

2010

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Michael Tkacik

Stephen F Austin State University, mtkacik@sfasu.edu

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Pakistan's Nuclear Weapons Program and Implications for US National Security

Michael Tkacik

Abstract

This article analyzes Pakistan's nuclear weapons program and the characteristics of the environment in which the program is nested. These characteristics include Pakistan's history of internal and external instability; nuclear saber rattling during crises; support for Islamic terrorism in order to advance state goals; indigenous production of many elements of its nuclear forces; possession of delivery and command and control systems with destabilizing characteristics; and finally, nuclear doctrine that appears to advocate first use of nuclear weapons. The article argues that the characteristics of Pakistan's nuclear weapons program generate threats to US national security interests. The article examines six interrelated and synergistic challenges for US national security: first, Pakistan is engaged in an arms race in Southwest Asia that has negative implications for Pakistan's stability; second, the threat of nuclear proliferation from Pakistan continues; third, Pakistan's arsenal characteristics make accidental and/or unauthorized nuclear war more likely; fourth, there is an ongoing possibility of war with India; fifth, Islamist influence is spreading through key sectors of Pakistani society; and finally, there is an increasing danger of state failure in Pakistan.

Key Words: Nuclear Weapons; Pakistan, US National Security; Terrorism; India; Nuclear Proliferation.

INTRODUCTION

Pakistan's nuclear weapons program generates concern in Washington and among its allies for a variety of reasons. There are concerns about the potential of nuclear war with India, about proliferation, and about seizure by Islamist militants. These concerns are legitimate to be sure. But a close examination of the program itself and the environment in which that program nests raises a larger concern: the likelihood of a synergistic interaction among these variables leading to even greater danger to US security. This malevolent manifestation of unintended outcomes cannot be predicted, but the way in which these dangers arise can be better understood. To this end, the article examines the environment in which Pakistan's program nests, how these environmental

variables may interact, what sorts of dangers may arise therefrom, and how these variables and dangers might themselves interact synergistically, leading to even greater peril. The resulting hazards are more difficult to understand, less predictable, and thus pose an even greater threat to US security than generally acknowledged. Because the threats generated are more likely to have unintended consequences, it is more important than ever to plan for coherent, interconnected responses.

ENVIRONMENTAL VARIABLES

To best understand Pakistan's nuclear weapons program, it is essential to understand Pakistan's relationship with India. Pakistan's relationship with India is perhaps more complicated than the relationship United States shares with any state, including nuclear-armed states. Pakistan and India were born together of the subcontinent. And as a sibling rivalry can be far more complex than any "normal" rivalry, so too is the rivalry between Pakistan and India. India is, first and foremost, far larger and more powerful than Pakistan. Nothing can change this geopolitical and economic fact, though Pakistan does hope to mute this difference through the possession of nuclear weapons. The weapons are viewed as the single possible equalizer between the two states.¹

Pakistan and India have also fought three major wars since 1947. In each of these wars Pakistan suffered defeat on some level. In the 1971 war particularly, Pakistan saw itself dismembered, with its eastern portion being granted independence as Bangladesh. The result of this war made clear to Pakistani elites that they could not hope to defeat or even fight India to a draw if India sought to fully impose its will. In the immediate aftermath of the 1971 war, Pakistan decided to move forward decisively and

develop nuclear weapons over all other national goals including economic development, political development, and conventional military development.² Since then, Pakistan has become proficient at asymmetrical warfare at both ends of the spectrum, whether through the development of nuclear weapons or by developing more traditional asymmetrical power such as terrorism and the use of irregulars.

Religious differences help explain the deep animosity between Pakistan and India. Pakistan has always seen Islam as part and parcel of its national identity. But the intensity of these religious feelings, and the distance to which elites have been willing to go to take advantage of religion, have increased markedly over time. Initially, Pakistani elites sought to minimize the involvement of religion with state. But as the country faced pressures, both internal and external, religion became the one unifying feature that elites could turn to and increasingly they did just that. Religion was a way of uniting Pakistanis against India as well as a way of garnering external support. When the Soviet Union invaded Afghanistan, religion was again invoked (with US encouragement) to rally Muslims from around the world against the Soviets.³ Pakistan has also used “jihad” to wage irregular war against India in Kashmir. Pakistan’s military governments too have used religion against domestic foes, especially pro-democracy groups.⁴ Finally, India in the late 1990s itself began to increasingly use religion as a method of mobilizing the masses. Thus Hindu fundamentalism, as manifested in the nationalistic BJP in India, met Islamic fundamentalism.⁵ These religious tensions therefore expanded beyond the disputed Kashmir region where they had previously been central and began to take center stage in many facets of the states’ relations. This is particularly disturbing for nuclear

deterrence theory because religious differences are often perceived as zero-sum. The Indo-Pakistani hostility has manifested itself most dangerously during nuclear crises.

NUCLEAR CRISES

Since the 1980s, the relationship between Pakistan and India has stumbled from one crisis after another. These crises have been characterized by nuclear brinkmanship. Though such nuclear brinkmanship was implicit in the late 1980s and the early 1990s, by the late 1990s and early in the 21st century such brinkmanship had become explicit. At least for Pakistan's military this brinkmanship evidences successful nuclear deterrence of its more powerful neighbor.⁶

The Brasstacks crisis of 1986-1987 arose out of a large-scale November 1986 India training exercise close to Pakistan's border in Rajasthan (a likely Indian jumping off point for any future war with Pakistan). The exercises were of unprecedented size and included most of India's armored formations. Tactical nuclear weapons were included in the exercises. Pakistan viewed the exercises as threatening (indeed they could have been a cover for military strikes) and responded with its own large scale exercises near Punjab. Each state thereafter engaged in further threatening maneuvers heightening the crisis. In January 1987 A.Q. Khan allegedly revealed to the press that Pakistan had enriched uranium and could simulate a nuclear weapons test. The article that contained Khan's comments was not published until 1 March, by which time the crisis had started to wind down. Still, the Khan threat is widely perceived in Pakistan as having been a successful threat of nuclear weapons use against India. Additionally, Pakistan "reportedly made a veiled nuclear threat to the Indian ambassador in Islamabad in an effort to contain and defuse the crisis."⁷ Moreover, there are reports that India intended a preventative attack

against Pakistan at this time to foreclose Pakistan's development of nuclear weapons. Whatever the veracity of these reports, they are widely accepted in Pakistan. Thus the lesson Pakistan's military drew from Brasstacks was that nuclear threats work. For the purposes of this article the perceptions in Pakistan of how this crisis was resolved are just as important as the reality.⁸

In early 1990 another crisis occurred, this time in Kashmir. Although one might argue Kashmir is in a perpetual state of crisis, in this particular case it was a combination of ongoing tensions within Kashmir, a violent Indian crackdown, and an increase in Pakistani-sponsored militant activity (as well as a failure to withdraw Pakistani troops who participated in earlier exercises in the area), which in turn led to an Indian military build-up not just in Kashmir but also south into Punjab.⁹ In February India also deployed units for armored exercises far to the southwest in Rajasthan, evoking images of Brasstacks.¹⁰ Pakistan's leadership responded itself with a further troop build-up. Tensions increased, additional units were deployed and/or alerted, and once again the possibility of uncontrolled escalation loomed.¹¹ Some have minimized this crisis, noting that much of the Indian deployment was infantry-based and directed at stopping cross-border infiltration from Pakistan into Kashmir.¹² But the deployments went beyond Kashmir and in any event it is not clear that Pakistani intelligence interpreted the Indian build-up in this fashion. In March and April the capitals exchanged threats, including some that later observers have interpreted as nuclear.¹³ By mid-April Pakistan believed "India had deployed a strike force of up to 100,000 men within fifty miles of the border in Rajasthan."¹⁴ This southwestern deployment raised the possibility of a decapitating attack designed to split Pakistan or at least prevent the movement of troops toward

Kashmir in the northeast. Again some observers assert that, notwithstanding such deployments, neither side deployed the armor necessary to support such a strike.¹⁵

Whatever the actual deployments, leaders in the United States were growing concerned. A US diplomatic mission was sent to both India and Pakistan in May 1990 and by June 1990 the crisis had abated. Although there is debate about how close this crisis came to conventional or nuclear war, most analysts believe nuclear weapons played some role. Seymour Hersh, in what many in the scholarly community have concluded is a sensationalized account, argues the two states were at the brink of nuclear war, with Pakistan having deployed nuclear weapons on F-16s that were held on runway alert.¹⁶ Devin Hagerty and others claim no such alerts existed. But Hagerty nevertheless argues that existential nuclear deterrence (caution induced by the very existence of nuclear weapons or at least the ability to assemble them relatively quickly) helped to prevent the crisis from exploding.¹⁷ P.R. Chari credits the United States diplomatic mission with defusing the crisis.¹⁸ For the purposes of this article, two points are important. First, the 1990 crisis was the second serious crisis in only three years for the two states. “U.S. intelligence estimated there was a 50-50 chance of war.”¹⁹ India definitely had a nuclear capability at this point and, given A.Q. Khan’s comments during Brasstacks, there is strong evidence that Pakistan had at least a fledgling capability.²⁰ Vague nuclear threats were again part of the political communications exchanged between the two states. Second, whether this crisis was close to nuclear war or whether nuclear weapons provided a backdrop for the crisis, nuclear weapons were part of the calculus present during the crisis. From the Pakistani security establishment’s perspective, they were threatened by a conventionally superior power, one that had convincingly defeated

Pakistan three times in the past, and yet Pakistan was able to stand that power down, at least in part through veiled nuclear threats. “The restraint imposed by the nuclear factor on the conventional military confrontation between India and Pakistan was all too obvious.”²¹ Pakistan’s nuclear weapons program was thus validated for the second time in only three years.

Some have claimed that after the Indian nuclear tests in 1998 India prepared for preemptive strikes against Pakistani nuclear facilities. At least one source claims that in response, Pakistan deployed Ghauri ballistic missiles to stress its ability to retaliate. Some have even said the missiles were mated with nuclear warheads. The preemptive strike did not occur and, if the Ghauri’s did deploy, this would again indicate to Pakistani authorities that the weapons have utility.²²

The next severe crisis occurred in 1999 in Kargil. Observers believe the Kargil crisis arose out of Pakistani military attempts to negate India’s seizure of the Siachin Glacier in 1984. At Kargil, Pakistani controlled forces occupied high mountain positions on India’s side of the Line of Control that Indian had abandoned for the winter months. Control over these positions would allow Pakistan to interdict supply lines to the Siachin Glacier.²³ India learned of Pakistan’s presence in May 1999. Many analysts believe that Pakistan’s military presumed India would not risk a serious conventional conflict with Pakistan in the wake of the 1998 nuclear tests. At the same time, Pakistan’s government hoped the danger created by this crisis would bring about international intervention to resolve the larger Kashmir dispute on terms favorable to Pakistan. Some of Pakistan’s calculations appear to have been correct. India did not horizontally escalate and strike Pakistan elsewhere (though India did deploy troops elsewhere). But India did attack

Pakistani forces at Kargil. While both sides suffered significant casualties (over 1,000 dead in total), India was eventually able to dislodge Pakistani forces.²⁴ Indian forces did not however attack Pakistani forces over the LOC and limited their attacks to the immediate Kargil area. But the international support Pakistan had hoped for was not forthcoming. To the contrary, the United States intervened politically and brokered a Pakistani withdrawal.

Much has been written about the application of the stability/instability paradox in the Kargil context. The arguments are somewhat confused because they ultimately rest on antecedent assumptions about whether or not the strategic (i.e., nuclear) situation is indeed, stable or unstable at its heart. Nevertheless, regional scholars often argue that Kargil is an example of the stability/instability paradox whereby the stability evoked by the existence of nuclear weapons (and the concomitant undesirability of engaging in the sort of serious conventional conflict that could lead to a nuclear exchange) also made lesser forms of conflict (such as Kargil) attractive to Pakistan.²⁵ The argument claims Pakistan, as a revisionist power, sought to change the status quo by seizing Kargil and then daring India to take a risk in conventionally escalating, as Pakistan believed would be necessary to evict its forces from Kargil. In essence, nuclear weapons provided cover for low intensity conflict. Significant escalation would have risked nuclear war and Pakistan felt India would not take such a risk. Once again, Pakistan is alleged to have made nuclear threats during the crisis to underline the danger of escalation.²⁶ Sources indicate no fewer than 13 threats between officials of the two states from 26 May to 30 June.²⁷ Pakistani leadership further felt that the international community would quickly intervene to avert nuclear crisis and allow Pakistan to keep its gains. As it turned out,

India managed to restore the status quo ante without significant escalation. India gained the upper hand militarily and won international support, which in combination led to Pakistan's withdrawal. But for Pakistan's military, this once again showed the value of nuclear weapons in staring down its more powerful opponent. Even if Pakistan was forced to back down in this case, just as clearly nuclear weapons seem to have prevented Indian escalation and thus again proved their worth.²⁸ From Pakistan's point of view, without nuclear weapons India would surely have escalated conventionally, both to reduce its own casualties and to teach Pakistan a lesson as India had so often done in the past.²⁹

Though the resolution of Kargil initially reduced violence in Kashmir, tensions soon increased once more. The 2001-2002 Border Confrontation crisis began on 13 December 2001 when terrorists supported by Pakistan's ISI (*Jaish-e-Mohammed* and *Lashkar-e-Taiba* militants) attacked the Indian Parliament.³⁰ In fact, the precursor to this attack was a 1 October 2001 attack on the Jammu and Kashmir Legislative Assembly. As a result, India deployed at least 500,000 troops on its border with Pakistan including significant offensively oriented assets, as well as air and naval forces.³¹ Pakistan's military deployed its forces in response. By early spring US intelligence officials were publicly voicing concerns over war in Southwest Asia. There was, of course, an associated risk of nuclear escalation in the region, either by design or mistake. In fact, on 14 May 2002 families of Indian military personnel were killed in Kaluchak by terrorists. This is exactly the sort of spark some feared could lead to war and perhaps eventual nuclear use. But there was no significant escalation of the ongoing crisis. As in other Indo-Pakistani crises of the late 20th century, nuclear signaling seems to have played an

important role.³² “These nuclear signals were multiple in kind, carried out at multiple levels, and addressed to multiple constituencies – internal, regional, and international.”³³

A combination of existential deterrence and US mediation helped to deescalate the crisis.

For purposes of this article, two different though not necessarily contradictory conclusions can be drawn from the 2001-2002 crisis. First, the existential deterrence generated by the presence of nuclear weapons seems to have induced caution on both sides, but perhaps more so in India than Pakistan.³⁴ Second, there remains a very real chance of nuclear use in the region given the propensity of each side to resort to nuclear saber rattling and other regional factors that may serve to weaken restraint at critical junctures of some future crisis as discussed below (for example, deficiencies in Pakistan’s arsenal, societal weaknesses in Pakistan, religious extremism, and so forth). Though these conclusions seem contrary, it may instead be that a sort of especially fragile existential deterrence exists in Southwest Asia that is susceptible to failure at some critical but unknown future juncture. Each of the recent four Indo-Pakistani crises, Brasstacks (1986-1987), Kashmir (1990), Kargil (1999), and 2001-2002, involved numerous nuclear threats and only eventually ended with external mediation. Indeed it may be that US diplomacy is especially important and a failure to intervene diplomatically in the future could precipitate nuclear war. US diplomacy may have maintained this fragile existential deterrence. Of course, other variables could also cause a failure of nuclear deterrence, such as accident, miscalculation, or a loss of control over the weapons. An examination of current developments in Pakistan’s nuclear weapons program should give one pause for thought: Pakistan is developing a large, usable, and modern arsenal, but one without the safety mechanisms and crisis tolerance other large

arsenals include. Before examining these specifics, however, there is one final environmental variable that needs to be examined.

LINKS TO ISLAMIC TERRORISM

Pakistani society has proven a fertile breeding ground for Islamist terrorism. Some of the reasons for this terrorism can be traced to Afghanistan and Kashmir. But the growth of the phenomenon also rests with the decisions of Pakistan's government (of course the policies of other states are also a causal variable).

Pakistan has used Islam as a domestic mobilizing factor since the state's inception. But the growth of violent Islamists really began when the Soviet Union invaded Afghanistan in December 1979. Pakistan supported the Afghan Mujahideen almost from the beginning. The United States quickly ascertained that here was an opportunity to bleed the Soviets, and thus supported Pakistan's efforts with money, weapons, and advice. Pakistan and the Mujahideen both used Islam to rally international support – the war was fought as jihad against the infidel Soviets. The viciousness of the conflict further radicalized these Islamic warriors, as did the influx of Arab radicals whose home countries thought Afghanistan a good dumping ground for troublemakers.³⁵ Once the Soviets were evicted, the Mujahideen turned against one and other. The ongoing instability in Afghanistan worried Pakistan, so it helped to form and support the Taliban, who eventually swept the other warlords from power. Pakistan thus achieved some measure of “strategic depth” in its rear vis-à-vis India as well as a steady stream of radicals for use elsewhere, such as Kashmir.

Another key linkage between Pakistan and Islamic terrorism exists in Kashmir. Though Pakistan has been loath to directly confront the conventionally superior India, it

has supported Kashmir rebels to a lesser or greater extent for years.³⁶ Since 1990 in particular, Pakistan has facilitated terrorism against Indian interests in Kashmir. And Pakistan has again mobilized on the basis of Islam. The Pakistani Army finds a key source of domestic legitimacy in its support for Kashmir insurgents.³⁷ This Pakistani support has led to numerous crises, some of which have been examined above. But it has also managed to keep pressure on India and has internationalized the crisis in a way that Pakistan thought might encourage resolution.³⁸

Both of these groups of terrorists, though once serving their Pakistani masters, have proven somewhat harder to control when their interests diverged from those of Pakistan. So by 2005 Pakistan no longer controlled its frontier regions bordering Afghanistan, having ceded these to Taliban friendly militants or otherwise violent, Salafi jihadist and/or Deobandi influenced groups. Similarly, Kashmir rebels sometime seem intent on achieving their own agenda without regard for Pakistan's goals.

The Pakistani environment (religiously, politically, and otherwise) is complex and unstable. Pakistan's nuclear weapons program can best be understood as nested within this social environment. As such, the characteristics of Pakistan's program could either reduce instability (perhaps through a clear increase in existential deterrence) or it could further destabilize an already fragile environment. When one examines the various characteristics of Pakistan's nuclear weapons program, it becomes apparent that most (though not all) factors mitigate in favor of further instability. This instability has negative implications for US security interests.

CURRENT DEVELOPMENTS IN WEAPONS PRODUCTION

Pakistan has a broad and well-developed nuclear infrastructure that has been assisted variously by the US, by Europe, and most significantly by China.³⁹ It has indigenous uranium mines and uranium mills with which to produce yellowcake. The yellowcake is fed into a local hexafluoride (UF₆) conversion plant. Thereafter it can be placed on one of two paths: weapons grade uranium (highly enriched uranium – HEU) or plutonium.

Pakistan produces HEU at one or more gas centrifuge facilities.⁴⁰ The largest of these enrichment facilities is located at Kahuta. Secondary facilities, possibly focused on research or training, are located at Sihala, Golra Sharif, and maybe Gadwal (near Wah).⁴¹ From there, the HEU is sent into the weaponization process, including the formation of pits, triggers, and other key mechanisms. Significant portions of this process may occur at Kahuta and Wah. Pakistan is thought to be capable of producing between 55 and 95 kg of HEU per year. Most open sources indicate Pakistan's HEU based nuclear weapons are implosion devices requiring between 15 and 20kgs of HEU per core. While Pakistan has historically had greater success enriching uranium rather than extracting plutonium, it has maintained a dual track approach, attempting to master both processes in order to give itself more options for the production of nuclear weapons.

For Pakistan's plutonium line, the yellowcake is fabricated into reactor fuel for Pakistan's heavy water reactors. The fuel is fabricated at Kundian and possibly near Chashma as well. Pakistan is capable of producing the heavy water necessary to moderate these reactors. The heavy water production facility is located at Multan. There may also be a facility in Khushab. The heavy water reactors associated with plutonium production are located at Khushab (Khushab-1). Khushab-1 is thought to produce about 10kgs of

plutonium per year. Throughout the 1990s the Khushab-1 (40-50 megawatts thermal) reactor produced spent fuel which was then taken to a reprocessing plant known as “New Labs” in Rawalpindi. New Labs was able to chemically separate about 10-20kgs of plutonium annually using the PUREX method.⁴² It therefore appears that Khushab-1 produces just about as much spent fuel as New Labs can reprocess.⁴³ It should be noted that Khushab-1 can also produce tritium, which can be used to boost the yield of certain weapons and otherwise refine nuclear weapons.

A second heavy water reactor has been under construction at Khushab (Khushab-2) since 2000.⁴⁴ Although some analysts initially speculated that Khushab-2 might be a 1,000 megawatt thermal output reactor, most analysts now argue the reactor is not nearly so large.⁴⁵ Still, it is unclear from open sources whether Khushab-2 will be similar to Khushab-1’s 50 megawatt thermal output (as some US government officials have asserted) or will be somewhere between 70-130 megawatt thermal output (as some private analysts have argued).⁴⁶ Whatever the case, this represents at minimum a doubling of Pakistan’s plutonium production possibilities. The problem for Pakistan is that New Labs may already be at or near maximum capacity.⁴⁷ Thus it is likely that an expansion of an existing facility or a separate reprocessing facility is necessary. Pakistan may be doing both by expanding the New Labs facility and restarting construction at Chashma, the site of a terminated 1970s French reprocessing facility.⁴⁸ Construction on the new Chashma reprocessing facility began about the same time as Khushab-2.⁴⁹ The Chashma reprocessing facility under construction may have the capability to reprocess fuel in excess of that which will be produced by Khushab-2.⁵⁰ Indeed, a third heavy water reactor, Khushab-3, is also under construction.⁵¹ Though Khushab-3 was also once

claimed to be in the “several hundred megawatts thermal” area, most analysts seem to be settling for somewhere between 50-100 megawatts thermal.⁵² Whatever the precise capabilities of these new reactors, there is little doubt that Pakistan will soon, at a minimum, double its plutonium production capabilities. Once Khushab-3 comes on line, that capacity will grow further.⁵³ Of course, at some point Pakistan’s ability to produce enough heavy water for these facilities will come under strain, so we might expect to see an expansion of capabilities in this area as well.⁵⁴ Plutonium allows Pakistan to diversify its nuclear weapons arsenal, to create lighter weapons (possibly for use on cruise missiles, see below), to create greater yields, and eventually may lead to a thermonuclear capability.⁵⁵ In particular, the increase in plutonium production presages a move toward more reliance on missile delivery systems, because plutonium weapons can be made smaller than HEU based weapons.⁵⁶

Understanding the number and type of HEU and plutonium production facilities, as well as when they became operational, allows one to make educated guesses about how much weapons grade material has been produced by Pakistan.⁵⁷ These numbers are necessarily ranges because we cannot be sure about the capacity at which each facility has been operating. It is estimated that Pakistan is able to enrich between 80-140kgs of uranium per year at Kahuta, or enough to produce 4-8 bombs per year. It is estimated that Khushab-1 produces 10-20kgs of plutonium per year, or enough for 2-3 plutonium weapons per year. Of course, Pakistan may be using uranium and plutonium in the same weapon. The range of HEU and plutonium produced in total by Pakistan runs from 1175 – 2020 kg and 95 – 115 kg, respectively.⁵⁸ It is typically estimated that Pakistan’s HEU devices require between 15-20 kg each, while plutonium devices require between 4-5 kg

each.⁵⁹ Thus, at the beginning of 2008 a number of open sources estimated Pakistan had around 60 nuclear weapons, and perhaps additional HEU that could be weaponized.⁶⁰ By late 2009 however, analysts had increased that number to between 70-90 warheads.⁶¹ It should be noted that at various times unnamed government sources have claimed Pakistan's arsenal is significantly underestimated in the open literature.⁶² It is also often unclear from the open literature whether estimates apply to weapons grade material or finished cores.⁶³ This article estimates that as of January 2010 Pakistan has enough weapons grade material for between 100-158 weapons, with a narrower (and more speculative) estimate of 123-129 warheads (see notes 58 and 62 for further discussion). It is ultimately unclear precisely how much of the material has been fabricated into the cores and constituent elements of the weapons, though this article errs on the side of more weapons due to the worst case scenario planning associated with nuclear security. Finally, it is believed that Pakistan maintains its weapons in a disassembled state, with the core separate from the non-nuclear explosives.

Conclusions about the impact of Pakistan's nuclear weapons production complex on larger issues of stability are mostly negative. First, the complex is itself nested in an unstable environment, which implies multiple and sometimes unseen opportunities for error. Second, the program is undergoing rapid growth, which again opens the door to accident and unforeseen consequences. Moreover, the arsenal itself is probably larger than generally thought, increasing the opportunity for losing control over one or more weapons. On the positive side, the weapons are thought to be unassembled. One would assume this is preferred by the United States, though unassembled warheads may be destabilizing in time of crisis (as well as easier to steal). Recent developments within

Pakistan's delivery systems add yet again to at least the short term instability generated by Pakistan's nuclear weapons program.

CURRENT DEVELOPMENTS IN DELIVERY SYSTEMS

Pakistan has assorted methods for delivering its nuclear weapons. It is suspected of having modified at least 32 F-16s to deliver nuclear weapons. The primary advantage of the F-16 for Pakistan is its long range. But increasingly Pakistan is developing missile delivery systems, both ballistic and cruise. Pakistan's operational missiles do not currently have the range of the F-16, but Pakistan has missiles entering deployment that exceed the F-16s range. It can be anticipated the Pakistan will retain its F-16 delivery option in order to maintain flexibility, but will increasingly depend on its missile delivery options because of their greater ability to penetrate to the target.⁶⁴

Although Pakistan may also have modified its Mirage V and A-5 aircraft to deliver nuclear weapons, the F-16 is the most survivable of its aircraft and thus probably the primary platform for air delivered weapons. The F-16 has a range of 1,600 km and a payload of 5,450 kg. Under a 2006 agreement with the United States Pakistan is to receive 36 more F-16s.⁶⁵

Pakistan's missile program includes three operational, nuclear-capable ballistic missiles, one ballistic missile apparently soon to be operational, and two cruise missiles under development (see figure 1). Pakistan's operational ballistic missiles include the Ghaznavi (Hatf-3), the Shaheen-1 (Hatf-4), and the Ghauri (Hatf-5). Most analysts now believe Pakistan has mastered the ability to miniaturize warheads for missile delivery.⁶⁶ It should be noted that open sources vary greatly on the characteristics of Pakistan's missiles. This article relies upon those characteristics most often cited in the literature.⁶⁷

All Pakistani missiles carry only a single warhead. The missiles are not thought to be kept on operational alert, are not loaded with nuclear weapons (which themselves are not assembled), and are *probably* stored separately from the warheads during peacetime.⁶⁸ During crisis, the warheads would be assembled at one stage of the alert and mated with their delivery systems at a higher stage of alert. “Integrated teams of military personnel and nuclear scientists/engineers probably undertake such a task, ensuring organizational checks and balances, as well as ensuring that no rogue commander or scientist could act independently of the national command authority.”⁶⁹

Pakistan’s oldest nuclear capable missile is the Ghaznavi, a solid fuel, road mobile missile with an approximate range of 300-500 km. It became operational in 1995 and Pakistan is thought to have 30-84 of these missiles. It was derived from the Chinese M-11.⁷⁰ It can carry a payload of approximately 500 kg. At least some of these missiles are based at Sargodha Weapons Storage Complex.⁷¹ It is thought that Pakistan now produces these missiles indigenously at Fatehjung (where China built a turnkey factory in the mid-1990s).⁷²

Pakistan’s second nuclear capable missile is the Shaheen-1 (Hatf-4). The Shaheen-1 was derived from the Chinese M-9. This missile may come in two variants, one with a range of 450 km and the second with a range between 650-750 km. The first version has a payload of 1,000 kg, while the second is thought to have a payload of 500 kg. The missile is road mobile and solid fueled. It became operational in 2003 but it is not known how many Shaheen-1s Pakistan possesses. It may be assembled or possibly produced at a missile plant at Fatehjung (note there are multiple spellings for this

location). Some sources indicate a high degree of accuracy for this missile (300 meter circular error probability [CEP]).⁷³

The Ghauri (Hatf-5) is most likely actually a North Korean Nodong missile. Though it has the greatest range of Pakistan's operational nuclear capable missiles (700-1,500 km), and though it is road mobile, it is liquid fueled. Liquid fueled missiles require lengthy fueling procedures during which time they may be vulnerable to attack. The Ghauris became operational in 2002 or 2003. Pakistan is thought to have about 15 such missiles. It is far less accurate than other delivery systems (2,500 CEP) making it most useful as a city attack weapon.⁷⁴

The missile of Pakistan's future is probably the Shaheen-2 (Hatf-6). This missile may be derived from the Chinese M-18. It is road mobile and solid fueled. It has a range of between 2,000 and 2,500 km, allowing it to threaten almost all of India. It has a payload of 500-1,000 kg. First tested in 2004, it may have GPS guidance. Pakistan is believed to have 12-15 of these missiles in various stages of completion. The missile appears to be undergoing its initial deployment in 2009.⁷⁵

Pakistan also has two cruise missiles under development. The Babur (Hatf-7) is derived from the Chinese DH-10 (itself thought to be a reverse engineered copy of a US Tomahawk cruise missile that crashed in Pakistan during the 1998 US cruise missile attack on Afghanistan).⁷⁶ The Babur has a range of 500-700 km and a payload of 450 kg. It is solid fueled and is probably ground launched, though other sources indicate an air and sea capability.⁷⁷ If it can indeed be deployed on Pakistan's Agosta submarine, it will provide Pakistan with a rudimentary but seemingly secure second strike capability.⁷⁸ This would bring an element of stability to what has heretofore been an unstable nuclear

relationship *vis-à-vis* India. It would also allow Pakistan to develop the beginnings of a triad. Pakistan is thought to have 5-10 of the Babur cruise missiles. They are highly accurate with a CEP estimated to be 350 meters. The missile was tested in 2005, 2006, 2007, and 2009.

Less is known about Pakistan's second cruise missile, the Hatf-8 or Ra'ad.⁷⁹ It is thought to have a range of 350 km. It is solid fueled and probably air launched. It has been rumored to have some stealthy characteristics. The air launch capability is important because it allows launch from Pakistan's less survivable aircraft and because it extends the range of whatever aircraft launches the weapon.

In conclusion, according to the open literature, Pakistan has a nuclear arsenal of about 70-90 weapons and more weapons grade material. It has multiple delivery options. Pakistan seems to be developing arsenal and delivery options to maximize war fighting capabilities as opposed to maximizing crisis instability. As with other variables this bodes poorly for regional stability and therefore also has negative implications for US security.⁸⁰ Though little is known about Pakistan's command and control system, it seems this element has not advanced as quickly as the weapons and delivery systems.

CURRENT DEVELOPMENTS IN COMMAND AND CONTROL

Pakistan's command and control (C&C) systems and procedures seem less developed than the other elements of its nuclear weapons program.⁸¹ Indeed some assert that Pakistan made very little effort to develop its C&C or a nuclear doctrine until after it tested in 1998.⁸² In February 2000 Pakistan established the National Command Authority (NCA) to formulate nuclear policy and exercise control "over the employment and development of all strategic nuclear forces and strategic organizations."⁸³ Though this

system officially includes political leadership, the Pakistani military may well make the final decisions regarding nuclear use.⁸⁴ Pakistan has reportedly adopted measures to avoid unauthorized or accidental use of its nuclear weapons. Procedurally, although a few assert Pakistan uses a “three-man rule,” most assert a “two-man rule” whereby the use of nuclear weapons requires the concurrent decision of two people.⁸⁵ Personnel involved with Pakistan’s nuclear program are reportedly vetted by four different security agencies.⁸⁶ Allegedly no single person can authorize use of nuclear weapons.⁸⁷

The open literature tells us far less about technical aspects of Pakistan’s C&C system. It does appear that the United States has provided technical assistance to help secure Pakistan’s nuclear weapons against unauthorized or accidental use.⁸⁸ Still, it also seems that Pakistan has not yet developed “secure command and control systems” for its nuclear forces.⁸⁹ Instead, and not surprisingly, Pakistan has chosen to focus on developing the weapons and delivery systems first. The problem with this approach is that Pakistan’s nuclear forces may be susceptible to decapitation or lack of communication during a war. During a crisis this may generate pressures to launch. These pressures will increase even more as conventional hostilities unfold. And of course, Pakistan does not have the mitigating factors of the early Cold War such as slow delivery times and long distances to target. Missile flight times between India and Pakistan may be as short as three minutes.⁹⁰ There is also some evidence that Pakistan is using its conventional C&C system for its nuclear forces.⁹¹ If this is the case, it may find its C&C degrading more quickly than a dedicated nuclear C&C system during a conventional war, again creating incentives for nuclear use or possibly devolution of launch authority during hostilities. Alternatively, realizing that such a breakdown may

occur, Pakistan could pre-delegate launch authority as the crisis spins up.⁹² Many analysts recognize the need for better C&C.⁹³ Better C&C reduces the risk of unauthorized or accidental war. But it is simply not possible from open sources to determine the extent of the need, especially in the technical area. While Pakistan has adopted procedures to reduce the likelihood of unauthorized or accidental use, it does not appear to have acquired the technical resources necessary to most fully support this policy. Similarly, Pakistan's nuclear doctrine does not aim to promote stability first and foremost. Finally questions remain about its Personnel Reliability Program (PRP), especially given the increasingly radicalized population from which it draws.

CURRENT DEVELOPMENTS IN NUCLEAR DOCTRINE

The weapons, the delivery systems, and the command and control all serve a state's nuclear doctrine.⁹⁴ Unlike India, Pakistan has not released an official version of its nuclear doctrine in part because Pakistan sees itself as benefiting from ambiguity (see below).⁹⁵ Instead, analysts have discerned the outlines of a probable doctrine, while Pakistani government officials have occasionally seen fit to comment on doctrine, allowing analysts to refine their understanding. It is likely that Pakistan's nuclear doctrine focuses almost entirely on India.⁹⁶

Pakistan's nuclear doctrine rests on at least three primary assumptions. First, as demonstrated from the crises reviewed above, Pakistani officials believe nuclear deterrence has worked to prevent Indian aggression in the past and that an existential deterrent relationship is developing in Southwest Asia.⁹⁷ Second, India clearly has conventional superiority and Pakistan lacks strategic depth, thus *first use of nuclear weapons may be necessary* for Pakistan.⁹⁸ Third, ambiguity about what might trigger first

use is valuable in maintaining the general peace.⁹⁹ To some extent this approach mirrors the US policy during the Cold War regarding the potential first use of nuclear weapons in the face of a Warsaw Pact invasion of West Europe. Fundamentally then, Pakistan's nuclear weapons are designed to deter war with India and to prevent catastrophic defeat should war somehow come about. There are two primary prongs to Pakistan's nuclear weapons doctrine.

Prong one identifies the major elements of Pakistan's nuclear weapons doctrine. The doctrine may be identified as "credible minimum deterrence" or "dynamic minimum deterrence."¹⁰⁰ It is dynamic because it has no hard and fast numbers.¹⁰¹ Rather, the number of weapons necessary to maintain a minimum deterrent change as the threats Pakistan faces change. For example, if India increases its nuclear capabilities, Pakistan may need to increase its capabilities (including warhead numbers) to maintain deterrence. Less obviously, if India achieves some level of conventional counterforce capability, Pakistan may have to modify its nuclear force structure. Indeed, even if India only increases its conventional capabilities *vis-à-vis* Pakistan's conventional forces, Pakistan may be forced to upgrade its nuclear forces so as to maintain acceptable levels of existential deterrence. It follows then that Pakistan's deterrent posture is "proportional" to India's nuclear (and other) advancement. While this may make sense from Pakistan's position, it is in at least one sense destabilizing. It is destabilizing because India has a second potential nuclear foe in China. Thus as India moves to reach acceptable levels of deterrence *vis-à-vis* China, it is in fact driving Pakistani expansion, which in turn breeds insecurity and further arming in India.¹⁰² This is the classic security dilemma leading to an arms race. In fact Southwest Asia is currently in the midst of a nuclear arms race.

Even if an arms race does not necessarily lead to war, it is still expensive and practically guarantees negative externalities.¹⁰³ Moreover, there are continuing concerns about the security of Pakistan's weapons and further expansion is likely to exacerbate these vulnerabilities.

The second major prong provides some hints regarding when Pakistan might use nuclear weapons (beyond simply responding to a nuclear attack). Lieutenant General Khalid Kidwai during an interview listed four times when Pakistan might use nuclear weapons. These were: 1) Pakistan suffers large territorial losses; 2) India destroys a large portion of Pakistan's army; 3) India engages in "economic strangulation" (this may be referring to a blockade); and, 4) India engages in serious political destabilization.¹⁰⁴ Pakistan might also use nuclear weapons to prevent "Pakistan's adversaries from attempting a counter-force strategy against our strategic assets, by effectively securing our strategic assets and threatening nuclear retaliation should such an attempt be made."¹⁰⁵ This statement is meant to deter either nuclear or conventional counterforce attacks by India.¹⁰⁶ It is noteworthy that even as set forth above these are still fairly vague descriptions of what might lead to nuclear use by Pakistan. This vagueness is by design: Pakistan wants to create uncertainty in the minds of India's policy makers and therefore maximize the benefits of existential deterrence. Retired Lieutenant General Sardar FS Lodi has added some specificity to what sort of military set back would almost certainly evoke a nuclear response. He notes that in "a deteriorating military situation when an Indian conventional attack is likely to break through our defenses or has already breached the main defense line causing a major setback to the defenses, which cannot be restored by conventional means at our disposal, the government would be left with no other option

except to use nuclear weapons to stabilize the situation.”¹⁰⁷ Pakistan’s stated willingness to use nuclear weapons during a conventional conflict, which in turn would likely cause Indian retaliation and all out nuclear war, is thought to reduce the probability of conventional war from starting in the first place.¹⁰⁸ Lodi’s statements do not reduce ambiguity however, because there are many other situations in which the weapons *might* be used. Even those who claim Pakistan’s doctrine excludes warfighting, note target options that include “a number of major Indian cities, military installations, command and control headquarters, battlefield targets, communications centers, etc.”¹⁰⁹

There are at least two conclusions that may be drawn from what is understood about Pakistan’s nuclear weapons doctrine. First, while Pakistan claims there is no race for quantitative equality, clearly force ratios matter as do qualitative factors. Pakistan cannot afford to fall too far behind because this may allow India to reduce uncertainty and provide greater opportunity to manipulate Pakistani behavior. While this may seem somewhat absurd from an outsider’s perspective, one must remember that when facing a nuclear-armed foe almost all states (including the US) engage in worst-case scenario analysis. Second, Pakistan is likely to try to take advantage of asymmetries in its conflict with India so as to minimize India’s obvious military, economic, and demographic advantages. These asymmetries might include technological advantages such as mobile missiles, allies such as China, ambiguity in declaratory policy, and even “asymmetric soft power” inasmuch as militant Islam seems to be creating sympathies from the world wide (and Indian) Muslim community.

Since acquiring nuclear capability, first oblique and later explicit, Pakistan has avoided large-scale war with India. Pakistani authorities see this as evidence that nuclear

weapons work to deter aggression. But Pakistan continues to fear India economic, conventional, and nuclear strength. Consequently, Pakistan continues extensive development of nuclear weapons and associated delivery systems. Pakistan has done less to develop effective command and control for its arsenal. Less yet is known about the security of the weapons themselves. Thus, Pakistan's nuclear weapons program is an immature program. This immature program complicates US policy in the region and beyond.

The United States has a direct interest in the Pakistan's nuclear weapons program. First, since the end of the Second World War the US has provided certain collective goods for the international community such as an open economic system and zones of peace that allow for continued economic development. A nuclear war in Southwest Asia would do severe damage to those collective goods. Second, the US is itself engaged in a global war against militant Islamists, many of whom find safe haven in Pakistan. These militants seek to acquire and use nuclear weapons against the US and its allies. Third, the US is engaged in wars within two of Pakistan's neighbors. For all these reasons, the US has a very direct interest in what occurs within Pakistan and especially within Pakistan's nuclear weapons program. The following sections examine the challenges to US national security arising out of Pakistan's nuclear weapons program as well as synergistic interactions between these challenges.

CHALLENGES TO US SECURITY

There are at least six related challenges to US security that arise out of Pakistan's nuclear weapons program. The challenges are as follows:

1. The ongoing arms race in Southwest Asia;

2. Proliferation out of Pakistan;
3. Pakistan's arsenal characteristics, including but not limited to, the possibility of accidental or unauthorized war;
4. War with India;
5. Islamist influence in Pakistan and infiltration into key sectors of society; and,
6. State failure in Pakistan.

It is difficult to precisely rank these in terms danger. Later, this article places challenges on two axes (danger and likelihood) (see figure 2). Though these challenges are recognized in the literature, their synergistic interaction gets far less attention. Similarly, little is said about how these challenges are heightened by the immature nature of Pakistan's nuclear weapons arsenal. These points are important because they imply that the United States can mitigate some of these dangers more than is generally recognized. US action to further develop certain aspects of Pakistan's nuclear weapons program could relieve stress on those US security interests threatened by immaturity as well as depressurize the synergistic nature of certain security challenges. It is these synergistic challenges that in fact cause the most dangerous and unpredictable threats to the United States.

1. The Ongoing Arms Race in Southwest Asia

The question here is less one of potential and more one of the costs and consequences of a nuclear arms race on the subcontinent. There is little doubt that a nuclear arms race is underway between Pakistan and India (and to a lesser extent China).¹¹⁰ Pakistan is engaged in expanding its ability to produce plutonium. Increased plutonium production points to both the quantitative addition of more warheads as well as

the qualitative addition of higher yield and/or smaller warheads. In the long-term, it may indicate a desire to cross the thermonuclear threshold.¹¹¹ Pakistan continues to enrich uranium and improve delivery platforms. For example, Pakistan is enhancing its missile delivery options. The Shaheen-2 will hold almost all of India at risk. Pakistan is also developing two cruise missiles. This effectively extends the range of Pakistan's aircraft, improves their survivability, and increases the likelihood that the weapons will reach their Indian targets.¹¹² India is attempting to match or exceed Pakistani capabilities, both quantitatively and qualitatively, across the board.¹¹³

Arms races are often claimed to start wars, though there is little evidence to support this contention. In the case of Pakistan, some of the primary dangers are as follows. First, a nuclear arms race diverts badly needed funding from social projects including an improved education system, economic development, health care, and other infrastructure. Second, any war that occurs on the subcontinent and involves nuclear weapons will surely kill untold millions, severely damage the world economy, and therefore indirectly kill more. Third, more weapons increase the likelihood of unauthorized access. Fourth, the arms race has created immature arsenals that are themselves subject to accident, unauthorized use, and/or miscalculation (see below). The race is occurring at the "sharp end of the spear." But the command and control that has to guide the spear has been neglected.¹¹⁴ Consequently, mistakes and miscalculation, especially during crisis, are more likely. This fourth set of problems underscores the synergistic quality of the challenges resulting from recent developments in Pakistan's nuclear arsenal. Somewhat counter-intuitively, an arms race that goes only half way (i.e., one that neglects C&C) actually increases the dangers of mistaken war and thus

endangers US security interests. So if US actions could enhance Pakistani C&C capabilities the chances of war (and other threats such as illicit seizure of weapons) might in reality be reduced.

Another challenge that interacts synergistically is proliferation. Nuclear proliferation has allowed Pakistan to upgrade its nuclear weapons arsenal by exchanging nuclear weapons knowledge for other needed technology, such as delivery vehicles. Here US nonproliferation strategy has actually increased proliferation. Rather than limiting proliferation to Pakistan, the US refusal to provide Pakistan other technology forced Pakistan to trade with and assist the nuclear programs of states like North Korea and Iran. Simplistic, one dimensional and unimaginative US foreign policy (influenced far too often by uninformed public opinion) has bred additional security threats.

2. *Proliferation out of Pakistan*¹¹⁵

A.Q. Khan was implicated in 2004 in a widespread nuclear technology proliferation ring.¹¹⁶ Though Pakistan's government denied involvement, most observers believe the proliferation ring could not have existed without approval of higher Pakistani authorities.¹¹⁷ It seems logical that Pakistan would trade nuclear technology to Iran and North Korea in exchange for help with missile development.¹¹⁸ In fact, the Pakistani Ghauri is generally regarded as a copy of the No-Dong (North Korea) or possibly the Shahab 3 (Iran).¹¹⁹ Although Khan has been removed from positions of power, the United States has never been allowed to interrogate him. It is therefore impossible for the US to determine the true nature and extent of the proliferation ring.

Certainly many individuals associated with the ring remain at large.¹²⁰ This implies that parts of the ring are dormant and subject to awakening at a later time. This

would allow Pakistan to begin proliferation activities again. One way this might happen is if the US were to again disengage from Pakistan as it has done in the past (for example under a Pressler Amendment decertification by the George H. W. Bush administration). Although a high profile relationship between the US and Pakistan probably increases discontent across the larger Pakistani society, the US nevertheless needs to remain close with the army and more moderate sectors of society.

If the US disengages, it should expect proliferation incentives to grow because Pakistan will have to find other sources from which to acquire those assets deemed necessary to its security needs. Pakistan can afford to forgo certain developments if the United States is engaged and perceived to be providing security.¹²¹ The *quid pro quo* for such US involvement, from the Pakistani viewpoint, is the necessity to avoid more egregious breaches of nuclear arms control regimes. Pakistan's military can live with this bargain only so long as the US provides security through engagement.

Of course, too much US involvement could also lead to undesired results. Overt and heavy handed US involvement is likely to trigger a backlash in Pakistani society against the United States and any cooperating Pakistani government. Rather, the US should increase the use of soft power, making the United States more attractive to Pakistan.¹²² This is a long term approach, but one that must begin immediately and take center-stage as perhaps the key US objective in Pakistan (along with educational reform). Meanwhile, unobtrusive engagement is particularly desirable. Obviously area specialists need to be consulted on short- and long-term engagement. But certainly training more Pakistani officers (and perhaps even rank-and-file) in the United States and reopening US universities to Pakistanis would help.¹²³ One risk for the United States in becoming too

obviously involved in Pakistan is that Pakistani society may react as Iranian society did in 1979.

A revolution or state failure in Pakistan encouraged in part by too much US involvement would be catastrophic.¹²⁴ Depending on the nature of such a revolution, it might be that the government itself would not seek to provide nuclear weapons to radical nonstate actors, but that elements within the now fractured Pakistani state would reactivate the proliferation ring and provide nuclear knowledge to untrustworthy states and perhaps even nonstate actors. Even if the transfer were limited to states unfriendly to the US, these states in turn might transfer nuclear materials to nonstate actors.¹²⁵ And all of this presupposes that radicals themselves do not gain firm control of Pakistan, in which case they may simply provide weapons to nonstate actors directly. These eventualities again demonstrate the synergistic nature of these challenges. Similarly, proper US policy, either by reducing incentives to proliferate by providing security to Pakistan, by enhancing economic growth within Pakistan (especially by improving Pakistan's education system), or by reducing the effectiveness of malcontents in Pakistan, would have positive synergistic impacts across linked policy issues.¹²⁶ In turn, the security of Pakistan's nuclear weapons complex would be enhanced and threats to the US reduced.

3. *Pakistan's arsenal characteristics, including but not limited to, the possibility of accidental or unauthorized war*

Pakistan's nuclear arsenal is best characterized as an immature arsenal. For example, its delivery systems do not offer a secure second strike capability. Its F-16s are increasingly vulnerable to Indian anti-aircraft measures and/or a first strike.¹²⁷ Its most effective missile, the Shaheen-2, may be in the initial stages of deployment, but is not

widely deployed as of this writing. As a result, the arsenal is currently unable to threaten with high probability much of India, and especially those areas where India's nuclear weapons establishment is located. Thus to maximize effectiveness, Pakistan's current arsenal must be deployed close to the border, making it vulnerable to Indian attack, and therefore creating a strong incentive for Pakistan to use the arsenal early or risk losing it. The problem of immature delivery systems will slowly begin to dissipate as the Shaheen-2 is deployed.¹²⁸

Pakistan's warhead cores appear to be kept separate from the detonation components, as noted above. But they are likely stored in close proximity to each other so that they may be quickly assembled during crisis. Similarly, it can be surmised that the delivery vehicles to which the warheads must be mated are also located close to the warheads. This raises questions of how easy it would be for the various components to be destroyed in a first strike or perhaps seized by militants. Though many scoff at the notion of militants seizing nuclear weapon materials, many of the weapon components appear to be stored in western Pakistan closer to militant sympathetic areas. Moreover, the militants have shown an ability to infiltrate Rawalpindi and other Punjab strongholds. It is thus not a foregone conclusion that the weapons are safe from militants. All of these challenges are heightened during any sort of crisis when the military might have to assemble and move the weapons, making them more vulnerable to seizure and easier to use.¹²⁹

Another problem for Pakistan's immature arsenal is the process by which it moves from peacetime deployment to crisis mobilization. As others have noted, this transition crystallizes Peter Feaver's "always/never" dichotomy.¹³⁰ Any state wants its nuclear weapons to "never" be used when not authorized, but to "always" work when so

ordered. The two goals create tension. Pakistan apparently maintains its peacetime arsenal decoupled from launch vehicles and its warheads disassembled. This deployment status maximizes the goal of never allowing unauthorized use of the weapons (though the cores may be more vulnerable to illicit seizure than if mated with delivery vehicles). However this deployment approach also makes the weapons vulnerable to a first strike. It is not just the cores that are vulnerable; the other components and delivery vehicles are vulnerable as well. At various stages of a crisis, the weapons are apparently put on increasingly heightened stages of alert and at different points also assembled, coupled with their delivery vehicles, and finally prepared for launch. While this is supposed to be stepwise process reflecting slowly building alert status similar to the US DEFCON approach, in past crises the process appears hurried through (increasing the chance for accident or unintended use). Even if done in a slow and steady fashion, the movement from peacetime to mobilization is dangerous in and of itself.¹³¹ Some have argued the move from decoupled to coupled status may be more dangerous than simply maintaining deployed weapons.¹³² Beyond this, once mobilization has been achieved, while the weapons and delivery vehicles become less vulnerable (the “always” factor increases), the possibility of unauthorized or accidental use increases, as does the chance of miscalculation (the “never” factor decreases).¹³³ But the problem is even more complicated for Pakistan than for most states because of its immature C&C system.¹³⁴

Pakistan’s strategic C&C systems are underdeveloped. Regarding control, there are persistent questions about the day-to-day security of the arsenal.¹³⁵ Regarding command, it appears there may be “significant overlap between Pakistan’s normal conventional command and control structures that would be subject to attack in a large-

scale war and its strategic command and control structure.”¹³⁶ Thus Pakistan may find its nuclear C&C being attrited during conventional hostilities. This might force Pakistan’s leadership to consider ordering the early use of nuclear weapons or possibly devolving launch authority.¹³⁷ Intra-war stability would be threatened in either case. Other destabilizing alternatives include pre-delegation or adopting a launch on warning policy. Some even argue launch authority has been granted to field commanders during crises.¹³⁸ Beyond this crisis-centric concern, there are other endemic weaknesses in Pakistan’s strategic C&C structure.

There is room for improvement on both the procedural and the technical ends of Pakistan’s C&C system.¹³⁹ On the procedural end, the effectiveness of Pakistan’s PRP is unclear.¹⁴⁰ The program appears rigorous and has been adapted to Pakistan’s challenges. For example, it pays special attention to religious fundamentalism, as opposed to focusing on issues like alcohol, as in the United States. Further, the Pakistanis are thought to recruit largely from the Punjab, “who are thought to be less sympathetic to Islamist ideas...”¹⁴¹ Still, the program is even more secretive than the US PRP and thus it is impossible to determine the program’s effectiveness. It is possible that the program has failed to completely eliminate individuals whose interests and goals do not conform to official Pakistan state goals. In such a case this could lead to compromised security, perhaps during mobilization (or during social instability). The two (or three) person launch rule should work effectively to prevent unauthorized launch unless the PRP has been seriously compromised.¹⁴² But the two (or three) person launch rule does nothing to prevent an erroneous launch order (especially if launch authority has been devolved or pre-delegated). Finally, the standard operating procedures for assembling weapons and

mating them to launch vehicles are of unknown character. They may or may not reflect best practices.¹⁴³

It seems clearer yet that the technical end of Pakistan's C&C system is in need of assistance. While the US has apparently provided some technical assistance, this assistance is limited by national and international law.¹⁴⁴ One area in which the US has shared technology is physical security.¹⁴⁵ But in general, it appears that the technology for Pakistan's C&C system remains insufficient. The Pakistanis need assistance with modern communications equipment that can operate after an EMP event, they need early warning equipment, they need equipment that can determine where and how many nuclear weapons have detonated, they need state-of-the-art permissive action links (PALs) or similar technology, and so forth.¹⁴⁶ The problem with such recommendations, in addition to legal, is that the Pakistanis have also been wary of sharing information that is necessary to make some US technology transfers (e.g., PALs) effective. Some in the US might also worry about transfer of technology to the Chinese or others.

In peacetime Pakistan's C&C system may remain somewhat vulnerable to compromise by unreliable personnel or perhaps to a "bolt from the blue" attack. But barring massive social instability, the greatest concerns arise during a mobilization when the system's procedural and technological vulnerabilities are themselves buffeted by synergistic forces. This article examines two iterations of Pakistan's C&C weaknesses during mobilization, though others exist.

First, as Pakistan's nuclear forces are deployed, they are put on what is essentially a hair-trigger.¹⁴⁷ The problems with a nuclear hair-trigger are well known, but they are complicated for Pakistan because it has inadequate early warning systems. Pakistan is

therefore in the unenviable position of being on a “blind hair trigger.” The situation is further complicated in that, because of Pakistan’s immature C&C, we may see pre-delegation or possibly devolution of launch authority. Knowing Pakistan is on a blind hair trigger may in turn tempt India to strike first. The end result is heightened crisis instability, perhaps to a level never reached before in the history of nuclear conflict. When combined with the close proximity of India, with religious differences, and with historical animosity unparalleled even during the Cold War, it is not difficult to imagine an undesired nuclear war starting.¹⁴⁸

The second iteration follows the first, but presupposes an Indian conventional counterforce capability. It would be surprising if India did not attempt to eliminate as much of Pakistan’s nuclear weapons complex as possible during the opening stages of any serious conventional conflict (something larger than Kargil). In that case and combined with the factors set forth above, Pakistan will have an incentive to use its weapons and to use them early. Again, the result of this is heightened crisis instability.

In closing this section, it should be noted that immature arsenals may mature over time.¹⁴⁹ If Pakistan invests in dedicated strategic C&C, if it continues to improve its procedures, if it can develop a secure second strike capability, and if it can increase weapon survivability while resisting deployment postures that encourage early use, the subcontinent could in the future enter a period of far greater stability: existential deterrence will itself solidify.¹⁵⁰ For the US this implies policies that improve Pakistan’s arsenal in ways that address the problems set forth in the previous sentence even though this may be politically unpopular and legally challenging. But Pakistan will have to pass through troubled waters before it reaches greater stability. Synergistic interactions with

other security challenges during the period of immaturity, moreover, could lead to nuclear war.

4. *War with India*

War between Pakistan and India would harm US national security interests in assorted ways, including *inter alia* economic costs and the implications of a large-scale war between civilizations. It is not difficult to imagine war breaking out between the states and the last 60 years have borne this possibility out.¹⁵¹

The crises since 1986-87 indicate that nuclear saber rattling plays a large role once a Southwest Asian crisis begins. Although each of the crises was serious, none involved large-scale, border-length violence. Thus one might distinguish between limited war (e.g., Kargil) or less (e.g., Brasstacks) on the one hand, and large-scale warfare on the other hand. While a limited war could escalate into a nuclear exchange, the greater concern is a large-scale war. Such a large scale war is less likely to occur, but carries greater danger of nuclear use were it to occur. To be sure, though a limited war could “slip” into a nuclear exchange through accident, miscalculation, or otherwise, it is more likely that such a limited war would first escalate into significantly larger-scale conventional violence. Consequently while any type of crisis is to be avoided, it is large scale conflict that carries the greatest concern.

Any large-scale conflict between India and Pakistan is likely to involve the use of nuclear weapons. Indeed India will almost certainly attempt to engage in conventional counterforce attacks to minimize Pakistan capabilities. Knowing this, Pakistan will have an incentive for early use, especially given their weaknesses in C&C. Even if the states successfully negotiate this stage, Pakistan’s nuclear doctrine indicates it will use nuclear

weapons to forestall a major defeat, which would be the probable end stage in any such war. The synergistic combination of inherent animosity, a history of nuclear threats during crisis, an immature arsenal and an aggressive nuclear doctrine makes it unlikely the states could survive a major conflict without using nuclear weapons.

The question of limited war between India and Pakistan is more hopeful, though still generates the risk of nuclear release. Here, if Kargil is indicative, India at least has resolved to avoid threatening Pakistan with overt escalation. India retook the mountain positions at greater loss of life than might have been necessary had it escalated vertically (to the wider use of weaponry) or horizontally (opening a new front and forcing Pakistan to divert resources from Kargil). Nevertheless there is ample room for limited war to escalate to greater conventional conflict (with the likelihood of nuclear use then growing) or for some miscalculation leading to use or unauthorized use to occur. The synergies discussed above arise again in limited conflict.

Though war with India is always a concern, instability in Pakistan is a more immediate worry. If Pakistan were to enter a period of sustained, extensive social instability, violent Islamists would almost certainly play a central role. The likelihood of violent Islamists negatively impacting the nuclear weapons complex will most likely depend upon their influence over three key sectors of Pakistani society.

5. *Islamist influence in Pakistan and infiltration into key sectors of society*

Although Pakistani society is complex, this section focuses on Islamist influence within three sectors of society that have unique connection with the country's nuclear weapons program: the Directorate for Inter-Services Intelligence (the ISI), the military, and nuclear weapons scientists and technicians. Open sources do not provide much data

regarding the depth of Islamist influence on these three sectors, though certainly Islamist influence exists. This article distinguishes between infiltration, which implies deeply committed Islamists holding key positions within a given sector, and sympathy for Islamists' views from within a given sector, which implies less commitment, but the potential for individuals within a sector to support certain Islamist goals. Infiltration opens the way for direct cooperation with Islamists. Sympathy makes indirect support more likely. Infiltration is discussed first.

Each of the three sectors examined has suffered some level of infiltration by Islamists. The evidence is least clear in the case of the ISI. Though undoubtedly members of the ISI are sympathetic to Islamists (see below), the extent to which Islamists have infiltrated the ISI and can therefore provide counterintelligence opportunities, or even influence operations, is simply unknown. Examples that indicate some level of infiltration include those like the 4 September and 24 November 2007 attacks on buses carrying ISI employees. These attacks imply inside knowledge of the bus routes and passengers. Similarly other attacks on the ISI imply inside knowledge, though this knowledge could probably have been provided by low level ISI employees or even through careful surveillance. It has been noted elsewhere that some ISI operatives may be assisting Islamists and even Al Qaeda.¹⁵² The suicide bombing attack on the Indian embassy in Kabul (July 2008) is noteworthy as are the Mumbai attacks (November 2008). Finally, a number of ISI employees have been purged from the agency as a result of sympathies toward militant Islamists.¹⁵³ At some point sympathy turns into active support, which thus suggests infiltration. Alternatively, the US and the ISI have cooperated for a number of stunning intelligence successes in Pakistan, especially against

Al Qaeda (though far few successes have occurred in recent years).¹⁵⁴ Pakistan's tacit and sometimes overt assistance to the Taliban in its Afghan insurgency is widely thought to emanate from the ISI, though this may be more indicative of a foreign policy goal (an Afghanistan hostile to India) rather than infiltration of the ISI by Islamists.

There is more data on the level of Islamist infiltration into Pakistan's military. Certainly the links between the military and violent Islamists strengthened during the war with the Soviet Union in Afghanistan, as well as since the 1980s in Kashmir. It is reasonable to assume that some in the military are active Islamists as well. During the General Zia ul Haq years some even spoke of a "military-mullah alliance."¹⁵⁵ Since 9/11 there have been purges of senior military leaders who were also Islamists.¹⁵⁶ But one cannot eliminate the infiltration of decades in a few short years. To wit, former officers have been arrested in raids on militants again indicating infiltration of the military. Additionally, Khalid Sheikh Mohammed "was captured in the 'safe house' of a serving military officer with close family links to the Islamist political party Jamaat-I-Islami... having previously been kept, moved and protected by a network of Pakistan military officers linked only by their Islamist beliefs."¹⁵⁷ At least two assassination attempts on Musharraf were alleged to have inside military assistance.¹⁵⁸ It seems clear there has been significant infiltration into at least the junior officer corps and rank-and-file.¹⁵⁹ Recent attacks in Islamabad, Rawalpindi, and on military bases also imply inside assistance.¹⁶⁰ Moreover, as Pakistani society has become more accepting of Islamists views, so too would be those conscripted into the military from this society. This may be particularly true of the roughly one-quarter of the military (including 15-22% of the officer corps) made up of Pashtuns (the same ethnic group straddling the Pakistani/Afghan border and

providing the bulk of the membership to the Taliban).¹⁶¹ Pashtuns have been especially Islamized by Pakistani state policy over the last 30 years. Thus they provide a fertile source of likely Islamist infiltration, at least at the rank-and-file level of the military. Pashtuns also make up a significant proportion of Frontier Corp personnel who serve in the Federally Administered Tribal Areas (FATA).¹⁶² This ethnic division presents the potential for a split within the military, though this is not thought likely by most analysts at this point. Similarly, officers who rose “through the ranks in the post-Zia era” are likely to have faced greater Islamist influence.¹⁶³ All of this indicates not just sympathies for Islamists, but the prospect that Islamists now occupy increasingly important positions within the military – that they have truly infiltrated the military. But there is contra evidence as well.

The military and especially the officer corps should be expected to be anti-Islamist because increased Islamist power would reduce military power. In particular, the upper-level of the officer class has benefited greatly from its military service. Heads of universities, key government positions, and key bureaucratic positions are each a *de facto* benefit for senior military service.¹⁶⁴ These benefits would disappear with a significant increase in Islamist power, thus we can expect the military to attempt to prevent infiltration that might weaken the military. Similarly, recent attempts on the lives of key military officials are likely to make the military itself wary of potential Islamist infiltration. Furthermore, the military sees itself as the guardian of the Pakistani state. To the extent that an Islamist take-over threatens that role, it should be expected that the military would attempt to limit Islamist influence.

The status of Islamist infiltration into the nuclear weapons establishment is less clear. Certainly the establishment was infiltrated into its upper echelon of scientists at one point. A.Q. Khan and others have made their affinity for Islamists' concerns clear. Top level scientists, including Sultan Bashiruddin Mahmood and Majid Ali visited Al Qaeda when the Taliban held power in Afghanistan. These individuals may have recruited scientists from the nuclear weapons complex.¹⁶⁵ On the other side of the ledger, Musharraf purged the nuclear weapons establishment after 9/11. Current civilian leadership seems to appreciate the danger of militant Islam, as does Army Chief of Staff Kayani. Additionally, employees have been reassigned and/or terminated under Pakistan's revamped PRP, though how effective this program is in an increasingly "Islamist-sympathetic" society is unclear. It is thus ultimately difficult to discern the true extent of infiltration here, though it is probable that infiltration continues.

Societal sectors may not have been thoroughly infiltrated, but may still have sympathies for the Islamists' agenda. For example, it seems clear that there is notable sympathy for Islamists within the ISI.¹⁶⁶ The ISI has long used Islamists to support its agenda in Kashmir and Afghanistan. The ISI played a key role in the very creation of the Taliban.¹⁶⁷ The ISI has also been alleged to have helped rebuild Islamist militants in Northwest Pakistan after the United States toppled the Taliban regime. The ISI has not been "proactive" in providing the West with intelligence, has been "unhelpful in relation to specific investigations – most notably 7/7 and 21/7..." has "restricted or denied the US/UK access to many alleged terrorists..." and may even "misdirect" Western intelligence services.¹⁶⁸ The ISI is sympathetic to Islamists because Islamists further ISI agendas such as weakening India and keeping pressure on Kashmir.¹⁶⁹

Yet, the ISI also played a key role in capturing Al Qaeda operatives including Khalid Sheikh Mohammed.¹⁷⁰ Thus it may be somewhat useful to distinguish between ISI sympathy for the Taliban and similar “regional Islamists” on the one hand, and international Islamists such as Al Qaeda, on the other hand.¹⁷¹ Still, even support for regional Islamists may threaten Pakistan’s stability and therefore put its nuclear weapons at risk with attendant perils to US national security.

Radical Islamist groups provide a key regional foreign policy tool for Pakistan and the ISI. These militants are perceived as valuable in promoting ISI goals in Afghanistan and Kashmir. The ISI is loath to abandon such tools when US long-term support could wane.¹⁷² Moreover, close relationships have been built between the ISI and the militants in support of regional goals and more than a few ISI members agree with the long-term ideological goals of the militants.¹⁷³ A key question then is whether the militant attacks on the ISI and the broader Pakistani state could so alienate the ISI that it throws its lot in with the West. At this writing, though elements within the ISI recognize the dangers posed by radical Islamists, they continue to be wary of cooperation with the West, on both pragmatic and philosophical levels. Pragmatically, any association with the West and especially the US is profoundly unpopular with the Pakistani masses. Philosophically, the attraction of a more austere form of Islam is strong among elements within the ISI.¹⁷⁴

Pakistan’s military, too, has a mixed record of sympathy for Islamists.¹⁷⁵ On the pro-Islamist side of the ledger, the military has a long history of supporting Islamists to further its domestic and international ambitions. These connections are viewed “as a hedge against abandonment by Washington.”¹⁷⁶ A significant number are thought to

sympathize directly “with the politics of Salafist Islamism.”¹⁷⁷ Furthermore, the military has repeatedly shown an unwillingness and/or inability to assert control over northwest Pakistan. Moreover, the military recruits from an increasingly radicalized society, indicating its personnel may be increasingly radicalized (not just Pashtuns). Such troops have shown a disturbing proclivity to surrender without fighting in the tribal areas. Finally, the military was cutoff from the US between 1990 and 2002. Even now, the level of US contact with the Pakistani military remains low.¹⁷⁸ Previously, contacts between Pakistan’s military and the United States tended to moderate the Pakistani military, especially among the officer corps that was able to train with the US.

On the other side of the ledger, the Pakistani Army attacked the Islamist held Red Mosque (though admittedly this attack was carried out primarily by elite units thought to be least susceptible to Islamists). In 2008-2009 the military began a more systematic effort to rid the tribal areas of anti-government forces including foreign fighters and at least some elements of the Pakistani Taliban. As a result, the military has found itself increasingly targeted by militants (October 2009). Sympathy for violent Islamist views may wane as a result of these attacks. In fact there is evidence that the military views itself as increasingly threatened by Islamism.¹⁷⁹ Senior officers with Islamist leanings were purged by Musharraf.¹⁸⁰ Moreover, the military has benefited economically through its control of the country and is not likely to relinquish such control (and wealth) to anyone, democrats or Islamists.¹⁸¹

There is also evidence that Pakistan’s nuclear weapons establishment has some sympathies for Islamists. Some scientists have had connections with radical Islamists. It is likely that these scientists also attempted to recruit other Pakistanis scientists to assist

militants or at least engaged in Islamist proselytizing.¹⁸² The problem may be exacerbated by a lack of access to Western education institutions.

On the other hand, the government has removed a number of Islamist-oriented scientists. Moreover, personnel security has been heightened within the program, as well as physical security. Better auditing procedures have been introduced and export controls have been improved.¹⁸³ Given the Pakistan's perception of the threat posed by India, however, it is doubtful that attempts to remove such Islamist influences go so far as to reduce the program's effectiveness. Put another way, the efficacy of the nuclear weapons program surely wins out when weighed against Islamist influences.

The question arising out of this conjecture is how will these institutions react to increasing social instability? Infiltration of these institutions, or sympathies from within, both imply that Islamists could find willing allies during times of social upheaval. But infiltration implies a more overt role on behalf of the institution serving Islamists, while sympathies imply more passive acquiescence. In the case of the ISI or the military, this could be a key tipping point. Assistance from military units securing nuclear weapons is especially worrisome. In the case of the nuclear weapons establishment, social volatility could lead to the leakage of weapons and/or technology. Or perhaps insiders could assist in breaching security measures, such as by disabling PALs. Here, one example of negative synergy is an immature arsenal driven forward during an arms race and nested in social instability.

6. *State failure in Pakistan*

The radicalization of Pakistani society is not limited to the tribal areas but is a countrywide phenomenon. The number of madrassas had, by one estimate, expanded

from 7,000 in 2000 to 13,000-14,000 in 2006.¹⁸⁴ While by most accounts a large majority of the schools do not all produce jihadists, it seems clear that a number of the schools do and even more advocate a world-view that is distinctly hostile to the West. Government attempts to “reorient the curricula of many of these Madaris away from jihadi radicalization have largely failed with around 35 percent of the Madaris still not even registered under the government scheme.”¹⁸⁵ Perhaps more importantly, the government-run and privately-run schools also have an intolerant and anti-Western curriculum. The radicalization of Pakistani society is most notable though in the tribal areas. Pakistan’s government has essentially abandoned its polio elimination campaign due to resistance by militants.¹⁸⁶ The US presence in southwest and Central Asia surely contributes to the radicalization of local society, especially among Pashtuns about whom observers often speak of “creeping Talibanization...”¹⁸⁷ This results in the possibility of “Pashtun nationalism fusing with Islamism...” increasing the likelihood of international jihadists rather than only regional jihadists.¹⁸⁸ Already Pashtun jihadists in the Afghan border areas are making common cause with Punjabi jihadists originally focused on Kashmir and India.¹⁸⁹ In addition to Islamist support among the people, those areas that enjoy representation in Pakistan’s parliament (such as the NWFP, as opposed to the FATA) often boost political leadership that is also sympathetic to Islamists such as the Taliban, if not Al Qaeda directly.¹⁹⁰ Islam throughout southwest Asia has arguably become less tolerant.¹⁹¹ Even in the more urbane areas such as Quaid-e Azam University in Islamabad, “*hijabs* and *burqas* have increasingly become the norm...”¹⁹² And as the radicalization of society increases, the strength of the central government wanes. As a result we repeatedly see the central government attempting to make deals with militants

in the tribal areas. The government also assents to Islamists demands in order to appease Islamists or to bolster its own religion credentials. For example, in recent years the government has begun imposing Islamic studies for children earlier than in the past, countering moderate Islamic scholars who argued such you children could become “rigid and doctrinaire.” Similarly, in 2007 the “federal minister for religions affairs... argued that anyone who did not believe in jihad was neither a Muslim nor a Pakistani.”¹⁹³ Support for both Osama bin Laden and the *sharia* is high and rising in Pakistan.¹⁹⁴ Some even argue an Islamic revolution is already underway.¹⁹⁵

Of course one cannot be certain that Pakistan is headed for revolution or state failure. Even within the most radicalized areas, tribal differences exist that inhibit cooperation.¹⁹⁶ Astute policy might accentuate these differences, rather than amalgamating groups. Similarly, while certainly Pashtun nationalism is rampant, it is not clear that this must lead to international jihad. Traditional Pashtun culture remains alive even as foreign and local Islamists increase their strength in the region.¹⁹⁷ The trends are troubling, but it is not clear that the Pashtuns in particular, or Pakistani society in general, is unwavering in its desire to move toward an Islamic state. Thus the state may be able to retain the people’s support if it is viewed as serving the people.

Nevertheless, Pakistan is clearly becoming more unstable. The tribal areas are virtually ungovernable. Since the assault on the Red Mosque suicide attacks have occurred across the country, in urban areas as well as rural areas. These have continued in the face of Pakistani military operations in the tribal areas during 2008-2009. Heretofore untouchable entities, such as the ISI and the military now come under attack. Although many argue the military (and particularly the Army) can maintain control over Pakistan,

there is an increasingly likelihood (if still small) that the military cannot control itself; that its rank and file is so supportive of Islamist ideas that the Army itself may be suspect, as the Iranian Army was in 1979.

The synergistic threat from these last two sections arises first from national instability combined with important sectors of society (e.g., the ISI and the Army) either supporting Islamists or becoming paralyzed at key moments. Similarly, during great social upheaval, elements of the nuclear weapons infrastructure might collapse, switch sides, or otherwise compromise nuclear weapons security and/or technology. Any one of these eventualities has negative implications for US security. Moreover these variables could combine with other challenges such as economic meltdown or crisis with India, again resulting in damage to US national security, perhaps in unanticipated ways.

CONCLUSIONS

The variables and complexities can be overwhelming when examining even a small section of Pakistan. Figure 2 places the negative eventualities on a chart, estimating their likelihood of occurrence and the danger caused by any given event. The chart lists most of these as individual and discrete events, but as this article has tried to make clear, the greatest danger arises from the synergistic interactions of these events. So, for one example, state failure combined with Islamist influence may yield the nightmare scenario for the United States – militant acquisition of nuclear weapons. Similarly, a war with India, combined with immature arsenals may well yield multiple nuclear explosions on the subcontinent. Of course, there are other synergies to be examined (including, *inter alia*, severe global recession).

This article has not, in large part, proposed solutions. Rather, this article has tried to make clear the very real dangers presented by recent developments in Pakistan's nuclear weapons program and linked some of these to larger trends in Pakistan. There are solutions, but time is running short. Just as importantly, some of the most effective responses such as improving the United State's image, liberalizing education, and "maturing" Pakistan's nuclear weapons program, will take the longest to put into place. If any good can come from recent instability in Pakistan, it would be the recognition on the part of the United States that Pakistan may be the most dangerous country on earth, that it poses a very serious threat to US national security in the years to come, and that integrated solutions that take negative synergies into account are necessary now.

NOTES

The author wishes to thank three anonymous referees for their insightful comments on this article. The author is grateful for the financial and intellectual support provided by the Center for Strategic and International Studies' Project on Nuclear Issues (PONI). Earlier versions of this article were presented at PONI conferences in London and Omaha. The author is also indebted to Brianna Gartner and Shandra Breed for research assistance. Finally, the author would like to acknowledge the continuing support of Stephen F. Austin State University. The author is solely responsible for any inaccuracies contained within this article.

¹ The security dilemma for Pakistan and India is more perverse than it was for the US and the Soviet Union. A key problem with Pakistan's fixation on India is that India is also concerned with China. Therefore, as India increases its forces to deter China, Pakistan is threatened and builds its forces to deter India. China, of course, is concerned with the United States, and therefore steadily modernizes and builds its forces. Although the United States is building down, the other parties are all building up, and the resulting three-way arms race is both unstable and has no logical end. For a discussion of the security dilemma, see Sharad Joshi, "Nuclear Proliferation and South Asia: Recent Trends," *Nuclear Threat Initiative* (August 2007) available at <http://www.nti.org/e_research/e3_91.html> accessed 29 December 2007.

² On the relation between Pakistan's attempt to guarantee its security, the 1971 war, and the decision to develop nuclear weapons, see Rasul Bakhsh Rais, "Conceptualizing Nuclear Deterrence: Pakistan's Posture," *4/2 India Review*, 144-172, 147-149. On the alternative of emphasizing alliances instead of nuclear weapons development, see also Adnan Sawar Khan, "Pakistan's Foreign Policy in the Changing International Scenario," *96/2 The Muslim World*, (April 2006), 233-250, especially, 235-238. Major General (Ret'd) Mahmud Ali Durrani argues Pakistan's development of nuclear weapons was not driven by a need to "correct the conventional imbalance," but instead was driven by the need "to respond to a looming nuclear threat from India..." Maj. Gen. (Ret'd) Mahmud Ali Durrani, "Pakistan's Strategic Thinking and the Role of Nuclear Weapons," *Cooperative Monitoring Center Occasional Article 37* (Sandia National Laboratories) (July 2004), 1-54, 18. On the roots of hostility between Pakistan and India, see Rais, "Conceptualizing Nuclear Deterrence: Pakistan's Posture," especially 145-147.

³ On the impact of the Soviet invasion of Afghanistan, see Khan, "Pakistan's Foreign Policy," 239-242.

⁴ On the problems generated for Pakistan's rules from attempts to use Islam and especially Islamic fundamentalism's invocation of jihad, see for example, Jessica Stern, "Pakistan's Jihad Culture," *Foreign Affairs*, 79/6 (November/December 2000), 115-126. On the deleterious effects of military rule in Pakistan, see generally, Ashley J. Tellis, "U.S. Strategy: Assisting Pakistan's Transformation," *The Washington Quarterly*, 28/1 (2004-2005), 97-116, especially 99-106

⁵ See generally, Pervez Hoodbhoy and Zia Mian, "The India-Pakistan Conflict – Towards the Failure of Nuclear Deterrence," *Policy Forum Online* (13 November 2002) available at <http://www.nautilus.org/archives/fora/Special-Policy-Forum/48_Pervez_Zia.html> accessed 26 November 2007. But cf., it was the Hindu fundamentalist Atal Bihari Vajpayee who extended an olive branch to Pakistan at the Lahore Summit after the 1998 nuclear tests. I am grateful to an anonymous referee for making this point to me.

⁶ For instance, one observer noted in summer 2004: "Since its development, nuclear weapons capability has not only been considered an integral component of Pakistan's defense strategy but is believed to have been actually invoked on a number of occasions in the past decade and a half, to ward off an all-out war with India in the three conflict situations the two countries have faced." Zafar Iqbal Cheema, "The Role of Nuclear Weapons in Pakistan's Defense Strategy," Islamabad Policy Research Institute (Summer 2004) available at <<http://ipripak.org/journal/summer2004/therole.shtml>> accessed 5 September 2007.

⁷ Timothy D. Hoyt, "Pakistani Nuclear Doctrine and the Dangers of Strategic Myopia," 41/6 *Asian Survey*, 41/6 (November/December 2001), 956-977, 970.

⁸ This paragraph relies on P.R. Chari, "Nuclear Crisis, Escalation Control, and Deterrence in South Asia," *Working Article Version 1.0*, The Henry L. Stimson Center (August 2003), 14-16 <http://www.stimson.org/southasia/pdf/escalation_chari.pdf> accessed 26 October 2007; see also, Cheema, "The Role of Nuclear Weapons in Pakistan's Defence Strategy," Hoyt, "Pakistani Nuclear Doctrine and the Dangers of Strategic Myopia," 969-970.

⁹ For background on the crisis, see Devin T. Hagerty, "Nuclear Deterrence in South Asia: The 1990 Indo-Pakistani Crisis," *International Security*, 20/3 (Winter 1995), 79-114, especially 91. On the notion that Pakistan was not controlling Kashmiri militants at this point (and thus did not instigate the crisis) see generally, Edward Desmond, "The Insurgency in Kashmir (1989-1991)," 4/ 1 *Contemporary South Asia*, 5-16. Of course, this last point is disputed, and there is little doubt that Pakistan increased its active role in Kashmir after discovering the opportunity in 1990.

¹⁰ Hagerty, "Nuclear Deterrence in South Asia," 91.

¹¹ See generally, Barbara Tuchman, *The Guns of August* (New York: MacMillan Company, 1962).

¹² Hagerty quotes US military attaches that saw little evidence of an offensive build-up on either side of the border in February. While this may be true, it does not account for the increasing level of concern in all capitals, nor does it account for the increasingly virulent exchanges between Islamabad and New Delhi. Timothy Hoyt notes the importance of US military attaches in communicating to each country the lack of offensive preparations. Hoyt, "Pakistani Nuclear Doctrine and the Dangers of Strategic Myopia," 970.

¹³ Hagerty, "Nuclear Deterrence in South Asia," 93-96. Hersh reports that an Indian Jharatiya Janata Party member told Parliament that "in case of war, 'Pakistan ceases to exist.'" Seymour M. Hersh, "On the Nuclear Edge," *New Yorker*, 69/6 (29 March 1993), 56-73, 65.

¹⁴ Hagerty, "Nuclear Deterrence in South Asia," 92.

¹⁵ Hagerty, "Nuclear Deterrence in South Asia," 93.

¹⁶ Hersh, "On the Nuclear Edge."

¹⁷ I am indebted to an anonymous referee for reminding me that assembled nuclear weapons may not have been present in 1990. Of course, notwithstanding the 1998 tests, the respective nuclear weapons establishments may have assembled the weapons during the 1990 crisis.

¹⁸ Chari, "Nuclear Crisis, Escalation Control," 16-18.

¹⁹ Hagerty, "Nuclear Deterrence in South Asia," 97, note 80 citing 1994 interview with a US intelligence analyst.

²⁰ It should be noted that others indicate India did not believe Pakistan could deliver a nuclear weapon at this time. Chari, "Nuclear Crisis, Escalation Control," 17.

²¹ Cheema, "The Role of Nuclear Weapons in Pakistan's Defence Strategy."

²² This paragraph relies on Cheema, "The Role of Nuclear Weapons in Pakistan's Defence Strategy." Durrani also mentions "threatening statements coming out of India after India's nuclear explosions in 1998..." Durrani, "Pakistan's Strategic Thinking and the Role of Nuclear Weapons," 19. It is notable that

only Pakistani sources are available for this contention. There may, in fact, have been no such intent by India. The events may have been planted by Pakistani intelligence in the press or may simply be a reflection of mass paranoia.

²³ Conference Report, "Asymmetric Warfare in South Asia: Crisis of 1999, 2002, and Beyond," Center for Contemporary Conflict (New Delhi, India) (26-27 September 2002),

<http://www.ccc.nps.navy.mil/events/recent/sept02Kargil_rpt.asp> (accessed 14 November 2007).

²⁴ The fighting was quite fierce, though underreported in the United States.

²⁵ Note that the stability/instability paradox differs from existential deterrence, though it incorporates existential deterrence. Existential deterrence induces caution in the relations between nuclear-armed states. Although it is not clear just how much caution is induced, the US/Soviet experience implies that nuclear-armed states will not allow their military forces to engage one and other directly. The stability/instability paradox, on the other hand, allows for that caution at higher levels of conventional conflict, but paradoxically, encourages low-level conflict. It encourages such behavior, especially by a revisionist power, because the status quo state will probably have to escalate to return the situation to the status quo, and such escalation is dangerous in light of the increased probability of nuclear war. So the Pakistani occupation of Kargil is viewed by some as just the sort of action that would be expected and therefore demonstrates the stability/instability paradox.

S. Paul Kapur has a different understanding of the paradox, and argues that instability at the strategic level encouraged Pakistan's attack. He asserts that since Pakistan is a weaker actor, it should have expected India to expel its forces, and that only Pakistani nuclear threats could prevent this result. Thus, Pakistan must have believed that it had convinced India in some way that Pakistan would be willing to use nuclear weapons, indicating strategic instability. S. Paul Kapur, "India and Pakistan's Unstable Peace," *30/2 International Security* (Fall 2005), 127-152.

²⁶ See "Asymmetric Warfare in South Asia;" see also, Gaurav Kampani, "The Military Coup in Pakistan: Implications for Nuclear Stability in South Asia," *CNS Reports* (James Martin Center for Nonproliferation Studies) (October 1999); P.R. Chari, "Nuclear Crisis, Escalation Control," 19; and Hoyt, "Pakistani Nuclear Doctrine and the Dangers of Strategic Myopia," 973.

²⁷ Cheema, "The Role of Nuclear Weapons in Pakistan's Defence Strategy," quoting Timothy Hoyt.

²⁸ On preventing horizontal escalation, see Rais, "Conceptualizing Nuclear Deterrence," 162.

²⁹ See for example, Cheema, "The Role of Nuclear Weapons in Pakistan's Defence Strategy," and Durrani, "Pakistan's Strategic Thinking".

³⁰ This paragraph relies in part on Chari, "Nuclear Crisis, Escalation Control;" Rahul Roy-Chaudhury, "The United States' Role and Influence on the India-Pakistan Conflict," *2 Disarmament Forum* (2004), 31-39, available at <<http://www.unidir.org/pdf/articles/pdf-art2117.pdf>> accessed 6 November 2009; and Sumit Ganguly and Michael R. Kraig, "The 2001-2002 Indo-Pakistani Crisis: Exploring the Limits of Coercive Diplomacy," *14/2 Security Studies* (January 2005), 290-324.

³¹ See Chari, "Nuclear Crisis, Escalation Control," 20-21. Almost one million troops were massed on both sides of the border during parts of the crisis.

³² See generally, Hoodbhoy and Mian, "The India-Pakistan Conflict." Note that this signaling was not limited to verbal statements. Ganguly and Kraig, "The 2001-2002 Indo-Pakistan Crisis," 301 and 311. See also, Rais, "Conceptualizing Nuclear Deterrence," 159. "It is very likely that had Pakistan not possessed nuclear weapons, India would have started an all-out war during the Kargil Crisis and may have even declared war during the military stand off resulting from the terrorist attack on the Indian Parliament on 13 December 2001." Durrani, "Pakistan's Strategic Thinking and the Role of Nuclear Weapons," 31. On signaling, see Owen Price, "Preparing for the Inevitable: Nuclear Signaling for Regional Crises," *26/2 Comparative Strategy*, (March 2007) 103-115.

³³ Roy-Chaudhury, "The United States' Role and Influence," 35.

³⁴ Though many Indian commentators and officials dismiss Pakistan's nuclear arsenal, the actions of India bespeak caution, whether in avoiding escalation during Kargil or refraining from conventional operations during the 2001-2002 crisis. In fact, in the aftermath of the 2001-2002 crisis, "key individuals in Indian national security circles believed Pakistan's nuclear arsenal neutralized India's threats and plans to resort to large-scale conventional conflict..." Ganguly and Kraig, "The 2001-2002 Indo-Pakistan Crisis," 311.

³⁵ These "troublemakers" helped form the core of today's international violent Islamist movement, including but not limited to Al Qaeda.

³⁶ See Ganguly and Kraig, “The 2001-2002 Indo-Pakistani Crisis,” 296-297. See also, Joshi, “Nuclear Proliferation and South Asia.”

³⁷ Ganguly and Kraig, “The 2001-2002 Indo-Pakistan Crisis,” 297.

³⁸ The internationalization of the crisis has not played out the way Pakistan intended to date. International powers have largely taken India’s side because of the ways in which Pakistan drew international attention (Kargil, for example).

³⁹ On Chinese assistance, see for example, Anthony H. Cordesman, “The Threat of Pakistani Nuclear Weapons,” Center for Strategic and International Studies (8 November 2001), 3-4 available at <http://www.csis.org/burke/hd/reports/threat_pak_nukes.pdf> accessed 6 September 2007. Among other things, China is alleged to have provided a 25-kiloton weapon design, 5,000 ring magnets for use in gas centrifuges, missile technology, and a missile factory. For a broader discussion of China’s role in Indo-Pakistani relations, see Joshi, “Nuclear Proliferation and South Asia.” See also, Gregory S. Jones, “From Testing to Deploying Nuclear Forces: The Hard Choices Facing India and Pakistan” *RAND Issue Article 192* (2000), 1-11, 3.

⁴⁰ This paragraph relies in large part on Andrew Koch and Jennifer Topping, “Pakistan’s Nuclear Weapons Program: A Status Report,” 4/3 *The Nonproliferation Review* (Spring/Summer 1997), 109-113. Though dated, this excellent piece is still useful in producing a broad overview of Pakistan’s nuclear weapons program.

⁴¹ It has been noted repeatedly that much of Pakistan’s nuclear weapons infrastructure is located in the north and west of the country, those areas most vulnerable to Taliban militants and perhaps Al Qaeda. For example, see Shaun Gregory, “The Terrorist Threat to Pakistan’s Nuclear Weapons,” *CTC Sentinel* 2/7 (July 2009), 1-4, 2.

⁴² Mark Hibbs, a widely respected expert who depends upon open source materials estimated in June 2000 that New Labs was capable of producing between 8 and 10kgs of plutonium annually. David Albright and Paul Brannan estimate New Labs may be able to produce between 10 and 20kgs of plutonium annually. See Jack Boureston, “Assessing Pakistan’s Nuclear Reprocessing Capabilities,” 18/9 *Jane’s Intelligence Review* (October 2006), 39.

⁴³ See Boureston “Assessing Pakistan’s Nuclear Reprocessing Capabilities,” 40.

⁴⁴ Andrew Koch, “Pakistan Moves Towards a Plutonium-Based Arsenal,” 18/9 *Jane’s Intelligence Review* (September 2006), 48-49. Jane’s indicates Khushab-2 is a “CANDU-type heavy water reactor...”

⁴⁵ For the initial argument that Khushab-2 could be in the 1000 megawatts thermal range, see David Albright and Paul Brannan, “Commercial Satellite Imagery Suggests Pakistan is Building a Second, Much Larger Plutonium Production Reactor: Is South Asia Headed for a Dramatic Buildup in Nuclear Arsenals?” The Institute for Science and International Security (24 January 2006) available at <<http://isis-online.org/uploads/isis-reports/documents/newkhushab.pdf>>. Other analysts have since argued the reactor is smaller, though how much smaller is unclear. Whatever the production capacity, Albright and Brannan are correct that Khushab-2 (and now possibly Khushab-3 as well) provide Pakistan a significantly upgraded plutonium production capacity and indicate that Southwest Asia is indeed entering a new stage of its nuclear arms race.

⁴⁶ Norris and Kristensen argue Khushab-2 will be “in the 40- to 100 megawatt range.” Robert S. Norris and Hans Kristensen, “Pakistan’s Nuclear Forces, 2007,” 63/3 *Bulletin of the Atomic Scientists* (May/June 2007), 71-74, 71. Albright and Brannan continue to assert that the reactor will produce “100 megawatts thermal or more.” See David Albright and Paul Brannan, “Second Reactor Nears Completion, The Institute for Science and International Security (18 September 2008) available at <http://isis-online.org/uploads/isis-reports/documents/Khushab_18September2008.pdf> accessed 28 October 2009.

US government officials have claimed 40-50 megawatts, and indicated that the reactor may simply be a replacement for Khushab-1. On US government claims, see William J. Broad and David E. Sanger, “U.S. Disputes Report on New Pakistan Reactor,” *International Herald Tribune* (3 August 2006) available at <<http://www.iht.com/articles/2006/08/03/asia/web.0803pakistan.php>> accessed 5 September 2007.

⁴⁷ On the New Labs facilities being “scaled to handle” Khushab-1’s output, see Koch, “Pakistan Moves Towards a Plutonium-Based Arsenal,” 49. See also, Boureston, “Assessing Pakistan’s Nuclear Reprocessing Capabilities,” 40.

⁴⁸ On the New Labs expansion, see David Albright and Paul Brannan, “Pakistan Expanding Plutonium Separation Facility Near Rawalpindi,” Institute for Science and International Security (19 May 2009)

available at <http://isis-online.org/uploads/isis-reports/documents/PakistanExpandingNewLabs_19May2009.pdf> accessed 29 October 2009.

⁴⁹ On the Chashma reprocessing facility, see David Albright and Paul Brannan, “Chashma Nuclear Site in Pakistan with Possible Reprocessing Plant,” The Institute for Science and International Security (18 January 2007) available at <<http://isis-online.org/uploads/isis-reports/documents/chashma.pdf>> accessed 29 October 2009.

⁵⁰ Norris and Kristensen note the Chashma chemical separation facility is nearing completion. Norris and Kristensen, “Pakistan’s Nuclear Forces, 2007,” 71.

⁵¹ On Khushab-2 and Khushab-3, see David Albright and Paul Brannan, “Pakistan Appears to be Building a Third Plutonium Production Reactor at Khushab Nuclear Site.” (21 June 2007) available at <<http://www.isis-online.org/publications/southasia/ThirdKhushabReactor.pdf>> accessed 14 January 2010. On Khushab-3, see also, Jane Perlez, “U.S. Group Says Pakistan is Building New Reactor,” *The New York Times* (23 June 2007), A5.

⁵² For the initial assessment, see Albright and Brannan, “Pakistan Appears to be Building a Third Plutonium Reactor.” After much criticism, Albright and Brannan backed off to “100 megawatts-thermal or more.” Albright and Brannan, “Second Khushab Production Reactor Near Completion.” Albright and Brannan still assert the reactor’s power could be expanded in the future.

⁵³ Jane’s indicates the new Chashma reprocessing facility is being completed with Chinese assistance. Chinese facilities of similar size have had the capacity to process “50 tonnes to 100 tonnes of spent fuel per year, which equates a capacity of up to 50 kg per year of plutonium with six percent Pu-240.” See “Assessing Pakistan’s Nuclear Reprocessing Capabilities,” *Jane’s Intelligence Review* (October 2006), 40. If this is the case, and the Chashma reprocessing facility is designed to handle the output of Khushab-2 and Khushab-3, it may be that each plant will produce 25kgs of plutonium and therefore have an output of 125 megawatts thermal each.

⁵⁴ On the stress that Khushab-2 (and possibly Khushab-3) would place on Pakistan’s reprocessing and heavy water production facilities, see “Pakistan Moves Towards a Plutonium-Based Arsenal,” *Jane’s Intelligence Review* (September 2006), 48-49. See also, William J. Broad and David E. Sanger, “U.S. Disputes Report on New Pakistan Reactor,” *International Herald Tribune* (3 August 2006) available at <<http://www.iht.com/articles/2006/08/03/asia/web.0803pakistan.php>> accessed 5 September 2007.

⁵⁵ See generally, Albright and Brannan, “Pakistan Appears to be Building a Third Plutonium Reactor.” See also, Norris and Kristensen, “Pakistan’s Nuclear Forces, 2007,” 71 and “Pakistan Moves Towards a Plutonium-Based Arsenal,” *Jane’s Intelligence Review* (September 2006), 48-49. On India breaching the thermonuclear threshold, see James Lamont and James Blitz, “India announces capability to build a high-yield nuclear arsenal,” *Financial Times* (28 September 2009), 1.

⁵⁶ Jane’s notes that plutonium-based weapons “can more easily be configured for carriage on the country’s growing array of ballistic and cruise missiles.” “Pakistan Moves Towards a Plutonium-Based Arsenal,” *Jane’s Intelligence Review* (September 2006), 48.

⁵⁷ See for example, Pakistan Nuclear Stockpile (28 April 2005) available at <<http://www.globalsecurity.org/wmd/world/pakistan/nuke-stockpile.htm>> accessed 31 August 2007. More recently, analysts have begun using Crystal Ball forecasting software in order to gain “more systematic and defensible uncertainty analysis.” See for example, the ISIS page on Pakistan’s military stocks of fissile material available at <http://www.isis-online.org/maproject/country_pages/pakistan.html> accessed 5 September 2007. This paragraph relies on all of these sources.

There is some debate about whether Pakistan refrained from enriching uranium above 20% U-235 in the early 1990s. A.Q. Khan claims Pakistan never slowed its enriching activities. See Mark Hibbs, “U.S. Appears to be Losing Track of Pakistan’s Nuclear Program,” *Nuclear Watch* (17 July 1998) available at <<http://www.bu.edu/globalbeat/nucwatch/nucwatch071798.html>> accessed 5 September 2007.

⁵⁸ David Albright estimated Pakistan had 1,100kgs of HEU and 40kgs of plutonium at the end of 2003, quoted in Norris and Kristensen, “Pakistan’s Nuclear Forces, 2007,” 71. Koch and Topping estimated 460-785 kg at the beginning of 1997. They also estimate HEU production capability of 55-95 kg per year. In the 13 following years, Pakistan may have produced 715-1235 kg additional, for a total of 1175-2020 kg of HEU in January 2010. This would be enough HEU for 81-135 warheads (at 15-25 kg per warhead). On the plutonium range, see “Assessing Pakistan’s Nuclear Reprocessing Capabilities,” *Jane’s Intelligence Review* (October 2006), 41. Jane’s indicates 60-80kgs of plutonium in mid-2006. If Khushab-1 continues to

produce 10kgs per year, one would expect between 95-115 kg of plutonium as of early 2010. At 5kgs per weapon, this is enough plutonium for between 19 and 23 plutonium-based weapons. Note the plutonium production should ramp up considerably upon the completion of Khushab 2 and 3. Note also that this could have a ripple effect whereby less HEU may be necessary for warheads, thus possibly enabling a dramatic expansion of Pakistan's arsenal. Norris and Kristensen argue against a rapid expansion because of a lack of delivery vehicles. See Robert S. Norris and Hans Kristensen, "Nuclear Notebook: Pakistani Nuclear Forces, 2009," *Bulletin of Atomic Scientists* 65/5 (September/October 2009), 82-89, 82.

⁵⁹ See, for example, Norris and Kristensen, "Pakistan's Nuclear Forces, 2007," 71.

⁶⁰ Norris and Kristensen, "Pakistan's Nuclear Forces, 2007," 72. Jane's estimated 50-60 weapons in September 2006. See also, "Pakistan Moves Towards a Plutonium-Based Arsenal," *Jane's Intelligence Review* (September 2006), 48.

⁶¹ Norris and Kristensen, "Nuclear Notebook: Pakistani Nuclear Forces, 2009," 83. It is my view that given Pakistan's worst-case scenario planning and the ability to rearm F-16s (and any cruise missile delivering aircraft), Pakistan's nuclear warhead stockpile is at the high end of the Norris and Kristensen estimate, if not beyond it. For further discussion, see notes 58 and 62 herein.

⁶² See for example, Ben Barber, "Pakistan's Nuclear Arsenal Underestimated, Reports Say," *The Washington Times* (9 June 2000) available at <http://www.fas.org/news/pakistan/2000/e20000609pakistan.htm> accessed 9 August 2007; see also, Rasul Bakhsh Rais, "Conceptualizing Nuclear Deterrence: Pakistan's Posture," *India Review*, 4/2 (April 2005), note 32 where Rais comments, "The author's interviews with Pakistani experts reveal much higher figures of Pakistani nuclear warheads..." than NRDC and other estimates. My own estimate assumed Pakistan had 30 HEU devices at the beginning of 1999 (based on US government and GlobalSecurity.org estimates). Using GlobalSecurity estimates, one may assume 6 more HEU warheads per year for a total of 96 HEU warheads or warhead equivalents in January 2010. One may further estimate 2.5 warheads per year since 1999 (again, based on GlobalSecurity.org) for around 27 plutonium based weapons (or material for the same) in January 2010. Of course, Pakistan may not have produced cores from all of the weapons grade material it has. Moreover, it could be creating warheads that mix HEU and plutonium. Nevertheless, this estimate indicates that Pakistan has the weapons grade material for a total of approximately 123 nuclear weapons as of January 2010. If Kahuta produced between 10 and 20 kg of plutonium (and has been doing so since 1999), it may make more sense to estimate 15 kg per year, enough for three plutonium-based weapons per year, and thus roughly enough plutonium for 33 weapons. Note that while my estimate is higher than some open source estimates, Lavoy and Smith, writing in 2003, gave the following weapons grade uranium estimates: low: 815 kg, medium 1020 kg, and high 1230 kg. Thus my predictions, if backed up to 2003, would be on the low to medium end of Lavoy and Smith's predictions. On the Lavoy and Smith numbers, see Peter R. Lavoy and MAJ Stephen A. Smith, "The Risk of Inadvertent Nuclear Use Between India and Pakistan," *Strategic Insight*, 2/2 (3 February 2003) available at <http://www.ccc.nps.navy.mil/si/feb03/southAsia2.asp> accessed 31 December 2007.

⁶³ The Natural Resources Defense Council (NRDC) has, however, traditionally distinguished between weapons grade material reserves and produced bombs. See for example, Robert S. Norris, et al., "Pakistan's Nuclear Forces, 2001," *Bulletin of the Atomic Scientists* (January/February 2002), 70-71. Interestingly, Norris and Kristensen did not distinguish in the 2007 version. See Robert S. Norris and Hans M. Kristensen, "Pakistan's Nuclear Forces, 2007," *Bulletin of the Atomic Scientists* (May/June 2007), 71-74. Rather, they simply "estimate a current Pakistani nuclear stockpile of about 60 warheads." Norris and Kristensen, "Pakistan's Nuclear Forces, 2007," 72. Presumably they believe Pakistan retains additional weapons grade material, but they do not make clear how much that is. The Carnegie Endowment for International Peace estimated Pakistan had enough fissile material in 2005 for between 50-110 weapons. "Proliferation Status 2007," available at http://www.carnegieendowment.org/files/proliferation_status07.pdf accessed 28 December 2007. Their 2009 analysis is more nuanced, estimating 70-90 warheads with HEU and weapons grade plutonium to spare. See Norris and Kristensen, "Nuclear Notebook: Pakistani Nuclear Forces, 2009."

⁶⁴ Analysts at the Nuclear Threat Initiative (NTI) set forth three reasons that Pakistan is moving toward missiles as their primary delivery system. These reasons are the inability of Pakistan to procure modern combat aircraft, the expense associated with modern combat aircraft, and a concern that India's air defenses are becoming increasingly difficult to penetrate. See "Pakistan: Missile Overview," Nuclear Threat

Initiative (April 2007) available at

<http://www.nti.org/e_research/profiles/Pakistan/Missile/index_3066.html> accessed 5 September 2007.

⁶⁵ Paul Kerr and Mary Beth Nikitin, "Pakistan's Nuclear Weapons: Proliferation and Security Issues," *CRS Report for Congress* (CRS Report RL34248) (28 September 2009), 1-18, 6. Pakistan's current F-16s are also due for midlife upgrades.

⁶⁶ See for example Nuclear Threat Initiative, "Pakistan: Missile Overview," (April 2007) available at <http://www.nti.org/e_research/profiles/Pakistan/Missile/index_3066.html> accessed 5 September 2007; but cf., A. Baskaran, "An Assessment of Nuclear and Missile Development in South Asia," unpublished manuscript presented at Seven Annual Conference on Economics and Security, Bristol, England (June 2003). See also, Cheema, "The Role of Nuclear Weapons in Pakistan's Defence Strategy."

⁶⁷ Sources on Pakistan's nuclear capable missiles include, Norris and Kristensen, "Pakistan's Nuclear Forces, 2007," 72-73; "Weapons of Mass Destruction," *GlobalSecurity.org* (28 April 2005) available at <<http://www.globalsecurity.org/wmd/world/pakistan/missile.htm>> accessed 31 August 2007; "Pakistan: Missile Overview," Nuclear Threat Initiative (April 2007) available at <http://www.nti.org/e_research/profiles/Pakistan/Missile/index_3066.html> accessed 5 September 2007; Baskaran, "An Assessment of Nuclear and Missile Development in South Asia;" Daniel S. Geller, "Nuclear Weapons and the Indo-Pakistani Conflict: Global Implications of a Regional Power Cycle," *International Political Science Review* 24/1(2003), 137-150 (on missiles, see 142); Cheema, "The Role of Nuclear Weapons in Pakistan's Defence Strategy;" and, "Missile Developments in India and Pakistan," *WMD Insights*, Issue 19 (October 2007), 13-21; and, Norris and Kristensen, "Nuclear Notebook: Pakistani Nuclear Forces, 2009."

⁶⁸ But cf., Kerr and Nikitin, "Pakistan's Nuclear Weapons," 9, where it is noted that Lt. Gen. Kidwai has "suggested that the nuclear warheads (containing the fissile cores) may be mated with their delivery vehicles" (citation omitted).

⁶⁹ "Pakistan: Missile Overview."

⁷⁰ In some cases the Chinese have provided production facilities (the M-11), while in other cases the Pakistanis seem to have reverse engineered Chinese systems (the M-9 and the M-18). Whatever the specifics, China clearly has provided a great deal of assistance to Pakistan's missile program. "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." See "Pakistan: Missile Overview."

⁷¹ Norris and Kristensen, "Pakistan's Nuclear Forces, 2007," 72.

⁷² "Pakistan: Missile Overview." Baskaran argues Pakistan faces numerous hurdles, both technical and organizational, that will hinder large-scale missile production for the foreseeable future. Baskaran, "An Assessment of Nuclear and Missile Development in South Asia," especially 20-25.

⁷³ "Pakistan: Missile Overview."

⁷⁴ Some argue Pakistan has upgraded the Ghauri's guidance system. See Cheema, "The Role of Nuclear Weapons in Pakistan's Defence Strategy."

⁷⁵ On the Shaheen-2, see "Missile Developments in India and Pakistan," *WMD Insights*, Issue 19, 13-21, especially 17. See also, "Pakistani Nuclear Forces, 2007," *Strategic Security Blog* (May 2007) available at <http://www.fas.org/blog/ssp/2007/05/article_pakistan_nuclear_forc_1.php> accessed 10 September 2007.

⁷⁶ On operational readiness tests in 2008, see Norris and Kristensen, "Pakistan's Nuclear Forces, 2009," 87. Pakistan's entire nuclear weapons program, from infrastructure to arsenal to delivery systems has been heavily dependent upon Chinese assistance. See generally, Cordesman, "The Threat of Pakistani Nuclear Weapons."

⁷⁷ On the possibility that the Babur can be sea-launched, see "Missile Developments in India and Pakistan," *WMD Insights*, Issue 19 (October 2007), 18. See also Sharad Joshi, "Nuclear Proliferation and South Asia: Recent Trends," Nuclear Threat Initiative (August 2007) available at <http://www.nti.org/e_research/e3_91.html> accessed 29 December 2007. Norris and Kristensen note that as of 2009 there has been no evidence to support rumors of a sea-launched Babur. See Norris and Kristensen, "Pakistan's Nuclear Forces, 2009," 88.

⁷⁸ On the Agosta submarine, see Sharad Joshi, "Nuclear Proliferation and South Asia: Recent Trends," Nuclear Threat Initiative (August 2007) available at <http://www.nti.org/e_research/e3_91.html> accessed 29 December 2007.

⁷⁹ On the Hatf-8, see “Pakistan Test-Fires New Air-Launched, Nuke Capable Cruise Missile,” Agence France-Presse (25 August 2007) available at <<http://www.defensenews.com/story.php?F=2992413&c=>> accessed 14 September 2007. This article also discusses the stealthy properties of the Hatf-8. See also, “Missile Developments in India and Pakistan,” 18.

⁸⁰ But cf., a deployed Shaheen-2 enhances regional stability because of its survivability. On the other hand, it may tempt Pakistan to deploy assembled warheads mated to their delivery systems. This would increase the risk of theft or unauthorized or accidental use.

⁸¹ It has been noted that “neither India nor Pakistan has yet instituted secure command and control systems for their nuclear forces.” Daniel S. Geller, “Nuclear Weapons and the Indo-Pakistani Conflict: Global Implications of a Regional Power Cycle,” *International Political Science Review*, 24/1 (2003), 144. This article uses the generic “command and control” term rather than the often changing and cumbersome abbreviations used by military analysts.

⁸² See Timothy D. Hoyt, “Pakistani Nuclear Doctrine and the Dangers of Strategic Myopia,” *Asian Survey*, 41/6 (November/December 2001), 956-977, at 958.

⁸³ Rizwan Zeb, “David versus Goliath? Pakistan’s Nuclear Doctrine: Motivations, Principles and Future,” *Defense & Security Analysis*, 22/4 (December 2006), 387. This article provides an excellent outline of the organizational structure of Pakistan’s National Command Authority. This paragraph relies extensively on Zeb.

⁸⁴ This issue is of less relevance when a general controls the country, but of more relevance under civilian leadership. Benazir Bhutto claimed “no control over Pakistan’s nuclear forces in the 1990 crisis.” Timothy D. Hoyt, “Pakistani Nuclear Doctrine and the Dangers of Strategic Myopia,” 961. Hoyt also states “[c]ommand and control of nuclear weapons rests primarily in military hands.” Timothy D. Hoyt, “Pakistani Nuclear Doctrine and the Dangers of Strategic Myopia,” 962. Hoyt concludes that the “new NCA clearly indicates continued military dominance in Pakistan’s nuclear program.” Hoyt, “Pakistani Nuclear Doctrine and the Dangers of Strategic Myopia,” 965. Zeb indicates the chair of the NCA is the Pakistan’s president though he does not discuss the extent to which the military dominates the NCA. Zeb, “David Versus Goliath? Pakistan’s Nuclear Doctrine,” 394-397.

⁸⁵ Kerr and Nikitin, “Pakistan’s Nuclear Weapons,” especially 12. Some assert Pakistan adheres to a “three-man rule.” On the two or three man rule, see Zeb, “David versus Goliath? Pakistan’s Nuclear Doctrine,” 396. Durrani notes “Pakistan is using a three-man rule, a variant of the two-man rule for security.” Maj. Gen. (Ret’d) Mahmud Ali Durrani, “Pakistan’s Strategic Thinking and the Role of Nuclear Weapons,” *Cooperative Monitoring Center Occasional Article 37* (Sandia National Laboratories) (July 2004), 33. Note that on 24 Durrani cites a “2-3 man rule...”

⁸⁶ Zeb, “David versus Goliath?” 396. Of course, given Pakistan’s view that it is in a precarious security situation, it is unlikely that skilled technicians will be turned away from the Pakistani nuclear weapons complex. Durrani claims “at least three intelligence/security agencies” vet individuals. Durrani, “Pakistan’s Strategic Thinking and the Role of Nuclear Weapons,” 25. Informed Pakistanis seem to agree that the personnel reliability program needs constant review and improvement. Durrani, “Pakistan’s Strategic Thinking and the Role of Nuclear Weapons,” 28.

⁸⁷ Zeb, “David versus Goliath?” 396. Though again, the if reports are correct, the army may have deployed nuclear weapons without presidential authority during the late Benazir Bhutto’s presidency as well as Sharif’s presidency. Hoyt notes that authority is largely delegated to the military (specifically the Army), that ensuring use of the weapons is emphasized over safety, and that this authority “probably include[s] both devolution and possibly pre-delegation in order to ensure use of weapons.” Hoyt, “Pakistani Nuclear Doctrine and the Dangers of Strategic Myopia,” 966. Durrani claims greater civilian control, but even he acknowledges the “major role” of the military. Durrani, “Pakistan’s Strategic Thinking and the Role of Nuclear Weapons,” 32.

⁸⁸ Kerr and Nikitin, “Pakistan’s Nuclear Weapons,” 12.

⁸⁹ Geller, “Nuclear Weapons and the Indo-Pakistani Conflict: Global Implications of a Regional Power Cycle,” *International Political Science Review*, 24/1 (2003), 144.

⁹⁰ Cheema indicates three to five minutes. Cheema, “The Role of Nuclear Weapons in Pakistan’s Defence Strategy.”

⁹¹ Lavoy and Smith, “The Risk of Inadvertent Nuclear Use Between India and Pakistan.” Lavoy and Smith are concerned with the creation of “use them or lose them” incentives during hostilities or pre-delegation of

launch authority. Both of these are of serious concern, as is any attempt to delegate launch authority in the midst of a war.

⁹² Pakistani sources recognize the possible need to delegate but are unclear about whether this would be pre-delegation before hostilities or devolution during ongoing hostilities. See Lt. Gen. (Ret'd) Sardar FS Lodi, "Pakistan's Nuclear Doctrine," *Defense Notes* (April 1999) available at <<http://www.defencejournal.com/apr99/pak-nuclear-doctrine.htm>> accessed 7 September 2007. Lodi argues for *pre-delegation* in the event that the seat of government or "a higher military quarters" has been destroyed, and *devolution* in other events. Hoyt notes reports that field commanders may have authorization "to use nuclear weapons in crisis." Hoyt, "Pakistani Nuclear Doctrine and the Dangers of Strategic Myopia," 966 (footnote omitted).

⁹³ See, for example, Cheema, "The Role of Nuclear Weapons in Pakistan's Defence Strategy," Ishtiaq Ahmad, *New Nuclear Order* (Institute of Regional Studies, Islamabad) available at: <<http://fas.org/nuke/guide/pakistan/doctrine/nuclear-book1.htm>> accessed 5 September 2007; Rasul Bakhsh Rais, "Conceptualizing Nuclear Deterrence: Pakistan's Posture," *India Review*, 4/2 (April 2005), 169; and Lt. Gen. (Ret'd) Sardar FS Lodi, "Pakistan's Nuclear Doctrine," *Defense Notes* (April 1999) available at <<http://www.defencejournal.com/apr99/pak-nuclear-doctrine.htm>> accessed 7 September 2007. Lodi calls for a "modest" command and control system given the smaller numbers of nuclear weapons as compared to the superpowers. He sees such a system costing "150-200 million rupees per year, for at least five years." While Lavoy and Smith do not explicitly call for upgrading Pakistani command and control, they do call for the US to reorient "its arms transfer policy to help stabilize the military balance." A key part of this imbalance is the questionable survivability of Pakistan's command and control system. See generally, Lavoy and Smith, "The Risk of Inadvertent Nuclear Use Between India and Pakistan." Hoyt argues "not even the most robust command and control practices can guarantee stability in South Asia." Hoyt, "Pakistani Nuclear Doctrine and the Dangers of Strategic Myopia," 977. While it is true that improved command and control cannot guarantee stability, certainly it would add to stability.

⁹⁴ Referencing the US Department of Defense dictionary at <<http://www.dtic.mil/doctrine/jel/doddict/data/02027.html>>. Timothy Hoyt defines doctrine as "the 'fundamental principles by which the military forces or elements thereof guide their actions in support of national objectives.'" Hoyt, "Pakistani Nuclear Doctrine and the Dangers of Strategic Myopia," 966.

⁹⁵ Pakistan is said not have not even considered doctrine before the 1998 tests. Durrani, "Pakistan's Strategic Thinking and the Role of Nuclear Weapons," 18. On the benefits of ambiguity, see generally, Durrani, "Pakistan's Strategic Thinking and the Role of Nuclear Weapons," especially 26, 28, and 31.

⁹⁶ "Pakistan has stated time and again that 'the direction of our nuclear weapons program will be determined by India's actions.'" Shireen M. Mazari, "Understanding Pakistan's Nuclear Doctrine," (April 2004) available at <http://www.issi.org.pk/journal/2004_files/no_3/article/1a.htm> accessed 6 September 2007. Sharad Joshi notes, "according to one senior nuclear weapons planner, its weapons are 'aimed solely at India.'" Sharad Joshi, "Nuclear Proliferation and South Asia: Recent Trends," *Nuclear Threat Initiative* (August 2007) available at <http://www.nti.org/e_research/e3_91.html> accessed 29 December 2007 (citation omitted). But cf., "Some security analysts in Pakistan now declare that Pakistan's nuclear program is *not India specific*, but fulfills regional security concerns." Durrani, "Pakistan's Strategic Thinking and the Role of Nuclear Weapons," 18 (emphasis added).

⁹⁷ On existential deterrence (the caution bred by the very existence of nuclear weapons), see for example, Robert Jervis, *The Meaning of the Nuclear Revolution* (Cornell University Press: Ithaca, NY) (1989). For an example of Pakistanis views on the success of its deterrent, see Lt. Gen. (Ret'd) Sardar FS Lodi, "Pakistan's Nuclear Doctrine," *Defense Notes* (April 1999) available at <<http://www.defencejournal.com/apr99/pak-nuclear-doctrine.htm>> accessed 7 September 2007. Lodi claims nuclear weapons "helped to preserve military equilibrium in the region resulting in 27 years of continues [sic] peace in South Asia. In comparison there were three Indo-Pak wars in the first 24 years of their independence." See also, Rasul Bakhsh Rais, "Conceptualizing Nuclear Deterrence: Pakistan's Posture," *India Review*, 4/2 (April 2005), 162. See also, Brig (Ret'd) Saeed Ismat, SJ, "Strategy for Total Defense: A Conceptual Nuclear Doctrine," (March 2000) available at <<http://www.defencejournal.com/2000/mar/doctrine.htm>> accessed 7 September 2007.

⁹⁸ On deterring India's conventional superiority, see Lavoy and Smith, "The Risk of Inadvertent Nuclear Use Between India and Pakistan." See also, Cheema, "The Role of Nuclear Weapons in Pakistan's Defence Strategy." Lavoy and Smith note that because of a lack of strategic depth and Indian conventional

superiority, Pakistan's delivery systems and weapons could be threatened by India during a conventional war, which may place Pakistan in a "use them or lose them" situation. On first use, Lodi is instructive: "India's offer of a treaty to be signed by the two countries, agreeing not to be the first to use nuclear weapons against each other is one-sided and would benefit India only, as it has a superior conventional force." Lodi, "Pakistan's Nuclear Doctrine." This was, of course, exactly the US position vis-à-vis the Soviet Union during the Cold War. See also, Rais, "Conceptualizing Nuclear Deterrence: Pakistan's Posture," 144-172, especially, 156. See also, Ismat, SJ, and "Strategy for Total Defense."

⁹⁹ On ambiguity, see Zeb, "David Versus Goliath? Pakistan's Nuclear Doctrine," especially 389 and 393-394 and Durrani, "Pakistan's Strategic Thinking and the Role of Nuclear Weapons," 26.

¹⁰⁰ On dynamic minimum deterrence, see Zeb, "David Versus Goliath? Pakistan's Nuclear Doctrine," 387-408. Mazari makes a similar argument in Mazari, "Understanding Pakistan's Nuclear Doctrine." An argument for "credible minimum deterrence, which might not have to match India's forces, is made in Rais, "Conceptualizing Nuclear Deterrence: Pakistan's Posture," 168.

¹⁰¹ For the term "credible minimum nuclear deterrent," see Durrani, "Pakistan's Strategic Thinking and the Role of Nuclear Weapons," 23. Facing Indian expansion of its capabilities, it would "not mean that Pakistan will see the need to match weapon for weapon, but that the minimum credible deterrence level will be at a higher numbers level." See also, Mazari, "Understanding Pakistan's Nuclear Doctrine," and Zeb, who notes that "nuclear deterrence will be adversely affected if there is an extensive discrepancy in the stockpiles of both India and Pakistan. Zeb, "David Versus Goliath? Pakistan's Nuclear Doctrine," 391. Though the policy is more often referred to as "credible minimum deterrence," the term "dynamic" probably better describes it. Dynamic refers more clearly to the "moving target" of necessary force levels. Credible does so as well, just more obliquely. Credibility is achieved by maintaining assurances of retaliation, which is itself achieved by maintaining certain general force ratios. Note that Durrani claims "Pakistan has determined the size of its minimum deterrent force irrespective of the eventual size of the Indian arsenal." Durrani, "Pakistan's Strategic Thinking and the Role of Nuclear Weapons," 24. Other analysts would disagree, and certainly the empirical evidence of a weapons grade material build up and continued missile development seem to disagree. Indeed, later in the same article Durrani favorably quotes "a Senator from the *Jamaat-e-Islami*... 'Minimum deterrence is based on the perception of threat. It is *dynamic*, both technically and operationally. It is constantly changing along with the threat. It does not mean equality or proportionality. Deterrence is a combination of nuclear and the conventional, and above all, the national will to face a challenge.'" Durrani, "Pakistan's Strategic Thinking and the Role of Nuclear Weapons," 32 (emphasis added). The dynamic nature of Pakistan's arsenal requirements was reflected in comments by former President Musharraf: "He stated that, as India builds up its nuclear weapons arsenal: 'Pakistan will have to maintain, preserve and upgrade its capability,' in order to ensure the survivability and *credibility* of its nuclear deterrent." Cheema, "The Role of Nuclear Weapons in Pakistan's Defence Strategy," (emphasis added) (citation omitted).

¹⁰² It should be noted that at least one Pakistani analyst has acknowledged India's position *vis-à-vis* China and has stated that "no one expects Pakistan to demand a missile-for-missile balance from India, given India's claimed security concerns in relation to China and its power projection ambitions beyond South Asia." Mazari, "Understanding Pakistan's Nuclear Doctrine." Yet, overkill is necessarily "built into the equation" to ensure damage that is unacceptable to the enemy. Durrani, "Pakistan's Strategic Thinking and the Role of Nuclear Weapons," 32. This could explain Pakistan's continued build up.

¹⁰³ On the more measured costs of an arms race (as opposed to the notion that arms races cause wars), see Thomas C. Schelling and Morton Halperin, *Strategy and Arms Control* (Twentieth Century Fund: New York, NY) (1961). In the current situation, the expense does contribute negatively, among other things, to externalities such as socio-economic underdevelopment, terrorism, state failure, and possibly nuclear proliferation.

¹⁰⁴ This list has been widely published. Zeb, "David Versus Goliath? Pakistan's Nuclear Doctrine," 394 (citation omitted).

¹⁰⁵ Durrani, "Pakistan's Strategic Thinking and the Role of Nuclear Weapons," 12.

¹⁰⁶ See Cheema, "The Role of Nuclear Weapons in Pakistan's Defense Strategy."

¹⁰⁷ Lodi, "Pakistan's Nuclear Doctrine." Lodi goes so far as to discuss the sort of escalation ladder that might be invoked, similar on some level to Herman Khan's work. Lodi seems however, to recognize the need for improved command and control to carry out such a strategy.

¹⁰⁸ A number of retired Pakistani military officers have made this argument, including Lodi, as well as retired Brigadier General Saeed Ismat, SJ. See Ismat, SJ, "Strategy for Total Defense: A Conceptual Nuclear Doctrine." The officers, unsurprisingly, focus on the use of tactical nuclear weapons in the face of defeat by Indian forces. Ismat goes so far as to discuss "low yield, high radiation nuclear weapons" for this warfighting purpose. He stresses the wish to avoid such use, but the probable need given Pakistan's lack of strategic depth and lines of communication that run very close to the border. He is careful to say that Pakistan would not attack civilians, but would attack only Indian military units at or near the border. He sees the possibility of escalating attacks, but again argues Pakistan will not be the first party to attack civilians (i.e., cities). Note that Hoyt argues explicitly that Pakistani doctrine does rely on targeting civilians. See Hoyt, "Pakistani Nuclear Doctrine and the Dangers of Strategic Myopia," 961. Others note a combination of countervalue attacks (Delhi and Mumbai) as well as counterforce attacks. See, Ishtiaq Ahmad, "New Nuclear Order!" (Institute of Regional Studies, Islamabad) (date uncertain) available at <<http://fas.org/nuke/guide/pakistan/doctrine/nuclear-book1.htm>> accessed 5 September 2007. This author does not distinguish between counterforce, countervalue, and counterterrorism or counterpower targets. In fact, few if any Pakistani authors distinguish any further than countervalue and counterforce targets.

¹⁰⁹ Zeb, "David Versus Goliath? Pakistan's Nuclear Doctrine," 391. Zeb argues Pakistan needs 50-75 warheads to reach this level and has reached this level. Zeb, "David Versus Goliath? Pakistan's Nuclear Doctrine" 391-392. This does not explain Pakistan's continuing expansion of its nuclear infrastructure and continued acquisition of improved delivery vehicles. I would argue Pakistan and India are in an arms race that shows no signs of abating. Zeb attributes some of the incentives for continued acquisition of nuclear forces on the recent US/India nuclear cooperation agreement of 2 March 2006 and on conventional arms transfers to India, which may allow for conventional counterforce capabilities in India or otherwise reduce Pakistan's confidence in its nuclear capabilities. See Zeb, "David Versus Goliath? Pakistan's Nuclear Doctrine," 401, quoting Rodney Jones, "Quest for Strategic Stability in Southern Asia," draft article prepared for a seminar on "Strategic Transitions in South Asia," Washington, D.C., Woodrow Wilson Center (2 February 2006).

¹¹⁰ On the synergistic interaction between India, China, and Pakistan, see Gregory S. Jones, "From Testing to Deploying Nuclear Forces: Hard Choices Facing India and Pakistan," *Issue Article 192* (Santa Monica, RAND: 2000), 3; on Pakistan and India, see Cheema, "The Role of Nuclear Weapons in Pakistan's Defence Strategy."

¹¹¹ On the potential for a thermonuclear weapon, see generally, Gregory S. Jones, "From Testing to Deploying Nuclear Forces: Hard Choices Facing India and Pakistan," *Issue Article 192* (Santa Monica, RAND: 2000), 9.

¹¹² For more on recent developments in Pakistan's delivery systems, see generally, Norris and Kristensen, "Pakistan's Nuclear Forces, 2007" and Norris and Kristensen, "Pakistan's Nuclear Forces, 2009."

¹¹³ For one example, see India's increasing attempts at enriching uranium and therefore moving away from reliance on plutonium only. David Albright and Susan Basu, "India's Gas Centrifuge Enrichment Program: Growing Capacity for Military Purposes," Institute for Science and International Security (18 January 2007) available at <<http://www.isis-online.org/publications/southasia/indiagrowingcapacity.pdf>> accessed 25 January 2008.

¹¹⁴ On the requirements for an effective nuclear deterrent, see Jones, "From Testing to Deploying Nuclear Forces," 2.

¹¹⁵ The problem of proliferation in Pakistan is actually one of both vertical and horizontal proliferation. However, this section concerns itself largely with horizontal proliferation or proliferation to other actors outside of the Pakistani state. On vertical and horizontal proliferation, see Sharad Joshi, "Nuclear Proliferation and South Asia: Trends," Nuclear Threat Initiative (August 2007) available at <http://www.nti.org/e_research/e3_91.html> accessed 5 September 2007.

¹¹⁶ On the Khan network, see William Langewiesche, "The Point of No Return," *Atlantic Monthly*, 297/1 (January/February 2006), 96-118; see also, David Albright and Corey Hinderstein, "Unraveling the A.Q. Khan and Future Proliferation Networks," *The Washington Quarterly*, 28/2 (Spring 2005), 111-128; and Kerr and Nikitin, "Pakistan's Nuclear Weapons: Proliferation and Security Issues," especially 9-12.

¹¹⁷ The Khan network may not be the only proliferation network operating out of Pakistan. Kerr and Nikitin, "Pakistan's Nuclear Weapons: Proliferation and Security Issues," 9. Some characterize Khan as simply having tapped into a pre-existing network. In this view, the "network," like the internet, is not controlled by anyone; it simply exists and may be used by those with the requisite knowledge. For the

internet analogy, see Langewiesche, “The Point of No Return.” As to the government agency involved, some say the ISI, but this is not certain from the open literature.

¹¹⁸ Indeed, “in 1990, Gen. Beg warned US government officials that Pakistan would be forced to provide nuclear technology to Tehran if Washington did not offer support to Pakistan. ...[V]isits by the Pakistani military leadership to North Korea throughout the nineties, suggests that there was a barter deal between Pyongyang and Islamabad (uranium enrichment technology in exchange for missiles).” Joshi, “Nuclear Proliferation and South Asia,” (notes omitted).

¹¹⁹ On the similarity of the Ghauri to the North Korean No Dong and/or Iran’s Shahab-3, see Hoyt, “Pakistan’s Nuclear Doctrine and the Dangers of Strategic Myopia,” 963.

¹²⁰ On the networks continuing activity, see Joshi, “Nuclear Proliferation and South Asia.” See also, Kerr and Nikitin, “Pakistan’s Nuclear Weapons: Proliferation and Security Issues,” 10.

¹²¹ But cf., Seymour Hersh in a recent New Yorker article sees Pakistan as having no faith whatsoever in the United States. Seymour Hersh, “Defending the Arsenal,” *The New Yorker* (16 November 2009) available at <http://www.newyorker.com/reporting/2009/11/16/091116fa_fact_hersh> accessed 10 November 2009. He also cites examples of almost complete hostility within Pakistan’s military to the United States and not a little hostility among many US officers toward the Pakistanis.

¹²² These suggestions borrow in part from Joseph Nye’s unrelenting (and sometimes verbatim) push for soft power. For example, see Joseph Nye, “U.S. Power and Strategy After Iraq,” *Foreign Affairs*, 82/4 (July/August 2003), 60-73 and Joseph Nye, “Soft Power and American Foreign Policy,” *Political Science Quarterly*, 119/2 (Summer 2004).

¹²³ Obviously procedures must be developed to preclude potential security threats from Pakistani students.

¹²⁴ For the argument that instability or a coup in Pakistan could lead to renewed use of the ring, see Joshi, “Nuclear Proliferation and South Asia.”

¹²⁵ On linkages between previous individuals thought to be involved in proliferation and Al Qaeda, see Kerr and Nikitin, “Pakistan’s Nuclear Weapons: Proliferation and Security Issues,” 9.

¹²⁶ The view of madrassas spewing forth terrorists is simplistic and incomplete. Pakistan’s public education system (and much of its private system as well) teaches a curriculum that also encourages extremism. On education in Pakistan education system, see for example, Jayshree Bajoria, “Pakistan’s Education System and Links to Extremism,” Council on Foreign Relations (7 October 2009) available at <http://www.cfr.org/publication/20364/pakistans_education_system_and_links_to_extremism.html> accessed 2 November 2009.

¹²⁷ On vulnerabilities of the F-16s, see among others, Gregory Jones, “From Testing to Deploying Nuclear Forces: The Hard Choices Facing India and Pakistan,” *Issue Article 192* (RAND, Santa Monica, CA: 2000), 8.

¹²⁸ It should be noted, however, that Pakistan is reportedly facing increased financial constraints even in the nuclear weapons area. See Kerr and Nikitin, “Pakistan’s Nuclear Weapons: Proliferation and Security Issues,” 6. This could affect Shaheen-2 deployment.

¹²⁹ This paragraph relies in part on see Shaun Gregory, “The Security of Nuclear Weapons in Pakistan,” Pakistan Security Research Unit, Brief No. 22 (18 November 2007) available at <http://spaces.brad.ac.uk:8080/download/attachments/748/Brief_22finalised.pdf> accessed 27 February 2007.

¹³⁰ For one discussion on Feaver, see Hoyt, “Pakistan’s Nuclear Doctrine and the Dangers of Strategic Myopia,” 956-977, especially 957-958. For Feaver’s argument, see Peter Feaver, *Guarding the Guardians: Civilian Control of Nuclear Weapons in the U.S.* (Ithaca, NY: Cornell University Press, 1992).

¹³¹ See Bruce Blair, *Global Zero Alert for Nuclear Forces* (Washington, D.C.: The Brookings Institution: 1995).

¹³² See Michael Tkacik, *The Future of U.S. Nuclear Operational Doctrine: Balancing Safety and Deterrence in an Anarchic World* (Lewiston, NY: The Edwin Mellen Press: 2003).

¹³³ On this point, see Jones, “From Testing to Deploying,” 8.

¹³⁴ Hoyt notes “that no serious effort was made to develop either a doctrine or a secure command and control system until after the nuclear tests [in 1998] – even though Pakistan had been nuclear capable for a decade.” Hoyt, “Pakistan’s Nuclear Doctrine and the Dangers of Strategic Myopia,” 961.

¹³⁵ On militant Islamist attacks against Pakistan’s nuclear weapons infrastructure, see Shaun Gregory, “The Terrorist Threat to Pakistan’s Nuclear Weapons,” *CTC Sentinel* 2/7 (July 2009), 1-4.

¹³⁶ On the overlap between conventional and nuclear command and control systems, as well as the implications, see Peter Lavoy and Stephen Smith, "The Risk of Inadvertent Nuclear Use Between India and Pakistan," *Strategic Insight* (3 February 2003) available at

<<http://www.ccc.nps.navy.mil/rsepResources/si/feb03/southAsia2.asp>> accessed 13 February 2008.

¹³⁷ Pre-delegation occurs prior to conflict. Devolution of launch authority occurs during conflict. Pre-delegation or delegation of launch authority implies procedurally structured authorization of launch authority. Devolution of authority, on the other hand, implies launch authority seeping out from central authorities to more decentralized authorities (high or even low ranking generals) possibly due to a failure in communication and fear that central authorities have been eliminated.

Devolution of authority implies that the authority to use weapons has moved from the NCA to other authorities (probably military leadership, possibly in the field), and that such leadership operates to the best of its knowledge at the time, making decisions to launch or not, and at what targets, based on the information it has available. Pre-delegation, on the other hand, implies ordering other authorities to retaliate in specific eventualities if it appears that the NCA has been incapacitated.

¹³⁸ Hoyt, "Pakistan's Nuclear Doctrine and the Dangers of Strategic Myopia," 966.

¹³⁹ In fairness, over \$100 million has been provided to Pakistan since 9/11 to improve the security of its arsenal, and a second phase of this program is underway. David Sanger and William Broad, "U.S. Secretly Aids Pakistan in Guarding Nuclear Arms," *The New York Times* (18 November 2007) available at <<http://www.nytimes.com/2007/11/18/washington/18nuke.html>> accessed 21 February 2008).

¹⁴⁰ For a short discussion of Pakistan's Personnel Reliability Program, see Peter Wonacott, "Pakistan's Nuclear Arsenal and its Islamic Extremists," *Atlantic Community* (31 December 2007) available at http://www.atlantic-community.org/index/articles/view/Pakistan's_Nuclear_Arsenal_and_Its_Islamic_Extremists, accessed 7 February 2008.

¹⁴¹ Shaun Gregory, "The Security of Nuclear Weapons in Pakistan," *Pakistan Security Research Unit, Brief No. 22* (18 November 2007) available at <http://spaces.brad.ac.uk:8080/download/attachments/748/Brief_22finalised.pdf> accessed 27 February 2007.

¹⁴² Most observers believe Pakistan operates under a two-person rule, though some speak of a three-person rule. On this point, see Shaun Gregory, "The Security of Nuclear Weapons in Pakistan," *Pakistan Security Research Unit, Brief No. 22* (18 November 2007) available at <http://spaces.brad.ac.uk:8080/download/attachments/748/Brief_22finalised.pdf> accessed 27 February 2007.

¹⁴³ On the possibility of shared best practices from the US, see Kerr and Nikitin, "Pakistan's Nuclear Weapons: Proliferation and Security Issues," 12.

¹⁴⁴ On the provision of technical systems to Pakistan, see Kerr and Nikitin, "Pakistan's Nuclear Weapons: Proliferation and Security Issues," 12. On the legal and technical difficulties in providing certain technical assistance to Pakistan, see Sanger and Broad, "U.S. Secretly Aids Pakistan in Guarding Nuclear Arms."

¹⁴⁵ At least two recent US intelligence assessments have concluded that Pakistan's nuclear arsenal is safe "under current conditions." Sanger and Broad, "U.S. Secretly Aids Pakistan." It is unclear what these "current conditions" are or what changes might make the arsenal unsafe. One may surmise that continued instability in Pakistan will not improve security.

¹⁴⁶ Some press reports indicate the US has provided Pakistan with PALs, but the Pakistanis themselves claim indigenously developed PALs. See Kerr and Nikitin, "Pakistan's Nuclear Weapons: Proliferation and Security Issues," 12. See also, Gurmeet Kanwal, "Are Pakistan's Nuclear Warheads Safe?" *Pakistan Security Research Unit, Brief No. 27* (24 January 2008), 4 available at <<http://spaces.brad.ac.uk:8080/display/ssispru/Home>> accessed 25 February 2008. On the quality of indigenously developed PALs, see Shaun Gregory, "The Security of Nuclear Weapons in Pakistan," *Pakistan Security Research Unit, Brief No. 22* (18 November 2007) available at <http://spaces.brad.ac.uk:8080/download/attachments/748/Brief_22finalised.pdf> accessed 27 February 2007. On the need for improved early warning, see Ishtiaq Ahmad, "Kashmir and Nuclear War," (Institute of Regional Studies, Islamabad: Pakistan: 1999) available at <<http://fas.org/nuke/guide/pakistan/doctrine/nuclear-book1.htm>> accessed 5 September 2007). On some of

the debates inside US government concerning providing Pakistan with PALs, see Sanger and Broad, “U.S. Secretly Aids Pakistan.”

¹⁴⁷ On nuclear weapons and hair trigger deployments, see Bruce Blair, *The Logic of Accidental Nuclear War* (Washington, D.C.: The Brookings Institution: 1993).

¹⁴⁸ For more on the destabilizing nature of Pakistan’s nuclear “immature” arsenal, see Cheema, “The Role of Nuclear Weapons in Pakistan’s Defence Strategy.”

¹⁴⁹ Waltz has argued that as command and control matures, stability should increase. Kenneth Waltz, “The Spread of Nuclear Weapons: More May Be Better,” *Adelphi Article no. 171* (London: International Institute for Strategic Studies, 1981).

¹⁵⁰ On stable force posture, see, among others, Scott Sagan, “The Perils of Proliferation,” *International Security*, 18/4 (1994).

¹⁵¹ The 1998 nuclear tests do not seem to have reduced the propensity of either country to threaten the use of force or even to use force. See generally, Christopher Snedden, “The India-Pakistan Peace Process: Overcoming the ‘Trust Deficit,’ *Pakistan Security Research Unit, Brief No. 20* (2 October 2007) available at: <<http://spaces.brad.ac.uk:8080/display/ssispsru/Home>> accessed 28 February 2008.

¹⁵² Shaun Gregory, “The ISI and the War on Terrorism,” *Pakistan Security Research Unit, Brief No. 28* (24 January 2008), 11 (footnote omitted) available at

<<http://spaces.brad.ac.uk:8080/download/attachments/748/Brief28finalised.pdf>> accessed 3 April 2008.

¹⁵³ See Carlotta Gall and David Rhode, “Militants Escape Control of Pakistan, Officials Say,” *The New York Times* (15 January 2008) available at <<http://www.nytimes.com/2008/01/15/world/asia/15isi.html>> accessed 4 April 2008.

¹⁵⁴ On intelligence coups, see Daniel Markey, “A False Choice in Pakistan,” *Foreign Affairs* 86/4 (July/August 2007), 89.

¹⁵⁵ Pervez Hoodbhoy, “Pakistan – The Threat from Within,” *Pakistan Security Research Unit, Brief No. 13* (23 May 2007), 15 available at

<<http://spaces.brad.ac.uk:8080/download/attachments/748/Brief+number+13.pdf>> accessed 9 April 2008.

¹⁵⁶ Sharif Shuga, “Pakistan: Islam, Radicalism and the Army,” *National Observer – Australia and World Affairs* (22 September 2007), 54.

¹⁵⁷ Shaun Gregory, “The ISI and the War on Terrorism.”

¹⁵⁸ On the military and assassination attempts, see Shaun Gregory, “The Security of Nuclear Weapons in Pakistan,” *Pakistan Security Research Unit, Brief No. 22* (18 November 2007), 8 available at

<http://spaces.brad.ac.uk:8080/download/attachments/748/Brief_22finalised.pdf> accessed 4 April 2008;

see also, Gaurav Kampani, “Seven Years After the Nuclear Tests: Appraising South Asia’s Nuclear Realities,” *Nuclear Threat Initiative Issue Brief* (June 2005) available at

<http://www.nti.org/e_research/e3_64a.html> accessed 5 September 2007 and Howenstein, “The Jihadi Terrain in Pakistan,” 10. Howenstein indicates there have been at least “six foiled or failed attempts on Musharraf’s life...” Howenstein, “The Jihadi Terrain in Pakistan,” 11.

¹⁵⁹ Pervez Hoodbhoy, “Pakistan – The Threat from Within,” 15.

¹⁶⁰ October 2009 saw no less than 14 major attacks, most of which were directed against the military or the police. The Taliban denied responsibility for the Peshawar attack of 28 October 2009 claiming they were only targeting “the government and security forces...” There has been speculation that the Peshawar attack was carried out not by the Taliban but by an affiliated group such as the Islamic Movement of Uzbekistan. See Bill Roggio, “Taliban blame ‘Blackwater’ for Peshawar bombings,” *The Long War Journal* (30 October 2009) available at <http://www.longwarjournal.org/threat-matrix/archives/2009/10/taliban_blame_blackwater_for_p.php> accessed 2 November 2009.

¹⁶¹ On Pashtuns in the officer corps, see James Revill, “Militancy in the FATA and the NWFP,” *Pakistan Security Research Unit, Brief No. 23* (19 November 2007) available at

<http://spaces.brad.ac.uk:8080/download/attachments/748/Brief_23finalised.pdf> accessed 8 April 2008.

¹⁶² On Pashtuns in the Army and Frontier Corp, see Ahmed Rashid, “Pakistan Crisis ‘Hits Army Morale,’” *BBC News* (13 September 2007) available at: <http://news.bbc.co.uk/2/hi/south_asia/6978240.stm> accessed 14 September 2007.

¹⁶³ On such officers, see Shaun Gregory, “The Security of Nuclear Weapons in Pakistan.” The increasing Islamization of the junior officer corps mitigates in favor of the US providing a much-expanded training program for these officers, including extended visits to the United States.

¹⁶⁴ On the extent of the Pakistani military's control over "nearly every public institution," see Markey, "A False Choice in Pakistan," 96.

¹⁶⁵ Gaurav Kampani, "Seven Years After the Nuclear Tests: Appraising South Asia's Nuclear Realities," *Nuclear Threat Initiative Issue Brief* (June 2005) available at <http://www.nti.org/e_research/e3_64a.html> accessed 5 September 2007 and Rajesh Kumar Mishra, "Nuclear Safety and Security in Pakistan: Under the Shades of Terrorism," *South Asia Analysis Group, Article No. 520* (20 September 2002) available at <<http://64.233.169.104/search?q=cache:d0WT84ShEHUJ:www.southasiaanalysis.org/articles6/article520.html>> accessed 16 April 2008.

¹⁶⁶ For a detailed discussion of ISI links to militant groups, see Howenstein, "The Jihadi Terrain in Pakistan."

¹⁶⁷ The Taliban were an aggregation of Pashtun factions under one banner so as to insure the establishment of a Pakistan friendly Pashtun government in Kabul. Syed Saleem Shahzad, "Pakistan, the Taliban, and Dadullah," *Pakistan Security Research Unit, Brief No. 3* (1 March 2007), 5 available at: <<http://spaces.brad.ac.uk:8080/download/attachments/748/Brief3finalised1.pdf>> accessed 23 April 2008. The Pashtuns who straddle the Afghan/Pakistan boarder in turn have been religiously radicalized since the Soviet invasion of Afghanistan. This radicalization continued after the Soviets withdrew.

¹⁶⁸ Gregory, "The ISI and the War on Terrorism."

¹⁶⁹ Barnett Rubin, "Saving Afghanistan," *Foreign Affairs*, 86/1 (January/February 2007), 58.

¹⁷⁰ Gregory, "The ISI and the War on Terrorism."

¹⁷¹ For example, the ISI would provide intelligence and move against individuals seeking to attack in the West (see Souad Mekhennet and Michael Moss, "Europeans Get Terror Training Inside Pakistan," *The New York Times* (10 September 2007) available at <<http://www.nytimes.com/2007/09/10/world/europe/10germany.html>> accessed 16 April 2008), but would not move against those seeking to attack targets in Afghanistan or Kashmir. As ISI intelligence assets in the NWFP and the FATA have been depleted, ISI assistance has become more sporadic. But cf., some have argued the ISI was also instrumental in the creation of Al Qaeda: Gregory, "The ISI and the War on Terrorism." At the least it seems the ISI used Al Qaeda to help further its objectives in Kashmir. Gregory, "The ISI and the War on Terrorism."

¹⁷² On these arguments, see generally, Markey, "A False Choice in Pakistan."

¹⁷³ Markey attributes more weight to "strategic calculations" rather than "ideological sympathy," but I am wary of growing ideological sympathy within both Pakistani society and by extension the ISI. For Markey's point, see Markey, "A False Choice in Pakistan," 92.

¹⁷⁴ Richards, "Terrorists in the Tribal Areas: Endgame for Musharraf?"

¹⁷⁵ It is noteworthy that the term "Islamists" includes many groups, some of which the Army supports and some of which it does not. Moreover, these groups are constantly changing, as is the Army's support for them. See generally, Howenstein, "The Jihadi Terrain in Pakistan," 10. Still, the term Islamist retains meaning when referring to anti-status quo militants incorporating Islam as a justification for their challenge and tactics.

¹⁷⁶ Markey, "A False Choice in Pakistan," 86.

¹⁷⁷ Richards, "Terrorists in the Tribal Areas," 9-10.

¹⁷⁸ Press reports indicate the US will send a "two dozen" troops to Pakistan to train the Frontier Corps in insurgency tactics. "U.S. Military Trainers to Head to Pakistan," *CNN.com* (10 April 2008) available at <www.cnn.com/2008/WORLD/asiapcf/04/10/pakistan.trainers/index.html> accessed 25 April 2008. More recently, "the number of American Special Forces soldiers and support personnel who are training and advising the Pakistani Army and paramilitary troops has doubled in the past eight months, to as many as 150..." Eric Schmitt, "U.S. Speeds Aid to Pakistan to Fight Taliban," *The New York Times* (29 October 2009), A14.

¹⁷⁹ On this point, see Hoodbhoy, "Pakistan – The Threat From Within."

¹⁸⁰ Sharif Shuja, "Pakistan: Islam, Radicalism and the Army," *National Observer – Australia and World Affairs*, No. 72 (22 September 2007), 54 available at <http://goliath.ecnext.com/coms2/gi_0199-6688648/Pakistan-Islam-radicalism-and-the.html> accessed 20 May 2008.

¹⁸¹ See Gaurav Kampani, "Safety Concerns About the Command & Control of Pakistan's Strategic Forces, Fissile Material, and Nuclear Installations," *James Martin Center for Nonproliferation Studies* (28 September 2001) available at: <<http://www.cns.miis.edu/research/wtc01/spna.htm>> accessed 7 February 2008.

¹⁸² On Mahmood and Ali, see Kampani, “Seven Years After the Nuclear Tests: Appraising South Asia’s Nuclear Realities,” 5. See also, David Sanger, “Obama’s Worst Pakistan Nightmare,” *The New York Times* (11 January 2009) available at: <<http://www.nytimes.com/2009/01/11/magazine/11pakistan-t.html?scp=1&sq=%22obama%27s%20worst%20pakistan%20nightmare%22&st=cse>> accessed 5 November 2009.

¹⁸³ Kampani, “Seven Years After the Nuclear Tests: Appraising South Asia’s Nuclear Realities.”

¹⁸⁴ Note that the spelling of the plural of the word madrasa differs across publications. This article uses the spelling “madrassas” unless directly quoting a different spelling. Similarly, the word is inconsistently capitalized in the literature.

¹⁸⁵ Shaun Gregory, “Al-Qaeda in Pakistan,” *Pakistan Security Research Unit, Brief No. 5* (1 March 2007), 5 (citations omitted), available at <<http://spaces.brad.ac.uk:8080/download/attachments/748/Brief5finalised.pdf>> accessed 28 May 2008.

¹⁸⁶ Hoodbhoy, “Pakistan – The Threat From Within,” 4.

¹⁸⁷ Richards, “Terrorists in the Tribal Areas: Endgame for Musharraf?”

¹⁸⁸ On Pashtun Islamism, see “Militancy in the FATA and the NWFP,” *Pakistan Security Research Unit, Brief No. 23* (19 November 2007), 9 available at <http://spaces.brad.ac.uk:8080/download/attachments/748/Brief_23finalised.pdf> accessed 8 April 2008 (citation omitted).

¹⁸⁹ This “meeting of the minds” implies greater willingness to adopt internationalist goals.

¹⁹⁰ On sympathetic political leadership, see Revill, “Militancy in the FATA and the NWFP.”

¹⁹¹ For example. The “historically tolerant Sufi-influenced “Kashmiriat’ Islam” has been replaced by extremist Wahhabi Islam in parts of Kashmir. See Gregory, “The ISI and the War on Terrorism.” The same can surely be said for the tribal regions of northwest Pakistan.

¹⁹² Richards, “Terrorists in the Tribal Areas: Endgame for Musharraf?” 6.

¹⁹³ Both these examples come from Hoodbhoy, “Pakistan – The Threat From Within,” 12.

¹⁹⁴ Hoodbhoy, “Pakistan – The Threat From Within,” 12.

¹⁹⁵ See for example Syed Saleem Shahzad, “The Gathering Strength of Taliban and Tribal Militants in Pakistan,” *Pakistan Security Research Unit, Brief No. 24* (19 November 2007) available at <<http://spaces.brad.ac.uk:8080/download/attachments/748/Brief24finalised.pdf>> accessed 30 May 2008.

¹⁹⁶ Richards, “Terrorists in the Tribal Areas: Endgame for Musharraf?” 6.

¹⁹⁷ Ijaz Khan, “Pashtuns in the Crossfire: Pashtun Politics in the Shadow of ‘War Against Terrorism,’” *Pakistan Security Research Unit, Brief No. 19* (5 September 2007), 7 available at <<http://spaces.brad.ac.uk:8080/download/attachments/748/Brief19finalised3.pdf>> accessed 30 May 2008.