



Vivekananda International Foundation

Pakistan's Nuclear and Missile Programme: An Assessment

Rana Banerji



VIF Brief | February 2019



© Vivekananda International Foundation, 2019

Vivekananda International Foundation

3, San Martin Marg, Chanakyapuri, New Delhi - 110021

Tel: 011-24121764, Fax: 011-43115450

E-mail: info@vifindia.org, Website: www.vifindia.org

All Rights Reserved.

No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form, or by any means electronic, mechanical, photocopying, recording or otherwise without the prior permission of the publisher.

Published by Vivekananda International Foundation.

About the Author



Rana Banerjee, a former IAS officer, is a top expert on security issues, and an authority on Pakistan affairs. He retired as Special Secretary, Cabinet Secretariat.

Introduction

The closest formulation of Pakistan's Nuclear Security doctrine, if any, was enunciated in an article appearing in *The News*, in October 1999, written by former Foreign Minister Agha Shahi, former Foreign Secretary Abdus Sattar and Air Chief Air Marshal (retired) Zulfiqar Khan. It was India-specific and spoke of credible, minimum deterrence - it would be flexible in response in a dynamic threat environment. India's offer of 'No First use' was rejected - instead, Pakistan offered a 'No War Pact', which was not acceptable to India.¹

The primary rationale for the Pakistani bomb was security. Islamabad's loss of East Pakistan in the 1971 War was a key motivation: Pakistan needed the Bomb to ensure its survival. This rationale was bolstered by the perceived inevitability of the Indian bomb after the 1974 test, and the lack of a credible security guarantee. Always worried about Indian conventional superiority, Pakistan considered nuclear weapons as a means to avoid a defeat on the battlefield. An added benefit of the program was the ability to protect Pakistani support for the Kashmir insurgency by neutralizing the risk of major conventional war. This may have been a misguided belief but it has periodically helped Pakistan to internationalize the Kashmir dispute, playing upon Western Powers' fear of an avoidable nuclear conflagration in South Asia.

There was also a political component in Pakistan's nuclear policy. Zulfiqar Ali Bhutto wanted Pakistan to "walk tall". Though maintaining equality with India was a primary motivation, being the first Muslim nation to be endowed with the Bomb was also a matter of pride, and to this day the program remains popular in Islamist circles. This rationale has continued to exist after the 1977 coup that toppled Bhutto. In the late 1970s, Pakistan's nuclear weapons program became synonymous with national sovereignty and national prestige, even when it was run by the very military that had eliminated Pakistan's best-known populist politician. In the context of its nuclear policy, Islamabad did not believe that China would be ready to risk war to support Pakistan in case of hostilities in South Asia. The rocky history of US-Pakistan relations also made it impossible for Islamabad to count on Washington.

Key Elements of Pakistan's Nuclear Doctrine

In practice, Minimum Credible Deterrence translates into four objectives: (1) deterrence of all forms of external aggression; (2) building to this effect an effective combination of conventional and strategic forces; (3) avoiding a pre-emptive strike through protection and the threat of nuclear retaliation; (4) stabilizing strategic deterrence in South Asia. The theory of deterrence of the strong by the weak envisaged the possibility of a smaller country to deter a larger one through the threat of damage incommensurate with stakes of the conflict. It aims at being able to inflict "unacceptable" or "unbearable" damage to India. As it would be difficult to define unacceptable damage, overkill would by necessarily be built into the response. From an initial capability to deliver a few weapons on Indian cities with some guarantee of success, the level of minimum deterrence could change

over time, eliciting flexible response, not quantifiable in static numbers. Guaranteed unacceptable damage implied survivability even after a first strike by the adversary.

Though Pakistan has consistently stated that its nuclear weapons are solely intended to deter military aggression, in view of its assessment that “in view of the fact that India produces significant quantities of fissile materials and nuclear weapons from un-safeguarded nuclear reactors”, Pakistan Strategic Planning Division (SPD) held earlier that a country may need 68-70 warheads to hit at least ten identified enemy targets at a time, before pre-emptive strike by India. Pakistan reached the nuclear threshold somewhere between 1984 and 1987. The exact date is unclear and depends on whether one refers to the year enough Highly Enriched Uranium (HEU) was produced, or the year when weaponization was achieved.²

Conventional wisdom now accepts that China helped first test out Pakistan's nuclear bomb at Lop Nor, sometime after 1987 and before 1989 but this was kept secret till Dr. A.Q. Khan deliberately leaked the information through Mushahid Hussain to Indian journalists Kuldip Nayyar and Shekhar Gupta. Initially, Pakistan clandestinely followed the Enrichment Route under the guidance of Dr. A.Q. Khan. Centrifuges were installed at Kahuta. At peak capacity, the Kahuta Research Laboratories (KRL) was capable of producing 60-80 kg of enriched Uranium annually. KRL remains outside International Atomic Energy Agency (IAEA) safeguards, though enrichment is not being done there anymore. Facilities at KRL and Gadwal have in later years been used for developing ancillaries for Pakistan's missile program. Uranium waste from KRL is now diverted to Khushab for use under the Plutonium route. Pakistan has nuclear reactors at the Pakistan Institute of Nuclear Science and Technology (PINSTECH), Nilore (near Rawalpindi) and Karachi Nuclear Power Plant (KANUPP), Karachi, which along with a later nuclear plant at Chashma, are under IAEA safeguards. These follow the Plutonium Route – as do reactors at Khushab-4, all built with Chinese assistance – which are not under IAEA safeguards. Present assessment of capacity at Khushab is around 45-50 kg of nuclear grade Plutonium annually.

Pakistan's nuclear history has been marked by the rivalry between the Pakistani Atomic Energy Commission (PAEC), the initial organization created to deal with the nuclear program (both civilian and military), and the Khan Research Laboratories (KRL), originally created solely for uranium enrichment but which became in the 1980s a true competitor to PAEC, as both became involved in weaponization and missile acquisition. Fed initially by intense personal rivalry between Dr. Munir Khan, Chairman, PAEC and Dr. A.Q. Khan at KRL, this competition was probably deliberately encouraged by the Pakistani civilian and military leadership.

In the years 1999-2001, after the expose by USA of Dr. A.Q. Khan's clandestine sales of nuclear equipment to North Korea, Libya and Iran, a reorganization of the program took place. All military or dual use nuclear activities are now controlled by the National Command Authority (NCA), and the SPD. A division of labour among laboratories has been defined. The National Engineering and Scientific Commission (NESCOM, created in 2001),

oversees weapons systems development. It has authority on the National Development Complex (NDC, created in 1990 as an offshoot of PAEC), which is in charge of weaponization.³

The circumstances that might warrant nuclear use were described (for international audiences) by Lt Gen (Retd) Khalid Kidwai in late 2012, as shown below:-

- (1) **The Spatial Threshold.** Penetration of Indian forces on a large scale would elicit a nuclear response. The threshold could be low (some 50-100 km perhaps) in Kashmir and in Punjab;
- (2) **The Military Threshold.** Destruction of a large part of Pakistani land or air forces could lead to a nuclear response if Islamabad believed that it was losing the cohesiveness of its defence and feared imminent defeat;
- (3) **The Economic Threshold.** Economic strangulation refers primarily to a blockade of Karachi, but could also concern the stopping of the Indus water flow, or the capture of vital arteries such as the Indus and the Karakoram highway;
- (4) **The Political Threshold.** Destabilization of the country fermented by India could also be a nuclear threshold if Islamabad believed that the integrity of the country was at stake.

Pakistani planners insist that these thresholds are indicative and should not be viewed in isolation one from another. This policy statement, it was averred in official handouts, was intended to deter Pakistan's adversaries from attempting a counter-force strategy against its strategic assets by effectively securing the strategic assets and threatening nuclear retaliation should such an attempt be made.⁴

Fissile Material Cut-off Treaty (FMCT)

Pakistan has opposed start of talks on FMCT at the Conference on Disarmament since 2009. Its position has been that it would sign Fissile Material Treaty if the countries with fissile material reduce their stocks to a proportional level before setting the cut-off date, instead of agreeing on existing stock levels which put the country in a disadvantageous position. Concomitantly, Pakistan claims to possess all credentials for qualifying for access to civilian nuclear technology and becoming a member of the multilateral export control regimes including Nuclear Suppliers Group (NSG) on non-discriminatory basis. As such, it remains opposed to any arms control arrangement that is detrimental to its security and strategic interests.

Missile Development Program

Pakistan undertook a full-scale missile development program with Chinese and North Korean help in the mid-1990s. Starting from the 'Hatf' series, it moved to 'Ghazni' and 'Shaheen' variants, using both liquid and solid fuel propellants.

Pakistan's initial experience with space and missile technology began in the 1960s when the Space and Upper Atmospheric Commission (SUPARCO) blossomed under the guidance and stewardship of Abdus Salam and I. H. Usmani. Collaboration between the US National Aeronautics and Space Agency (NASA) and SUPARCO resulted in the 'Rehbar' series of sounding rockets. But this series remained very basic, at best. The wars of 1965 and 1971 took a toll on both the PAEC and SUPARCO — two premier organizations — when nearly half of their work forces, consisting of Bengali talent, left when Pakistan was dismembered and Bangladesh was created. In the 1970s and 1980s, Pakistan's focus was on development of the nuclear fuel cycle, fissile material production, and the development of nuclear weapons in the face of obstacles from the non-proliferation regime. Lack of funding compounded these problems.

In the 1990s, Pakistan's focus shifted toward acquiring ballistic missiles, especially after receiving a shock when its then-principal delivery means — F-16 aircraft — was withheld by the United States as a consequence of the Pressler amendment. Over the past quarter-century, Pakistan's strategic thinking has been based on three key premises. The first is that the reliance on Western technology and arms sales was a risky strategy. The demise of the Soviet Union reduced Pakistan's strategic significance, while Pakistan's pursuit of nuclear deterrent capabilities ran counter to Western non-proliferation objectives. The second premise is that Pakistan must become self-reliant in matching India's missile threat. The third premise is that ballistic missiles would become the premier delivery means of Pakistan's strategic arsenal. Pakistan's deterrence strategy involved buying technology off the shelf to fulfill immediate requirements; the transfer of technology from China and North Korea were necessary steps toward long-term self-reliance.

Pakistan's missile quest began with the development and testing of the 80-km range Hatf-I in 1989. In the 1990s, the focus shifted to Intermediate Range Ballistic Missiles (IRBM) with the acquisition of the Ghauri (Hatf V) from North Korea by the KRL, and development of the Ghaznavi (Hatf-III) and Shaheen-I (Hatf-IV) by a subsidiary of the PAEC — the NDC. These missiles were earmarked for counter value strikes inside India. Pakistan's acquisition of solid fuel technology eventually led to solid propellant baselines and the foundation of future missiles. Flight test of the Ghauri (liquid propellant), conducted on April 6, 1998, was a failure, with the missile burning up on re-entry. Another Ghauri test a year later also ended in failure.

Pakistan's missile arsenal currently includes 11 different types of ballistic and cruise missiles:-

Table 1

Name	Range (in kilometer)
Hatf 1A	100
Abdale	180
Ghaznavi	290

Name	Range (in kilometer)
Shaheen - I	750 – 900
Shaheen - 1A	1,100
Ghauri	1,150 - 1,300
Shaheen II	1,500 – 2,500
Shaheen III	2,750
Nasr	60 (Two types of cruise missiles are deployed)
Subsonic Babur LACM	500 - 700
Subsonic Raad Air-Launched Cruise Missile (ALCM)	350

A version of the ‘Babur’ (Hatf-X) is believed to be under development and might have been tested by the Pakistan Navy from naval platforms along with other LACMs following the creation of the Naval Strategic Force Command in May 2012. Among ballistic missiles, the Ghauri is Pakistan’s only liquid fueled system; all others use solid propellants. Several flight tests of each of these systems have been conducted over the past 15 years to achieve improved performance, targeting, and accuracy parameters.⁵

Recent shifts

In September, 2013 in a meeting of its NCA, Pakistan formally moved from a position of minimum credible deterrence to ‘full spectrum deterrence’, committing itself to second strike capability and parity with India through pursuit of land, air and naval nuclear capacity (nuclear triad), including new delivery systems such as short-range missiles (Nasr), air-launched (Raad) and naval (Babur) cruise missiles as well as miniaturization of war heads. Of the nine ballistic missile systems in Pakistan’s arsenal, five are short-range — the Hatf-1A, Abdali, Ghaznavi, Shaheen-I, and Nasr. Three cruise missile systems — the Babur, Raad, and the prospective naval variant of the Babur — are also only suitable for short-range counter-force targeting. Only four ballistic missile types have been tested with enhanced guidance and penetration capabilities - these four are intermediate-range systems — the Shaheen-1A, Ghauri, Shaheen-II, and Shaheen-III — which possess ranges suitable for deep strikes inside India. These missiles could be utilized for counter-value or counter-force targeting. Given their payload capacity, at least two of these — the Shaheen-II and Shaheen III — are likely to have the potential to carry Multiple Independent Re-entry Vehicles (MIRV).

A serious pursuit of MIRVs and counter-force capabilities requires the availability of large stocks of fissile material and the engineering potential to weaponize these stockpiles for a variety of warheads of different yields and designs. Currently, Pakistan’s fissile

material stockpiles are assessed to have gone up to over 145 warheads. No precise information exists about storage sites of these warheads, which are in de-mated status. These could be in underground facilities in general area of Kirana hills, near the NDC complex at Fatehjung. A recent report leaked by Pakistani sources suggested that nuclear capable missiles are already deployed with the Strategic Forces Command field installations and that the time to install de-mated warheads on to operationally capable carriers (missiles) has been reduced to two hours.

Taking a cue from perceived developments in India, indicative of a palpable shift toward more counter-force targeting along with counter-value targeting, current concern of Pakistan's Nuclear practitioners has focused on Ballistic Missile Defense (BMD) and MIRV. To proceed towards MIRV capability, it was assessed that Pakistan would need to design guidance mechanisms, compact warheads, and a 'bus' that could carry and release multiple warheads. Pakistan's nuclear policy strategists may be considering three options in this regard.

The 'Ignore' Option

In a major departure from past practice, Pakistan could simply decide to rely on its existing mix of counter-value and counter-force targeting capacities. This would involve accelerated production of single-warhead ballistic and cruise missiles while taking additional steps to increase the survivability of its deterrent, such as the multiplication of missile storage sites. Mixing real with dummy sites would complicate India's targeting ability. Pakistan could also add to its stockpiles of Tactical Nuclear Weapons (TNW). Given the domination of the military-bureaucratic-scientific enclave in Pakistan, and Pakistan's history of competing with India in nuclear capabilities, an 'ignore' option is unlikely.

The 'Tortoise' Option

This option presumes that Pakistan will try to match India if it flight tests and inducts missiles carrying multiple warheads, but at a measured pace. This choice of a middle course would be dictated by resource constraints, including available stockpiles and production rates of fissile material. In this quest Pakistan might face natural uranium constraints (e.g. depleting reserves in Bagalchur) in the absence of foreign supplies and fresh discoveries at home. By 2020, Pakistan can be estimated to have accumulated about 450 kg of weapons-grade plutonium from the four production reactors at the Khushab Complex. This would be sufficient for perhaps 90 warheads, which would have to be distributed on a priority basis among delivery vehicles. If a projected Pakistani nuclear arsenal includes perhaps 200 miniaturized warheads, this might require at least 800 kg of weapons-grade plutonium. By choosing the 'tortoise' option, Pakistan could still employ counter-vailing strategies to defeat the twin threat of Indian MIRVs and missile defenses.

Under this option, Pakistan's strategic deterrent would still pose a threat to India if, first, it were to employ increased dispersal and a higher state of readiness. Second, Pakistan could increase production of missiles carrying single warheads. Third, Pakistan could undertake less costly counter-measures to assure penetration and destruction of Indian

targets. Pakistan's strategic forces could: employ depressed trajectories for ballistic missiles; rely increasingly on cruise missiles; resort to simultaneous launches; develop maneuvering re-entry vehicles that are not MIRVs; increase electronic warfare capabilities; and, acquire rudimentary stealth technologies. Pakistan will most certainly undertake counter-measures such as decoys and chaff. All of these steps could be taken while the technological maturation of MIRVs occurs at a measured pace.

The 'Hare' Option

For the 'hare' option, it would necessarily entail increased production of fissile material. Under this option, Islamabad would spend and have to do what it takes to deploy MIRVs as quickly as possible. In responding to India's capability in MIRVs and to counter prospective Indian BMD deployments, Pakistan has unfurled plans to test a new missile, the 'Ababeel'. Pakistan conducted a "test launch" of the Ababeel on 24 January 2017 (Urdu: *الابابيل*; lit. Swallow), a surface-to-surface medium-range ballistic missile, with a claimed maximum range of 2,200 kilometre (1,400 mi). The missile can reportedly carry both conventional and nuclear warheads, and is claimed to use MIRVs, a first for Pakistan's arsenal. Ababeel is claimed to be a development of the Shaheen-III airframe and solid-fuel motors, but with a payload fairing of enlarged diameter, "to house the MIRV carrier bus".⁶ The second stage is also lengthened. Independent Indian assessments suggest partial success in use of a single warhead missile for re-entry purposes but work is proceeding apace for perfecting multiple warhead re-entries.

In addition to MIRV-ing, Pakistan is likely to marginally, but not significantly, increase the number of its delivery vehicles and transporter-erector launchers.

The 'hare' option is fraught with obstacles and risks for Pakistan at a time when it wants to be recognized as a legitimate, normal, *de facto* nuclear power like India. Islamabad is struggling to counter India's efforts to prevent Pakistan's entry into the NSG. It is trying to project an image as a responsible nuclear power, making significant efforts on nuclear security and safety while tightening export and custodial controls. Pakistan's utmost desire is to be treated on par with India. Islamabad would rather avoid spending additional sums for Pakistan's nuclear program in addition to avoiding additional challenges to its nuclear legitimacy. Further, this option requires significant help from China that is not assured — especially during periods of crisis — given China's evolving strategic outlook and priorities in the world.

Conversely, if Pakistan seems unlikely to gain legitimacy via NSG membership, and if it is unlikely to secure equal treatment to India as a 'mainstreamed' nuclear state, then there would be no incentive for self-restraint if India were to embrace MIRVs and BMD. Pakistan's strategy would also be contingent on other variables, such as budget constraints, technological challenges, and the willingness of friends (China) to extend financial or technical cooperation.⁷

A third test of Shaheen III missile carried out on Jan 28, 2018 was a total failure. The earlier two tests had been successful, with full range of 2,750 km being achieved and

the circular error probability was also okay. This time, at the Windar testing range near Sonmiani, Baluchistan, the missile exploded into fireballs soon after the launch – the then Prime Minister, Shahid Khaqan Abbasi had to be escorted to safety from the VIP visitors' camp which had been set up to witness the launch at the testing range. The technical reasons for the failure could not be known – it is possible they were testing the liquid propellant aspect for the engine to be used in the final stage of launch, or for the dummy warhead mating. The Inter-Services Public Relations (ISPR) maintained complete silence afterwards. A meeting of experts was held at Karachi under supervision of SPD afterwards to determine the cause of failure. The Windar range has been closed down for repairs at site till May, '18. Despite this failure, Pakistan has not given up preparations for launch of Shaheen IV missile, which will have a range of 3,500 km using solid propellant fuel.

Civil Military Dissonance in Nuclear Context

Though Pakistan's nuclear scientists have been lionized in the past, disclosures regarding Dr. A.Q. Khan's clandestine nuclear component sales through Scomi Precision Factories of Syed Abu Tahir Bukhari in Malaysia and UAE created a major blot on their reputation. The military leadership under President Musharraf tried to distance itself from any foreknowledge of these dealings. This strained credulity of the Pakistani nuclear scientists' community, especially after nine of Dr A.Q. Khan's top team of scientists and personal staff working at the KRL were arrested in Nov, 2003 and Jan, 2004 - Dr. Mohammad Farooq (uncle of Syed Abu Taher Bukhari), Brig Sajawal (ret'd), Maj Islamul Haq (ret'd), Dr. Badar Habib, Dr. Yasin Chohan, Dr. Saeed Ahmed, Dr. Abdul Majid, Dr. Zubair Khan and technician Shameem. Their families were placed under surveillance of the Inter-Services Intelligence (ISI) even as they sought legal remedies (*habeus corpus*). The scientists categorically let Western newsmen and Human Rights NGOs know, through some Pakistani intermediaries, that the attempt of the Pakistani military leadership to pose ignorance of these sales to North Korea, Libya and Iran was palpably untrue. They contended that Gen Aslam Beg and even Musharraf definitely had prior knowledge or may have given concurrence.⁸

Though Gen Kidwai introduced Personal Reliability Programs in all nuclear related establishments afterwards, this intense dislike of the military within Pakistan's Nuclear Scientists community is unlikely to have diminished, especially as the SPD leadership at its top echelons is almost entirely headed by army generals. This distrust permeated families of the arrested scientists. Some Western journalists tried to exploit this resentment in quest of hard inputs but their efforts were scuttled by effective deterrent counter-measures by the ISI.

References:

1. Agha Shahi, Zulfiqar Khan and Abdul Sattar, 'Securing Nuclear Peace,' *The News International*, Karachi, October 5, 1999; also cited by Brig(retired) Naeem Salik : *The Evolution of Pakistan's Nuclear Doctrine: Carnegie Endowment for International peace*, June, 2016.
2. Bruno Tertrais, *Pakistan's Nuclear Program: A net assessment*; No 04/2012-recherches & documents; June 13, 2012, https://www.files.ethz.ch/isn/151278/RD_201204.pdf

3. Feroz H.Khan, *Eating Grass: The making of the Pakistani Bomb*, Stanford University Press, California, 2012.
4. Peter Lavoy: Carnegie Endowment for International Peace: A conversation with Gen Khalid Kidwai: March 23, 2015.
5. Bruno Tertrais, Pakistan's Nuclear Program: A net assessment; No 04/2012 (paras 2-5 above)- recherches & documents; June 13, 2012, https://www.files.ethz.ch/isn/151278/RD_201204.pdf
6. Maj Gen Asif Ghafoor, 'Pak successfully conducted first flight test of SSM ABABEEL, Rg 2200 Km.' [[@OfficialDGISPR](#)], January 24, 2017. (Twitter Post).
7. Feroz H.Khan and Mansoor Ahmed, 'Pakistan, MIRVs, and Counterforce Targeting', in Michael Krepon, Travis Wheeler and Shane Mason (eds.), 'The Lure & Pitfalls of MIRV, Stimson Center, Washington DC, 2016. https://www.stimson.org/sites/default/files/file-attachments/Lure_and_Pitfalls_of_MIRVs.pdf
8. Adrian Levy & Catherine Scott-Clark: *Nuclear Deception*, Walker, New York, 2008.

Image Source:

- https://nationalinterest.org/sites/default/files/styles/desktop__1486_x_614/public/main_images/missile_13.jpg?itok=6Eso8N0U

About the VIVEKANANDA INTERNATIONAL FOUNDATION

The Vivekananda International Foundation is an independent non-partisan institution that conducts research and analysis on domestic and international issues, and offers a platform for dialogue and conflict resolution. Some of India's leading practitioners from the fields of security, military, diplomacy, government, academia and media have come together to generate ideas and stimulate action on national security issues.

The defining feature of VIF lies in its provision of core institutional support which enables the organisation to be flexible in its approach and proactive in changing circumstances, with a long-term focus on India's strategic, developmental and civilisational interests. The VIF aims to channelise fresh insights and decades of experience harnessed from its faculty into fostering actionable ideas for the nation's stakeholders.

Since its inception, VIF has pursued quality research and scholarship and made efforts to highlight issues in governance, and strengthen national security. This is being actualised through numerous activities like seminars, round tables, interactive dialogues, Vimarsh (public discourse), conferences and briefings. The publications of VIF form lasting deliverables of VIF's aspiration to impact on the prevailing discourse on issues concerning India's national interest.



VIVEKANANDA INTERNATIONAL FOUNDATION

3, San Martin Marg, Chanakyapuri, New Delhi – 110021

Phone: +91-11-24121764, 24106698

Email: info@vifindia.org, Website: <https://www.vifindia.org>

Follow us on [twitter@vifindia](https://twitter.com/vifindia)