised much concerns.[120] Following the Khan scandal and Mahmood-Majid episode, pressure fell on Pakistan to strengthen legal control over export of all nuclear and biological weapons-related goods and technology and efforts were intensified in early 2000 until 2004 when a legal instrument was finally enacted.

On September 25, 2004, Pakistan adopted the Export Control on Goods, Technologies, Materials and Equipment Related to Nuclear and Biological Weapons and their Delivery Systems Act, 2004, also known as, Export Control Act 2004, which regulates the export of goods, technologies, material and equipment related to nuclear and biological weapons and their delivery system.[121] The Act was first presented by Pakistan's foreign ministry, approved by the cabinet on May 5, 2004,[122] not long after the UNSCR 1540 (adopted on April 28, 2004),[123] that called for member states to prevent proliferation of weapons of mass destruction to nonstate actors by adopting and implementing domestic legislation to control sensitive nuclear and biological weapons related materials and technology, was unanimously approved by the UN Security Council. Pakistani government notified to the U.S. about the introduction of this bill in mid-May.[124] The bill was introduced in Pakistan's Parliament in June 2004.[125] The Export Act provided for stringent mechanism to criminalize and prosecute individuals or organizations that conduct illegal transfer of items prohibited by the Act.

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[119] Ibid.
[120] Luongo, Kenneth N., and Salik, Naeem (2007), "Building Confidence in Pakistan's Nuclear Security," *Arms Control Today,* December, [Online: Web] Accessed August 16, 2011, URL: http://www.armscontrol.org/act/2007_12/Luongo
[121] Khattak, Masood Ur Rehman, (2011), "How Pakistan is a responsible nuclear state," January 7, [Online: Web] Accessed March 21, 2012, URL: http://www.weeklypulse.org/details.aspx?contentID=24&storylist=10
[122] Kohimeier, Gabrielle (2004), Pakistan Introduces Export Control Bill," *Arms Control Today,* September, [Online: Web] Accessed February 16, 2012, URL: http://www.armscontrol.org/act/2004_09/Pak_Export_Control
[123] *United Nations Security Council Resolution 1540*, (2004), UNSC, April 28, [Online: Web] Accessed September 23, URL: http://daccess-dds-ny.un.org/doc/UNDOC/GEN/N04/328/43/PDF/N0432843.pdf?OpenElement
[124] Kohimeier, Gabrielle (2004), Pakistan Introduces Export Control Bill," *Arms Control Today,* September, [Online: Web] Accessed February 16, 2012, URL: http://www.armscontrol.org/act/2004_09/Pak_Export_Control
[125] Ibid.

The Export Control Act 2004, established control over export, re-export, transshipment and transit of goods, technologies, material and equipments related to nuclear and biological weapons. It noted that appropriate action will be taken against a recipient of controlled goods or technology. The exporters are mandated to maintain detailed inventories and records and report suspected illegal activities if any to competent authority. It has provision for punishment up to 14 years of imprisonment and Rs.5 million fine or both, and confiscation of property and assets of offenders.[126] The Act had a wide jurisdiction as it applies to Pakistani citizens anywhere, foreign national while in Pakistan's territory and any transport system registered in Pakistan where ever it may be located. It also provided that a Control Lists of goods and technologies subject to controls will be notified separately.[127]

As provided for in the Export Act, the Strategic Export Control Division (SECDIV) was created to implement and enforce the Act. The SECDIV come under the Ministry of Foreign Affairs, and is a multidisciplinary body that includes members from: the Ministry of Foreign Affairs; the Ministry of Commerce; Ministry of Defence; the Central Board of Revenue; the PAEC; the Pakistan Nuclear Regulatory Authority (PNRA); and the SPD.[128] To avoid conflict of interest, SECDIV operates autonomously. The necessary rules and regulations for internal function and implementation of the act are formulated by the SECDIV independently. It is mandated with the role of establishing structures or issue of licensed for export of items as per the National Control List and conduct outreach programme for industry and the media. [129] In July 2007, the Oversight Board was established, with the responsibility to independently review the

[126] Ibid.
[127] *Export Control on Goods, Technologies, Material and Equipment related to Nuclear and Biological Equipment related to Nuclear and Biological Weapons and their Delivery Systems Act, 2004*, The Gazette of Pakistan, [Online: Web] Accessed September 23, 2011 URL: http://www.iaea.org/Publications/Documents/Infcircs/2004/infcirc636.pdf
[128] Kohimeier, Gabrielle (2004), Pakistan Introduces Export Control Bill," *Arms Control Today,* September, [Online: Web] Accessed February 16, 2012, URL: http://www.armscontrol.org/act/2004_09/Pak_Export_Control
[129] Luongo, Kenneth N. and Salik, Naeem (2007), "Building Confidence in Pakistan's Nuclear Security," *Arms Control Today,* December, [Online: Web] Accessed August 16, 2011, URL: http://www.armscontrol.org/act/2007_12/Luongo

implementation of the Export Control Act 2004 and supervises over the SECDIV.[130] Headed by the foreign secretary, other members include officials from the Ministries of Foreign Affairs, Defence, Interior, Cabinet Division, Federal Board of Revenue, PNRA and the SPD.[131]

In October 2005, Pakistan released the National Control List (NCL), specifying items of nuclear and biological weapons related materials and technologies that would be subjected to export control.[132] The NCL was set to conform to the European Union (EU) system of classification/model, Australia Group, NSG and the MTCR lists, is reviewed and revised or updated and notified periodically.[133]

Personnel Reliability Programme (PRP)

The main purpose of PRP is to safeguard nuclear assets against "insider threats." Taking note of the threat that Pakistan faces from the "insider," Pakistan sought to employ only trustworthy personnel in its nuclear complex by weeding out persons with religious extremism and other related problems that might threaten the sanctity of safety and security of its nuclear assets. Towards this objective, an elaborate screening-and-surveillance programme, a Personnel Reliability Programme (PRP) similar to U.S. PRP was adopted. Evaluation of individuals working in sensitive nuclear facilities were conducted since 2001 by the SPD[134] but it is believed to have been weak until a comparatively robust PRP was put in place by Pakistan in 2005 after years of exchanges in this sensitive matter with the U.S.[135] The SPD continues to be in charge of PRP. The SPD conducts the programme along with other three intelligence agencies – ISI, military

[130] Akhtar, Rabia and Hussain, Nazir (2010), "Safety and Security of Pakistan's Nuclear Assets", in Usama Butt and N Elahi (eds.), *Pakistan's Quagmire: Security, Strategy, and the Future of the Islamic-nuclear Nation*, Continuum International Publishing Group, New York, p.186.
[131] Ibid.
[132] Khattak, Masood Ur Rehman, (2011), "How Pakistan is a responsible nuclear state," January 7, [Online: Web] Accessed March 21, 2012, URL: http://www.weeklypulse.org/details.aspx?contentID=24&storylist=10
[133] Ibid.
[134] Luongo, Kenneth N. and Salik, Naeem (2007), "Building Confidence in Pakistan's Nuclear Security," *Arms Control Today*, December, [Online: Web] Accessed August 16, 2011, URL: http://www.armscontrol.org/act/2007_12/Luongo
[135] Wonacott, Peter (2007), "Inside Pakistan's Drive to Guard it's A-Bombs," Rawalpindi, November 19, [Online: Web] Accessed February 18, 2012, URL: http://online.wsj.com/public/article...095207239.html

intelligence, and the Intelligence Bureau.[136] Modeled after U.S. PRP, Pakistan's PRP involves a series of checks and surveillance that take note of not just religious extremism but also other factors like lust, greed or depression that might possibly lead to leakage of national secrets.[137] It also looks into personal finance, political views, sexual history and mental health of personnel and also maintains the surveillance.[138]For potential recruits, the background checks which includes checks on family, educational background, political affiliations, and inclinations is said to take as much as a year time.[139] New recruits are monitored for months before being placed in sensitive areas.[140] They are also administered periodic psychological tests and also reports from fellow colleagues.[141]While random checks are carried out, the periodic clearance rechecks are conducted every two years or when individual(s) get transferred from one area to another of nuclear programme.[142] The security division of the SPD conducts security clearance review annually, semiannually or quarterly and also maintains weekly, monthly, and quarterly reports of the security of all strategic organization to prevent theft, loss, or accident.[143]

In 2007, it was reported by a certain two-star general that an employee was fired from the nuclear programme for specifically two counts of offences: distributing political pamphlets of an ultraconservative Islamic party and persuading his colleagues to

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[136] Clary, Christopher (2010), "Thinking about Pakistan's Nuclear Security in Peacetime, Crisis and War," IDSA Occasional Paper No. 12, September, p.14, [Online: Web] Accessed August 16, 2011, URL: www.idsa.in/system/files/OP_PakistansNuclearSecurity.pdf

[137] Wonacott, Peter (2007), "Inside Pakistan's Drive to Guard it's A-Bombs," Rawalpindi, November 19, Rawalpinid, [Online: Web] Accessed February 18, 2012, URL: http://online.wsj.com/public/article...095207239.html

[138] Ibid.

[139] Luongo, Kenneth N. and Salik, Naeem (2007), "Building Confidence in Pakistan's Nuclear Security," *Arms Control Today*, December, [Online: Web] Accessed August 16, 2011, URL: http://www.armscontrol.org/act/2007_12/Luongo; Wonacott, Peter (2007), "Inside Pakistan's Drive to Guard it's A-Bombs," Rawalpindi, November 19, [Online: Web] Accessed February 18, 2012, URL: http://online.wsj.com/public/article...095207239.html

[140] Wonacott, Peter (2007), "Inside Pakistan's Drive to Guard it's A-Bombs," Rawalpindi, November 19, [Online: Web] Accessed February 18, 2012, URL: http://online.wsj.com/public/article...095207239.html

[141] Ibid.

[142] Luongo, Kenneth N. and Salik, Naeem (2007), "Building Confidence in Pakistan's Nuclear Security," *Arms Control Today*, December, [Online: Web] Accessed August 16, 2011, URL: http://www.armscontrol.org/act/2007_12/Luongo

[143] Khan, Feroz Hassan, (2009), "Nuclear Security in Pakistan: Separating Myth from Reality," [Online: Web] Accessed September 16, 2011, URL: *Arms Control Today*, July/August, http://www.armscontrol.org/act/2009_07-08/khan

participate in party rallies purported organized at a local mosque.[144] Apparently, while being religious is permitted for a personnel working in strategic sites, inclination to fundamentalism was unacceptable.[145] Drawing a delicate balance between being religious and fundamentalist is often a difficult job, given the close relation between them.[146] Surging religious conservatism and growing anti-Americanism among young people in Pakistan spurred by U.S.-led 'war on terror' makes the task of security officials even tougher.[147]

Apart from the growing influence of extremism among new generations, Pakistan is faced with the challenge of monitoring and controlling nuclear expertise, the scientists. There is a greater threat that comes from the growing number of young people inclined towards religious conservatism, and in many cases induced by the U.S.-led military operations in Iraq and Afghanistan following 9/11 terrorists attack, which have stirred anti-American or anti-West attitude.[148] New recruits to various nuclear facilities in Pakistan could be influenced by religious conservatism or anti-Western feelings.[149] Keeping track of scientists and other personnel working in various nuclear facilities in Pakistan would be a tough job. According to Lt. Gen. Kidwai, about 70,000 people are employed in various nuclear facilities in Pakistan. Among them, 7,000 to 8,000 are scientists, of which about 2,000 have "critical knowledge." Apart from this there is also the task of keeping track of retired scientists and other personnel who possess sensitive information about nuclear weapons and assets in Pakistan.[150] While Pakistan extends the employment of scientist with sensitive knowledge and expertise, number of retired personnel in this category is increasing.[151] Keeping tap and surveillance of this category

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[144] Wonacott, Peter (2007), "Inside Pakistan's Drive to Guard it's A-Bombs," Rawalpindi, November 19, [Online: Web] Accessed February 18, 2012, URL: http://online.wsj.com/public/article...095207239.html
[145] Ibid.
[146] IISS Strategic Dossier(2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,* The International Institute for Strategic Studies, London, p.113.
[147] Wonacott, Peter (2007), "Inside Pakistan's Drive to Guard it's A-Bombs," Rawalpindi, November 19, [Online: Web] Accessed February 18, 2012, URL: http://online.wsj.com/public/article...095207239.html
[148] Ibid.
[149] Ibid.
[150] Clary, Christopher (2010), "Thinking about Pakistan's Nuclear Security in Peacetime, Crisis and War," IDSA Occasional Paper No. 12, September, p.14, [Online: Web] Accessed August 16, 2011, URL: www.idsa.in/system/files/OP_PakistansNuclearSecurity.pdf
[151]Luongo, Kenneth N. and Salik, Naeem (2007), "Building Confidence in Pakistan's Nuclear Security," *Arms Control Today,* December, [Online: Web] Accessed August 16, 2011, URL: http://www.armscontrol.org/act/2007_12/Luongo

of individuals to ensure that there is no spillage of sensitive information would be a daunting task. Pakistan is reported to be working with the U.S. in this regard.[152]

According to Feroz Khan, the former SPD director, security watchdogs watches over most of the top officials even after retirement, the job of which include monitoring phone calls, movements and overseas travel.[153] He assured that "the system knows how to distinguish who is a 'fundo' (fundamentalist) and who is simply pious."[154] Though Pakistan's PRP reported to have worked well till 2010, five years since it was adopted, it will be sometime before the effectiveness can be determined. In 2002 – this is prior to adoption of the present PRP – under the screening system, successful selection of new recruits to lower levels posts in the nuclear complex averaged 5 percent.[155]Going by that standard the selection process seems to be quite rigorous. Now, as Pakistan is facing greater threat from extremism, we can only hope that the PRP adopted in 2005, will be even more rigorous. Lack of information about certain critical issues such as: use of hi-tech technology like the polygraph systems; qualification of those who carry out the clearance process; precise criteria for security clearance;[156] the percentage of selection and elimination of potential new recruits in the nuclear complex; data about successful detection, investigation and penalization of rogue personnel, etc., the effectiveness of Pakistan's PRP will remain an open question. As such, confidence in Pakistan's PRP will have to be complemented by the technical and procedural safeguards in limiting insider threats to the safety and security of Pakistan's nuclear assets.[157]

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[152] Ibid., p.14.
[153] Wonacott, Peter (2007), "Inside Pakistan's Drive to Guard it's A-Bombs," Rawalpindi, November 19, [Online: Web] Accessed February 18, 2012, URL: http://online.wsj.com/public/article...095207239.html
[154] Ibid.
[155] Cotta-Ramusino, P. and Martellini, M. (2002), "Nuclear safety, nuclear stability and nuclear strategy in Pakistan: A concise report of a visit by Landau Network – Centro Volta," *Landau Network-Centro Volta,* Como, Italy, Janurary 14, [Online: Web] Accessed September 5, 2011, URL: http://www.pugwash.org/september11/pakistan-nuclear.htm
[156] IISS Strategic Dossier(2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,* The International Institute for Strategic Studies, London, p.113.
[157] Clary, Christopher (2010), "Thinking about Pakistan's Nuclear Security in Peacetime, Crisis and War," IDSA Occasional Paper No. 12, September, p.24, [Online: Web] Accessed August 16, 2011, URL: www.idsa.in/system/files/OP_PakistansNuclearSecurity.pdf

Nuclear weapons safety technology and operation protocol

To ensure nuclear safety and security, it is important to take appropriate technical and procedural measures. Such measures aim at preventing inadvertent or unauthorized use of nuclear weapons and averting accidents. As of 2002, Pakistan, as stated by General Kidwai, did not have Permissive Action Links[158] (PALs), in its nuclear weapons.[159] At that time, Pakistan maintained that the nuclear weapons being in a disassembled state, PALs was not necessary.[160] In 2004, Samar Mubarakmand, former Pakistani nuclear scientist, stated during a television interview that a "code-lock device," which requires entry of specified code for use of nuclear weapons, is fitted in all Pakistani nuclear warheads.[161] For the first time, in November 2006, General Kidwai stated that Pakistan has employed PALs system in its nuclear warheads.[162] According to Air Commodore Khalid Banuri and Adil Sultan, officials connected with the SPD, safety measures are employed both within the warheads and also in the chain of command, and that no single person can operate nuclear weapons system.[163] Though the level of sophistication or effectiveness of Pakistan's PALs is not known, available sources indicate that Pakistan uses indigenous PALs in its nuclear weapons.[164] Though Pakistan's PALs system is not as sophisticated as U.S. PALs, it is believed that they are dependable enough to prevent unauthorised use of its nuclear weapons.[165]

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[158] PALs is an electronic (originally electro-mechanical) device that prevents arming of the nuclear weapon unless the correct codes are inserted into it. Depending on the level of increasing sophistication, the PALs are categorized as A, B, C, and so on. See, Sublette, Carey (1997) "Principles of Nuclear Weapons' Security and Safety," October 1, [Online: Web] Accessed September 23, 2011, URL: http://www.stealthskater.com/Documents/Nuke_17.pdf.

[159] Cotta-Ramusino, P. and Martellini, M. (2002), "Nuclear safety, nuclear stability and nuclear strategy in Pakistan: A concise report of a visit by Landau Network – Centro Volta," *Landau Network-Centro Volta,* Como, Italy, Janurary 14, [Online: Web] Accessed September 5, 2011, URL: http://www.pugwash.org/september11/pakistan-nuclear.htm

[160] Ibid.

[161] Luongo, Kenneth N. and Salik, Naeem (2007), "Building Confidence in Pakistan's Nuclear Security," *Arms Control Today,* December, [Online: Web] Accessed August 16, 2011, URL: http://www.armscontrol.org/act/2007_12/Luongo

[162] Ibid., p.13.

[163] Clary, Christopher (2010), "Thinking about Pakistan's Nuclear Security in Peacetime, Crisis and War," IDSA Occasional Paper No. 12, September, p.16, [Online: Web] Accessed August 16, 2011, URL: www.idsa.in/system/files/OP_PakistansNuclearSecurity.pdf

[164] Wonacott, Peter, (2007), "Inside Pakistan's Drive to Guard It's A-Bombs," Rawalpindi, November 29, [Online: Web] Accessed February 18, 2012, URL: http://online.wsj.com/public/article...095207239.html

[165] IISS Strategic Dossier(2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,* The International Institute for Strategic Studies, London, p.115.

In 2002 General Kidwai said that in order to prevent unauthorised acts, Pakistan maintains a "three-man rule," which requires concurrent decision of three persons for any operation relating to nuclear weapons.[166] As of now, Pakistan is believed to have adopted both "three-man rule" and "two-man rule," for nuclear weapons related operation.[167] According to Brig. Gen. Naeem Salik, former senior officer within the NCA, "a standard two-man rule" is adopted to validate access to nuclear release codes.[168] Pakistan's nuclear weapons are believed to be kept in a "disassembled state."[169] This would mean that the fission core and the ignition components are kept separated from each other. General Kidwai, however, says that the bomb can be assembled "very quickly." This means that the disassembled parts are not kept far from each other.[170] Also, keeping the weapons disassembled would also mean that the nuclear weapons are not fitted to nuclear delivery system.[171] The use of PALs, "three-man rule" and "two-man rule," and keeping nuclear weapons in a disassembled state, are significant as they prevent accidents and unauthorised use.

Transportation Security

Nuclear weapons and materials are most vulnerable to theft and sabotage while in transit. The Convention on the Physical Protection of Nuclear Materials (CPPNM) of 1980, which Pakistan has ratified in October 2000,[172]and the amended CPPNM of 2005,

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[166] Cotta-Ramusino, P. and Martellini, M. (2002), "Nuclear safety, nuclear stability and nuclear strategy in Pakistan: A concise report of a visit by Landau Network – Centro Volta," *Landau Network-Centro Volta,* Como, Italy, Janurary 14, [Online: Web] Accessed September 5, 2011, URL: http://www.pugwash.org/september11/pakistan-nuclear.htm

[167] Luongo, Kenneth N. and Salik, Naeem (2007), "Building Confidence in Pakistan's Nuclear Security," *Arms Control Today,* December, [Online: Web] Accessed August 16, 2011, URL: http://www.armscontrol.org/act/2007_12/Luongo

[168] Wood, David (2007), "Crisis raises alarm over arsenal amid Pakistani turmoil, renewed concerns over nuclear weapons," *The Baltimore Sun,* Washington, November 8, [Online: Web] Accessed February 16, 2012, URL: http://articles.baltimoresun.com/2007-11-08/news/0711080102_1_nuclear-weapons-nuclear-arsenal-pakistan

[169] Cotta-Ramusino, P. and Martellini, M. (2002), "Nuclear safety, nuclear stability and nuclear strategy in Pakistan: A concise report of a visit by Landau Network – Centro Volta," *Landau Network-Centro Volta,* Como, Italy, Janurary 14, [Online: Web] Accessed September 5, 2011, URL: http://www.pugwash.org/september11/pakistan-nuclear.htm

[170] Ibid.

[171] Luongo, Kenneth N. and Salik, Naeem (2007), "Building Confidence in Pakistan's Nuclear Security," *Arms Control Today,* December, [Online: Web] Accessed August 16, 2011, URL: http://www.armscontrol.org/act/2007_12/Luongo

[172] Ibid., p.14

which Pakistan has not signed as of March 2012,[173] Article 3 of both the convention, calls upon member states to take appropriate measures to protect nuclear materials during transport – domestic or international – by land, air or sea.[174]In order to fulfill its obligation under the CPPNM, 1980, Pakistan has sought to increase protection measures by acquiring specialised vehicles and tamper-proof containers, and military escort to prevent theft and sabotage of nuclear materials during transport.[175] In April 2007, Abdul Mannan, Director of Transport and Waste Safety, PNRA, and former Visiting Fellow at Henry L. Stimson Centre, in his article, "Preventing Nuclear Terrorism in Pakistan: Sabotage of a Spent Fuel Cask or a Commercial Irradiation Source in Transport," made a hypothetical case studies of terror attack during transport of nuclear materials in Karachi and Lahore, in which he considered types of attacks that Pakistan would be vulnerable to: multiple missile fire, high penetration weaponry, truck bomb and other ingenious combustible device.[176] He recommended that transport of nuclear materials be carried on specialised government transport system and driven by only trustworthy drivers and that authorities should make only single shipment at a time, of radiological materials, instead of multiple shipments so that in case of emergency, mitigation measures can be effectively implemented.[177] The five year National Security Action Plan (NSAP) approved by Government of Pakistan in May 2006 and implementation by July 2006, has give due importance to transport security as it emphasized on physical protection, training and inspection, and other capacity building initiatives to increase Pakistan's

[173] Cann, Michelle et al. (2012), "The Nuclear Security Summit: Assessment of National Commitments," An Arms Control Association and Partnership for Global Security Report, March 20, p.26, [Online: Web] Accessed September February 18, 2012, URL: http://www.armscontrol.org/files/ACA_NSS_Report_2012.pdf

[174] *Convention On The Physical Protection Of Nuclear Material*, (1980), United Nations Organisation, [Online: Web] Accessed September October 11, 2012, URL: http://treaties.un.org/doc/db/Terrorism/Conv6-english.pdf; *Convention on The Physical Protection of Nuclear Material*, (2005), United Nations, Organisation, [Online: Web] Accessed September October 11, 2012, URL: http://www.nti.org/e_research/official_docs/inventory/pdfs/aptcppnm.pdf

[175] Luongo, Kenneth N. and Salik, Naeem (2007), "Building Confidence in Pakistan's Nuclear Security," *Arms Control Today*, December, [Online: Web] Accessed August 16, 2011, URL: http://www.armscontrol.org/act/2007_12/Luongo; Akhtar, Rabia (2009), "Pakistan's Nuclear Assets: Safe and Secure", CBRN South Asia Brief, June, Issue No.13, p.4, [Online: Web] Accessed August 16, 2011, URL: http://www.ipcs.org/pdf_file/issue/CBRNIB13-Rabia-PakNukes.pdf

[176] Mannan, Abdul (2007), "Preventing Nuclear Terrorism in Pakistan: Sabotage of a Spent Fuel Cask or a Commercial Irradiation Source in Transport," The Henry L. Stimson Center, Washington, April, p.19, [Online: Web] Accessed September 23, 2011, URL: http://www.stimson.org/images/uploads/research-pdfs/VFMannan.pdf

[177] Ibid., p.30.

ability to "plan for, respond to, and recover from terrorist incidents in collaboration with relevant government agencies."[178] Musharraf also stated in 2009 that Pakistan uses an intricate system of secret tunnels for storage and transport of nuclear weaponry.[179] Such system would be quite secure from outsider threat. Though not much is known about the equipment and systems put in place for transport security, there is a sense of earnestness in Pakistan's efforts to enhance security in this sphere as it recognizes the vulnerabilities, which is an encouraging sign.

Secrecy and Deception

Maintaining secrecy and deception can be an effective line of defence against extremists. Like any other nuclear weapons states, Pakistan maintains a high degree of secrecy about nuclear issues. Analyzing on this issue, Christopher Clary asserted, "Secrecy is Pakistan's most important protective measure against external threats" and added, "If adversaries – be they foreign governments or non-governmental actors – are unaware of the locations of nuclear materials, they cannot threaten them."[180] Pakistani military maintain strict secrecy over location of storage sites and takes precaution to limit visible signs of movement through use of secret tunnels for storage and transport of nuclear weapons, transport and deployment of weapons clandestinely rather than in convoys that are highly visible, etc.[181] The use of tunnel system keeps preying eyes at bay, especially the satellite monitoring systems, and also protects the nuclear assets from military assaults including nuclear attacks. Pakistan also keeps the information of this and

[178] Ibid.; Akhtar, Rabia (2009), "Pakistan's Nuclear Assets: Safe and Secure", CBRN South Asia Brief, June, Issue No.13, p.2, [Online: Web] Accessed August 16, 2011, URL: http://www.ipcs.org/pdf_file/issue/CBRNIB13-Rabia-PakNukes.pdf

[179] Hersh, Seymour M. (2009), "Defending the Arsenal: In an unstable Pakistan, can nuclear warheads be kept safe?" *Newyorker,* November 16, [Online: Web] Accessed February 18, 2012, URL: http://www.newyorker.com/reporting/2009/11/16/091116fa_fact_hersh?currentPage=all

[180] Clary, Christopher (2010), "Thinking about Pakistan's Nuclear Security in Peacetime, Crisis and War," IDSA Occasional Paper No. 12, September, p.13, [Online: Web] Accessed August 16, 2011, URL: www.idsa.in/system/files/OP_PakistansNuclearSecurity.pdf

[181] Mowatt-Larssen, Rolf (2009), "Nuclear Security in Pakistan: Reducing the Risks of Nuclear Terrorism," *Arms Control Today,* July/August [Online: Web] Accessed September 23, 2012, URL: http://www.armscontrol.org/act/2009_07-08/Mowatt-Larssen; Hersh, Seymour M. (2009), "Defending the Arsenal: In an unstable Pakistan, can nuclear warheads be kept safe?" *Newyorker,* November 16, [Online: Web] Accessed February 18, 2012, URL: http://www.newyorker.com/reporting/2009/11/16/091116fa_fact_hersh?currentPage=all

other storage facilities watertight and is known to only few.[182] Likewise, the information regarding aspects of Pakistan's command and control arrangements is closely guarded. Pakistan also used deceptions such as the use of dummy missiles, fake bunkers that contain fake nuclear warheads to create confusion on adversaries' end.[183]

There are, however, problems associated with secrecy. While secrecy is useful options, there is not guarantee that it will remain so. Further, secrecy is often compromised by physical arrangements to provide nuclear security. This happens because physical security systems are visible and this puts the site at greater risk.[184] Apart from this, for Pakistan, in terms of threat perceptions, there is a dilemma here. Because not much is known about the safety and security system put in place in Pakistan, the threat perceptions tend to increase. If, however, Pakistan decides to reveal this system in order to allay concerns, it would allow adversaries to get acquainted with the system and ease their efforts at causing harm. It is due to this reason, Pakistan decline to share sensitive information or allow U.S. personnel into strategic areas. Drawing a balance between revealing and maintaining secrecy, while keeping its core national interests intact, will not be an easy task. But if Pakistan choose and try to do so, much of the threat perceptions would likely be reduced.

Pakistan and the Nuclear Security Instruments

In order to gain international confidence in the safety and security of its nuclear weapons, Pakistan has become a state party to some of the crucial nuclear security instruments. Pakistan has ratified the CPPNM of 1980, which Pakistan has ratified in

[182] Hersh, Seymour M. (2009), "Defending the Arsenal: In an unstable Pakistan, can nuclear warheads be kept safe?" *Newyorker*, November 16, [Online: Web] Accessed February 18, 2012, URL: http://www.newyorker.com/reporting/2009/11/16/091116fa_fact_hersh?currentPage=all

[183] Iqbal, Anwar (2007), "Impact of U.S. wargames on Pakistan N-arms 'negative,'" *Dawn*, Washington, December 2, [Online: Web] Accessed March 28, 2012, URL: http://archives.dawn.com/2007/12/03/top7.htm; Gregory, Shaun (2007), *The Security of Nuclear Weapons in Pakistan*, Pakistan Security Research Unit, Department of Peace Studies of University of Bradford, p.6, [Online: Web] Accessed September 2, 2011, URL: http://spaces.brad.ac.uk:8080/download/attachments/748/Brief_22finalised.pdf

[184] Clary, Christopher (2010), "Thinking about Pakistan's Nuclear Security in Peacetime, Crisis and War," IDSA Occasional Paper No. 12, September, p.13, [Online: Web] Accessed August 16, 2011, URL: www.idsa.in/system/files/OP_PakistansNuclearSecurity.pdf

October 2000,[185] but has not signed the amended CPPNM of 2005, as of March 2012;[186] it is a state party to the Convention on Nuclear Safety;[187] adheres to UNSCR 1540 of April 2004 – it presented an 11-page report about national measures in October 2004 and a follow-up 125-page report about national compliance in September 2005;[188] and is a state party to IAEA Code of Conduct on Safety and Security of Radioactive Sources.[189] In fulfillment of its obligation under the Convention on Nuclear Safety, the Pakistan Nuclear Regulatory Authority was created in 2001.[190] The Export Control Act 2004, a crucial national instrument, was created not long after the UNSCR 1540 was adopted.[191]The National Export Control List (NCL) notified on October 19, 2005, that contains list of items that come under export regulation is said to be consistent with the European Union (EU) system of classification/model, Australia Group, NSG and the MTCR control lists.[192] Pakistan is yet to sign the International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT), opened for signature in 2005 (entered into force in 2007[193]), which criminalizes the planning, threatening, and acts of

[185] Luongo, Kenneth N. and Salik, Naeem (2007), "Building Confidence in Pakistan's Nuclear Security," *Arms Control Today*, December, [Online: Web] Accessed August 16, 2011, URL: http://www.armscontrol.org/act/2007_12/Luongo

[186] Cann, Michelle et al. (2012), "The Nuclear Security Summit: Assessment of National Commitments," An Arms Control Association and Partnership for Global Security Report, March 20, p.26, [Online: Web] Accessed September June 15, 2012, URL: http://www.armscontrol.org/files/ACA_NSS_Report_2012.pdf

[187]Akhtar, Rabia and Hussain, Nazir (2010), "Safety and Security of Pakistan's Nuclear Assets", in Usama Butt and N Elahi (eds.), *Pakistan's Quagmire: Security, Strategy, and the Future of the Islamic-nuclear Nation*, Continuum International Publishing Group, New York, p.189.

[188] IISS Strategic Dossier(2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment*, The International Institute for Strategic Studies, London, p.116.

[189] Akhtar, Rabia and Hussain, Nazir (2010), "Safety and Security of Pakistan's Nuclear Assets", in Usama Butt and N Elahi (eds.), *Pakistan's Quagmire: Security, Strategy, and the Future of the Islamic-nuclear Nation*, New York: Continuum International Publishing Group, p.189.

[190]Ibid., p.187.

[191] Kohimeier, Gabrielle (2004), Pakistan Introduces Export Control Bill," *Arms Control Today*, September, [Online: Web] Accessed February 16, 2012, URL: http://www.armscontrol.org/act/2004_09/Pak_Export_Control

[192] Ibid.; Akhtar, Rabia and Hussain, Nazir (2010), "Safety and Security of Pakistan's Nuclear Assets", in Usama Butt and N Elahi (eds.), *Pakistan's Quagmire: Security, Strategy, and the Future of the Islamic-nuclear Nation*, Continuum International Publishing Group, New York, p.185.

[193] Bun, Mathew et al. (2012), "Progress on Securing Nuclear Weapons and Materials: The Four-Year Effort and Beyond," Harvard Kennedy School, Belfer Center for Science and International Affairs, March, p.17, [Online: Web] Accessed September June 15, 2012, URL: http://nuclearsummit.org/files/security_progress_report_2_482949862.pdf

nuclear terrorism and mandates state parties to adopt appropriate national legislation to this effect.[194]

Pakistan Nuclear Regulatory Authority (PNRA) and Nuclear Safety and Security

Securing nuclear weapons entails ensuring safety and security of all sources of nuclear materials: civilian nuclear installations and other nuclear sources. This is so because fissile materials from these sources can be used to construct nuclear weapons. Given the visibility of such sources the need for appropriate security is even greater because these sources could be easy targets for extremists. Therefore, though the PNRA is a body mandated with the responsibility over civilian nuclear programme, it works in close coordination with the SPD, and the two complement each other by sharing best practices in nuclear safety and security.[195] Established in January 2001, under the PNRA Ordinance No. III of 2001, the PNRA is the national statutory authority charged with the duty of regulating all aspects relating to radiation and nuclear energy that include ensuring safety and security of nuclear materials, radiation protection, physical protection around nuclear sites, transport and waste safety. [196] While PNRA is an autonomous body, in order to create coordination, the Director General of the SPD is member.[197] Following the Export Act 2004, the PNRA was bestowed with the responsibility to issue licenses by providing "no objection certificate" for import and export of radiological substances – this function, prior to 2004, was exercised by the PAEC.[198] Apart from this, the responsibility of the PNRA include, control, regulation and supervision of all matters

[194] Cann, Michelle et al. (2012), "The Nuclear Security Summit: Assessment of National Commitments," An Arms Control Association and Partnership for Global Security Report, March 20, p.26, [Online: Web] Accessed September June 15, 2012, URL: http://www.armscontrol.org/files/ACA_NSS_Report_2012.pdf
[195] Khan, Feroz Hassan, (2009), "Nuclear Security in Pakistan: Separating Myth from Reality," *Arms Control Today*, July/August, [Online: Web] Accessed September June 15, 2012, URL: http://www.armscontrol.org/act/2009_07-08/khan
[196] Akhtar, Rabia and Hussain, Nazir (2010), "Safety and Security of Pakistan's Nuclear Assets", in Usama Butt and N Elahi (eds.), *Pakistan's Quagmire: Security, Strategy, and the Future of the Islamic-nuclear Nation*, Continuum International Publishing Group, New York, p.186.
[197] Akhtar, Rabia (2009), "Pakistan's Nuclear Assets: Safe and Secure", CBRN South Asia Brief, June, Issue No.13, p.2, [Online: Web] Accessed August 16, 2011, URL: http://www.ipcs.org/pdf_file/issue/CBRNIB13-Rabia-PakNukes.pdf
[198] Luongo, Kenneth N. and Salik, Naeem (2007), "Building Confidence in Pakistan's Nuclear Security," *Arms Control Today*, December, [Online: Web] Accessed August 16, 2011, URL: http://www.armscontrol.org/act/2007_12/Luongo; Wagner, Alex and Brugger, Seth (2000), "Pakistan Clarifies Nuclear Export Control Guidelines," *Arms Control Today*, September, [Online: Web] Accessed September 23, 2011, URL: http://www.armscontrol.org/act/2000_09/pakistansept00

relating to nuclear safety and radiation protection. It is its mandate to ensure that the licensee takes appropriate measures for physical protection of nuclear facilities and materials, and to ensure that this is complied with, the PNRA conducts periodical inspections. The system for nuclear control in this sphere is quite efficient: the federal government creates legislation and regulation for imports and exports; the PNRA issues licenses and conduct follow up checks; the Ministry of Commerce issues the import and export procedures through the chief controller of imports and exports; and the Customs authorities control the entry and exit of nuclear and radiological materials.[199]

In 2006, the PNRA prepared a five-year Nuclear Security Action Plan (NSAP) with the objective of strengthening the safety and security of all nuclear facilities and other radioactive sources. The NSAP had the key objectives as: management of all radioactive sources, evaluation of vulnerable facilities and supporting the efforts to upgrade security measures; establishment of Nuclear Safety and Security Training Centre (NSSTC) for imparting training programme in the area of nuclear security and physical protection of radiological materials; establishment of Nuclear Security Emergency Co-ordination Centre (NuSECC) at Islamabad, to coordinate government agencies, including customs, border fences, local governments, and PNRA regional directorates located in Karachi, Chasma, and Islamabad, and the inspectorates; locate and secure orphan radioactive sources, which are outside regulatory control; and provision for installation of detection equipment at strategic points.[200]

The Nuclear Security Directorate which has been established has a vast area of responsibilities in ensuring nuclear safety, that include giving out licenses, conducting periodic safety reviews of facilities, makes regulations for nuclear safety, coordination and dissemination of information on nuclear safety within the PNRA, etc.[201] It practically serves as the secretariat of the PNRA. The PNRA, thus, play an important and indispensible part in maintaining safety and security of Pakistan's nuclear assets by

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[199] Luongo, Kenneth N. and Salik, Naeem (2007), "Building Confidence in Pakistan's Nuclear Security," *Arms Control Today,* December, [Online: Web] Accessed August 16, 2011, URL: http://www.armscontrol.org/act/2007_12/Luongo

[200] Ibid.

[201] Akhtar, Rabia and Hussain, Nazir (2010), "Safety and Security of Pakistan's Nuclear Assets", in Usama Butt and N Elahi (eds.), *Pakistan's Quagmire: Security, Strategy, and the Future of the Islamic-nuclear Nation,* Continuum International Publishing Group, New York, p.188.

ensuring the safety and security of civilian nuclear facilities and sources, and working in coordination with the SPD.

U.S. Assistance to Pakistan for Nuclear Safety and Security

The first U.S. offer for assistance towards securing Pakistan's nuclear assets came in mid-October, 2001, during a meeting with President Pervez Musharraf, where Secretary of State, Collin Powell invited Pakistani officials to come and check out how U.S. maintain safety and security of its nuclear assets.[202] Pakistan reportedly declined the mid-October offer. Offer of assistance were made again in late October, 2001 and in a November 11 interview on NBC's Meet the Press, Powell stated that he conversed with Musharraf about the threat of Pakistan's nuclear weapons falling "into the wrong hands."[203] There were apprehensions in Pakistan that U.S. might use the assistance initiative to "track and monitor" Pakistan's nuclear programme.[204]

Though Pakistan hesitated initially, it agreed to accept U.S. offer of assistance based on three conditions: (a) it would not allow any form of unwarranted intrusion; (b) Pakistan will accept only those technologies as it deems fit for its national interest; and, (c) the SPD would be the signatory authority for the end-user certifications required by Washington.[205] The SPD being the end-user, the information about the final destination of technology transferred could be kept a closely guarded secret, thus preventing disclosure of the position of strategic sites. After these conditions were agreed upon, some time in 2001, U.S. began to assist Pakistan in the field of nuclear safety and security by providing training of Pakistani personnel, technology transfer and other forms of assistance.[206] Pakistan has also taken extra precaution by insisting that Pakistani

[202] Wagner, Alex (2001), "U.S. Offers Nuclear Security Assistance to Pakistan," *Arms Control Today*, December, [Online: Web] Accessed September 23, 2011, URL: http://www.armscontrol.org/act/2001_12/paknucsecdec01
[203] Ibid.
[204] Ibid.
[205] IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment*, The International Institute for Strategic Studies, London, p.114.
[206] Ibid.

technicians travel to the U.S. for training rather than allowing U.S. officials into Pakistani facilities.[207]

On November 18, 2007, David E. Sanger and William J. Broad reported in the *New York Times* that since 2001, the Bush administration has already spent about $100 million, (which is about one percent of estimated $ 10 billion American aid to Pakistan since Sept.11, as of 2007)[208] on highly classified programme to help Pakistan secure its nuclear weapons. This amount was reportedly used for training Pakistani personnel in the U.S. and for construction of a nuclear security training center in Pakistan, but the construction progress of the facility, which was supposed to be completed in 2007, was apparently sluggish and nowhere near completion.[209] Equipments like helicopters, night-vision goggles, intrusion detectors, identification system, nuclear detection equipments, fencing and surveillance systems, etc., were supplied to Pakistan to secure its nuclear weapons, materials and other nuclear sources.[210]

There was debate within the Bush administration whether to share PALs technology – a system that prevent detonation if proper codes or procedural protocol are not met – with Pakistan, and apparently, it was decided that due to legal constraints[211] PALs will not be given to Pakistan.[212] Pakistan also had reservations regarding PALs as they feared that U.S. might install secret "kill switch" that could disable Pakistan's nuclear weapons.[213] Pakistan has not revealed much about this programme but Lt. Gen.

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[207] Warrick, Joby (2007), "Pakistan Nuclear Security Questioned: Lack of Knowledge About Arsenal Limit U.S. Options," *Washington Post*, November 11, [Online: Web] Accessed October 21, 2011, URL: http://www.washingtonpost.com/wp-dyn/content/story/2007/11/10/ST2007111001833.html

[208] Sanger, David E. and Broad, William J. (2007), "U.S. Secretly Aids Pakistan in Guarding Nuclear Arms," *The New York Times*, Washington, November 18, [Online: Web] Accessed January 27, 2012, URL: http://www.nytimes.com/2007/11/18/washington/18nuke.html?pagewanted=1&ei=5087&em&en=0a660d001add7cd0&ex=1195534800

[209] Ibid.

[210] Ibid.; Mian, Zia (2007), "Pakistan learns the U.S. nuclear way," *Foreign Policy in Focus*, Dec 19, [Online: Web] Accessed January 27, 2012, URL: http://www.atimes.com/atimes/South_Asia/IL19Df02.html

[211] Article 1 of the treaty of the Non-Proliferation of Nuclear Weapons (NPT) 1968, provides that no nuclear-weapon states shall transfer technology or devices that would help non-nuclear-weapon state to have "control over such weapons or explosive devices." It is generally held that PALs come under this category.

[212] Sanger, David E. and Broad, William J. (2007), "U.S. Secretly Aids Pakistan in Guarding Nuclear Arms," *The New York Times*, Washington, November 18, [Online: Web] Accessed January 27, 2012, URL: http://www.nytimes.com/2007/11/18/washington/18nuke.html?pagewanted=1&ei=5087&em&en=0a660d001add7cd0&ex=1195534800

[213] Ibid.

Khalid Kidwai acknowledged in 2006 that Pakistan has received help from foreign sources.[214] Pakistan is also working with U.S. to boost transport security: since 2006, Pakistan is a member of the U.S. sponsored Container Security Initiative (CSI).[215] In March 2006, Pakistan signed the CSI declaration of principles and was selected as a model state for running the Pilot Programme of the CSI.[216] The progress of U.S. assistance is reported to be slow because of delays of programme caused by Pakistan military's suspicion that U.S. wish to gather intelligence about the locations of its arsenals and probably aim at disabling them.[217]

Seymour M. Hersh reported in November 2009 that Obama administration has been trying to persuade Pakistan to arrive at "sensitive understandings" with Pakistani military that would pave the way for special U.S. units to provide additional security for Pakistani nuclear assets in case of emergency, such as mutiny or terrorist threat to nuclear facility.[218] Purportedly, the terms of the "sensitive understanding" would include monetary assistance to Pakistani military to help them equip and train soldiers to provide better security of its nuclear assets. For this purpose, in June 2009, the U.S. congress has approved the Pakistan Counterinsurgency Capability Fund, a US$ 400 million package, as requested by the administration for Pakistani Army.[219] However, because of Pakistan's strategic interest in safeguarding its nuclear capabilities and the perception of distrust that

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[214] Ibid.

[215] Salik, Naeem (2009), *The Genesis of South Asian Nuclear Deterrence: Pakistan's Perspective,* New York: Oxford University Press, p.290.

[216] IISS Strategic Dossier (2007), *Nuclear Black Markets: Pakistan, A.Q. Khan and the rise of proliferation networks – A net assessment,* The International Institute for Strategic Studies, London, p.116.

[217] Sanger, David E. and Broad, William J. (2007), "U.S. Secretly Aids Pakistan in Guarding Nuclear Arms," *The New York Times,* Washington, November 18, [Online: Web] Accessed January 27, 2012, URL: http://www.nytimes.com/2007/11/18/washington/18nuke.html?pagewanted=1&ei=5087&em&en=0a660d001add7cd0&ex=1195534800; Mian, Zia (2007), "Pakistan learns the U.S. nuclear way," *Foreign Policy in Focus,* Dec 19, [Online: Web] Accessed January 27, 2012, URL: http://www.atimes.com/atimes/South_Asia/IL19Df02.html

[218] Seymour M. Hersh wrote in the *Newyorker* on November 16, 2009, that an American former senior intelligence official has revealed that a special unit, which included elite counterterrorism personnel from the Joint Special Operations Command (JSOC) has trained for years to remove or dismantle parts of the Pakistani arsenal and evacuation of the triggers, the non-radioactive part which are easier to handle (Hersh writes in the same article that this was, however, denied by Admiral Mike Mullen). The official also told him that at one occasion, in order to augment security system, Pakistan give his team a virtual view of the number of warheads, position of some warheads, their command and control system, target list, mobilization plans and security plans. See, Hersh, Seymour M. (2009), "Defending the Arsenal: In an unstable Pakistan, can nuclear warheads be kept safe?" *Newyorker,* November 16, [Online: Web] Accessed February 18, 2012, URL: http://www.newyorker.com/reporting/2009/11/16/091116fa_fact_hersh?currentPage=all

[219] Ibid.

U.S. intends to diminish or destroy Pakistan's nuclear capability, arriving at such a delicate understanding would be unlikely.

There are concerns that U.S. intervention in Afghanistan might have intensified terrorists' efforts in acquiring nuclear assets and consequently posing more danger to Pakistan's nuclear weapons and materials due to growth in anti-Americanism, and more so because Pakistan joined U.S. war on terror.[220] This is likely true as there has been growth of radical Islamism following these events. The alleged U.S. "contingency plan" reported in 2005, for unilateral action to secure Pakistan's nuclear assets in case of Islamic takeover of the state, and the conduct of 'wargames' by U.S., reported in 2007, to simulate capture of nuclear weapons to prevent these assets from falling into wrong hands could potentially do more harm than good.[221] Scott Sagan observed in 2007 that such actions only increase suspicion and "ironically increases the likelihood of terrorist seizure" because Pakistan will be induced to move its nuclear weapons to other locations if it get an impression of attack, just as Pakistan did in 2001, thus making the weapons more vulnerable in such situation.[222] Also, the practicality of such measures is

[220]Sanger, David E. and Broad, William J. (2007), "U.S. Secretly Aids Pakistan in Guarding Nuclear Arms," *The New York Times*, Washington, November 18, [Online: Web] Accessed January 27, 2012, URL: http://www.nytimes.com/2007/11/18/washington/18nuke.html?pagewanted=1&ei=5087&em&en=0a660d001add7cd0&ex=1195534800; Mannan, Abdul (2007), "Preventing Nuclear Terrorism in Pakistan: Sabotage of a Spent Fuel Cask or a Commercial Irradiation Source in Transport," The Henry L. Stimson Center, Washington, April, p.8, [Online: Web] Accessed September 23, 2011, URL: http://www.stimson.org/images/uploads/research-pdfs/VFMannan.pdf

[221]United Press International (2005), "U.S. Contingency Plan for Pakistani Nukes," Washington DC, January 19. [Online: Web] Accessed August 16, 2011, URL: http://www.spacedaily.com/news/nuclear-blackmarket-05d.html; Iqbal, Anwar (2007), "Impact of U.S. wargames on Pakistan N-arms 'negative,'" *Dawn*, Washington, December 2, [Online: Web] Accessed March 28, 2012, URL: http://archives.dawn.com/2007/12/03/top7.htm.

[222]Iqbal, Anwar (2007), "Impact of U.S. wargames on Pakistan N-arms 'negative,'" *Dawn*, Washington, December 2, [Online: Web] Accessed March 28, 2012, URL: http://archives.dawn.com/2007/12/03/top7.htm; Alex Wagner notes that the relocation or nuclear arsenals post 9/11 was prompted by fears of possible terrorist strikes and also to remove weapons from air bases and corridors that the U.S. might use for operation in Afghanistan. He notes, however, that this report was denied as baseless by Pakistan. See, Wagner, Alex (2001), "U.S. Offers Nuclear Security Assistance to Pakistan," *Arms Control Today*, December, [Online: Web] Accessed September 23, 2011, URL: http://www.armscontrol.org/act/2001_12/paknucsecdec01; Admitting that some nuclear weapons were indeed moved by Pakistani government in 2001, Feroz Khan, former SPD director, said that the relocation did not decrease but increased the security of the nuclear arsenals. See, Iqbal, Anwar (2007), "Impact of U.S. wargames on Pakistan N-arms 'negative,'" *Dawn*, Washington, December 2, [Online: Web] Accessed March 28, 2012, URL: http://archives.dawn.com/2007/12/03/top7.htm

questionable because the location of Pakistan's nuclear weapons storage sites is unknown.[223]

Pakistan has given enough reasons for observers and analysts to seriously doubt the safety and security of its nuclear weapons. Following international pressure after the Khan and Mahmood-Majid episode, Pakistan has taken significant measures to augment its capacity to safeguard its nuclear assets. Pakistan was not quick to react: corrective measures to revamp its nuclear control system came late. It took lots of pressure from the outside to instigate Pakistan to start kicking on taking appropriate steps. However, once the measures were adopted, it seems to have been effective enough to address the security needs. In spite of political instability, growing Islamic radicalism and terror attacks that threatened the growing Pakistani nuclear weapons and materials, Pakistan managed to pull through the past decade, 2000-2010, without incidents that posed serious danger to its nuclear assets, but precariously so. U.S. assistance in the form of training Pakistani personnel, assistance with equipment and technology, and sharing of best practices in the area of nuclear safety and security have strengthened Pakistan's capability for safeguarding the nuclear assets.

[223] Warrick, Joby (2007), "Pakistan Nuclear Security Questioned: Lack of Knowledge About Arsenal Limit U.S. Options," *Washington Post*, November 11, [Online: Web] Accessed October 21, 2011, URL: http://www.washingtonpost.com/wp-dyn/content/story/2007/11/10/ST2007111001833.html

CHAPTER 5
CONCLUSION

The past decade, 2000-2010, has been a tumultuous decade for Pakistan and also a nervous decade for keen observers and analysts who kept continuous tab of situation in Pakistan. In the light of the threat of nuclear terrorism that intensified after the 9/11 terror attacks in the U.S., threat perception about the safety and security of Pakistan's nuclear weapons ensued. There were compelling factors that pessimists cited to support the threat perceptions about nuclear safety and security in Pakistan. The factors ranged from growing number of Pakistan's nuclear weapons and materials, nuclear black marketing, political instability, growing Islamic radicalism and increasing trend of incidents of terror attacks in Pakistan, and the likely high risk Pakistan nuclear posture.

From few nuclear arsenals since 1998, it increased to about 60 in 2007 to 70-90 in 2010, by estimates of *IPFM* and *SIPRI* and a higher estimate of about 110 by 2010, according to nuclear forces estimate of the *Bulletin of the Atomic Scientists*. A higher number meant greater stress on the nascent Pakistani NCA – which has been reorganised at least twice – in 2007 and 2009 – to protect its nuclear assets, which places the security of nuclear assets at more risk.

The nuclear black marketing witnessed in Khan episode raised serious questions about state complicity. Important leaders, inspired by the Islamist ideology and the motivation for defiance of west, encouraged Khan to deal with Iran. Khan's 13-page confession to his wife, corroborate the complicity of important state officials in the Iran case. In the case of North Korea, factors such as: (a) the intersection of Pakistan and North Korea's strategic interests – Pakistan wanted the missile technology and North Korea, the enrichment technology; (d) absence of evidence/documentary proof to show government to government missile-for-cash transfer; (b) the likely transfer of uranium enrichment components and materials from the C-130 Pakistani military transport plane; (c) the presence of North Korean team at the KRL, Kahuta for at least five years, who were apparently briefed on enrichment technology; (d) the non-involvement of the usual foreign players of the Khan nuclear black marketing network; and (e) Khan's 13-page letter confession to his wife that explicitly named names of officials involved in the North

Korean case, are reasons that indicate Pakistani state complicity in the case of nuclear technology transfer to North Korea. The Libya case is the most detailed of the nuclear black marketing scandal that came out of Pakistan. In this case too, there are reasons that indicate state complicity: the fact that the military maintains a monopolistic control of Pakistan's nuclear programme means that Khan could not have passed nuclear technology to Libya without its knowledge. In fact, Khan had confessed that the orders to deal with Libya came from the highest state authority and this was corroborated by a certain former senior military official closely associated with Pakistan's nuclear oversight that the military knew about it, and that Khan's order came from the highest political authority; Pakistan may have passed nuclear technology to Libya in return for the support that Libya gave towards construction of an "Islamic bomb" in Pakistan between 1973 and 1982; also, for reasons of Libya's kind assistance and the offer of attractive price for the nuclear technology Pakistan could have readily accepted, given that the deal with Iran and North Korea was already on. As such, in order to save the state from major embarrassment, Khan was made a "scape-goat." As stated by Khan himself in 2008, the 2004 televised confession was made under duress and stated that he saved the state by being the fall-guy. Analysis of Khan network suggests Pakistani state complicity so much that it would be logical to term Khan network as Pakistan network. The fact that nuclear black marketing came out of Pakistan and that Pakistani state remains a suspect in following nuclear technology export as a state policy, meant that Pakistan came to be seen as an irresponsible nuclear weapons capable state, where its capability to secure the nuclear weapons was seriously questioned.

Political instability in Pakistan marked by history of crisis involving military coups, tussle for power among the president, prime minister and army chief, differences between the executive and the judiciary, and separatist movements in Pakistan meant that signs of crisis were followed by alarmist forecast of looming imminent danger. Growing radical Islamism in Pakistan coupled with increasing incidents of terror attacks, which increased from 30 incidents in 2001, and peaked at 1916 in 2008 and down to a high of 1331 in 2010, gave the impression of Pakistan being one of the dangerous places and that the state was under serious threat of takeover by radical Islamists. A dispersed nuclear weapons position and likely delegated system of nuclear command and control in

Pakistan was viewed to be highly vulnerable to accidental and unauthorised use, especially in times of crisis. Given these factors there were concerns that Pakistan's nuclear weapons and materials were dangerously vulnerable to accidents, unauthorised use, and theft and sabotage by terrorists or assistance by insiders to radical elements to acquire Pakistan's nuclear assets.

Looking back to the past decade, now that most of what has come about can be seen, it is easy to say that the threat perceptions about imminent danger have been overstated, but at that point in time, observations were made based on prevailing compelling factors, as already shown, and in a situation of uncertainty. As such, there were good reasons to fear that Pakistan could be the state from where extremists could possibly acquire nuclear capabilities for carrying out nuclear terrorism. There were incidents of terror attacks in Pakistan which showcased terrorists' resoluteness in purpose and tactics that could have had nuclear ramifications. These incidents of terror attacks includes the assassinations attempts on Musharraf in 2003 and 2006, and Benazir Bhutto in 2007, who was killed on the second attempt that same year; terror attack on Sargodha Air Force base on November 1, 2007; Kamra Air Force base on December 10, 2007; and Wah Ordinance Factory on August 20, 2008. It is a relief that Pakistan has not witnessed those threats that were perceived to be imminent, but that this was achieved under precarious conditions is a case for greater concern. So far, Pakistan has not reached a point where it was under threat of takeover of state by radical Islamic elements. Islamic parties have not captured more than 12 percent of votes in elections in Pakistan. The MMA managed to secure only 11.1 percent of the votes in 2002. While this may be true, capture of state-power by Islamic radical elements will not be electoral but direct state take-over by force. There has been no coup after the last one in 1999. Thus far, instances of insider threat has not occurred after the Khan and Mahmood-Majid episode, but in an environment of growing Islamic radicalism in Pakistan, preceding events does not inspire confidence that such events will not occur.

Pakistan has taken significant measures to augments its capability to secure its nuclear assets. The measures taken by Pakistan, however, show that rather than being proactive in working to prevent future risks and adoption of corrective measures without delay, it followed a pattern of reaction to events and international pressure which came in

the form of direct communication from prominent leaders or threat perceptions that appeared in the literatures. Regarding Khan's case, the action taken by Pakistan was tardy because of state complicity. While suspicion about Khan's activities was noticed by ISI in 1989, nothing was done. It was only after the U.S. put strong pressure on Pakistan between 1998 and 2000 that some sort of enquiry began but was at best halfhearted. No action followed the 700-page document on Khan's illegal wealth brought out by National Accountability Bureau (NAB) in 2000. It took another three years to take some actions against Khan. That Khan was let away easily and that international agencies were not allowed to question him gave the impression that Pakistan had lots to hide. That Khan remained Special Adviser to the Chief Executive on Strategic and KRL Affairs even after his dismissal and he held this title until the NCA stripped the title on January 31, 2004, show Pakistan's lackadaisical attitude about the issue. On the plus side, following the Khan episode and the international pressure, Pakistan was prompted to take important measures to enhance its capability to safeguard its nuclear assets.

Adoption of nuclear safety and security measures or revelation about the adoption of such measures came after strong international pressure on Pakistan, post-9/11, post-Khan and Mahmood-Majid episode: Pakistan's PRP, established with U.S. assistance, was adopted only in 2005 replacing the evaluation system of 2001 which was found to be deficient; in 2002, it was revealed that Pakistan did not have PALs on their nuclear arsenals, and as concerns mounted it was revealed in 2006 that it has already adopted an indigenous version of PALs – which means that until the time around 2006, Pakistan's arsenals were more vulnerable to accidents and misuse; a significant measure i.e., the Export Control Act that replaced the seriously deficient Statutory Regulatory Orders (SROs) of the late 1990s, was adopted in 2004 and the National Control list containing items under regulation was released in October 2005; the revelation about keeping its nuclear arsenals in a "disassembled state" and the adoption of "three-man rule" and "two-man rule" for nuclear operation came in 2002; in coordination with the SPD, the Pakistan Nuclear Regulatory Authority which was established in 2001, adopted the five year National Security Action Plan (NSAP) in May 2006 with the objective of enhancing capability to ensure nuclear safety and security; the use of secret tunnels for storage and transport of nuclear weaponry, was revealed by Musharraf in 2009. Pakistan also became

state party to important nuclear security instruments like the CPPNM of 1980 in 2000, adheres to UNSCR 1540 of 2004, state party to IAEA Code of Conduct on Safety and Security of Radioactive Sources. It is yet to sign the amended CPPNM of 2005 and the ICSANT of 2005.

While these were significant measures, the measures were delayed. For instance, PRP was adopted only in 2005, the Export Control Act in 2005, and the indigenous PALs was adopted apparently only around 2006. Things could have gone seriously wrong until then. Problems were already noticed before-hand: the U.S. complaint on Khan's suspicious activities to Pakistani authority dates back to late 1990s and the Mahmood-Majid episode happened in 2001. As such, on such a critical issue as nuclear safety and security, Pakistan should have displayed some urgency to take active steps to address weaknesses. Again, with offer of assistance coming from the U.S. since 2001, Pakistan could have monopolized on the offer to adopt effective measures with much haste. As ensuring nuclear safety and security depends largely on preventing future risks, it is extremely vital for Pakistan to act in a proactive manner, which requires positive effort to prevent future risks and adoption of remedial measures without delay. Thanks to the international pressures, significant measures were eventually adopted by Pakistan.

Due to factors such as lack of strong civilian political leadership, General Zia's coup in 1977, and the fact that nuclear weapons programme is a chief aspect of military security, Pakistani military has maintained central control over Pakistan's vital security component, the nuclear weapons. Pakistani military's special interest in maintaining a monopolistic control over the nations priced possession, the nuclear weapons, have been a vital factor in safeguarding Pakistan's nuclear assets in the decade under consideration. As long as Pakistani military remains stable under moderate forces, there will be less danger to Pakistan's nuclear assets but as radical elements begin to gain access in the government, the military and other state institutions the risk will increase. Measures such as the three tier perimeter security system for physical security; the PRP; keeping nuclear arsenals in a "disassembled state;" the technical and procedural safeguards; and the maintenance of strict secrecy about location of nuclear weapons storage sites, information regarding aspects of Pakistan's command and control arrangements, have been stated to be critical factors in ensuring nuclear safety and security in Pakistan.

For U.S., the need to ensure nuclear safety and security in vulnerable states was even more urgent because it had become the prime target of terrorists' wrath. Al Qaeda's supreme leader Osama bin Laden had already declared war on U.S. in 1996 and the 9/11 terror attacks demonstrated the potential danger of use of weapons of mass destruction by terrorists. This urgency to ensure nuclear safety and security in vulnerable states with nuclear assets was captured by U.S. pressure on Pakistan to revamp its nuclear safety and security system, and assistance to Pakistan in this regard. U.S. assistance to Pakistan in the matter of nuclear safety and security has been a vital factor in augmenting Pakistan's capabilities in safeguarding its nuclear assets. The details about the assistance is not known but assistance from U.S., since 2001, came in the form of training of Pakistani personnel in the area of nuclear safety and security in the U.S., supply of equipments and technology, and sharing of best practices in the area of nuclear safety and security. Better reviews about nuclear safety and security that came in the later part of 2000 were largely because of the security measures that Pakistan adopted with help from the U.S.

On the issue of nuclear black marketing that emerged from Pakistan, U.S. could have done more. U.S. laid-back attitude in the late 1980s, was perhaps because its attention was focused on countering Russian invasion of Afghanistan, in which Pakistan became a crucial partner of the U.S. Again, after 2001, because Pakistan became a partner in "war on terror," U.S. seems to have given concessions to Pakistan in Khan's case by not insisting too much on digging into the scandal. Given the compelling issues at hand, U.S. compromised on the issue of nuclear black marketing that emerged from Pakistan. While the assistance in the areas of nuclear safety and security were significant, there were concerns about certain actions of the U.S. The statement by Condoleezza Rice in 2005, about a U.S. "contingency plan" for a unilateral action to secure Pakistan's nuclear assets in case of Islamic takeover of the state, or the 2007 report by *The Washington Post* about conduct of 'wargames,' sponsored by U.S., to simulate capture of Pakistan's nuclear weapons to prevent them from falling into wrong hands does more harm than good. In 2009, Seymour M. Hersh reported in the *Newyorker*, that he was told by a certain former senior intelligence officer that U.S. has a special unit to secure Pakistan's nuclear arsenals in case of crisis situations in Pakistan. While the practicality of such endeavor is questionable – given that the locations of storage sites are unknown –

the public discussion of such a sensitive issue is irresponsible. Chances are that Pakistan might be prompted to relocate its nuclear weapons in case it senses such action from the U.S., which would make the weapons vulnerable to accident, theft and sabotage while in transit. Some restraint on the part of U.S. in this regard would be a sensible move.

For India, the threat of nuclear terrorism is even much greater, given Pakistan's geographical proximity, porous borders and traditional inimical attitude towards India. Pakistan has gone to war with India for at least four times since 1947, and Pakistan continue to wage proxy war against India using terrorist groups such as Harkat-ul-Mujahideen (HuM), Hizbul Mujahideen (HM), Lashker-e-Toiba (LeT) and Jaish-e-Mohammad (JeM) which are known to have close links with Al Qaeda. Due to these reasons, the threat of terror attacks looms large in India's security calculus. The December 13, 2001, terror attack on Parliament of India and in recent years, the November 2008 Mumbai terror attack demonstrated terrorists' determination and sophistication in perpetrating mass destruction in India. The military-ISI-terrorists nexus and growing Islamic radicalism in Pakistan are a dangerous threat to India. Given these factors, India has great interest in the safety and security of Pakistan's nuclear weapons and materials. That radical elements have so far failed to get hold of Pakistan's nuclear weapons and materials is a relief for India. Pakistan claims that it fears a preemptive action by a league of U.S., Israel and India, to disable or prevent its nuclear weapons from falling into the hands of extremists. India's participation in such endeavour seems to be remote. For India, the stability of Pakistan is the most important condition for ensuring that Pakistan's nuclear weapons does not fall into the wrong hands. Though, India cannot do much in this sphere as ensuring stability is a domestic affair, India can assist by fostering peaceful relation with Pakistan. The strong interest of U.S. in the safety and security of Pakistan's nuclear assets and assistance to Pakistan in this regard seems to have reduced some of India's fears. Precarious factors, however, remains in Pakistan: the end to political instability does not seem to be any closer, Islamic radicalism and terror attacks are likely to grow in Pakistan, the likely high risk nuclear posture of Pakistan is poised to remain as such, the increased number Pakistan's nuclear weapons and materials are likely to remain and grow, and the proxy war against India is likely to persist.

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