CHAPTER V
NUCLEAR PAKISTAN AND INDIA'S SECURITY

According to broad estimates, Pakistan’s nuclear arsenal comprises approximately 60 nuclear warheads and Islamabad continues fissile material production for weapons, and is adding to its weapons production facilities and delivery vehicles. Pakistan reportedly stores its warheads unassembled with the fissile core separate from non-nuclear explosives, and these are stored separately from their delivery vehicles. Pakistan does not have a stated nuclear policy, but its ‘minimum credible deterrent’ is thought to be primarily a deterrent to Indian military action. Command and control structures have been dramatically overhauled since 11 September 2001 and export controls and personnel security programmes have been put in place since the 2004 revelations about Pakistan’s top nuclear scientists, A.Q. Khan’s international proliferation network. Pakistan has reportedly taken a number of steps to prevent further proliferation of nuclear-related technologies and materials and improve its nuclear security.

Pakistan reportedly embarked on a nuclear weapon programme in the early 1970s after its defeat and break up in the Indo-
Bangladesh war of 1971. India’s peaceful nuclear explosion (PNE) in May 1974 provided further impetus to Pakistan’s quest for nuclear weapons. Islamabad regards nuclear weapons as essential to safeguard the South Asian balance of power and offset its conventional inferiority and lack of strategic depth against India. Pakistan had embarked upon the uranium enrichment route from the mid-1970s onwards to acquiring a nuclear weapons capability and by the mid-1980s; it had acquired a clandestine uranium enrichment facility. As early as 1989-1990, the United States concluded that Islamabad had acquired the capability to assemble a first-generation nuclear device.

Currently, Pakistan is believed to have stockpiled approximately 580-800kg of highly enriched uranium (HEU), which is sufficient to build 30-50 fission bombs. In 1998, Pakistan commissioned the Khushab research reactor, which is capable of yielding 10-15kg of weapons-grade plutonium annually. China has reportedly helped Pakistan by providing nuclear-related materials, scientific expertise, and technical assistance. Islamabad conducted nuclear tests in May 1998, shortly after India conducted its own weapon tests and declared itself a nuclear weapon state. Pakistan’s nuclear programme is India-specific because Islamabad is always interested
in having strategic superiority or parity vis-à-vis India in conventional as well as nuclear weapons, including missiles. In order to comprehend India’s security concerns from nuclear Pakistan, it is important to briefly examine Pakistan’s missile programme, its nuclear weapons’ capabilities, command and control and other related issues.

**Pakistan’s Missile Programme**

Pakistan commenced the pursuit of its ballistic missile programme in the early 1980s as part of an effort to develop a deliverable nuclear strike capability against India. According to one opinion, three major factors; namely the easy availability of the Chinese missiles and missile-related technologies, its inability to acquire the delivery of all its F-16 fighters from the United States and the success of India’s missile development programme proved to be the main reasons for Pakistan’s missile acquisitions. Although Pakistan's initial efforts appeared experimental, the scale of Islamabad's current programme obviously reflects a strategic requirement to build a diversified and survivable nuclear deterrent capable of targeting the bulk of the Indian landmass. However unlike India, whose development of missile-based power projection
capabilities reflects both regional and extra-regional security concerns, Pakistan's ballistic missile effort is largely Indo-centric.

Islamabad's present nuclear dyad comprises nuclear-capable combat aircraft and solid-motor and liquid-engine short-range ballistic missiles (SRBM). The F-16 combat aircraft obtained from the United States during the 1980s were probably the earliest delivery systems in Pakistan's nuclear inventory.² Combat aircraft are operationally more reliable than ballistic missiles. In comparison to Pakistan's current inventory of SRBMs, they also offer other advantages such as greater payload and combat radius. However, despite these existing advantages, land-based ballistic missiles are emerging as the mainstay of Pakistan's nuclear strike force.

There are three main reasons for the growing dominance of the missile leg in the emerging Pakistani nuclear dyad. First, Pakistan has been unable to augment its fleet of modern combat aircraft due to the past U.S. policy of military and economic sanctions designed to arrest and slow down Pakistan's nuclear weapons program. Although Pakistan is now a U.S. ally in the global war on terrorism and no longer the target of proliferation sanctions, the United States has been hesitant to supply Pakistan with advanced combat aircraft as it would invariably augment the latter's nuclear strike capability.
Second, the country's overall poor economic performance has prevented the Pakistan Air Force (PAF) from undertaking major fleet expansion and modernization efforts by making the switch from U.S. to European and Russian suppliers. During the late 1990s, especially after India's and Pakistan's May 1998 tests, U.S. pressure combined with instability concerns in Pakistan prevented external suppliers from selling high-tech nuclear capable combat aircraft to Islamabad. Finally, the unfolding and proposed advances in India's air combat, air-defense, and long-range reconnaissance capabilities are channeling Pakistani investments into a ballistic missile-based capability for which India has no defense at present.

Since the late 1980s and early 1990s, Pakistan has invested in both solid-motor and liquid-engine ballistic missile programs with Chinese and North Korean assistance, respectively. Pakistan's reasons for investing in both solid- and liquid-propulsion technologies remain unclear. However, analysts speculate the rival programs could be the result of intra-institutional rivalry and one-upmanship between the Pakistan Atomic Energy Commission (PAEC) and Khan Research Laboratories (KRL), which have historically feuded over control and credits for Pakistan nuclear weapons-related efforts. This rivalry may have also carried over to the development
of nuclear delivery systems. Moreover, the diversification effort could also be viewed as a proactive attempt on the part of Pakistan's military to factor in possible bottlenecks or failure along one technological front, as well as an attempt to diversify suppliers in the face of U.S. efforts to restrict the international trade in weapons of mass destruction-capable ballistic and cruise missile technologies.

While Pakistan's current fleet of missiles is restricted to SRBMs, the National Defence Complex (NDC) and KRL are actively pursuing programmes to develop medium-range ballistic missiles. Most analysts believe that the Pakistani military has achieved or is close to achieving the capability to mount nuclear warheads on its current ballistic missile fleet. Some reports even go so far as to suggest that Pakistan may be further along than India on the path to achieving nuclear operability.\(^4\)

Pakistan underscored its commitment to strengthening its military capability against India by conducting two ballistic missile tests in quick succession in February and March 2007, even as the discussions on nuclear confidence building measures and anti-terrorism initiatives between New Delhi and Islamabad continued. The Pakistani tests came at a time when India had also sought to
strengthen its strategic capabilities vis-à-vis Pakistan. Although Pakistan’s tests involved ballistic missiles, both Islamabad and New Delhi are also developing powerful cruise missiles, (e.g., the Pakistani Babur and the Indian Brahmos), adding a further dimension to their strategic competition.

**External Dependencies**

When Pakistan embarked upon its programme of acquisition of ballistic missiles in the early 1980s, it lacked the technological resources, industrial infrastructure, and human capital to undertake the development of such missiles indigenously. After a brief and unsuccessful attempt in the 1980s to develop solid-fueled short-range ballistic missiles most likely derived from sounding rocket technology obtained from France, Pakistan turned to China and North Korea for assistance.

In the early 1990s, the NDC, a subsidiary of the PAEC, acquired complete though unassembled M-11s and possibly an undisclosed number of M-9 SRBMs from Beijing. Chinese assistance extended to training Pakistani missile crews in the assembly, maintenance, and simulated launches of the missiles. During the mid-1990s, China apparently transferred an entire production line for M-11s and possibly M-9s to the NDC. Chinese assistance most likely
encompassed equipment and technology transfers in the areas of solid-fuel propellants, manufacture of airframes, re-entry thermal protection materials, post-boost vehicles, guidance and control, missile computers, integration of warheads, and the manufacture of transporter-erector launchers (TELs) for the missiles.

Although China subsequently agreed to abide by Missile Technology Control Regime (MTCR) guidelines under U.S. pressure, it has interpreted those guidelines narrowly. Beijing has apparently agreed not to supply complete ground-to-ground missiles, which would not cover air-launched cruise missiles. And it does not abide by the MTCR's key technological annex. Indeed, the U.S. Central Intelligence Agency (CIA) has alleged that Chinese missile-related assistance to Pakistan increased in the wake of the latter's May 1998 nuclear tests, and that such assistance is critical for the success of Pakistan's medium-range, solid-fueled ballistic missile program.\(^5\)

There exists difference of opinion among the American intelligence agencies with regard to whether Pakistan can produce short-range, solid-fueled ballistic missiles indigenously, or whether it remains dependent on support from Chinese entities. According to some analysts, the NDC's Fatehjung missile plant built with Chinese
assistance in the mid-1990s, is a ‘soup-to-nuts’ facility that can turn out replicas of the M-11s. However, other analysts believe that while the NDC plant can produce most parts and sub-systems of the Chinese SRBMs, Pakistan is still dependent on China for specialty materials, guidance systems, and other critical missile components.⁶

Similarly, Pakistan has relied extensively on North Korea for its liquid-engine ballistic missile program. North Korea is alleged to have supplied Pakistan with 12-25 operational Nodong ballistic missiles and their TEL vehicles.⁷ North Korean assistance has also included technical support, including missile launch and telemetry crews. Analysts speculate that North Korea may have also transferred an entire production line of the Nodong ballistic missiles to KRL. After allegations surfaced in U.S. media that KRL had assisted North Korea with its centrifuge-based uranium enrichment programme in exchange for Nodong missiles, Pakistani President Pervez Musharraf stated that defense cooperation between the two countries had ended.⁸ However, defence experts fee that it will take Pakistan at least a decade or more to master and produce liquid engines indigenously. Until then, Pakistan will remain dependent on North Korea for importing complete liquid engines, or at least their major component parts, as well as the liquid propellants to fuel its
missiles. Pakistan’s nuclear-capable ballistic missiles are shown in the following Table 5.1.

Table 5.1

Pakistan's Nuclear Capable Ballistic Missiles

<table>
<thead>
<tr>
<th>Type</th>
<th>Launchers</th>
<th>First Tested</th>
<th>Range kms</th>
<th>Payload kg</th>
<th>Technical Details</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-11 or Hatf-II</td>
<td>30-84?</td>
<td>Mid 1990 (Chinese Test)</td>
<td>280</td>
<td>500-800</td>
<td>Two stage solid fuel</td>
<td>30+ stored in Sargodha Air Force Base near Lahore.</td>
</tr>
<tr>
<td>M-9 or Hatf-III</td>
<td>–</td>
<td>July 1997</td>
<td>600-800</td>
<td>500</td>
<td>Two stage solid fuel</td>
<td>Many consider Hatf-III and Shaheen-I are one and the same missile.</td>
</tr>
<tr>
<td>Shaheen-I or Hatf-IV</td>
<td>–</td>
<td>April 1999</td>
<td>600-750</td>
<td>1,000</td>
<td>Solid fuel</td>
<td>Reported to be based on No Dong.</td>
</tr>
<tr>
<td>Shaheen-II or Hatf-VI</td>
<td>In development</td>
<td>Demonstrated in Pakistan Day Parade on 23rd March 2000</td>
<td>2,000</td>
<td>1,000</td>
<td>Two stage solid fuel, road mobile missile</td>
<td>–</td>
</tr>
<tr>
<td>Ghauri or Hatf-V</td>
<td>–</td>
<td>April 1998</td>
<td>1,300</td>
<td>700</td>
<td>Single stage, liquid fuel, and road mobile missile.</td>
<td>Reported to be based on No Dong. Tested to 1,100 kms.</td>
</tr>
<tr>
<td>Ghauri-II</td>
<td>In development</td>
<td>April 1999</td>
<td>1,500-2,000</td>
<td>700</td>
<td>Liquid fuel</td>
<td>Tested to 1,165 kms.</td>
</tr>
<tr>
<td>Tipu</td>
<td>–</td>
<td>–</td>
<td>4,500?</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Ghaznavi</td>
<td>–</td>
<td>–</td>
<td>3,000</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>
Sources:
2. "Pakistan's missiles" at: www.fas.org/nuke/guide/pakistan/missile/htm

It can be evidenced from Table 5.1 that Pakistan has developed various variants of *Hatf* class of missiles which inter alia, include *Hatf*-I, *Hatf*-II, a Pakistani version of *M*-11 missile, *Hatf*-III or *M*-9, *Hatf*-IV renamed as *Shaheen*-I, *Hatf*-V renamed as *Ghauri*, *Hatf*-VI renamed as *Shaheen*-II and *Hatf*-VII renamed as *Ghauri*-II. Besides, Pakistan is also engaged in preparing other versions of missiles like *Tipu* and *Ghaznavi*. These various verities of missiles available with Pakistan are briefly described here along with period of testing, launchers, payload capacity and range. This description is envisaged under two broad subheads – Solid Motor missiles and Liquid Engine.

**Solid-Motor Missiles**

**Hatf-1, -1A, & -2**

Pakistan embarked on a ballistic missile programme with the launch of the *Hatf* class of missiles in the early or mid-1980s. The
Space and Upper Atmosphere Research Commission (SUPARCO), Pakistan's primary civilian space agency, undertook the Hatf programme. The existence of the missiles was publicly disclosed by Pakistan's Chief of Army Staff General Mirza Aslam Beg in February 1989.10

The Hatf-1 is a single-stage, solid-motor missile capable of delivering a 500kg payload over a maximum range of 60-80km.11 A subsequent version, the Hatf-1A, was tested in February 2000 and is believed to have an extended range of 100km.12 The Hatf-2 is a two-stage, solid-motor missile that reportedly has a throw-weight of 500kg over a maximum range of 290-300km. The Hatf-2 is sometimes also referred to as the Shadoz and Abdali, nomenclatures that cause considerable confusion.13 The Hatf-2 is most likely a modified version of the Hatf-1 composed of the second stage of the Hatf-1 with a new boost motor added to the first stage.14

Construed in a broad spectrum, all versions of the Hatf, -1, -1A, and -2, are capable of delivering conventional high-explosive warheads. However, it is unclear if the missiles have been modified for nuclear delivery. Some strategic analysts have speculated that the Hatf-1, -1A, and -2 use an inertial guidance system. But some
American analysts have contended that these versions of Hatf missile are essentially inaccurate battlefield rockets.\textsuperscript{15} Although the Hatf-1 was declared operational in 1992 and the -IA and -2 versions operational by the mid-1990s, the missiles do not appear to have been manufactured in large numbers.\textsuperscript{16} Neither do they appear to be in operational service with the Pakistan Army. The Pakistani Army flight-tested a Hatf-1A in February 2000; it also conducted two flight-tests of the Hatf-2 version in May 2002 and March 2003. These tests suggest that the Pakistan Army probably has a limited number of these systems in its inventory. However, the absence of large-scale manufacturing or an extended flight-test program indicates that the Hatf-1, -1A, and -2 were interim contingency programs, which were then superseded by the Ghaznavi, Shaheen, and Ghauri ballistic missile programs, with Chinese and North Korean assistance.

\textbf{Hatf-III/Ghaznavi/M-11}

The Chinese DF-11/M-11 (NATO designation CSS-7), which goes by the dual nomenclatures Hatf-III and Ghaznavi in Pakistan, is a short-range, solid-propellant, road mobile, single-warhead ballistic missile. China began development work on the M-11 in the mid-
1980s; the first flight-test of the missile is believed to have occurred in 1990, and it probably entered operational service in 1992. The M-11 has a throw-weight of 800kg over a maximum range of 280km. By trading payload weight for increased range, the M-11 could deliver a 500kg payload over a range of 300km.

According to one report, control in this system of missile during the boost phase is probably exercised through ‘vanes in the exhaust’ or ‘small vernier motors with an inertial platform for guidance.’ It is also believed that ‘the warhead assembly separates during flight’ and that there are four small fins mounted at the rear of the warhead section. However, it is not known if these four fins move, or are simply stabilizers. Some reports suggest that the missile has a terminal guidance system; the "separating warhead section has a miniature propulsion system to correct the attitude before re-entry, as well as adjusting the terminal trajectory."\(^{17}\)

In the late 1980s, Pakistan apparently concluded an agreement with China to procure an undisclosed number of M-11 ballistic missile systems. The presence of an M-11 training missile in Pakistan with an accompanying TEL vehicle was reported sometime during 1990-1991, by the U.S. intelligence, which indicated that operational missile systems were likely to follow.\(^{18}\) Beginning in
1992, U.S. intelligence agencies tracked shipments of at least 30 M-11 ballistic missiles from China through the Pakistani port city of Karachi. Subsequently, China resorted to transferring components and subsystems so that the missiles could be assembled in Pakistan.\textsuperscript{19} Around the mid-1990s, China also built a turnkey missile facility for the NDC at Fatehjung in Pakistan side of Punjab, which is believed to be capable of building either complete missiles or most components and sub-systems of the M-11.

Broad estimates of Pakistan's M-11 inventory range from approximately 30-84 missiles, of which at least 30 missiles are believed to be stored at the Pakistan Air Force base at Sargodha in Central Punjab. Satellite imagery of the base has revealed the existence of shelters for missile crates and their mobile launchers, missile maintenance areas, and missile crew quarters.\textsuperscript{20} The missiles in Pakistan's inventory are believed to be nuclear-capable.\textsuperscript{21} In October 2003, the Pakistan Army conducted a launch of the Hatf-III/Ghaznavi to validate the missile's various design parameters.\textsuperscript{22} Subsequent to this test, in February 2004, Pakistan formally inducted the missiles into the Army's Strategic Forces Command.\textsuperscript{23}

\textbf{Hatf-IV/Shaheen-I/M-9}
According to broad estimates, Pakistan had reportedly acquired an undisclosed number of M-9 ballistic missiles from China in the mid-1990s, although open source reports alleging M-9 transfers from China to Pakistan date back to the early 1990s.\textsuperscript{24}

However, Pakistan first announced the test of an 800km-range ballistic missile in July 1997,\textsuperscript{25} which was subsequently designated \textit{Hafıf-IV} or \textit{Shaheen-I} and was publicly displayed for the first time during the National Day parade in March 1999. It was subsequently tested in April 1999, October 2002, and October 2003, respectively. The photographs of the missile displayed during the parade, and those of the tested version, along with its disclosed range and payload closely match the parameters of the Chinese M-9 class missile.

The DF-15/M-9 (NATO designation CSS-6) is a single-stage, solid-propellant, road mobile, short-range ballistic missile. It can reportedly deliver a 500kg warhead over a range of 600km; other reports suggest that with a smaller warhead, the missile could have a range of 800km. Pakistani government statements suggest that the missiles in Pakistan's possession have a maximum range of 700-800km, but the missile's payload capacity at that range remains unclear. Like the M-11 missiles, control during boost phase is
exercised through ‘exhaust vanes or small scale vernier motors.’ The M-9 has a reported 300m circular error probability (CEP) and is believed to employ some form of terminal guidance. Defence experts suggest that the missile has a 'strapdown inertial guidance system with an onboard digital computer,’ which enables rapid targeting and eliminates need for wind corrections prior to launch. Unconfirmed reports suggest that the "separating warhead section has a miniature propulsion system to correct the attitude before re-entry, as well as adjusting the terminal trajectory."\textsuperscript{26}

Pakistan is believed to have modified its missiles to make them nuclear capable.\textsuperscript{27} The total number of M-9s in Pakistan's inventory remains unknown. In March 2003, the Hatf-IV/Shaheen-I was formally inducted into the Pakistan Army\textsuperscript{28}; however, the continuation of flight-tests as late as October 2003\textsuperscript{29} have raised doubts whether all development concerns have been resolved.

**Hatf-VI/Shaheen-II/M-18?**

Pakistan is reportedly also developing a 700-2,500km-range missile dubbed as the *Shaheen-II*, about which little is known.\textsuperscript{30} Mock-ups of the missile displayed during the National Day celebrations in March 2003 suggest that it is a two-stage, solid-
motor, road mobile system, transported on a 12-wheel TEL vehicle. Defence experts speculate that the Shaheen-II is possibly a two-stage version of the M-9, or more likely a copy of the M-18, which was publicly displayed at an exhibition in Beijing in either 1987 or 1988. The M-18 was originally advertised as a two-stage system with a payload capacity of 400-500kg over a range of 1,000km.\(^{31}\)

According to American intelligence sources, Pakistan remains heavily reliant on external assistance for the Shaheen-II programme and that China is actively assisting Pakistan through the supply of missile components, specialty materials, dual-use items, and other miscellaneous forms of technical assistance.\(^{32}\) Development flight tests of the Shaheen-II commenced in March 2004 when a 26-ton missile was launched from Pakistan's Somiani Flight Test Range on the Arabian Sea.\(^{33}\) According to one report, the missile covered a distance of 1,800km during the test. Development flight-tests were continued during 2005-2006.

**Liquid Engine Missiles**

*Hatf-V/Ghauri-I/Nodong*

Pakistan's liquid-engine ballistic missile program is spearheaded by KRL in collaboration with North Korea. Cooperation in the area of
ballistic missiles between the two countries dates back to the early 1990s. In the aftermath of the finalization of Nodong deal between North Korea and Pakistan in December 1995, Pakistan flight-tested a Nodong, which was rechristened the Ghauri, in April 1998.\textsuperscript{34} and since then, Pakistan has conducted flight-tests of the Ghauri-I/Nodong on two other occasions: in April 1999 and May 2002.

The Ghauri-I/Nodong missile's propulsion system is a liquid rocket engine that uses a storable combination of inhibited red fuming nitric acid and kerosene. During the boost phase, four jet vanes are used for thrust vector control. It is also believed that the missile uses three body-mounted gyros for attitude and lateral acceleration control. In addition, ‘a pendulum integration gyro assembly serves for speed control.’ The Nodong's range and throw weight has been variously estimated between 800-1,500km and 700-1,300kg, respectively.\textsuperscript{35} The Nodong is nuclear capable and can also deliver high-explosive conventional warheads. However, it is unclear whether KRL has mastered the capability to mount nuclear warheads on the missiles acquired from North Korea. Estimates of Pakistan's Ghauri inventory remain unknown, although information available in open sources suggests that Pakistan may have obtained between 12-25 missile systems from North Korea. Speculation also
persists that North Korea may have transferred an entire production line for Nodong ballistic missiles to Pakistan.

According to media reports, Pakistan has plans for longer-range versions of the *Ghauri*: the *Ghauri-II* and possibly *Ghauri-III*. A more powerful engine for longer-range versions of the Ghauri is under development.\textsuperscript{36} These reports also suggest that the *Ghauri-II* will have a range of 1,700km; other statements suggest that the *Ghauri-III* will have a strike-range of 2,000-3,500km.\textsuperscript{37} However, the details of the programmes have remained unknown and unlike the proposed *Shaheen-II*, no mock-ups have been displayed in public as well. Nevertheless, some experts speculate that the *Ghauri-II* and -III may either be a *Taepodong* or draw extensively on components and technologies from the latter programme.

In February 2004, former Pakistani Prime Minister Benazir Bhutto admitted that Pakistan obtained missile technology from North Korea in *lieu* of cash,\textsuperscript{38} whereas the Pakistan's outgoing President Pervez Musharraf vehemently denied that Pakistan obtained ballistic missiles from North Korea; insisting that Pakistan purchased surface-to-air missiles instead.\textsuperscript{39} In March 2003, the United States imposed sanctions on KRL and North Korea's
Changgwang Sinyong Corporation for engaging in proliferation activities.⁴⁰

**Pakistan’s Nuclear Weapons Programme**

Pakistan’s nuclear energy program dates back to the 1950s, but it was the loss of East Pakistan (now Bangladesh) during the 1971 Indo-Pakistan war that reportedly triggered a political decision in January 1972 to begin a secret nuclear weapons programme. Defence against India is said to be the primary motivation for Pakistan’s nuclear deterrent. Peaceful nuclear explosion (PNE) by India in May 1974 provided further impetus to Pakistan’s quest for nuclear weapons programme.

Pakistan’s path to the bomb was through uranium enrichment technology, mastered by the mid-1980s. Pakistan gained technology from many sources. This extensive assistance is reported to have included, among other things, uranium enrichment technology from Europe, blueprints for a small nuclear weapon from China, and missile technology from China. In 1989, the United States learned that Pakistan had assembled a nuclear warhead, which then led to a cut-off in military and financial aid under the Pressler Amendment.⁴¹
When India conducted nuclear weapon tests on 12 May 1998, Pakistan’s government responded two weeks later on May 28 and May 30 with six tests at the Chagai Hills test site in western Pakistan. Test yields were about 10 kilotons and 5 kilotons, according to seismic analysis. The United States imposed additional sanctions after the tests on both India and Pakistan, which were lifted in the aftermath of the 11th September 2001 terrorist attacks. Some observers estimate that Pakistan has enough nuclear material (highly enriched uranium and a small amount of plutonium) for about 60 nuclear weapons. Pakistan’s nuclear warheads use an implosion design with a solid core of highly enriched uranium (HEU), approximately 15-20 kg per warhead. Pakistan reportedly continues to produce highly-enriched uranium for weapons at a rate of at least 100 kg per year.

Pakistan has also pursued plutonium-based warheads since the 1990s and continues to produce plutonium for weapons. Pakistan has received Chinese assistance for its plutonium programme. The 40-50 megawatt heavy water Khushab plutonium production reactor has been operating since 1998. A second heavy water reactor is being built at Khushab, which will at least double Pakistan’s plutonium production capacity.
complex also includes the 300-megawatt reactor at Chasma, a reprocessing plant at Chasma, fuel fabrication plant, tritium production facility, etc.\textsuperscript{47} The continued expansion of the complex and production of weapons materials indicates plans to increase its nuclear weapons arsenal in the near future. Pakistan may be partially responding to India’s ambitious plans to build a nuclear triad.\textsuperscript{48}

**Delivery Vehicles**

Pakistan has two types of delivery vehicles for nuclear weapons: aircraft under the Pakistan Air Force and surface-to-surface missiles under the Pakistan Army. Pakistan could deliver its nuclear weapons using F-16s purchased from the United States, provided modifications are made. It is widely believed that Pakistan has made modifications to the F-16s previously sold to them. Concerns have been raised about the impact of these sales on the strategic balance in South Asia.\textsuperscript{49} However, Washington maintains that the sale of additional F-16s to Pakistan will not alter the regional balance of power.\textsuperscript{50} The contract for provision of an additional 36 aircraft was signed on September 30, 2006, but it is unclear what portion of the fleet will be capable of a nuclear mission. Mirage III and V aircraft
could also be used, although would have limited range. A-5’s may have been modified to carry a nuclear payload.\textsuperscript{51}

After India’s first test of its \textit{Prithvi} ballistic missile in 1988, Pakistan jumpstarted its own missile programme. Three types of ballistic missiles are thought to be nuclear-capable: the solid fuel \textit{Hatf-III} (\textit{Ghaznavi}) and \textit{Hatf-IV} (\textit{Shaheen}) with a range of 100-290 and 200-650 km respectively; and the medium-range \textit{Hatf-V} (\textit{Ghauri}) with a 1200 km range. The \textit{Hatf-VI} (\textit{Shaheen-2}) is under development.\textsuperscript{52} Reports also indicate that Pakistan may be developing a nuclear-capable cruise missile, the \textit{Hatf-7} (\textit{Babur}), with ground, sea and air-launched versions. According to A.Q. Khan, former head of Pakistan’s Khan Research Laboratories, only the medium-range \textit{Ghauri} missiles would be usable in a nuclear exchange (given fallout effects for Pakistan of shorter-range missiles). Other observers view the 30 to 50 \textit{Hatf-II} short-range (300km) missiles (modified Chinese M-11s) as potential delivery vehicles for nuclear weapons.

According to broad estimates, \textit{Ghauri} missiles (1350 and 2300km), which reportedly are based on the North Korean \textit{No-Dong} and \textit{Taepo-Dong-1}, are capable of reaching New Delhi with large payloads.\textsuperscript{53} Pakistan continues to carry out ballistic missile tests, but
notifies India in advance in accordance with the bilateral missile pre-notification pact of October 2005.\textsuperscript{54}

**Pakistan’s Nuclear Doctrine**

Pakistan thus far has not made its nuclear doctrine public and it remains undeclared, and will probably remain so, but prominent officials and analysts have offered insights concerning its basic tenets.\textsuperscript{55} They have indicated that Pakistan’s posture is designed to preserve territorial integrity against Indian attack, prevent military escalation, and counter its main rival’s conventional superiority. ‘Minimum credible nuclear deterrence’ is the guiding principle.\textsuperscript{56} Statements of high level officials point to four policy objectives for Pakistan’s nuclear weapons: deter all forms of external aggression; deter through a combination of conventional and strategic forces; deter counterforce strategies by securing strategic assets and threatening nuclear retaliation; and stabilize strategic deterrence in South Asia.\textsuperscript{57}

Pakistani officials state that they have already determined the arsenal size needed for a minimum nuclear deterrent and they will not engage in an arms race with India. Pakistan has also pledged no-first-use against non-nuclear-weapon states, but has not ruled
out first-use against a nuclear-armed aggressor that attacks Pakistan — for example, India. Defence observers feel that such an ambiguity serves to maintain deterrence against India’s conventional superiority. Others argue that keeping the first-use option against India allows Pakistan to conduct sub-conventional operations while effectively deterring India at the strategic level.58 Pakistan has reportedly addressed issues of survivability through second strike capability, possible hard and deeply buried storage and launch facilities, road-mobile missiles, air defenses around strategic sites, and concealment measures.59

**Command and Control**

Pakistan’s command and control over its nuclear weapons is compartmentalized and includes strict operational security. Pakistan’s command and control system is based on “C4I2SR” (command, control, communication, computers, intelligence, information, surveillance and reconnaissance). The system has three components — the National Command Authority (NCA), the Strategic Plans Division (SPD), and the Strategic Forces Commands.60 The NCA was created in 2000 and for the first time the nuclear programme was under military control with oversight. The SPD acts
as the secretariat for the NCA and coordinates with the strategic forces commands.

The Army, Air Force, and Navy each have their respective strategic force command, but operational control remains with the NCA. The authority to launch a nuclear strike requires consensus within the NCA. The NCA is a 10-member body, which comprises the President, Prime Minister, the chairman of the joint chiefs of staff, the Ministers of Defence, Interior and Finance, the Director-General of the Strategic Plans Division, and the Commanders of the Army, Air Force and Navy. The NCA Chairman, who is the President of Pakistan, casts the final vote.

On December 13, 2007, the then President of Pakistan, Pervez Musharraf formalized these authorities and structure in the “National Command Authority Ordinance, 2007.” The NCA, established earlier by administrative order, now has a legal basis. It outlines punishable offenses related to breach of confidentiality or leakage of “secured information,” gives the SPD authority to investigate suspicious conduct, states that punishment can be up to 25 years imprisonment, and applies to both serving and retired personnel, including military personnel, notwithstanding any other laws. As a result, Pakistani authorities say that the Ordinance should
strengthen their control over strategic organizations and their personnel.\textsuperscript{63} 

**Security Concerns**

Security concerns emanating from Pakistan’s nuclear weapons can be specified into three main categories – (i) Global Security Concerns; (ii) Proliferation Prospects; and (iii) India’s Security Concerns. These are briefly analyzed here.

**(i) Global Security Concerns**

Pakistan’s nuclear weapons are reportedly stored unassembled, with the fissile core separated from the non-nuclear explosives. These components are stored separately from delivery vehicles. A Department of Defense report says that Pakistan can probably assemble the weapons fairly quickly.\textsuperscript{64} Nevertheless, separate storage may provide a layer of protection against accidental launch or prevent theft of an assembled weapon.\textsuperscript{65}

In the aftermath of the tragic terrorist attacks of 9/11, as the United States prepared to launch an attack on the Afghan Taliban, President Musharraf reportedly ordered Pakistan’s nuclear arsenal be redeployed to “at least six secret new locations.”\textsuperscript{66} This action came at a time of uncertainly about the future of the region, including the
direction of U.S.-Pakistan relations. In President Musharraf’s speech justifying his decision to assist the United States against the Taliban, he cited protection of Pakistan’s nuclear and missile assets as one of the reasons for the dramatic policy shift.67 Pakistan’s leadership was uncertain whether the U.S. would decide to conduct military strikes against Pakistan’s nuclear assets if it did not do so.

These events, in tandem with the 1999 Kargil crisis, the 2002 conflict with India at the Line of Control and revelations about the A.Q. Khan proliferation network, inspired a variety of reforms to secure the nuclear complex. Risk of nuclear war in South Asia ran high in the 1999 Kargil crisis, when the Pakistani military was believed to have begun preparing nuclear-tipped missiles.68 It should be noted that even at high alert levels of 2001 and 2002, there were no reports of Pakistan mating the warheads with delivery systems.69

In the fall of 2007 and early 2008, Pakistan was faced with another crucial moment in its history in the wake of domestic turmoil70 and some observers have recently expressed concern about the security of Pakistan’s arsenal if the current situation persists.71 Former Prime Minister and main opposition leader, Benazir Bhutto, who was later assassinated, had said in an interview
on 5 November 2007 that while President Musharraf said he was in firm control of the nuclear arsenal, she was afraid this control could weaken due to instability in the country. U.S. military officials had also expressed concern about the security of Pakistan’s nuclear weapons.

Mohamed El Baradei, Director General of the International Atomic Energy Agency, had expressed fears that a radical regime could take power in Pakistan, and thereby acquire nuclear weapons. Defence experts expressed worry over the fact that while nuclear weapons are currently under firm control, with warheads disassembled, technology could be sold off by insiders during a worsened crisis.

The US Deputy Secretary of State John D. Negroponte in testimony to Congress on 7 November 2007 expressed confidence that Pakistan’s nuclear weapons were not at risk. He expressed his belief that there was ‘plenty of succession planning that’s going on in the Pakistani military’ and that Pakistan’s nuclear weapons were under “effective technical control.” President Musharraf also said that Pakistan’s nuclear weapons were under “total custodial controls.”
The issue of U.S. plans to secure Pakistani nuclear weapons in case of a loss of control by the Pakistani government were famously addressed in Secretary of State Condoleezza Rice’s confirmation hearing in January 2005. In response to a question by Senator John Kerry asking what would happen to Pakistan’s nuclear weapons if there was a radical Islamic coup in Islamabad, Secretary Rice answered, “We have noted this problem, and we are prepared to try to deal with it.” On 12 November 2007, responding to press reports about this contingency, the Pakistan Foreign Office said, “Suffice it to say that Pakistan possesses adequate retaliatory capacity to defend its strategic assets and sovereignty.” The Foreign Office spokesman also emphasized that Pakistan’s nuclear weapons have been under “strong multi-layered, institutionalized decision-making, organizational, administrative and command and control structures since 1998.”

The issue of U.S. contingency plans to take over Pakistani strategic assets was raised again in the press following Benazir Bhutto’s assassination, and was met with similar assurances by Pakistan’s government. Washington had reportedly offered Pakistan nuclear security assistance soon after 11 September 2001. U.S. assistance to Pakistan, which must comply with
nonproliferation guidelines, has included the sharing of best practices and technical measures that could help prevent unauthorized or accidental use of nuclear weapons as well as contribute to physical security of storage facilities and personnel reliability.\textsuperscript{83} Some media reports suggested that the United States provided Pakistan with Permissive Action Links (PALs) in 2003, although former Pakistani military officials have said Pakistan has developed PALs for their warheads without assistance.\textsuperscript{84}

PALs require a code to be entered before a weapon can be detonated. Pakistan reportedly requires the ‘standard two-man rule’ to authenticate access to nuclear release codes, a standard practice in nuclear weapon states.\textsuperscript{85} Security at nuclear sites in Pakistan is the responsibility of a 10,000-member security force, commanded by a two-star general.

While confirming that the U.S. had assisted Pakistan in this area, Richard Armitage, former US Deputy Secretary of State, said in an interview that the US was unlikely to intervene militarily in a crisis in Pakistan because “we have spent considerable time with the Pakistani military, talking with them and working with them on the security of their nuclear weapons. I think most observers would say that they are fairly secure. They have pretty sophisticated
mechanisms to guard the security of those.”\textsuperscript{86} Indian National Security Adviser M. K. Narayanan said that the Pakistani nuclear arsenal was safe and had adequate checks and balances.\textsuperscript{87} While officials and experts have expressed some assurance as to the security of nuclear weapons themselves, the security of nuclear materials and know-how also pose a significant proliferation challenge.

\textbf{(ii) Proliferation Prospects}

Prospects of proliferation of nuclear weapons from Pakistan are worrying many observers who are concerned that other states or terrorist organizations could obtain material or expertise related to nuclear weapons from Pakistan.\textsuperscript{88} Beginning in the 1970s, Pakistan used clandestine procurement networks to develop its nuclear weapons programme. Former Pakistani nuclear official A.Q. Khan subsequently used a similar network to supply Libya, North Korea, and Iran with materials related to uranium enrichment.\textsuperscript{89} Al-Qaeda has also sought assistance from the Khan network. According to former Director of Central Intelligence George Tenet, the United States “received fragmentary information from an intelligence service” that in 1998 Osama bin Laden had “sent emissaries to establish contact” with the network.\textsuperscript{90}
Other Pakistani sources could also provide nuclear material to terrorist organizations. According to a 2005 report by the Commission on the Intelligence Capabilities of the United States Regarding Weapons of Mass Destruction, al-Qaeda “had established contact with Pakistani scientists who discussed development of nuclear devices that would require hard-to-obtain materials like uranium to create a nuclear explosion.” Tenet explained that these scientists were affiliated with a different organization than the Khan network.

The current status of Pakistan’s nuclear export network is unclear, although most official reports indicate that, at the least, it has been damaged considerably. Director of US National Intelligence John D. Negroponte implied that the network had been dismantled when he asserted in an 11 January 2007 statement to the Senate Select Committee on Intelligence that “Pakistan had been a major source of nuclear proliferation until the disruption of the A.Q. Khan network.”

Likewise, the London-based International Institute for Strategic Studies found in a May 2007 report that “at least some of Khan’s associates appear to have escaped law enforcement attention and could ... resume their black-market business.” Similarly, the
International Atomic Energy Agency (IAEA) has not yet been able to interview Khan directly, according to an agency official. However, Islamabad has responded to written questions from the IAEA and has been cooperative in its investigation of Iran’s nuclear program.\(^{94}\)

Pakistani officials have tried from time to time to allay apprehensions about Pakistan being a potential source of nuclear weapons proliferation by arguing that Islamabad has taken a number of steps to prevent further proliferation of nuclear-related technologies and materials.\(^{95}\) Apart from strict compliance with legislative measures, Pakistani officials also insist that Islamabad has also taken several other steps to improve its nuclear security. For example, the Government of Pakistan announced in June 2007 that it was ‘implementing a National Security Action Plan with the [IAEA’s] assistance.’ That same month, Pakistan also joined the U.S. — and Russian-led Global Initiative to Combat Nuclear Terrorism.

The United States has also provided relevant assistance to Pakistan. According to an October 2007 U.S. Government Accountability Office report, Islamabad was during fiscal years 2003-2006 the second-largest recipient of bilateral U.S. assistance designed to improve target countries’ export controls. Pakistan received such assistance from the Departments of State, Energy,
Despite all these assurances, there lurk possibilities about the emergence of A. Q. Khan likes to leak the nuclear secrets to vested interests thereby jeopardizing the global security.

**India’s Security Concerns**

Pakistan continues to remain the immediate major determinant of India’s security, particularly in view of Pakistan’s growing missile and nuclear weapons’ prowess. In the aftermath of the May 1998 nuclear weapon tests, both India and Pakistan appear to be integrating nuclear weapons into security strategy and planning. With the ominous logic of nuclear deterrence, each side’s desire to make its nuclear forces more credible may make those nuclear forces more usable. Ballistic missiles offer both sides advantages over using aircraft as delivery vehicles, but the short ranges create a hair-trigger situation. From launch to impact, missile flight times may be as short as 5 minutes. In the past, both sides appeared to use the separation of warhead components as a form of command and control (in the sense of lowering the risk of unauthorized or accidental use). Some observers have noted that this approach becomes risky when the other side can launch short-range ballistic
missiles against which there is no defense. These observers have called for improving command and control of nuclear forces, while noting, ironically, that reduced ambiguity could conversely increase the likelihood of war.²⁷

The US Defense Intelligence Agency reportedly has estimated that a nuclear exchange could kill between 9 and 12 million persons on both sides, with 2 to 6 million injured. These estimates are likely predicated on nuclear exchanges aimed at cities; e.g., Indian Defense Secretary Yogendra Narain suggested in 2002 that India would retaliate against Pakistani aggression and that both sides should be prepared for mutual destruction.²⁸

According to a study conducted by US-based Natural Resources Defense Council (NRDC) about the consequences of nuclear war in South Asia, two nuclear scenarios have been presented. The first scenario assumes 10 Hiroshima-sized explosions with no fallout; the second assumes 24 nuclear explosions with significant radioactive fallout.

**First Scenario**

In the first scenario, the NRDC study used casualty data from the Hiroshima bomb to estimate what would happen if bombs
exploded over 10 large South Asian cities: five in India and five in Pakistan. The 15-kiloton yield of the Hiroshima weapon is approximately the size of the weapons now in the Indian and Pakistani nuclear arsenals. The deaths and severe injuries experienced at Hiroshima were mainly a function of how far people were from ground zero. Other factors included whether people were in buildings or outdoors, the structural characteristics of the buildings themselves, and the age and health of the victims at the time of the attack, the closer to ground zero, the higher fatality rate. Further away there were fewer fatalities and larger numbers of injuries. The table 5.2 below summarizes the first nuclear war scenario by superimposing the Hiroshima data onto five Indian and five Pakistan cities with densely concentrated populations.

Table 5.2 The First Nuclear War Scenario

<table>
<thead>
<tr>
<th>City Name</th>
<th>Total Population Within 5 Kilometers of Ground Zero</th>
<th>Number of Persons Killed</th>
<th>Number of Persons Severely Injured</th>
<th>Number of Persons Slightly Injured</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bangalore</td>
<td>3,077,937</td>
<td>314,978</td>
<td>175,136</td>
<td>411,336</td>
</tr>
<tr>
<td>Bombay</td>
<td>3,143,284</td>
<td>477,713</td>
<td>228,648</td>
<td>476,633</td>
</tr>
<tr>
<td>Calcutta</td>
<td>3,520,344</td>
<td>357,202</td>
<td>198,218</td>
<td>466,336</td>
</tr>
</tbody>
</table>
It is observed from table 5.2 that in this scenario the 10 bombs over Indian and Pakistani cities would be exploded in the air, as in the case of the bombs dropped on Hiroshima and Nagasaki, which will maximize blast damage and fire but creates no fallout. When on 6 August 1945, the United States exploded an atomic bomb on Hiroshima, a city home to an estimated 350,000 people; about 140,000 died by the end of 1945. When on 9 August 1945 the

<table>
<thead>
<tr>
<th></th>
<th>Population</th>
<th>Deaths</th>
<th>Missing</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Madras</td>
<td>3,252,628</td>
<td>364,291</td>
<td>196,226</td>
<td>448,948</td>
</tr>
<tr>
<td>New Delhi</td>
<td>1,638,744</td>
<td>176,518</td>
<td>94,231</td>
<td>217,853</td>
</tr>
<tr>
<td>Total India</td>
<td>14,632,937</td>
<td>1,690,702</td>
<td>892,459</td>
<td>2,021,106</td>
</tr>
<tr>
<td>Pakistan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Faisalabad</td>
<td>2,376,478</td>
<td>336,239</td>
<td>174,351</td>
<td>373,967</td>
</tr>
<tr>
<td>Islamabad</td>
<td>798,583</td>
<td>154,067</td>
<td>66,744</td>
<td>129,935</td>
</tr>
<tr>
<td>Karachi</td>
<td>1,962,458</td>
<td>239,643</td>
<td>126,810</td>
<td>283,290</td>
</tr>
<tr>
<td>Lahore</td>
<td>2,682,092</td>
<td>258,139</td>
<td>149,649</td>
<td>354,095</td>
</tr>
<tr>
<td>Rawalpindi</td>
<td>1,589,828</td>
<td>183,791</td>
<td>96,846</td>
<td>220,585</td>
</tr>
<tr>
<td>Total Pakistan</td>
<td>9,409,439</td>
<td>1,171,879</td>
<td>614,400</td>
<td>1,361,872</td>
</tr>
<tr>
<td>India and Pakistan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>24,042,376</td>
<td>2,862,581</td>
<td>1,506,859</td>
<td>3,382,978</td>
</tr>
</tbody>
</table>

United States exploded a plutonium implosion bomb above Nagasaki, about 70,000 of the estimated 270,000 residents died by the end of 1945. However, ten Hiroshima-size explosions over 10 major cities in India and Pakistan would kill as many as three to four times more people per bomb than in Japan because of the higher urban densities in Indian and Pakistani cities.

**Second Scenario**

In January, The NRDC research team calculated the consequences a second scenario of a much more severe nuclear exchange between India and Pakistan in January 2002. This scenario calculated the consequences of 24 nuclear explosions detonated on the ground -- unlike the Hiroshima airburst -- resulting in significant amounts of lethal radioactive fallout.

Exploding a nuclear bomb above the ground does not produce fallout. For example, the United States detonated "Little Boy" weapon above Hiroshima at an altitude of 1,900 feet. At this height, the radioactive particles produced in the explosion were small and light enough to rise into the upper atmosphere, where they were carried by the prevailing winds. Days to weeks later, after the radioactive bomb debris became less "hot," these tiny particles
descended to earth as a measurable radioactive residue, but not at levels of contamination that would cause immediate radiation sickness or death.\textsuperscript{100}

Unfortunately, it is easier to fuse a nuclear weapon to detonate on impact than it is to detonate it in the air -- and that means fallout. If the nuclear explosion takes place at or near the surface of the earth, the nuclear fireball would gouge out material and mix it with the radioactive bomb debris, producing heavier radioactive particles. These heavier particles would begin to drift back to earth within minutes or hours after the explosion, producing potentially lethal levels of nuclear fallout out to tens or hundreds of kilometers from the ground zero. The precise levels depend on the explosive yield of the weapon and the prevailing winds.

For the second scenario, the NRDC researchers calculated the fallout patterns and casualties for a hypothetical nuclear exchange between India and Pakistan in which each country targeted major cities. They chose target cities throughout Pakistan and in northwestern India to take into account the limited range of Pakistani missiles or aircraft. The target cities, listed in the table below, include the capitals of Islamabad and New Delhi, and large cities, such as Karachi and Bombay. In this scenario, it was assumed
that a dozen, 25-kiloton warheads would be detonated as ground bursts in Pakistan and another dozen in India, producing substantial fallout.

The devastation that would result from fallout would exceed that of blast and fire. NRDC's second scenario would produce far more horrific results than the first scenario because there would be more weapons, higher yields, and extensive fallout. In some large cities, and it was assumed more than one bomb would be used.

**Table 5.3 The Second Nuclear War Scenario**

<table>
<thead>
<tr>
<th>Country</th>
<th>City</th>
<th>City Population</th>
<th>Number of Attacking Bombs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pakistan</td>
<td>Islamabad (national capital)</td>
<td>100-250 thousand</td>
<td>1</td>
</tr>
<tr>
<td>Pakistan</td>
<td>Karachi (provincial capital)</td>
<td>&gt; 5 million</td>
<td>3</td>
</tr>
<tr>
<td>Pakistan</td>
<td>Lahore (provincial capital)</td>
<td>1-5 million</td>
<td>2</td>
</tr>
<tr>
<td>Pakistan</td>
<td>Peshawar (provincial capital)</td>
<td>0.5-1 million</td>
<td>1</td>
</tr>
<tr>
<td>Pakistan</td>
<td>Quetta (provincial capital)</td>
<td>250-500 thousand</td>
<td>1</td>
</tr>
<tr>
<td>Pakistan</td>
<td>Faisalabad</td>
<td>1-5 million</td>
<td>2</td>
</tr>
<tr>
<td>Pakistan</td>
<td>Hyderabad</td>
<td>0.5-1 million</td>
<td>1</td>
</tr>
<tr>
<td>Pakistan</td>
<td>Rawalpindi</td>
<td>0.5-1 million</td>
<td>1</td>
</tr>
<tr>
<td>India</td>
<td>New Delhi (national capital)</td>
<td>250-500 thousand</td>
<td>1</td>
</tr>
</tbody>
</table>
As is revealed from Table 5.3, the NRDC researchers calculated that 22.1 million people in India and Pakistan would be exposed to lethal radiation doses of 600 rem or more in the first two days after the attack. Another 8 million people would receive a radiation dose of 100 to 600 rem, causing severe radiation sickness and potentially death, especially for the very young, old or infirm. NRDC calculates that as many as 30 million people would be threatened by the fallout from the attack, roughly divided between the two countries. Besides fallout, blast and fire would cause substantial destruction within roughly a mile-and-a-half of the bomb craters. NRDC estimates that 8.1 million people live within this radius of destruction. It also becomes discernible from Table 5.3 that most Indians (99 percent of the population) and Pakistanis (93 percent of the population)
the population) would survive the second scenario. Their respective military forces would be still intact to continue and even escalate the conflict.

The two South Asian scenarios assume nuclear attacks against cities. During the early Cold War period this was the deterrent strategy of the United States and the Soviet Union. But as both countries introduced technological improvements into their arsenals, they pursued other strategies, targeting each other's nuclear forces, conventional military forces, industry and leadership. India and Pakistan may include these types of targets in their current military planning. For example, attacking large dams with nuclear weapons could result in massive disruption, economic consequences and casualties. Concentrations of military forces and facilities may provide tempting targets as well.\textsuperscript{101}

It is evident that neither India nor Pakistan would welcome any eventuality culminating into a nuclear war and face devastation. Perhaps outgoing Pakistani President Pervez Musharraf’s interview in June 2002 with the \textit{CNN} offers respite from the nuclear rhetoric when he stated: “I don’t think either side is that irresponsible to go to that limit [i.e., nuclear conflict]. ... One shouldn’t even be discussing these things, because any sane individual cannot even
think of going into this unconventional mode, whatever the pressures.\textsuperscript{102}

**Conclusion**

Even a decade after conducting nuclear tests, India and Pakistan are slowly but steadily moving toward building operational nuclear forces. U.S. diplomatic attempts at capping nuclear weapons development in South Asia by persuading both countries to accept qualitative and quantitative caps on their weapons development process and fissile material production have failed. India and Pakistan also continue to resist international entreaties to join the nuclear nonproliferation regime.

However, in the post-May 1998 period, both India and Pakistan have initiated a series of intended steps at the technological, organizational, and doctrinal levels to transform their symbolic capabilities into operational and hence usable forces. These steps involve the development of rugged and reliable fission devices that can be mated onto both aircraft and short-and intermediate-range ballistic missiles. Armed forces in both countries are being trained in the safe handling, transport, storage, and use of nuclear weapons, including military exercises simulating nuclear weapons use on the
battlefield. A parallel process has involved the institution of nuclear command and control arrangements with clearly delineated roles for civilian and military authorities. And at the doctrinal level, both Indian and Pakistani militaries have become actively involved in drawing up operational plans concerning the deployment and use of nuclear weapons in war. In addition the two military crises (1999 and 2001-2002) that followed in the wake of the 1998 nuclear tests have had a forcing effect on the operationalization efforts in New Delhi and Islamabad.

But despite surface parallels, there exist major differences between India and Pakistan’s weaponization experiences. Pakistan’s nuclear weapons programme is exclusively India-specific. However, India’s deterrent is aimed at both Pakistan and China. As a result, the scale and scope of India’s nuclear weapons effort is much larger, as manifest not only in its efforts to develop more advanced weapon designs, such as boosted fission and thermonuclear warheads, but also in programmes to develop long-range ballistic and cruise missiles and ultimately a sea-based nuclear arsenal. However, there are no indications in open-source literature of any Pakistani programmes to rival or match India’s efforts in any of the above areas.
Despite the differences in the scale and scope of their nuclear efforts, Pakistan is believed by many observers to be further along than India in the evolution of a nuclear command and control system and operational planning involving the use of nuclear weapons. This development is the result of the differences in civil-military and inter-military relations in the two countries. Historically, the Army has dominated the political process in Pakistan. It has also controlled the nuclear weapons effort since the early 1980s. Among the three armed services, the Pakistani Army enjoys a position of unrivaled supremacy. A lack of interference by rival civilian authorities or the Air Force and Navy has allowed the Army to proceed relatively unimpeded with addressing command and operational issues associated with nuclear weapons, in accordance with its own organizational preferences. In India however, civilian domination of the professional military and control over the nuclear weapons effort have made it difficult for the military to stamp its organizational preferences on the direction of country’s nuclear weapons-related planning.

Although successive Indian governments in recent years have proceeded with the creation of a national nuclear command authority with a clearly delineated role for the military and sought to
streamline military decision-making by instituting a joint forces command, command and control of nuclear weapons remains divided between civilian political, defense-scientific, and military authorities. Equally significant, inter-service rivalry over custody issues, especially between the Army and Air Force, has also slowed down India’s transition toward operational status.

India and Pakistan have a three-decade old history of confidence-building measures. These include hotlines between army commanders and prime ministers, a joint India-Pakistan Military Commission (created in 1990), and agreements to provide prior notification of troop movements and ballistic missile tests. In 1991, both sides agreed not to attack nuclear facilities. Implementation, however, has been sporadic.

In February 1999, India and Pakistan concluded the Lahore Agreement. That agreement envisioned a plan for future work, to include measures to reduce the risk of unauthorized or accidental use of nuclear weapons, reviews of confidence-building measures and communications links, prior notification of ballistic missile tests, continuation of unilateral moratoria on nuclear testing, and dialogue on nuclear and security issues. The Lahore process was undermined by the summer 2001 military incursion by Pakistan in the vicinity of
Kargil, but the two sides began a dialogue in 2004. In September 2004, India and Pakistan announced 13 confidence-building measures. Three security-related ones included:

- Experts’ meetings on conventional and nuclear CBMs, including discussions on a draft agreement on advance notification of missile tests;
- Biannual meeting between Indian Border Security Force (BSF) and Pakistan Rangers;
- Implementation of the agreement reached between the defence secretaries in their talks in August 2001 to discuss “modalities for disengagement and redeployment” on the Siachen glacier.\(^{106}\)

Viewed in a broad perspective, foreign secretaries of both countries reported progress in their discussions on missile notifications in December 2004.\(^{107}\) Undoubtedly, during the regime of President Musharraf, the Indo-Pak relations continued to make headway towards normalization of relations. With the advent of civilian administration in Pakistan August 2008, it is to be seen whether the process of normalization gathers momentum or retards. However, Pakistan’s missile and nuclear programme is bound to be a matter of concern for India and it is through peaceful means that outstanding issues between the two countries, especially the issue of Jammu and Kashmir, are resolved that the danger of nuclear threat can be minimized.

**Notes**


3. However, the Pakistani Air Force is eagerly exploring options to upgrade its ageing fleet of combat aircraft. See, "Pakistan Air Force Weighing Various Aircraft As Procurement Options," *The News* (Islamabad), 15 May 2004.


17. Ibid.


24. China had reportedly started developing the M-9 class of missiles in the mid-1980s and the first flight-test of M-9 was reported to have taken place in June 1988 and the missile was probably inducted into service in 1990. However, some analysts believe that China probably also transferred an entire production line for M-9s to the Pakistan’s Fatehjung missile facility built by China for Pakistan in the mid-1990s. See, Bill Gertz, "China can’t say no to arm buyers", Washington Times, 28 May 1991.


41. The Pressler Amendment (August 1985) linked aid and military sales to two certification conditions: (1) that Pakistan not possess a nuclear explosive device; and (2) that new aid ‘will reduce significantly the risk’ that Pakistan will possess such a device. For background summary of sanctions legislation, see Jeanne Grimmet, Nuclear Sanctions: Section 102(b) of the Arms Export Control Act and Its Application to India and Pakistan, CRS Report 98-486, Washington, DC: Congressional Research Service, 2003.
44. Ibid.


50. “Release of these systems would not significantly reduce India’s quantitative or qualitative military advantage. Release of these modifications to Pakistan will neither affect the regional balance of power nor introduce a new technology as this level of capability or higher already exists in other countries in the region.” Press release of the US Defense and Security Cooperation Agency, 28 June 2006, available at http://www.dsca.mil/PressReleases/36-b/2006/Pakistan_06-11.pdf.


58. Peter Lavoy, n. 55.


60. Naeem Salik, n. 56.


63. Ibid.


65. In this regard, some experts take the opposite view – that disbursing assets enhances the risk of diversion.


69. Peter Lavoy, n. 55.

70. This domestic turmoil had taken place due to confrontation between the Judiciary and Executive in Pakistan and political parties’ demand for restoration of democracy in the country, mainly pioneered by People’s Party of Pakistan (PPP) under Benazir Bhutto and Nawaz Sharif’s party.


72. “Pakistan in Crisis: Interview with Benazir Bhutto”, CNN, 5 November 2007, and also see comments by David Albright in the same interview.


75. “Interview with Benazir Bhutto”, n. 72.


78. “The Nomination of Dr. Condoleeza Rice to be Secretary of State”, Hearings Before the Senate Foreign Relations Committee, 18-19 January 2005. It is interesting to note here that the concept of a contingency plan
to take over Pakistan’s nuclear assets was first somewhat sensationally written about by Seymour Hersh, “Watching the Warheads,” The New Yorker, 5 November 2001.

79.”Strategic Assets are Safe, Says FO”, The Dawn, 12 November 2007.

80.Ibid.


89.Libya obtained uranium enrichment technology and nuclear weapons designs that could support a nuclear weapons programme. North Korea currently has a plutonium-based nuclear weapons programme, but it is not clear whether it has also a uranium-based one. Iran is suspected of pursuing both plutonium- and uranium-based nuclear weapons programmes.


92.Unclassified Statement for the Record Annual Threat Assessment, Senate Select Committee on Intelligence, 11 January 2007.

93.This information is available at http://www.iiss.org/publications/strategic-dossiers/nbm.

94.Cited in ibid.

95.Detailed information pertaining to Pakistan’s nuclear-related legislation is available in the country’s reports to the United Nations, UN 1540


103. Annual data exchanges on the facilities, according to some, were at first less than forthcoming.


105. It is noteworthy that the hotlines were not used to good effect either in Operation Brass Track in 1987 or in May 1998 around the nuclear tests.

106. This is available at http://www.southasiamonitor.org/diplomacy/2004/sep/8dip5.shtml.