

Nuclear Weapons' Security and Pakistan: Theoretical Analysis

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Abstract

This research highlights numerous theoretical assessments to postulate a frame for evaluating Pakistan's security of nuclear weapons and management systems. This paper strives to establish relevance and thoroughly analyzes these theories to explain the subject at hand. While management of nuclear weapons is a highly complicated matter, no particular theory can describe the complete mechanism. In recent years, nuclear weapons security has been a subject of forethought for the worldwide public in several mediums. Nuclear weapons technology is quite difficult and comprises a high-risk method; therefore, no single social science theory can explain the complexity of nuclear weapons technology and its safeguard setup. However, this research has struggled to inspect and analyze the issue through an available set of pertinent theories in accord with accessible knowledge. Pakistan has various reasons to sustain a safe and secure nuclear weapons system. The main theories implied in this research are normal accident theory, high reliability

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theory, organizational theory, realism, deterrence theory, and constructivist school of thought. A safe and secure nuclear weapons programme is in the best interest of Pakistan. It has established a robust and advanced nuclear management system based on highly advanced international practices that are verifiable and credible.

Keywords: Nuclear Weapons, Threats, Theories, Pakistan, Nuclear Security.

Introduction

This paper presents various theoretical perspectives to provide a framework for the analysis of ground realities as well as the international perception of nuclear weapons security arrangements and structures implemented by Pakistan. Meanwhile, nuclear weapons security is a complicated subject; it is impossible to describe the whole mechanism through a single precise theory. Though "nuclear safety" was taken as a grave test for nuclear weapon states during the Cold War, "nuclear security" had not emerged as alarming apprehension by the security experts. The notion of nuclear security has loomed large, subsequently the breakdown of the former Soviet Union causing a state of alarm in the world community because of the division of its nuclear assets and installations.³

In recent years, almost all international forums have been used to stress and highlight the issue of nuclear security as a serious threat to the world peace; due to the emergence of well-organized trained terrorist groups, the increasing intensity of conflict between nuclear

³ Dmitry Kovchegin, "International Nuclear Security Forum Country Update: Russian Nuclear Security," *Stimson Centre*, May 12, 2021, Available at: <https://www.stimson.org/2021/international-nuclear-security-forum-country-update-russian-nuclear-security/> (Accessed on December 17,2021).

states that may cause accidental or intentional use of a nuclear weapon, the illegal proliferation of nuclear technology, cyber and physical threat to attack nuclear arsenals both by state and non-state actors. Owing to the complex nature of nuclear weapon mechanisms, it is hard to dissect the technical aspects of this issue. However, a social scientist can put the policy arrangements and political part of this capability under scrutiny. This research attempts to inspect the concerned issue with relevant theories appropriate to existing material. The concerned scientists struggled to discourse political and strategic features of this complex technology through the postulates formulated by various schools of thought. There is a wide misperception that Pakistan's nuclear weapons are not safe and secure, and its safety and security mechanisms are not adequate.

The High reliability theorists (HRT) and normal accident theorists (NAT) are two essential schools of thought that have discoursed the organizational features of nuclear [weapons] safety and security. HRT highlights the efficient task of an organization.⁴ A productive organization preserves the system in a decent working situation by displaying extraordinary professionalism. NAT recommends that in any system, catastrophes are predictable. It contends that no organization can maintain proper safety and security of the nuclear weapons twenty-four seven.

Conceptual Framework

Western analysts and authors mainly construct the existing literature on this subject. Some work of Indian researchers and analysts added to the prevalent bias on Pakistan's nuclear weapons programme and lacked the primary data resources. Observations based on assumptions

⁴ Scott D. Sagan, *The Limits of Safety: Organizations, Accidents and Nuclear Weapons*, (New Jersey: Princeton University Press, 1995), 55. See also, Karl E. Weick, "Organizational Culture as Source of High Reliability," *California Management Review*, Vol. XXIX, No.2 (winter1987),39.

are politically driven. On the other hand, Pakistan's perspective has been inadequately shared with the world; due to the opaque nature of nuclear programme and being ineffective in countering Indian frequent, organized, and relatively massive propaganda campaigns against Pakistan's nuclear programme. However, biased literature and research have enormously spoiled the international perception of Pakistan's nuclear weapon programme. Pakistan stayed preoccupied with politically annoyed in its more significant portion of life. The lack of access to primary data resources relating to Pakistan's nuclear programme and being unable to counter Indian negative publicity and propaganda with effective and persistent countermeasures; has failed Pakistan's view to disseminate and convince the world that Pakistan's nuclear programme is as secure as that of any developed nuclear state.

Indian lobbyists are instrumental in spreading the wrong perception of Pakistan's nuclear safety and security. Moreover, as nuclear technology is considered a complex and sensitive subject, the world community is doing everything to stop its proliferation in the Non-nuclear Weapon States (NNWS) and its further development in the Nuclear Weapon States (NWS). The concerns raised about Pakistan and other NWS, in general, are a way to curtail any further proliferation of this technology. Then, the spread of nuclear technology has been mainly in a confidential environment; no state or international organization knows about the exact situation of the nuclear programme of any state because of the general lack of trust in this regard.

However, Pakistan has a well-defined control and command structure that not only stops any weapon misuse but also work to stop technological proliferation. In 1987, Charles Perrow in *Normal Accidents: Living with High Risk Technologies* and Scott D. Sagan in *The Limits of Safety: Organizations, Accidents, and Nuclear Weapons*, expansively debated the non-technical features of the nuclear

technology. Sagan investigated numerous features of the safety of nuclear weapons with the support of organizational safety structures. Sagan utilized standard accident theory and high reliability theory. HRT explains the organizational usefulness and its role in maintaining a robust system. So, according to this theory, no organization can work effectively without a logical set of rules and protocols, making it too naive to think that Pakistan owns a highly developed nuclear programme without ensuring its smooth working and security.⁵ Whereas NAT is concerned, it anchors on the unavailability of accidents for multiple reasons.⁶ The researcher finds this theory relevant as the fear of accidents helps any organization to get well equipped and address all potential threats involved in the process.

In Pakistan's subjective situation, added pressure is always present because of the clandestine beginning and carrying out of its nuclear weapons programme. The scrutinizing eyes of the IAEA and other nuclear watchdogs are always set on finding loopholes in the safety mechanisms of Pakistan. So, this theory makes Pakistan even better prepared than the rest of the nuclear world. A cursory analysis through the lenses of the Realist Perspective, Concept of Deterrence, and Constructivism, provides the logic that Pakistan's nuclear weapons security is an essential part of Pakistan's national security; it is, therefore, imperative to ensure the security of nuclear weapons. Any security lapse would challenge the credibility of nuclear deterrence, which is the source of strategic stability in the region.

Normal Accidents Theory (NAT)

NAT usually deals with technical as well as administrative staff. NAT indicates that mishaps are predictable in any organization, and it is also required to recognize the difference between nuclear safety and

⁵ Sagan, *The Limits of Safety: Organizations, Accidents and Nuclear Weapons*, 55-56.

⁶ Charles Perrow, *Normal Accidents: Living with High-Risk Technologies* (Princeton, N.J.: Princeton University Press, 1999), 15-16.

security, which are two diverse notions. For example, NAT indicates that catastrophes and faults are constant within any system and organization because nuclear technology is highly complicated and hard to operate without highly efficient management. "Nuclear power plants are safety-critical organizations," said by Reiman and Oedewald.⁷ Several kinds of internal and external expansions lead to novel encounters for safety management."⁸ Charles Perrow initially formulated NAT after the disaster of a nuclear power plant in 1979 at Three Mile Island.⁹ This event elevated various queries over the organizational competencies of the concerned authorities. Perrow explained that "systems with interactive complexity and tight coupling will confront accidents that cannot be foreseen or prevented, and he named them system accidents."¹⁰

Enforcing the same point, Sagan promoted nuclear weapons safety concerns by advocating that no organization or system is free from committing mistakes and mishaps that could cause due to countless reasons and could result in threats to nuclear safety. The same argument is presented by NAT theorists, who argue that accidents and faults are interlinked with technology; they are predictable within every system or organization. They further recommend that it would be hard to imagine a hundred percent productivity from any system, institute, or its associates. Sometimes, an organization or system confronts unpredicted actions because of technical or political causes. Self-interest or an individual's conduct can also produce surprising circumstances.

⁷Ibid.2.

⁸ Ibid.

⁹ K. Marais, N. Dulac, and N. Leveson, "Beyond Normal Accidents and High Reliability Organizations: The Need for an Alternative Approach to Safety in Complex Systems," This paper was presented at the Engineering Systems Division Symposium, MIT, Cambridge, MA, (March 29-31, 2004), 1.

¹⁰ Ibid. 2.

Pakistan's history of nuclear programme offers adequate statistics concerning nuclear safety and security. It is on record that there has not been a single event of nuclear accident or incident in Pakistan.¹¹ Furthermore, Pakistan keeps nuclear devices in de-mated form, with warhead and fissile cores placed separately, and they are designed to avoid any accidental or an authorized launch.¹² Mubarakmand advocates that all these precautionary measures have been taken after several experimentations to secure nuclear material and facilities; therefore, he emphasizes that Pakistan has trustworthy nuclear safety and security system.¹³

Pakistan's situation can be tested in the light of normal accident theory. Pakistan has solid track record of maintaining a reliable, safe and secure nuclear weapon programme. Its nuclear weapons programme has not faced any major or minor incident.¹⁴ To sustain a credible and consistent command and control system, Pakistan has established a robust system under highly trained staff, ensuring a strong nuclear safety culture is in place at its nuclear complex. Pakistan has several nuclear institutes, regulatory authorities, and training sites that ensure nuclear safety in Pakistan as Nuclear Regulatory Authority (PNRA) is responsible for carrying out safe nuclear operations and protection of workers from radiation, and employing effective regulations.¹⁵ Furthermore, within the PNRA, the National Institute of Safety and Security (NISAS), the Nuclear Security Training Centre

¹¹ T. M. Azad and H. Shahid, "Evolution of Pakistan's Nuclear Weapon Programme," *Global Strategic & Security Studies Review (GSSSR)*, Vol. VI, no. I (Winter 2021), 7.

¹² Zafar Ali, "Pakistan's Nuclear Assets and Threats of Terrorism: How Grave is the Danger?," *The Henry L. Stimson Center Washington*, (July 2007), 12.

¹³ Samar Mubarakmand (a prominent Pakistani nuclear physicist), in an interview with Tahir Mahmood Azad, Islamabad, (August 06, 2014).

¹⁴ Ibid.

¹⁵ "Pakistan Nuclear Regulatory Authority (PNRA) Report," *PNRA*, 2014, Available at: <http://www.pnra.org/pnrarpt/PNRA%20Annual%20Report%202014.pdf>

(Accessed on December 17, 2021).

(NSTC), and School for Nuclear and Radiation Safety (SNRS) have been established.¹⁶

These arrangements play a significant role in maintaining a credible, safe and secure system. Furthermore, Pakistan has also signed safeguards agreements with the IAEA. Pakistan has endorsed and rectified several global legal resolutions and conventions.

These binding mechanisms contain diverse safety and security conventions, treaties, and regimes; Such as United Nations Security Council Resolution (UNSCR) 1373, UNSCR 1540, The convention on the Physical protection of nuclear material (CPPNM), Physical Protection of Nuclear Material and Nuclear Facilities, the IAEA code of conduct, Nuclear Summit at Washington 2010 and Seoul 2012 and Nuclear Threat Initiative (NTI) Index 2020.¹⁷ However, these international legal tools are related only to the civilian nuclear-related programme:

¹⁶Pakistan's National Statement in Nuclear Security Summit 2014 at Hague, Netherlands, 2. See also, Pakistan Nuclear Regulatory Authority (PNRA) Report," *PNRA*, 2014, Available at:<http://www.pnra.org/pnrarpt/PNRA%20Annual%20Report%202014.pdf> (Accessed on December 17,2021).

¹⁷ Tahir Mahmood Azad, "Pakistan's Evolving Nuclear security Culture," *South Asian voices*, November 15, 2021, Available at: www.Stimson.org/2021 (Accessed on December 17,2021).

Table: 1- Pakistan’s Safeguards Settings/ Agreements with the IAEA.¹⁸

S. No.	Facilities	Agency Publication	Date of Signing
1.	Pakistan Research Reactor-1 (PARR-1)	INFCIRC/34	March 05, 1962
2.	Karachi Nuclear Power Plant (KANUPP)	INFCIRC/116	Jun 17, 1968
3.	Karachi Nuclear Power Plant (KANUPP)	INFCIRC/135	October 17, 1969
4.	Fuel Reprocessing Plant	INFCIRC/239	March 18, 1976
5.	Hawks Bay Depot	INFCIRC/248	Mar 02, 1977
6.	Pakistan Research Reactor-2 (PARR-2)	INFCIRC/393	September 10, 1991
7.	Chashma Nuclear Power Plant-1 (C-1)	INFCIRC/418	February 24, 1993
8.	Chashma Nuclear Power Plant-2 (C-2)	INFCIRC/705	February 22, 2007
9.	Chashma Nuclear Power Plant-3 & 4 (C-3/C-4)	INFCIRC/816	April 15, 2011
10.	Karachi Units 2 & 3	INFCIRC/920	May 3, 2017

Source: S. Khan and M. Saeed Mulla, “Safeguards in Pakistan-State-Agency Cooperation,” IAEA, Paper No. IAEA-CN-220-xx, (2014), 2.

¹⁸ S, Khan and M. Saeed Mulla, “Safeguards in Pakistan – State-Agency Cooperation,” IAEA, Paper No. IAEA-CN-220-xx, (2014) 2, Available at: <http://www.iaea.org/safeguards/symposium/2014/home/e proceedings/sg2014-papers/000371.pdf> (Accessed on December 17, 2021).

These commitments replicate Pakistan's assurance of nuclear safety and security. Additionally, Pakistan is committed to several international safety conventions and export control laws and contributes to all international determinations against nuclear terrorism. Particulars of the concerned activities are given below:

Table: 2- Pakistan's International Nuclear Arrangements

Sr. No.	International Nuclear Arrangements
1	Convention on the Physical Protection of Nuclear Material, 1980 (CPPNM), including an amendment adopted in 2005. The Physical Protection of Nuclear Material and Nuclear Facilities INFCIRC/225/Rev.4 (INFCIRC/ 225).
2	Convention on Early Notification of a Nuclear Accident, 1986 (CENNA).
3	Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, 1986 (CACNARE).
4	Convention on Nuclear Safety.
5	Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management 2001.
6	Convention on Suppression of Acts of Nuclear Terrorism, 2005.
7	Code of Conduct on the Safety of Research Reactors on 8 March 2004.
8	Guidance on the Import and Export of Radioactive Sources.
9	United Nations Security Council resolution 1540.
10	The Global Initiative to Combat Nuclear Terrorism (GICNT).

11 IAEA Illicit Trafficking Database (ITDB).

12 Nuclear Security Summit 2010, 2012 and 2014.

Source: Tahir Mehmood Azad and Hina Shahid, "Evolution of Pakistan's Nuclear Program," *GSSR*, Vol.6, No.1 (Winter 2020), 4.

High Reliability Theory (HRT)

The HRT explains Pakistan's position on nuclear safety and security. The organizational structure, whether military or civil, is entirely in its place and working flawlessly.¹⁹ This theory's postulates are effectively promulgated by Pakistani organizations responsible for the smooth working of nuclear setup. The effectiveness of the working mechanism of any organization can avert or control accidents occurring within its realm. The pessimists of normal accident theory, Reiman and Oedewald, maintain that "the complexity of modern organizations, combined with typical human characteristics, makes them inherently unreliable."²⁰ Humans can cause to generate a stimulating condition in any organization. HRT suggests that "organizational management and leadership can overcome human and organizational tendencies."²¹

G. Rochlin, K. Weick, K. Roberts, T. La Porte and P. Consolini are Intellectuals who have commonly mentioned the high reliability theory or organizations (HROs). These experts acknowledge and clarify the position of HROs. They have attempted to investigate the ways used by an organization to thwart or control accidents, mishaps, or unapproved actions. They examined each feature of "studying such organizations

¹⁹ Mubarakmand (a prominent Pakistani nuclear physicist), in an interview with Tahir Mahmood Azad.

²⁰ Teemu Reiman and Pia Oedewald, "Evaluating Safety-Critical Organizations-Emphasis on the Nuclear Industry," *VTT, Technical Research Centre of Finland*, Report No. 2009:12, (April 2009), 28.

²¹ Ibid.

managing and operating complex and intrinsically hazardous technical systems.”²² La Porte, who recognized several topographies of HRO, has given internal and external descriptions of HRO.²³ Current theoretical literature regarding organizational nuclear security and its management is incapable of sophisticated discourse on nuclear weapons security.

An organization's function in any nuclear facility is significant. The safety and security of nuclear weapons and fissile material are highly sophisticated and delicate matters. Sagan has developed his theoretical framework carefully by describing nuclear safety qualities and emphasizing particular practical examples of the Cold War era to enhance validity of his theories. Instead of the fixed uncertainty of pessimist theorists about nuclear safety and security, the optimists of HR theory support the idea that accidents can be controlled by competent management and decent organizational arrangements. Sustaining safety in the system is in favor of every organization that it can ensure through several safety implementations and reliability culture. Every good organization corrects itself through self-accountability by omission and correcting its errors and faults. Furthermore, Sagan indicated that "organization theory has been highly appropriate in several essential areas of international relations, illuminating crisis behaviour, alliance politics, weapons procurement, military doctrine, and nuclear weapons safety.”²⁴

Additionally, high reliability organizations theorists elucidated that better professional organizational features can deliver outstanding

²² Gene I. Rochlin, "Reliable Organizations: Present Research and Future Directions," *Journal of Contingencies and Crisis Management*, Vol. 4, no. 2 (June 1996), 55.

²³ Todd R. La Porte, "High Reliability Organizations: Unlikely, Demanding, and at Risk," *Journal of Contingencies and Crisis Management*, Vol.4, No.2, (1996), 60-70.

²⁴ Scott D. Sagan, "The Perils of Proliferation: Organization Theory, Deterrence Theory, and the Spread of Nuclear Weapons," *International Security*, Vol. 18, No. 4 (Spring 1994), 73.

results even in the worst circumstances. They believe that an organization shall have a complete management system and professional skills from detecting a problem to its response to counter all possible challenges. Therefore, they have mentioned a multidimensional diverse, effective, and applicable pattern of management that they believe can ensure the functionality of the system and resolution of every challenge in all possible circumstances. In the case of the nuclear weapons security of Pakistan, the military has accomplished an adequate role. Sagan stated, "it has an effective control over nuclear weapons."²⁵

In nuclear weapon development and safety management, nuclear scientists and engineers have played a sufficient role. Gen. (R) Khalid Kidwai stated, "Credit goes to all those engineers and scientists and strategic organizations which helped Pakistan develop its infrastructure and deterrence capability."²⁶ Nuclear history of Pakistan unveils that nuclear weapons are safe and secure under the control of military organizations. The supreme authority in Pakistan that controls the nuclear programmes for civilian and military purposes is National Command Authority (NCA). One can observe a lot of propaganda against Pakistan's nuclear security. During a keynote address at the CISS conference on December 8, 2021, Gen. ® Khalid Kidwai stated, "Nuclear security is too serious a business to be used as a tool of political intimidation, point scoring or subjected to inadequately deliberated statements. Pakistan would expect that considered opinions must reflect objectivity, evidence, professionalism, and meet the high standards of confidentiality lest these become counter-

²⁵ Scott D. Sagan and Kenneth Waltz, *The Spread of Nuclear Weapons: A Debate Renewed* (New York: W.W. Norton, 2003), 91.

²⁶ Khalid Ahmed Kidwai, "Pakistan's Role in Nuclear Security Summit (NSS) Process," Inaugural statement in a Roundtable Discussion at ISSI, (March 25, 2016), Available at <http://issi.org.pk/wp-content/uploads/2016/03/Inaugural-statement-by-Lt-Gen-Khalid-Ahmed-Kidwai.pdf> (Accessed on December 17,2021).

productive.”²⁷ Sartaj Aziz stated that Pakistan's nuclear security regime is established on the national legislative, regulatory and administrative framework.²⁸ He added that the fundamentals of nuclear security in Pakistan comprise robust command and control system managed by the NCA rigorous regulatory regime, comprehensive export controls, and international cooperation. Additionally, people working in nuclear facilities have to clear various security steps such as Personnel reliability programme (PRP) and human reliability programme (HRP), also known as personnel security programme (PSP). These measures reduce the chances of human error in the nuclear facility. Pakistan has been constantly cooperation with the IAEA and its allies USA and China, to maximize nuclear security; even the Former Director-General has also appreciated Pakistan's cooperation and its efforts taken to ensure the security and safety of nuclear assets.²⁹

Organizational Theory

In national security issues, the military's functions have always been vigorous. Notably, in nuclear-armed countries, the military's role is more highlighted. The views of nuclear pessimists about military organization illustrate diverse characteristics. In the case of Pakistan, its nuclear weapons development programme has been founded under highly sophisticated safety and security measures taken by internationally existing parameters; Pakistan has been co-operating with IAEA, and it is co-operating with allies such as the US and China to

²⁷ Keynote address by Gen. © Khalid Kidwai at the CISS Conference (December 8, 2021). Available at: <https://strafasia.com/keynote-address-by-lt-general-r-khalid-kidwai-at-ciss-conference-8-dec-21/> (Accessed on December 24,2021).

²⁸ Sartaj Aziz, Advisor to the Prime Minister on Foreign Affairs, “Pakistan’s Non-Proliferation Efforts & Strategic Export Controls,” Inaugural address in a Seminar at ISSI, (May 03, 2016).

²⁹ Tahir Mahmood Azad, “Pakistan’s Evolving Nuclear security Culture,” *South Asian voices*, November 15, 2021, Available at: www.Stimson.org/2021(Accessed on December 24,2021).

maximize nuclear safety and security, it has established the number of regulatory bodies such NCA, Pakistan Nuclear Regulatory Authority (PNRA), and Strategic plans Division (SPD), Pakistan also adopted 2005 and endorsed convention on the Nuclear Physical protection of Nuclear Material (CPPNM).³⁰ Moreover, the preparation, skills, training, professionalism, and work beliefs of concerned personnel with nuclear administration and regulation are reliable, trustworthy, and dependable.

Organizational efficiency plays constant momentous part in preserving, functioning, and keeping the system in order. Adam Smith is thought to be the inventor and advocate of the organization theory.³¹ Johan P. Olsen, Michael D. Cohen, and James G. March, who are optimists of organizational theory, have identified that "an organization is a set of procedures for argumentation and interpretations as well as for resolving complications and making conclusions."³² Debating the character of military organization, Sagan discussed two vital points. He stated, "Military organizations, because of common biases, inflexible routines, and parochial interests, display strong proclivities toward organizational behaviour that lead to deterrence failures."³³ NWS cannot allow such organizational encounters. Furthermore, Sagan concludes that if civilian control is lacking so the interest of the military would dominate.³⁴

³⁰ Ibid.

³¹ Mary Jo Hatch and Ann L. Cunliffe, *Organization Theory: Modern, Symbolic and Postmodern Perspectives* (Oxford: OUP Oxford, 2013), 21.

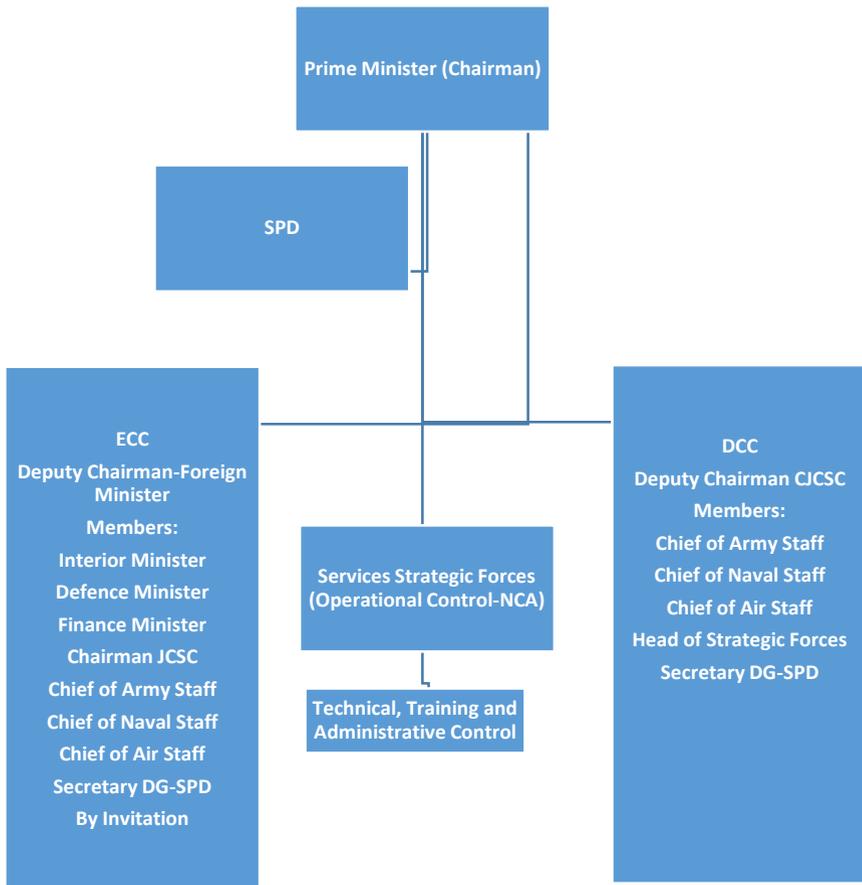
³² Michael D. Cohen, James G. March, Johan P. Olsen, "People, Problems, Solutions, and the Ambiguity of Relevance," in James G. March and Johan P. Olsen (ed.), *Ambiguity and Choice in Organization* (Bergen, Norway: Universitetsforlaget, 1976), 123.

³³ Sagan, "The Perils of Proliferation: Organization Theory, Deterrence Theory and The Spread of Nuclear Weapons," 68.

³⁴ Ibid.

Therefore, organizational disagreements could cause deterioration within the system that can generate fairly risky conditions. In contrast, Pakistan's civilian leadership enjoys the decision-making power regarding the use of nuclear weapons, which reduces the chances of misuse and early use of nuclear weapons and reduces the sole military dominance in the use of nuclear weapons.

Figure: 1- NCA: An Organizational Hierarchy Structure:



Source: Zafar Iqbal Cheema, *Indian Nuclear Deterrence, Its Evolution, Development, and Implications for South Asian Security* (Karachi: Oxford University Press, 2010), 184.

Above graph explains the power structure of NCA, the decision-making authorities, and the functions of each department.

Observing past practice, Pakistan's military has not faced any organizational disagreements. According to available data, in the nuclear safety security and management, there is no single event of organizational clash or mishap in Pakistan that is a sign of professionalism of related personnel and a proof that Pakistan's nuclear safety and security is reliable. "NCA, the top tier of the command and control structure, aims to ensure that the decision to deploy and release nuclear weapons rests in the hands of civilian and military leaders designated by the National Security Council (NSC) and the Constitution of Pakistan."³⁵ Development Control Committee (DCC) and Employment Control Committee (ECC) are the primary divisions of NCA, "The primary responsibility of these commands is to exercise technical, training and administrative control over the strategic delivery systems. The operational control, however, rests with the NCA."³⁶ The Strategic Plans Division (SPD) is the second division of NCA that is "accountable for keeping Pakistan's strategic programmes from insider and outsider threats, most prominently from theft or loss of nuclear material and against infiltration of the strategic organizations by ill-intentioned actors."³⁷ After the successful "Operation Zarb-e-Azb," "Operation Raddul Fasad," and "Combing operation," the terrorist organizations in Pakistan have been eliminated from Pakistan, and they are defeated, weakened enough that such terrorist organizations could hardly reorganize major attacks over civilian sights. Although there are

³⁵Sébastien Miraglia, "Deadly or Impotent? Nuclear Command and Control in Pakistan," *Journal of Strategic Studies*, Vol. 36, No. 6, (December 2013), 845.

³⁶Kenneth N. Luongo and Naeem Salik, "Building Confidence in Pakistan's Nuclear Security," *Arms Control Today*, December 2007.
<https://www.armscontrol.org/act/2007-12/features/building-confidence-pakistan's-nuclear-security>.

³⁷ Clary, "Thinking about Pakistan's Nuclear Security in Peacetime, Crisis and War" 13

fewer chances for an organized terrorist attack or theft of nuclear assets in Pakistan nuclear security is a continuous process, and these threat perceptions will always remain. Throughout terrorist history in Pakistan; terrorists have never been able to be a material threat to Pakistan's nuclear assets, and today these terrorist organizations are in the weakest position during the last four decades, particularly after the Taliban government agreement with the USA; that Afghan land would be no more used against any state. Pakistan received most of the terrorist flow from Afghanistan due to instability and constant war in Afghanistan that remains no more an active war.

Realism

Securing national interest is the primary duty of every state; its policy makers and establishment try to adopt ways to overcome the challenges in optimizing national interest. Several realist thinkers such as H Morgenthau, K Waltz, G Kennan, and R Niebuhr have expressed their views regarding development of nuclear weapons, which is a step in their opinions to increase power and ensure the survival and security of a state and its national interest within anarchic international system.³⁸ According to the realist perspective, Pakistan would do whatever is mandatory for the safety and security of nuclear weapons because Pakistan realizes that there is no one to help Pakistan in this anarchic and powerful greedy world. Based on the principles of self-help, Pakistan would do its best to retain nuclear arsenal so that it could guarantee the country's security of national interest, and its survival.³⁹ Strategically, Pakistan considers self-help the proper means to protect a state and its interest. Even during the crisis, Pakistan did not receive help from other states except the Muslim world and China.

³⁸ T. Ogilvie-White, "Is There a Theory of Nuclear Proliferation? An Analysis of the Contemporary Debate," *The Nonproliferation Review*, (Fall 1996), 44.

³⁹ Bhumitra Chakma, *Strategic Dynamics and Nuclear Weapons Proliferation in South Asia: a Historical Analysis* (Peter Lang, 2004), 26.

After the fall of Dhaka in 1971, Pakistani politicians realized that the only option for the survival of Pakistan was the development of nuclear weapons. According to Chakma, "Pakistani political elites, particularly Bhutto, believed that only nuclear weapons could guarantee the national survival of Pakistan against India's conventional and nuclear threats."⁴⁰

To ensure the credibility of its nuclear deterrence, Pakistan is constantly modernizing its nuclear capability, including nuclear safety, nuclear security, delivery, and command and control system; To ensure nuclear safety and security, Pakistan has been co-operating with IAEA and endorsing the IAEA protocols, it is co-operating with allies such as the US and China to maximize nuclear safety and security, it has established the number of regulatory bodies such NCA, PNRA, SPD, and Pakistan also adopted 2005 and endorsed convention on the Nuclear Physical protection of Nuclear Material (CPPNM).⁴¹ Nuclear weapons are a prominent and most important part of Pakistan's defence plan that Pakistan would not give up at any cost. ⁴² Therefore, Pakistan works hard to ensure security and safety of nuclear weapons, its installations, radioactive and fissile material, and apparatus. ⁴³

Based on the principles of self-help in this anarchic international system securing national interest and ensuring the state's survival is a major issue for Pakistan. Pakistan's only aggressive and nuclear enemy, India, cannot be countered through conventional means that could prove counterproductive for Pakistan. India being conventionally

⁴⁰Bhumitra Chakma, "The Pakistani Nuclear Deterrent," in Bhumitra Chakma (ed.), *The Politics of Nuclear Weapons in South Asia* (Burlington: Ashgate Publishing Ltd., 2011), 42.

⁴¹ Tahir Mahmood Azad, "Pakistan's Evolving Nuclear security Culture," *South Asian voices*, November 15, 2021, Available at: www.Stimson.org/2021(Accessed on December 24,2021).

⁴² Itty Abraham, *South Asian Cultures of the Bomb: Atomic Publics and the State in India and Pakistan* (Bloomington: Indiana University Press, 2009), 138.

⁴³ Singh, *Pakistan Nuclear Disorder: Weapons, Proliferation and Safety*, 50-51.

superior is a severe threat to Pakistan. Therefore, nuclear weapons are necessary for the defence of Pakistan, and it has successfully deterred Indian aggression; that is why nuclear weapons are the best cost-effective defence for the security of national interest and survival of Pakistan

Theory of Deterrence

Pakistan's political and military leaders believe that its nuclear weapons offer credible minimum deterrence in the subcontinent. Affirming nuclear weapons importance for Pakistan, R. Basrur stated: "to ensure the survivability and credibility of the deterrent, Pakistan will have to maintain, preserve and upgrade its capability."⁴⁴ It is well understood in Pakistan that to deter the enemy, Pakistan must have a safe and secure nuclear arsenal. Nuclear security is globally a vibrant issue particularly. A robust and effective, and credible nuclear deterrence is difficult in the absence of safe and secure nuclear arsenal. Therefore, to keep deterrence in effect, Pakistan has been upgrading its nuclear safety and security measures. P. Lavoy presenting his views about Pakistan's nuclear arsenal pointed out the following key factors: 1) An effective conventional fighting force and the demonstrated resolve to employ it against a wide range of conventional and sub-conventional threats; 2) A minimum nuclear deterrence doctrine and force posture; 3) An adequate stockpile of nuclear weapons and delivery systems to provide for an assured second strike; 4) A survivable strategic force capable of withstanding sabotage, conventional military attacks, and at least one enemy nuclear strike; 5) A robust strategic command and control apparatus designed to ensure tight negative use control during peacetime and

⁴⁴ Rajesh M. Basrur, *South Asia's Cold War: Nuclear Weapons and Conflict in Comparative Perspective* (New York: Routledge, 2008), 65.

prompt operational readiness (positive control) at times of crisis and war.⁴⁵

A minimum nuclear deterrence doctrine, force posture, and secure second-strike capability are ensured by adequate nuclear warheads and delivery systems. A strategic arsenal is sufficient to survive at least a single nuclear enemy strike and respond to any conventional or nuclear aggression. Strong command and control system ensures high readiness in wartime and excludes chances of any accident, mishap, or unauthorized misuse of nuclear assets.

Indian development of nuclear weapons and modernization forced Pakistan to go for countermeasures. Even the Cold Start doctrine compelled Pakistan to develop tactical short-range nuclear ballistic missiles to make nuclear deterrence more credible. In the views of Adil Sultan, to counter each type of Indian attack, "Pakistan developed and tested its short-range missile system 'NASR' (Hatf IX) in April 2011, to have 'assured deterrence' for a full spectrum threat, i.e., tactical, operational and strategic levels."⁴⁶ These short-range missiles are developed with credible and diverse safety protocols. Mubarakmand stated that these missiles are outstanding in assessing standards and mechanism.⁴⁷ They are very secure and retained by a very skilled, trained, and professional crew. They were operationalized after running multiple successful experimental tests and ensured their ability to hit objectives accurately.

⁴⁵ Peter R. Lavoy, "Islamabad's Nuclear Posture: Its Premises and Implementation," in Henry D. Sokolski (ed.), *Pakistan's Nuclear Future: Worries beyond War* (United States Army War College: The Strategic Studies Institute Publications Office, 2008), p.131.

⁴⁶ Adil Sultan, "South Asian Stability-Instability Paradox: Another Perspective," *IPRI Journal*, XIV, No.1, (Winter 2014), 14.

⁴⁷ Mubarakmand (a prominent Pakistani nuclear physicist), in an interview with Tahir Mahmood Azad.

Constructivist

Every state has a diverse identity, history, and interests. Its culture and values transform with time. To maintain the identity and social constructs is the duty of each state. Prominent constructivists M. Zehfuss, A. Wendt, N. Onuf, and F.V. Kratochwil described “the continued prevalence of nuclear weapons and states’ dominance in the nuclear arena constitutes social facts.”⁴⁸ After adopting nuclear capability, a state modifies its strategic approach. The social composition of a state characterizes national necessities, requirements, needs, and demands. In contrast, nuclear assets determine something different such as “states’ commitment to their constructed social purpose, namely, maintaining power and prestige (i.e. identity), and dominance (i.e., identity and interests) – despite the possibility of non-state actors’ access and application of nuclear technology and weapons.”⁴⁹ According to Sagan, “state behaviour is determined not by leaders’ cold calculations about the national security interests or their parochial bureaucratic interests, but rather by deeper norms and shared beliefs about what actions are legitimate and appropriate in international relations.”⁵⁰

The sole purpose of nuclear weapons development in Pakistan is to assure its survival, identity, national interest, and sovereignty against enemy aggression. Van Wyk stated, “Pakistan’s nuclear programme emanates from that country’s insecurity as regards India, while India’s programme is a response to its insecurity as regards

⁴⁸ Jo-Ansie van Wyk et al., “The International Politics of Nuclear Weapons: A Constructivist Analysis,” *Scientia Militaria, South African Journal of Military Studies*, Vol. 35, No.1, (2007), p.23.

⁴⁹ Ibid.

⁵⁰ Scott D. Sagan, “Why Do States Build Nuclear Weapons? Three Models in Search of a Bomb,” *International Security*, Vol. 21, No. 3, (1996-97), 73.

China.”⁵¹ Although developing nuclear weapons is very expensive and technically challenging. But after their development by a state, its progress is inevitable such as introducing further improvements in its nuclear programme, increasing number of warheads and delivery systems, conducting experiments to test safety, security, and efficiency of the weapon. It even includes using a weapon in a war-like situation.⁵² Pakistan, a responsible nuclear-armed state, recognizes that effective deterrence can only be assured through reliable, safe, and secure nuclear weapons controlled by trained, skilled, skilled, and professional command and effective control system.

Pakistan's Nuclear Security

Since nuclear tests in 1998, Pakistan has effectively advanced in nuclear security management. In Nuclear Threat Initiative's (NTI) report "2020 Nuclear Security Index," it is stated that "Pakistan is the most enhanced country in the theft ranking for countries with weapons-usable nuclear materials, improving its overall score by 7 points."⁵³ According to NTI 2020, Pakistan's major progress is in its Security and Control Measures category (+25) because it approves of new regulations.⁵⁴ Pakistan also advanced in the Global Norms category (+1). Its developments in the Security and Control Measures category are considerable because reinforced laws and regulations result in durable boosts in Pakistan's score and provide justifiable security

⁵¹ Van Wyk et al., "The International Politics of Nuclear Weapons: A Constructivist Analysis," 26.

⁵² Ibid.

⁵³ Nuclear Threat Initiative, "2020 NTI Nuclear Security Index: Theft / Sabotage / Radiological (Fifth Edition)," (July 2020), 35-36, Available at: [https://media.nti.org/documents/2020 NTI-Index Report Final.pdf](https://media.nti.org/documents/2020%20NTI-Index%20Report%20Final.pdf) (Accessed on December 24, 2021).

⁵⁴ Ibid.

assistance.⁵⁵ A detailed analysis and findings are available in that report.

In Pakistan, the military has demonstrated an effective and satisfying role in ensuring nuclear security and its management through credible and reliable command and control system. Kidwai states that along with safeguarding nuclear arsenal and conventional forces, nuclear security also includes vigilance, threat assessment, and response mechanism.⁵⁶ Mubarakmand highlighted that Pakistan's track record of military in nuclear security management is highly significant.⁵⁷ Pakistan has sustained a safe and secure nuclear programme, free from any error, accident or unauthorized use of technology, stealing of fissile material in Pakistan. Additionally, Mubarakmand has added that Pakistan had implemented vigorous safety techniques to evade an accident. Through cold testing, command, and communication delivery system, the accuracy of missiles, and safety measures are perceived as the best quality standards.⁵⁸ The IAEA Former Director General, Yukia Amano, has also appreciated Pakistan's cooperation and its efforts taken to ensure security and safety of nuclear assets.⁵⁹

Additionally, Pakistan's nuclear arsenal is controlled by very skilled and professional military personnel, equipped with effective command and control system. Daniel S. Markey, while commenting on the performance and function of the military of Pakistan in the management of the nuclear arsenal, has praised the role of this

⁵⁵ Ibid.

⁵⁶ Kidwai, "Pakistan's Role in Nuclear Security Summit (NSS) Process."

⁵⁷ Mubarakmand (a prominent Pakistani nuclear physicist), in an interview with Tahir Mahmood Azad.

⁵⁸ Ibid.

⁵⁹ Tahir Mahmood Azad, "Pakistan's Evolving Nuclear security Culture," *South Asian voices*, November 15, 2021, Available at: www.Stimson.org/2021(Accessed on December 24,2021).

organization: Although nuclear weapons are risky by their nature, however, America would have reasons to trust Pakistan because Pakistan's military has firm command and it has been disciplined and trained.⁶⁰

To screen or examine the people, civilian or military-related to a nuclear arsenal, Pakistan has introduced Human Reliability Programme (HRP) and credible Personnel Reliability Programme (PRP).⁶¹ These programme PRP and HRP are universally acknowledged as trustworthy programmes in dealing with nuclear security subject. The military organization is made responsible due to the delicate nature of nuclear technology, the value of nuclear weapons and fissile material, and their importance for the defence of Pakistan. Although Pakistan has a reliable well equipped, highly trained considerable number of Army, Naval, and Air force to defend its territory from any internal and external, conventional or unconventional threat, nuclear weapon holds a key role in Pakistan's security to deter enemy, particularly a nuclear-armed enemy, and secure the territory without engaging in war and make him stand as a secure and robust nuclear state in this anarchic world.⁶² From its own and other past experiences, better training, highly disciplined and professional military engraved its importance and dependability on military for nuclear safety and security.

Pakistan's nuclear organizational control is under SPD, headed by a joint-staff organization. It has taken effective measures to ensure Pakistan's deterrence by ensuring effective, robust command, control, and safety of nuclear assets, and these arrangements strengthen the

⁶⁰ Daniel S. Markey, *No Exit from Pakistan: America's Tortured Relationship with Islamabad*, (New York: Cambridge University Press, 2013), 18.

⁶¹ Christopher Clary, "Thinking about Pakistan's Nuclear Security in Peacetime, Crisis and War," *Institute for Defence Studies and Analyses (ISDA) Occasional paper*, No.12 (September 2010), 14.

⁶²C. Christine Fair, et al., *Pakistan: Can the United States Secure an Insecure State?* (Santa Monica: RAND Corporation, 2010), 27.

control of the army over nuclear assets.⁶³ The importance of nuclear arsenal is acknowledged and realized by Pakistan's military. Pakistan relies on full-spectrum nuclear deterrence for its security which can only be ensured through effective and reliable robust command and control system.

Conclusion

Islamabad needs nuclear weapons to deter belligerent New Delhi from any conventional or nuclear misadventure. Pakistan's military has always been a highly acknowledged, well-trained, disciplined, credible, and highly professional institution of Pakistan. Pakistan's armed forces are fully capable of ensuring the safety and security of nuclear weapons from any internal, external, and technical threat. The encouraging history of nuclear safety and security of Pakistani nuclear assets with no single accident or unauthorized use encourages the military organization to maintain its dominance over the nuclear management system. All discussed theories, i.e., HRT, NAT, Realism, and Constructivism, share the sense that Pakistan's nuclear weapons security is a crucial part of Pakistan's national security. Being conventionally inferior to India, Pakistan must maintain a nuclear stockpile to ensure its defence against enemy aggression. Pakistan believes that in the current anarchic international system, a nuclear arsenal is the only effective means for Pakistan to deter the enemy and maintain strategic stability in South Asia to secure its sovereignty, identity, and dignity.

⁶³ Ibid.