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THESIS

THE THREAT OF INADVERTENT NUCLEAR WAR IN SOUTH ASIA

by

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March 2001

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13. ABSTRACT

This thesis assesses the potential for a specific type of accidental nuclear conflict between India and Pakistan. Known as inadvertent war, such a conflict would be the result of a mistaken attempt at preemption, the launching of a nuclear attack by one nation in the mistaken belief that the other was doing likewise or was about to do so. While nuclear weapons can ordinarily be expected to exert a sobering influence on decision-makers, an escalating spiral of military activity during a crisis may generate different situational imperatives. Inadvertent war becomes possible when decision-makers perceive that conflict is inevitable and that there is a significant advantage in striking first.

Evidence suggests that there is good reason for concern about the threat of inadvertent nuclear war in South Asia. The nuclear force structures adopted by India and Pakistan can be expected to exert a particularly strong influence on the potential for both of the necessary conditions for inadvertent war. The current arsenals of these countries, small and heavily dependant upon aircraft for weapons delivery, may invite preemption in the event that nuclear war appears imminent. If India and Pakistan increase their nuclear delivery capabilities by deploying nuclear-armed ballistic missiles, the potential for inadvertent war will be even greater. In the context of a military confrontation in South Asia, ballistic missiles are likely to contribute both to perceptions of first-strike advantage and to reinforcing military alerts that can lead to the belief that nuclear war is inevitable.

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THE THREAT OF INADVERTENT NUCLEAR WAR IN SOUTH ASIA

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requirements for the degree of

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EXECUTIVE SUMMARY

Among the dangers associated with the development of India and Pakistan's nuclear capabilities is the possibility of an accidental nuclear war involving these two nations. Senior U.S. officials have expressed serious concern regarding the threat of an accidental nuclear conflict during recent Indo-Pakistani crises. Given the enormous destructive power of nuclear weapons and the urban density of human population in South Asia, the consequences of such a war would be horrific.

This thesis assesses the potential for a specific type of accidental nuclear conflict between India and Pakistan. Known as inadvertent war, such a conflict would be the result of a mistaken attempt at preemption, the launching of a nuclear attack by one nation in the mistaken belief that the other was doing likewise or was about to do so. While nuclear weapons can ordinarily be expected to exert a sobering influence on decision-makers, an escalating spiral of military activity during a crisis may generate different situational imperatives. Inadvertent war becomes possible when decision-makers perceive that conflict is inevitable and that there is a significant advantage in striking first.

Evidence suggests that there is good reason for concern about the threat of inadvertent nuclear war in South Asia. The nuclear force structures adopted by India and Pakistan can be expected to exert a particularly strong influence on the potential for both of the necessary conditions for inadvertent war. The current arsenals of these countries, small and heavily dependant upon aircraft for weapons delivery, may invite preemption

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These findings have significant implications for U.S. foreign policy. By improving the balance of incentives and disincentives that encourage restraint in the deployment of ballistic missiles, addressing security concerns that promote the growth of South Asian nuclear capabilities, reducing the salience of nuclear weapons in international politics, and acting to diffuse emergent Indo-Pakistani crises in a manner that discourages further confrontations, the United States can at least mitigate the threat of inadvertent nuclear war in South Asia. As similar risks of inadvertent war can be expected in the event of nuclear proliferation to other regions of the world, these findings also highlight the need for redoubled efforts to strengthen the global nuclear nonproliferation regime.

I. INTRODUCTION

A. BACKGROUND

India's nuclear tests in May of 1998 drew a strong and immediate reaction from the United States. The Clinton administration moved swiftly to impose wide-ranging sanctions upon India under U.S. legislative provisions, and encouraged other major trading nations to respond similarly.[1] The United States also attempted to dissuade Pakistan from responding to India's test in kind, promising significant military and economic aid in exchange for nuclear forbearance.[2] When Pakistan detonated its own nuclear devices later in the month, the United States led international efforts to isolate both South Asian countries, contributing to strongly worded calls from both the permanent five (P-5) members of the United Nations Security Council and the Group of Eight (G-8) for Indian and Pakistani "restraint." The G-8 and nations of the European Union ultimately were persuaded to follow their verbal condemnation of the tests with more significant punitive action. [3]

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[1] See United States, Bureau of Economic and Agricultural Affairs, *Fact Sheet: India and Pakistan Sanctions*, 18 June 1998, 12 Sep. 2000 <http://www.state.gov/www/regions/sa/fa_980618_india_pak.html> and United States, The White House, Office of the Press Secretary, "Statement by the Press Secretary: India Sanctions," 13 May 1998, Berlin, 21 Sep. 2000 <http://www.state.gov/www/regions/sa/980513_wh_india_sanctions.html>.

[2] Samina Ahmed, "Pakistan's Nuclear Weapons Program: Turning Points and Nuclear Choices," *International Security* 23.4 (Spring 1999): 194-95; Zafar Iqbal Cheema, "Pakistan's Nuclear Use Doctrine and Command and Control," *Planning the Unthinkable: How New Powers Will Use Nuclear, Biological, and Chemical Weapons*, eds. Peter R. Lavoy, Scott D. Sagan, and James J. Wirtz (Ithaca: Cornell UP, 2000) 164-65.

[3] Ahmed, 196-97 and Virginia I. Foran, "Indo-US Relations after the 1998 Tests: Sanctions Versus Incentives," *Engaging India: U.S. Strategic Relations with the World's Largest Democracy*," eds. Gary K. Bertsch, Seema Gahlaut, and Anupam Srivastava (New York: Routledge, 1999) 59-60.

Implicit in continuing U.S. opposition to the growth of nuclear capabilities in South Asia is the belief that nuclear proliferation is a dangerous phenomenon, illustrating the "proliferation pessimist" viewpoint that has informed U.S. foreign policy since the Baruch Plan of 1946.[4] In the South Asian case, nuclear weapons are seen as increasing the dangers associated with the Indo-Pakistani rivalry that has produced three wars and continual low-level violence during the past five decades. Moreover, the emergence of Indian and Pakistani nuclear arsenals has threatened the global non-proliferation regime at a time when its continued survival has already been called into question by the discovery of Iraq's clandestine nuclear weapons program and by friction between the international community and North Korea over that country's nuclear ambitions.

Among the variety of dangers that may be associated with the spread of nuclear capabilities to India and Pakistan is the possibility of an unintended or accidental nuclear war between these two nations. U.S. officials have implied on several occasions that a danger of unintended nuclear conflict exists in South Asia. In reference to the Kashmir crisis of 1990, a senior U.S. official reportedly stated:

> The concern was that they [India and Pakistan] were inadvertently lurching toward a conflict that neither one of them wanted... Each side was worst-casing the other's reactions or intentions. Each modest military move was looked on by the other as requiring a response by the other side. Also, there was a ratcheting up of military developments on both sides that was very worrisome.[5]

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[4] For a general discussion of concerns associated with nuclear proliferation, see Scott D. Sagan and Kenneth N. Waltz, *The Spread of Nuclear Weapons: A Debate* (New York: W. W. Norton, 1995) and Peter R. Lavoy, et al., "The Kenneth Waltz – Scott Sagan Debate, The Spread of Nuclear Weapons: Good or Bad?," *Security Studies* 4.4 (Summer 1995): 695-753.

[5] Michael R. Gordon, "War over Kashmir is Feared by U.S.," *New York Times* 17 June 1990, late ed.: A15.

While commander of the U.S. Central Command, General Anthony Zinni expressed similar concerns with respect to more recent Indo-Pakistani tensions. During an interview on the subject of South Asian nuclear developments, he noted that the 1999 Kargil crisis "scared both sides...it escalated with mobilizations on different fronts – tit for tat. Both sides are now very concerned about how escalation works and how it could happen very quickly."[6]

For all the weight that fears of unintended nuclear war are given in some accounts of Indo-Pakistani crises, there is considerable debate among scholars as to whether such concerns are justified. Some analysts ask why the logic of deterrence, by which fears of devastating retribution promote caution in relations between nuclear-armed states, should not serve new nuclear nations as well as it seems to have served the superpowers during the Cold War. They point out that many of the dangers purportedly associated with the spread of nuclear weapons depend upon broad characterizations of new nuclear states as radical, unstable, irrational, or even "undeterrable."[7] Historical evidence, they argue, gives reason to be optimistic about the resiliency of deterrence in the context of regional crises. As India and Pakistan have weathered periods of tension and even conflict without disaster since acquiring nuclear capabilities, these scholars find support for assertions that a nuclear war in South Asia is very unlikely.[8]

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[6] Robert Windrem and Tammy Kupperman, "Pakistan Nukes Outstrip India's, Officials Say: U.S. Reverses Assessment of South Asia Nuclear Balance," *MSNBC News* 4 Sep. 2000, 4 Sep. 2000 <http://www.msnbc.com/news/417106.asp>.

[7] Sagan and Waltz 10-13.

[8] Devin T. Hagerty argues this point in *The Consequences of Nuclear Proliferation: Lessons from South Asia* (Cambridge: MIT Press, 1998) and "Nuclear Deterrence in South Asia: The 1990 Indo-Pakistani Crisis," *International Security* 20.3 (Winter 1995/96): 79-114. His assertions, though made before the 1998 nuclear tests and 1999 Kargil crisis, are highly relevant to the issues under consideration here and will be addressed in some detail in Chapter II.

B. PURPOSE OF THESIS

Is there a significant danger of unintended nuclear war between India and Pakistan? Might the risk of such a conflict increase in the future? What can be done to eliminate or at least mitigate this danger? With the fate of millions of lives potentially in the balance, the imperative of finding answers to these questions is clear. Equally clear is that the analysis supporting such answers must avoid unsubstantiated characterizations of South Asian nuclear dynamics or decision making as different from those that obtain elsewhere, especially among the five nuclear weapon states (NWS).[9] Such arguments not only have failed to impress Western theorists, but also are likely to be rejected as ethnocentric and hypocritical by those individuals who are best positioned to effect changes in South Asia, the government officials and security analysts who shape nuclear policy in India and Pakistan.[10]

C. ANALYTICAL APPROACH

This thesis employs crisis instability theory as developed by Robert Jervis and other scholars to assess whether a particular type of unintended nuclear conflict known as inadvertent war is possible in South Asia. An *inadvertent war* would begin when one nation chose to launch a preemptive nuclear strike against another in the mistaken belief that the latter had launched or was about to launch a nuclear strike of its own. Insofar as the nation launching the preemptive nuclear attack in this scenario would do so deliberately, inadvertent nuclear war would not be unintentional in the strictest sense of the word. Such a war would be an accidental and undesired conflict nonetheless, as it

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[9] Here and throughout this paper, the term "nuclear weapon states" refers to the five nations accorded such status under Nuclear Nonproliferation Treaty (NPT): the United States, Russia, the United Kingdom, France, and the People's Republic of China.

[10] Hagerty, *Consequences* 10; Sagan and Waltz 13.

would not occur if the nation striking first accurately understood the intentions of the other.

Crisis instability theory describes two necessary conditions that together may be sufficient to cause inadvertent nuclear war. Since this theory employs a rational actor model of nuclear decision-making, it should be as applicable for assessing the likelihood of inadvertent war in South Asia as it is valid for analyzing nuclear dynamics elsewhere in the world.[11] By avoiding the theoretical pitfalls of arguments that characterize developing nations as different from the existing NWS, an analysis based on crisis instability theory should also be less susceptible to charges of First World-bias, and accordingly more persuasive to a variety of readers. Crisis instability theory will be discussed in detail in Chapter II.

Inadvertent war is not the only type of unintended or accidental nuclear war that might occur between India and Pakistan. Nuclear war could result from the theft or unauthorized launch of a weapon, an electrical or mechanical malfunction that results in the detonation of a device, an accident involving the transport of a weapon, or any one of a number of other potential causes.[12] The discussion of such possibilities is not entirely separable from that of inadvertent nuclear war – a nuclear weapons accident, for example, could result in the mistaken belief that an adversary had launched a nuclear strike. In the interest of maintaining focus, this thesis will address such eventualities only

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[11] The "rational actor" in this case is subject to the same psychological biases, incomplete information, and other potential sources of perceptual error that afflict actors in most well-developed models of rational behavior.

[12] For comprehensive discussions of the dangers of unauthorized nuclear weapons use or accidents involving nuclear weapons see Peter D. Feaver, *Guarding the Guardians: Civilian Control of Nuclear Weapons in the United States* (Ithaca: Cornell UP, 1992) and Scott D. Sagan, *The Limits of Safety: Organizations, Accidents, and Nuclear Weapons* (Princeton: Princeton UP, 1993). See also Charles Perrow, *Normal Accidents: Living with High-Risk Technologies* (New York: Basic Books, 1984).

as they relate directly to inadvertent war. How the theft, unauthorized use, or accidental detonation of nuclear weapons might be prevented in South Asia remains a worthy subject for further research.

D. ORGANIZATION

Chapter II begins by addressing the theoretical arguments and historical evidence for the robustness of nuclear deterrence in South Asia. Proliferation optimists have argued that nuclear weapons exert such a sobering influence on decision makers that a nuclear war between regional nuclear powers is very unlikely. They contend that historical evidence from crises involving India and Pakistan since these countries developed nuclear weapons provides confirmatory evidence about the resiliency of deterrence in South Asia. Crisis instability theory will be described in detail and used to critique the arguments of these scholars, demonstrating that their assumptions about the nature of crisis decision-making are flawed and that the history of South Asian crises gives less cause for comfort than they assert.

Chapter III argues that the potential for inadvertent war in South Asia during future crises will be strongly influenced by the nuclear force structures adopted by India and Pakistan, and discusses how regional force structures (and the nuclear postures and employment doctrines that derive from them) might evolve during the next decade in order to assess the impact that specific alternatives might have upon the likelihood of such a conflict. The relatively short time frame that this analysis will consider is the product of both the particularly destabilizing effects that near-term South Asian nuclear force structure developments may have, and the difficulty of making predictions about the state of regional forces that apply to the more distant future. Evidence indicates that a

substantial danger of inadvertent nuclear war between India and Pakistan already exists, and that potential near-term enhancements to South Asian nuclear capabilities – especially the introduction of ballistic missiles as nuclear delivery systems – would greatly increase the danger of inadvertent war during the next ten years.

Chapter IV offers a summary of the findings of this thesis and an assessment of their implications for U.S. policy.

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II. THE DANGER OF INADVERTENT NUCLEAR WAR

A. NUCLEAR DETERRENCE AND CONFLICT PREVENTION

1. Arguments for the Robustness of Regional Nuclear Deterrence

Proliferation optimists argue that the employment of nuclear weapons by new nuclear powers is highly unlikely, and that nuclear weapons can serve to enhance the security of these states. While individual optimists differ on whether their prescriptions are applicable to the entire world, the central tenets of their arguments are similar.[13] Kenneth N. Waltz makes a case for proliferation optimism in two essays that appear within *The Spread of Nuclear Weapons: A Debate*, coauthored by Scott D. Sagan. Starting from the neo-realist assumption that state behavior is the product of a rational cost/benefit calculus, Waltz asserts that states act with great care in choosing war if the perceived cost of fighting is high. In a nuclear environment, the stakes are the highest possible. "Countries armed with conventional weapons go to war knowing that even in defeat their suffering will be limited," he writes. "Calculations about nuclear war are differently made. In a nuclear world, one is concerned about surviving or being annihilated."[14]

Waltz and other optimists argue that given the potentially enormous costs of fighting a nuclear war, the mere possibility of being punished with nuclear weapons should deter a state from threatening the vital interests of another state that possesses these devices, even if the first state has nuclear weapons of its own.[15] Because the

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[13] Peter R. Lavoy, et al. 700-7, 716-17.

[14] Sagan and Waltz 5-7.

[15] Optimists acknowledge that nuclear deterrence may not prevent the outbreak of limited conflicts

damage that can be caused by even a single nuclear weapon is so great, uncertainty over whether the victim of an attack *might* respond with nuclear weapons should be enough to prevent major conflict.[16] This faith in the value of retributive uncertainty has important implications for the kinds of nuclear forces that optimists believe are needed for deterrence. A state's possession of small nuclear forces, easily hidden and perhaps supplemented by decoys, should suffice to convince any adversary considering nuclear first-use that unacceptable levels of punishment would result from such a decision, since an attempt at a counterforce first strike is bound to be less than perfectly successful.

In fact, optimists argue, the modest nuclear capabilities that regional powers will possess should make counterforce attacks even less of an option. As David J. Karl writes:

> The shortage of critical resources and capabilities faced by emerging nuclear powers are, in the abstract, a bane for crisis stability, but in practice they may tend to operate as blessings in disguise. While constraints limit arsenal size and thus in theory create inviting targets for offensive action, they also restrict the number of weapons available for use in counterforce attacks. Unless counterforce attacks are executed with improbable accuracy and effectiveness – all the more improbable in view of the rudimentary intelligence capabilities possessed by new proliferators – they are impossible using the sparse arsenals that emerging nuclear states are likely to employ against each other.[17]

Optimists expect that uncertainty over the possibility of retribution will allow deterrence to hold even when the nuclear forces of one nation are larger or otherwise superior to those of the other. "Variations in number mean little within wide ranges," asserts Waltz. "The expected effect of the deterrent achieves an easy clarity because such wide margins

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that do not threaten the vital interests of the states involved. "War can be fought in the face of deterrent threats," writes Waltz, "but the higher the stakes, and the closer a country moves towards winning them, the more surely that country invites retaliation and risks its own destruction." Sagan and Waltz 8.

[16] Sagan and Waltz 24-25.

[17] David J. Karl, "Proliferation Pessimism and Emerging Nuclear Powers," *International Security* 21.3 (Winter 1996/97): 105

of error in estimates of the damage one may suffer do not matter. Do we expect to lose one city or two, two cities or ten?"[18]

2. Nuclear Weapons and Deterrence in South Asia

Devin T. Hagerty, Peter Lavoy, and other analysts of Indo-Pakistani security dynamics have argued that evidence from a number of crises supports the optimist contention that nuclear war, intended or otherwise, is unlikely in South Asia.[19] Although Indian military commanders apparently proposed preventive strikes against Pakistan's nascent nuclear infrastructure twice during the 1990s, prime minister Indira Gandhi ruled against such action on both occasions in part due to concerns that Pakistan might strike back against Indian nuclear facilities, causing an environmental catastrophe that could have endangered many lives.[20] While Hagerty finds only ambiguous evidence that nuclear deterrence prevented war from erupting during the "Brasstacks" crisis of 1986-87, he nonetheless points out that the "dire predictions" of proliferation pessimists were not borne out in this case.[21] During the 1990 Kashmir crisis, by contrast, he concludes that the deterrent value of India and Pakistan's rudimentary nuclear forces was likely the most important factor in the prevention of war, that uncertainty over the possibility of nuclear retaliation prevented a conflict from erupting. Both India and Pakistan were

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[18] Sagan and Waltz 8.

[19] Lavoy lists a number of analysts who share this view, including (in addition to himself and Hagerty) George Perkovich, former Indian and Pakistan army chiefs of staff K. Sundarji and Aslam Beg, Pakistani general K. M. Arif, and Indian security analyst K. Subrahmanyam. See Lavoy, et al. 707.

[20] George Perkovich, *India's Nuclear Bomb: The Impact on Global Proliferation* (Berkeley: University of California Press, 1999) 239-41, 258; Sidhu, "India's Doctrine" 132-34.

[21] Hagerty, *Consequences* 115-16.

deterred from initiating a war, he states, simply "by the knowledge that the other was nuclear weapon-capable."[22]

Hagerty is able to draw his conclusions about the 1990 Kashmir crisis because of clear evidence that each of the antagonists had come to recognize the other's nuclear capabilities by this point in time, making the crisis an apparent textbook case for the arguments of deterrence optimists. Mutual recognition of these limited capabilities and the possibility of devastating retribution that flowed from them appears to have been sufficient to prevent the outbreak of major war, as optimists would predict. The evidence that each side was aware of the nuclear capabilities of the other during this crisis is sound. India's ability to construct nuclear weapons on short notice (if not its outright possession of such weapons) was widely acknowledged at this time, as it had tested a nuclear device some sixteen years earlier. Meanwhile, public statements by Pakistani officials and the U.S. government's well-publicized concern over Pakistan's nuclear aspirations had served to "build transparency" into that country's otherwise opaque nuclear program during the late 1980s, ensuring Indian awareness of Pakistan's capabilities.[23]

With tensions running very high during the Kashmir crisis (the two sides deployed hundreds of thousands of additional troops to the vicinity of their common border) and the nuclear forces of both India and Pakistan existing in only a crude (and potentially vulnerable) form, pressures for nuclear preemption and war should have been strong. Previous crises involving Kashmir, after all, were the proximate cause of two of

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[22] Hagerty, "Nuclear Deterrence" 80.

[23] Hagerty, *Consequences* 117-32.

the three wars that India and Pakistan had fought since gaining their independence. In marked contrast to events in 1947 and 1965, however, the two countries exhibited considerable restraint in 1990, and conflict was averted. Why? The most plausible explanation, argues Hagerty, is that there was "simply no way that Indian and Pakistani planners could have had confidence in launching an entirely successful [counterforce] first strike."[24] Uncertainty over the possibility of nuclear retaliation, in other words, was sufficient to deter war under extremely volatile conditions. "Having weathered the Brasstacks and Kashmir crises," Hagerty adds, "Indian and Pakistani leaders can rest more easily in the knowledge that as tempers flared during these war scares, neither side was tempted into preemptive action."[25]

B. CRISIS INSTABILITY AND INADVERTENT CONFLICT

1. Crisis Instability Theory

Proliferation optimists tend to be dismissive of the danger that one state will launch a preemptive nuclear strike against another during a crisis. Their arguments, however, presume that the cost/benefit calculus for launching preemptive attacks during crises is identical to that for launching an aggressive or preventive nuclear war – so long as a state cannot guarantee *with certainty* that a nuclear strike will not bring a devastating response, the potential costs of launching an attack well outweigh any gains to be had. Crisis instability theory indicates that this presumption is dangerously flawed.

Robert Jervis provides a comprehensive description of crisis instability in *The Meaning of the Nuclear Revolution*. Quoting Thomas Schelling, he notes that this condition derives from "the reciprocal fear of surprise attack." He writes:

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[24] Hagerty, *Consequences* 165.

[25] Hagerty, *Consequences* 191.

> Since each side fears being taken by surprise, each must remain on alert, which means not only monitoring the other side's military activities... but also preparing one's forces to act. These actions, however, can lead the other side to conclude that the state may be about to attack. The other side would then move to an increased state of readiness, thus confirming the state's suspicion that an attack was likely... The result could be an awful self-fulfilling prophecy in which the actions each side takes... fuel the fears of the other side, producing a war neither side sought.[26]

Crisis instability is dangerous because of the potential it generates for a rational decision to use nuclear weapons under conditions where neither side would consider doing so if in the possession of complete information about the other's intentions. The result would be an inadvertent war, a war that neither state would prefer even to a defeat in the crisis at hand.[27] Inadvertent nuclear war would begin with a mistaken attempt at preemption, driven by the conviction that "as terrible as striking first would be, receiving the first blow would be even worse."[28]

2. Necessary Conditions for Inadvertent War

According to Jervis, crisis instability creates a potential for inadvertent war when decision makers come to subscribe to a set of "twin beliefs" about the confrontation in which their nation is involved:

1. The belief that total war (a nuclear exchange) is inevitable.

2. The perception that there is a significant advantage to striking first.

For an inadvertent war to occur between two nations, decision makers in at least one of the two would have to believe both that nuclear war was unavoidable and that there was

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[26] Robert Jervis, *The Meaning of the Nuclear Revolution: Statecraft and the Prospect of Nuclear Armageddon* (Ithaca: Cornell UP, 1989) 138.

[27] Jervis, *Meaning* 139.

[28] Jervis, *Meaning* 134.

some advantage to be gained by being the first to attack.[29] As the use of the words "belief" and "perception" should indicate, the existence of the necessary conditions for instability during a given crisis would depend as much upon the perceptions of decision-makers as upon substantive realities. The relation between the conditions necessary for inadvertent war is illustrated graphically in Figure 1.

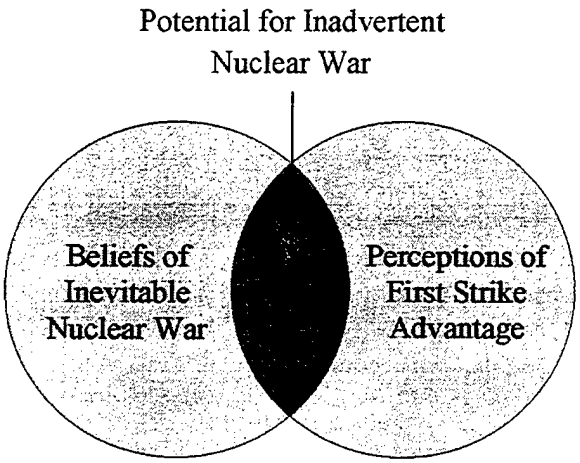

Figure 1. Necessary Conditions for Inadvertent Nuclear War

The second necessary condition for inadvertent nuclear war, perceptions that there is a significant advantage in striking first, depends specifically upon the existence of either of two sub-conditions:

1. The perceived vulnerability of an adversary's nuclear forces.

2. The perceived vulnerability of one's own nuclear forces.

In the first case, preemption is advantageous because it allows a state to limit the damage to itself that will result from the impending strike of its enemy. In the second, preemption

[29] Jervis, *Meaning* 136-37.

allows a state to inflict maximum damage upon its adversary before the state's ability to do so is disrupted, a form of advance retribution that may limit the adversary's ability to dominate the post-hostilities political/military environment.[30] By contrast, when the nuclear forces of both sides involved in a crisis are largely survivable, the temptation for preemption is eliminated – neither side can hope to significantly reduce the damage it will sustain in a nuclear war by striking first, and each can be confident that its own forces will be able to exact retribution in the unlikely event that the other still chooses to launch an attack.

3. The Stability-Instability Paradox

Some analysts have suggested that conditions of crisis stability, in which mutual fears of nuclear destruction prevent escalation, can be just as dangerous as crisis instability. Under such conditions a state with revisionist goals might initiate limited conventional operations against an adversary, confident that deterrence would prevent undesired escalation. In this view, a degree of crisis instability in relations between nuclear states is actually desirable, since the threat of inadvertent conflict serves as an added deterrent to would-be aggressors. Scholars describe the dilemma associated with choosing between the dangers of crisis stability and those of crisis instability as the "stability-instability paradox."[31]

Both Indian officials and extra-regional analysts have indicated that Pakistan has recently sought to exploit perceptions of crisis stability to further its political goals in Kashmir. Pakistani leaders have been sufficiently confident in the robustness of nuclear

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[30] Jervis, *Meaning* 145.

[31] This concept was first described by Glenn Snyder in "The Balance of Power and the Balance of Terror," *The Balance of Power*, ed. Paul Seabury (San Francisco: Chandler, 1965).

deterrence to infiltrate guerillas and even regular military forces across the Line of Control (LOC) with little fear of Indian escalation in response.[32] Such operations not only reap military benefits for Pakistan (by exacting high costs on the Indian military, increasing Pakistani experience in certain types of operations, providing opportunities for intelligence gathering, etc.), but also can bolster domestic support for Pakistan's political leaders. Moreover, by exacerbating international fears of crisis instability (even in an environment that Pakistan's leaders perceive as crisis stable), clashes in Kashmir draw global attention to the Indo-Pakistani dispute over the territory. Internationalization of the Kashmir dispute has been a long-standing strategic goal of Pakistan, which is at a disadvantage both diplomatically and militarily in the ongoing confrontation with its larger neighbor.[33]

Crisis instability remains more dangerous than crisis stability for one reason – conditions of crisis stability theoretically foster only low levels of violence that do not immediately threaten the vital interests of the nations involved. The existence of genuine nuclear crisis stability in South Asia might encourage a continuation of low-level fighting between India and Pakistan, but would dramatically reduce the potential dangers associated with that fighting. By contrast, although violence would probably be less frequent if Indian and Pakistani decision makers feared instability in the event of crises, the potential consequences of any outbreak of fighting would be far more horrific.[34]

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[32] Eric Arnett, "Nuclear Stability and Arms Sales to India: Implications for U.S. Policy," *Arms Control Today* Aug. 1997, 14 Aug. 2000 <http://www.armscontrol.org/ACT/august/arnett.html>; India, Government of India, *Kargil Committee Review Report* (New Delhi: Government of India, 2000) 203; Andrew Koch, "Nuclear Friction," *Jane's Defense Weekly* 13 Dec. 2000: 21-22.

[33] Robert G. Wirsing, *India, Pakistan, and the Kashmir Dispute: On Regional Conflict and Its Resolution* (New York: St. Martin's, 1994) 190-92.

[34] The example given earlier – describing Pakistani exploitation of international fears of crisis

4. Crisis Instability Theory and Proliferation Optimism

Under conditions of crisis instability, the cost/benefit calculus for launching a nuclear attack is likely to differ from that described by proliferation optimists. Uncertainty over whether some of an adversary's warheads might survive a counterforce first strike – ordinarily so important to deterrence – matters much less if one believes that an adversary intends to launch a nuclear attack irrespective of what one does. Waltz asks, "why fight if you can't win much and might lose everything?"[35] The answer is that choosing not to fight may *ensure* that one will lose everything when one believes that an adversary is already planning a nuclear attack (i.e. that nuclear war is inevitable), and that the adversary's or one's own nuclear forces are vulnerable (i.e. that there is an advantage in striking first). Preemption, rather than nuclear restraint, becomes the logical imperative, and the "easy clarity" of nuclear deterrence assumed by proliferation optimists is lost. The question, "do we expect to lose one city or two, two cities or ten," which seems absurd when asked in the abstract, could be very pertinent to leaders who perceived imminent nuclear war as a reality.

Optimists might counter that crisis instability is nonetheless unlikely because the logic of deterrence dictates against the development of perceptions that nuclear war is

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instability during conditions that Pakistani officials themselves see as stable – is suggestive of a rather insidious danger associated with crisis instability. To the extent that Pakistani (or Indian) perceptions of a given level of crisis stability are accurate, the danger of inadvertent nuclear war may indeed be small. A real danger, however, may stem from inaccurate or dissimilar perceptions of the level of crisis stability by Indian and Pakistani leaders, a condition that could promote dangerous decision-making. The problem of perceptions suggests one way in which the deterrent value associated with crisis instability under the stability-instability paradox might fail to prevent the occurrence of a devastating war. See Scott D. Sagan, "Nuclear Safety and Security in South Asia," *Proliferation Challenges and Nonproliferation Opportunities for New Administrations*, Monterey Nonproliferation Strategy Group Occasional Paper No. 4, ed. Michael Barletta (Monterey: Monterey Institute of International Studies, 2000).

[35] Sagan and Waltz 5.

inevitable – why would decision-makers come to believe that their adversaries were planning a nuclear attack despite the possibility of receiving a devastating response? The answer is that events during a crisis may cause decision-makers to interpret their adversaries' actions in the worst possible light, and even to doubt the rationality of their opponents. That erroneous perceptions of an adversary's intentions are both theoretically possible and historically demonstrable has been shown convincingly by Jervis in *Perception and Misperception in International Politics*, an authoritative work on this subject. Jervis demonstrates that processes of human perception are highly susceptible to error, being subject to imperfect information, psychological biases, and faulty learning. In *The Meaning of the Nuclear Revolution*, he applies these findings to the possibility of misperceptions of inevitable nuclear conflict, noting that the impact of stress, information overload, and a variety of psychological phenomena can make ambiguous indications that an adversary might be planning an attack far more convincing than would otherwise be the case.[36]

The history of Indo-Pakistani crises provides specific examples of behavior that could contribute to perceptions in one state that the other was planning a nuclear attack. This is not to suggest that South Asian decision makers have been especially irresponsible during previous crises, but rather that they have not been immune to the same types of problems now widely known to have plagued officials in other nuclear-armed states.[37] In an incident eerily similar to a potentially disastrous overflight of the Soviet Union by an American U-2 reconnaissance aircraft in the midst of the Cuban

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[36] Jervis, *Meaning* 148-64.

[37] Sagan and Waltz 52-55.

Missile Crisis, an Indian MiG-25 flew a reconnaissance mission over Pakistan during the 1990 Kashmir crisis.[38] As in the case of the U-2 flight, the Indian reconnaissance mission was authorized by military commanders as a matter of routine, without the notification of senior government officials who might have been reluctant to risk such provocative activity.[39] During the same crisis, Pakistani leaders are alleged to have carried out at least "some activities that suggested preparations for a nuclear strike, possibly to provoke Washington's intervention to resolve the crisis."[40] When fighting broke out near Kargil in the summer of 1999, senior Indian officials warned that their country's response to Pakistan-supported incursions in Kashmir might include cross-border attacks or "hot pursuit" of fleeing insurgents. Pakistan's foreign minister threatened the use of nuclear weapons if Indian forces violated the LOC, the first overt nuclear threat ever made during the course of open hostilities between the two countries.[41] While some efforts to control escalation of the fighting were evident, Indian aircraft were employed aggressively near the border (two of which crashed on the Pakistani side of the LOC), substantial portions of the Indian army were redeployed, and the Indian navy maneuvered in strength off the

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[38] James G. Blight and David Welch's essay "The Cuban Missile Crisis and New Nuclear States," describes the U-2 flight and other products of unchecked organizational behavior that could have led to catastrophe during the Cuban Missile Crisis. See *Security Studies* 4.4 (Summer 1995): 811-50.

[39] Waheguru Pol Singh Sidhu, "India's Nuclear Use Doctrine" in *Planning the Unthinkable: How New Powers Will Use Nuclear, Biological, and Chemical Weapons*, eds. Peter R. Lavoy, Scott D. Sagan, and James J. Wirtz (Ithaca: Cornell UP, 2000) 139. Information published since 1990, which indicates that the fast (Mach 3) Russian-built reconnaissance aircraft also possesses a high-altitude bombing capability, adds a chilling "what if?" that Pakistani nuclear decision makers might consider during future crises. See "MiG-25," *Jane's All the World's Aircraft 1994-1995*.

[40] Sidhu, "India's Doctrine" 140.

[41] Cheema 171.

southern coast of Pakistan.[42] In the future, the kinds of organizational behaviors and deliberate posturing described above could contribute to perceptions of imminent war.

Evidence also indicates that senior Indian and Pakistani officials regard the intentions of their neighbors with deep suspicion and at times have doubted their adversaries' capacity for rational decision-making under crisis conditions. During the Brasstacks crisis, "Pakistani intelligence suggested that Indians thought Zia [Pakistan's prime minister] was 'on his last legs' politically, and that Sindh [a region in Pakistan with a history of insurrection] was ripe for a repeat of the 1971 war."[43] Zia himself went further, noting, "We feel that India has not... yet been reconciled to the existence of Pakistan... There is some lurking suspicion in the minds of some Indian leaders about the existence of Pakistan. Is it going to last? Is it going to collapse?"[44] During the 1990 Kashmir crisis, Indian Prime Minister Singh confirmed India's suspicions of the stability of Pakistan's government, declaring his belief that no one in Islamabad was in control of the country.[45] Sagan indicates that Indian concerns over Pakistan's viability as a state have increased in recent years, writing, "leaders in New Delhi have declared publicly that they believe Pakistan is now a 'terrorist state' under the influence of Islamic fundamentalist forces, and now privately discuss their fears that Pakistan may collapse into chaos and civil conflict."[46] In such an environment, nuclear decision makers in either

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[42] Sidhu, "India's Doctrine" 138-39, 143.

[43] Hagerty, *Consequences* 108.

[44] Hagerty, *Consequences* 109.

[45] Hagerty, *Consequences* 147.

[46] Sagan, "Nuclear Safety" 37.

state might be inclined to assume the worst about the reported military activities of the other.

Crisis instability theory and evidence from the region thus suggest that optimists' assessments of the danger of nuclear war in South Asia are overly sanguine. While the level of deterrence provided by even rudimentary nuclear capabilities will probably be sufficient to prevent the launching of a premeditated nuclear attack during periods of calm or low-level hostility, a different logic could come to prevail during future Indo-Pakistani crises. If South Asian leaders begin to perceive that nuclear war is imminent, and believe that there is a significant advantage to striking first, then substantial pressures will exist to do so. From this perspective, the fact that nuclear war did not erupt as a result of Indo-Pakistani crises of the 1990s is attributable less to the robustness of nuclear deterrence than to the fortunate fact that circumstances never drove decision makers to subscribe to such beliefs. Had these crises escalated to the point where general war truly seemed inevitable, inadvertent nuclear war might well have been the result.

III. SOUTH ASIAN NUCLEAR FORCES AND THE THREAT OF INADVERTENT WAR

A. DETERMINING THE POTENTIAL FOR INADVERTENT NUCLEAR WAR IN SOUTH ASIA

Is the good fortune experienced by India and Pakistan during past crises likely to hold during future confrontations? How probable is it that Indian and Pakistani decision-makers could come to subscribe to Jervis's twin beliefs during periods of tension or low-level hostilities? How can the prospects for inadvertent war in South Asia be assessed?

The force structures adopted by India and Pakistan as they develop their nuclear capabilities during the next decade may exert a decisive influence on the potential for both of the perceptions necessary for inadvertent war during future South Asian crises. Nuclear force structures have a straightforward relationship to force vulnerability, and hence to the potential for perceptions of first-strike advantage. The numbers and types of nuclear weapons and delivery systems deployed by each side will form the basis for determinations of how vulnerable each arsenal is to an attack by the other. Certain delivery systems are more useful than others for conducting surprise attacks on nuclear forces or command and control (C^2) structures, and may be more or less vulnerable to attacks themselves.[47] Meanwhile, the nuclear force structures of adversarial nations can also strongly influence the manner in which those forces interact during peacetime, crisis, and war. The vulnerabilities generated by nuclear force structures may influence the

[47] In current literature, a number of abbreviations exist to describe the personnel and equipment needed to perform the coordinating and controlling functions upon which militaries depend. Command, control, communications, and intelligence, for example, are sometimes grouped together under the abbreviation C^3I, or with computers, surveillance, and reconnaissance as C^4ISR. To avoid unnecessary confusion, the term "command and control" (C^2) will be used throughout this paper to describe the systems needed to properly direct nuclear forces, and is meant to be inclusive.

adoption of force postures and nuclear doctrines that in turn create pressures for mutually reinforcing alerts during periods of tension. When coupled with the deficiencies of even the best intelligence and warning systems, such tightly coupled alert postures can create a significant potential for erroneous perceptions of imminent nuclear war.

Assessing the impact that India and Pakistan's developing nuclear force structures will have upon the potential for inadvertent war in South Asia requires an examination of the force structure alternatives available to each nation. Neither India nor Pakistan has committed itself irreversibly to the construction of specific numbers and types of nuclear weapons or delivery systems, and a variety of future force structures are possible. The effects of these alternative force structures must be considered with South Asia's geographic circumstances and strategic environment in mind. Only by matching theory with the particulars of the South Asian case can unsubstantiated generalizations be avoided and firmly grounded conclusions drawn about the potential for inadvertent nuclear war in the region.

Such an analysis reveals that as regional nuclear forces develop during the next decade, there is good reason for concern about the prospects for crisis instability and inadvertent nuclear conflict. Even in their current state, South Asian force structures are sufficiently vulnerable to attack that both the possibility of perceptions of first-strike vulnerability and the potential for mistaken beliefs of the inevitability of nuclear war are substantial. If India and Pakistan's capabilities to deliver nuclear weapons increase – especially through the introduction and operationalization of ballistic missile forces – the potential for inadvertent war during future crises will be even greater.

B. SOUTH ASIAN FORCE STRUCTURES AND PERCEPTIONS OF FIRST STRIKE ADVANTAGE

1. Force Size

a. Numerical Estimates of India and Pakistan's Nuclear Weapons Inventories

While estimates of the current quantities of nuclear weapons possessed by India and Pakistan vary, recent open-source studies of both countries' fissile material production capabilities provide fairly consistent assessments of the maximum number of weapons that will be available to each country during the next decade. These figures give a reasonable idea as to the size of the nuclear arsenals that might factor in future South Asian crises. Estimates for the ten-year period beginning in 2000 are shown in Table 1.

Table 1. Estimated Maximum South Asian Nuclear Weapons Inventories

	Maximum Inventory by Year*					
Country	2000	2002	2004	2006	2008	2010
India	50-100	60-110	70-130	80-170	90-210	100-250
Pakistan	32-56	36-64	40-72	44-80	48-88	52-96

* For upper-end Indian estimates, annual warhead production capacity is assumed to rise to 10 weapons per year after 2002, and 20 weapons per year from 2004. See text below.

To date, the Indian nuclear weapons program has relied primarily upon the reprocessing of plutonium for its stocks of fissile material, though pilot-level programs for the production of highly enriched uranium (HEU) were in place as of the late 1990s, and might eventually be used to augment India's fissile material supply. India operates two unsafeguarded heavy-water research reactors that are thought to be the primary

source of weapon grade plutonium, though the reprocessing of fuel from the country's six heavy water power reactors would make additional plutonium available. The limited capacity of India's reprocessing facilities, rather than the ability of its operating reactors to produce plutonium, currently may be the limiting factor in how much weapon grade material India can produce per year. [48]

Using an analytical model that accounts for the wide divergence in published data on the productive capacity of India's nuclear infrastructure, David Albright estimates a 90 percent statistical probability that India had enough fissile material for 45-95 weapons at the end of 1999, 65 being the median number.[49] This number compares well with other published estimates.[50] India's current plutonium production and reprocessing capabilities are believed to be sufficient for about five new nuclear weapons per year. If thermonuclear weapons are constructed, and India's capability to enrich uranium is not expanded, then the number may be fewer. If India's plutonium reprocessing capacity is increased, it might be able to produce as many as twenty weapons per year.[51] When coupled with Albright's estimates of India's 1999

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[48] Rodney W. Jones, et al., *Tracking Nuclear Proliferation: A Guide in Maps and Charts, 1998* (Washington: Carnegie Endowment for International Peace, 1998) 112.

[49] David Albright, "India's and Pakistan's Fissile Material and Nuclear Weapons Inventories, End of 1999," *Institute for Science and International Security Online*, 11 Oct. 2000, 24 Oct. 2000 <http://www.isis-online.org/publications/southasia/stocks1000.html>.

[50] Among recent studies, Gregory S. Jones estimates that India has enough weapon-grade plutonium for the manufacture of about 90 warheads. In a 1998 publication the National Resources Defense Council estimated sufficient material for 50 weapons, while a 1999 Congressional Research Service report suggested 75 or more. See Gregory S. Jones, *From Testing to Deploying Nuclear Forces: The Hard Choices Facing India and Pakistan*, RAND Project Air Force Issue Paper 192 http://www.rand.org/publications/IP/IP192>; Robert S. Norris and William Arkin, "After the Tests: India and Pakistan Update," *Natural Resources Defense Council Nuclear Notebook* 54.5 (Sep.-Oct. 1998); Barbara Leitch LePoer, *India-US Relations*, Congressional Research Service Issue Brief IB93097 (Washington: Congressional Research Service, 1999) 5.

[51] Estimates on India's annual nuclear weapon production capacity are from Gregory S. Jones. It is unclear at what point India's ability to manufacture and assemble the other components of nuclear weapons

fissile material inventory, these differing calculations of India's productive capacity would provide the country enough fissile material for 50 to 100 weapons at the end of 2000 (assuming that it would take India several years to improve its reprocessing capabilities) and from 100 to 250 weapons by 2010.

Pakistan's nuclear weapons program is believed to have relied thus far upon highly enriched uranium (HEU) as the type of fissile material in its devices. Pakistan reportedly manufactured its first HEU in 1985, and has operated a large-scale enrichment facility since 1987.[52] Since April of 1998, Pakistan also has had the theoretical capability to produce substantial amounts of weapon grade plutonium using fuel from its heavy water reactor at Khushab, though Pakistani officials deny that their country possesses the ability to reprocess reactor fuel.[53] U.S. intelligence officials, watchdog organizations, and nuclear industry journals have reported that Pakistan has at least an experimental reprocessing capability and that some reprocessing appears to be underway.[54]

Albright estimates that Pakistan had enough fissile material at the end of 1999 to manufacture 30 to 52 nuclear weapons, with 39 as the median quantity.[55] As in

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might become the limiting factor in the rate at which the country's arsenal could expand.

[52] Production of HEU at this facility has not been continuous – in 1989 and again from 1991 to 1998 the Pakistani government imposed a moratorium on the production of HEU in response to U.S. pressure, though production of low enriched uranium (LEU) is believed to have continued during this period. See Rodney W. Jones et al. 132.

[53] Cheema 166.

[54] Albright; Rodney W. Jones et al. 145.

[55] Albright's calculations presume the use of all the HEU produced at Pakistan's enrichment facility at Kahuta from 1987 to 1991 and from 1998 to the end of 1999, the further enrichment and use of LEU produced at Kahuta from 1991 to 1998, and the reprocessing and use of plutonium produced at Khushab in 1998-99. Losses of plutonium from the testing of six nuclear devices in 1998 are also included in the

the case of his estimates of India's fissile material, these numbers compare relatively well with those calculated by other analysts.[56] If Pakistan's uranium enrichment capacity remains unchanged in the future, one analyst postulates that it will be able to produce two to three new weapons a year (perhaps more if the LEU in its stockpile has not been utilized).[57] Meanwhile, a recent RAND study estimates that Pakistan could produce 1.7 weapons per year from HEU and another 2.2 weapons per year from reprocessed fuel from Khushab, for a total of almost four weapons per year.[58] Using Albright's low- and high-end estimates of Pakistan's fissile material inventory at the end of 1999, these productive capacities would give Pakistan a maximum inventory of 32 to 56 warheads at the end of 2000, and from 52 to 96 warheads by the end of 2010.

During the next few years, the numbers of nuclear weapons available to India and Pakistan during a crisis would likely be smaller than the above data indicate. Senior U.S. government officials believe that India may have manufactured few actual weapons from its stockpile of fissile material thus far, suggesting that as few as five devices may be assembled or immediately available for use.[59] A recent report that only one of the nuclear devices tested by India in 1998 was a usable weapon provides tentative support for the notion that the process of weaponizing the country's nuclear materials

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calculations.

[56] Cheema estimates 25-40 warheads (page 165), while Gregory S. Jones places the number at 27.

[57] Cheema 165.

[58] Gregory S. Jones.

[59] See Windrem and Kupperman. This would be consistent with the historical reluctance of Indian civilian leaders and scientists to allow participation of the military in nuclear decision-making, pressures for which can be expected to grow if the capabilities of India's arsenal are expanded or threats to the survivability of the arsenal increase. See Sidhu, "India's Doctrine," especially pages 145-57.

may be less far advanced than previously thought.[60] Meanwhile, the same U.S. officials who doubt high-end estimates of India's nuclear capabilities believe that Pakistan has made much greater use of its fissile material inventory to manufacture weapons, a conclusion that finds support in the generally more significant steps that Pakistan has taken to define a military command structure for them.[61] During the first years of the 21st century, Pakistan may have a slightly larger number of nuclear weapons ready for use than India, though India's greater resources and more substantial nuclear infrastructure should give it the ability to redress this imbalance in short order if the decision is made to do so. Both nations seem likely to have tens of weapons ready at mid-decade for delivery by whatever means are available.

b. Impact of Force Size

A number of authors have contended that small nuclear arsenals like those that will be available to India and Pakistan during the next decade need not be especially vulnerable to preemptive attack, and have even suggested that there may be survivability advantages associated with the possession of only a few weapons. Small numbers of nuclear weapons should be relatively easy to camouflage or otherwise conceal, and their survivability during periods of tension should be enhanced by the fact that regional

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[60] According to P.R. Chari, the chairman of India's Atomic Energy Commission has stated that the other four devices tested at Pokhran were "weaponizable configurations," but not constructed for delivery as warheads. See "India's Slow Motion Nuclear Deployment," *Non-Proliferation Project* 3.26, 7 Sep. 2000, Carnegie Endowment for International Peace, 9 Nov. 2000, available at <http://www.ceip.org>.

[61] Pakistan established a National Command Authority (NCA) in February of 2000 with the reported goal of developing and implementing a C^2 structure for the country's nuclear weapons. In November of the same year, all of Pakistan's "strategic organizations" were made subordinate to this body. See Koch, "Nuclear Friction" 23-24. India, by contrast, has proceeded more slowly. Late in 2000, its Defense Management Taskforce released recommendations for the creation of a strategic command, but these recommendations have not yet been acted upon. See Rahul Bedi, "Indian Taskforces Submit Security Recommendations," *Jane's Defense Weekly* 8 Nov. 2000: 15. An alternative explanation for the more rapid pace of Pakistan's nuclear C^2 development is that the high level of military involvement in the country's political decision-making (especially since the October 1999 coup that installed a military government) has facilitated this process to a degree not possible in India.

adversaries considering preemption will also have only a few weapons with which to conduct an attack.[62] Small arsenals should also require less elaborate (and hence less detectable and less targetable) supporting infrastructures and C^2 systems than larger ones.[63] Especially if warheads are mounted on mobile ballistic missiles, it is argued, preemptive attacks on small nuclear forces should be all but impossible. "Would be counterforce shooters," writes Jordan Seng, "may simply find nothing to shoot at."[64]

Unfortunately, the small size of the Indian and Pakistani arsenals is unlikely in and of itself to be a stabilizing factor during crises. The fact that small arsenals provide each side with fewer weapons with which to conduct preemptive strikes is offset by the smaller number of counterforce targets that would have to be hit to ensure a reasonable degree of success, and the additional use of conventional forces (such as aircraft with precision-guided munitions) for counterforce attacks would tend to make small arsenals even more vulnerable.[65] In fact, for opposing nuclear arsenals with a given

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[62] Karl 104-5; Sagan and Waltz 19-21.

[63] Jordan Seng asserts that the small size of the arsenals of new nuclear states also alleviates dangers of unauthorized use that dispersal and concealment strategies might entail by limiting the number of personnel who must be recruited, screened, and ultimately entrusted with the safeguarding of the weapons. This and other command and control advantages that he ascribes to small nuclear arsenals are discussed in the next section of this chapter. See "Less is More: Command and Control Advantages of Minor Nuclear States," *Security Studies* 6.4 (Summer 1997): 50-92.

[64] Seng 70.

[65] Sidhu reports that "conventional counterforce" has been an important part of the Indian military's planning for nuclear war since the early 1980s. See "India's Doctrine" pp. 128-30. Meanwhile, Peter Arnett notes that India's ability to conduct conventional strikes against nuclear targets has increased in recent years with the acquisition of laser-guided bomb kits from the United States. The text of India's draft nuclear doctrine (though not an official policy document of the Indian government) provides evidence that thinking along these lines continues, stating, "effective conventional military capabilities shall be maintained to raise the threshold of outbreak both of conventional military conflict as well as that of threat or use of nuclear weapons" and "the Indian defense forces shall be in a position to execute operations n an NBC environment with minimal degradation." Some analysts have interpreted this language as indicative of India's readiness to use conventional forces in a nuclear counterforce role, giving it the ability to launch a disarming first strike while shifting the onus of nuclear first use to Pakistan. See Arnett; Cheema 176-77; and Sections 2.7 and 5.5 of India, Government of India, *Report of National Security Advisory Board on*

mix of delivery systems, smaller arsenals are in some ways likely to induce instability, if for no other reason than that preemption may seem most promising as a strategy for damage limitation when the number of nuclear weapons possessed by adversaries is small. A strike that destroyed 75 percent of an adversary's arsenal of 20 weapons, for example, would leave the adversary only five for retaliation against the attacker, a return blow that the attacker might deem acceptable in the event that nuclear war was perceived as inevitable. An equally successful preemption (percentage wise) against an arsenal of 100 weapons would leave 25, and against an arsenal of 1000 a remainder of 250. As arsenals of hypothetical adversaries increase in size, the number of weapons surviving after even a very "successful" counterforce first strike becomes great enough to render discussion of damage limitation increasingly meaningless. Such a dynamic developed during the Cold War, where the arsenals of the superpowers grew so large that chances for damage limitation by first strikes against weapons and delivery systems alone all but vanished.[66]

The small size of India and Pakistan's nuclear arsenals is likely to contribute to perceptions of first-strike advantage in several other ways. When arsenals are small, minor differences in the weapons inventories of adversaries (consisting of even

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Draft Nuclear Doctrine, 17 Aug. 1999, 13 Mar. 2000 <http://www.indianembassy.org/policy/CTBT/nuclear_doctrine_aug_17_1999.html>.

[66] Paul S. Bracken, *The Command and Control of Nuclear Weapons* (New Haven: Yale UP, 1983) 87. The point here is that the small size of India and Pakistan's arsenals does not preclude (and may enhance) pressures for preemption in the event of crisis. This is not to suggest that larger arsenals are inherently stabilizing. Bruce G. Blair reveals that during the Cold War, the large number of targets that the massive U.S. arsenal was tasked with destroying effectively increased its vulnerability by making threats to even a small portion of the force unacceptable to U.S. planners. On the Soviet side, an especially pronounced need to maintain centralized command of nuclear forces in order to achieve doctrinal war aims meant that command and control vulnerability negated many of the survivability benefits of a large arsenal. See *The Logic of Accidental Nuclear War* (Washington: Brookings Institution, 1993).

a handful of warheads) may seem very significant, leading to "exchange ratio" calculations that create perceptions of first-strike vulnerabilities. Meanwhile, if South Asian nuclear weapons are to be made more mobile to enhance their survivability, steps will have to be taken to "operationalize" them by turning them over to military units.[67] As Sagan notes, the communications and organizational routines of operating military units "often produce 'signatures' to enemy intelligence agencies that inadvertently reveal secret information and the location of otherwise 'hidden' military forces."[68] Indian and Pakistani C^2 structures are likely to have the locations of their hidden command posts, transmitters, and the like revealed over time by this process. Having fewer critical nodes and less redundancy than the C^2 systems associated with larger arsenals, they are likely to be more vulnerable to "decapitating" attacks that paralyze nuclear forces by eliminating command systems and personnel or isolating them from the weapons they control.[69]

2. Nuclear Delivery Systems

a. Potential South Asian Nuclear Delivery Vehicles

Currently, the ability of India and Pakistan to deliver nuclear weapons depends largely upon the use of aircraft, though both countries have ambitious programs in place for the development and production of ballistic missiles that could lead to the

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[67] India's weapons are still believed to be in the custody of civilian authorities, most likely the Defense Research and Development Organization (DRDO), and Pakistani warheads, while controlled by military authorities, are also likely not to be in the possession of the military units (such as aircraft squadrons or missile batteries) that would be tasked with employing them in the event of war. See Chari; Neil Joeck, "Weaponization in South Asia," *Proliferation Brief 3.20*, 20 July 2000, Carnegie Endowment for International Peace, 9 Nov. 2000 <http://www.ceip.org>; Koch "Nuclear Friction"; and Farah Zarah, "Pakistan's Road to a Minimum Nuclear Deterrent," *Arms Control Today* July-Aug. 1999 <http://www.armscontrol.org/ACT/julaug99/fzja99.htm>.

[68] Scott D. Sagan, "Correspondence: Proliferation Pessimism and Emerging Nuclear Powers," *International Security* 22.2 (Fall 1997): 197.

[69] For a description of the complex C^2 system developed by the United States during the Cold War see Bracken, especially Ch. 6.

fielding of such delivery systems in quantity. Both India and Pakistan almost certainly have warheads designed for use in aerial bombs, and they may each possess some weapons adapted for use on missiles as well.

To date, the Indian government has been reluctant to authorize the mass production of missiles explicitly designed for nuclear weapons delivery. This hesitation stems in part from U.S. pressure to halt the fielding of ballistic missiles, and also from the wariness of Indian officials (including both political leaders and senior scientists) about involving the country's military in nuclear decision-making.[70] While Indian Air Force (IAF) pilots can be trained in the basics of nuclear weapons delivery with little change in the military's nuclear responsibilities, the construction of large numbers of nuclear-capable missiles would generate organizational pressures for the creation of the new kinds of military units needed to employ them.[71] Such developments would almost certainly enhance the role of senior officers in the formulation of nuclear policies, and might make current arrangements for the custody of nuclear weapons (with warheads probably in the possession the civilian-run Defense Research and Development Organization) infeasible.

Pakistan's military regime has moved more rapidly towards operationalizing its nation's nascent missile capabilities, and may already have done so to some degree. Senior U.S. officials suggest that Pakistan at least has the capability to

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[70] Sawhney "Evolving Nuclear Environment Moulds India's Military Strategy," *Jane's Intelligence Review* Aug. 2000: 41; Sidhu, "India's Doctrine" 145-57. India may have flight-tested an *Agni* series ballistic missile with a nuclear warhead lacking its fissile components. See Chari.

[71] The Indian Air Force is alleged to have practiced "toss bombing" techniques for the delivery of nuclear weapons by aircraft since the late 1970s. See Sidhu, "India's Doctrine" 132.

ready nuclear-capable missiles for use on short notice.[72] Other sources, however, indicate that a decision to formally incorporate ballistic missiles into Pakistan's nuclear arsenal would depend upon a corresponding move by India.[73] It may be that Pakistani leaders are wary of starting a missile race in which their country, with its limited financial resources, would ultimately be at a significant disadvantage.

Even without the introduction of ballistic missiles, India and Pakistan have a substantial capacity to deliver nuclear weapons at distances that exceed 1,000 kilometers, sufficient range to place civilian and military targets throughout all of Pakistan and most of India at risk. Both the Indian and Pakistani air forces possess a variety of aircraft that are suitable for use as nuclear delivery vehicles. Virtually all of the fixed-wing combat aircraft in their respective inventories are variants of types with nuclear capabilities in their countries of origin. For reasons of both cost and capability, however, limited numbers of "tactical" fighter-bomber aircraft are most likely to be adapted by each country for a nuclear strike role.[74] India, with greater numbers of recent-generation aircraft, would probably select only the more capable aircraft in its inventory

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[72] Windrem and Kupperman.

[73] Some sources also suggest that Pakistan's ballistic missiles may not become operational until sufficient quantities of plutonium are available for the construction of miniaturized warheads. See "...and the Federation of American Scientists Displays Pakistan's Secret Missile Base," *Jane's Missiles and Rockets* May 2000, 24 Nov. 2000 <http://www.janesonline.com>; "Pakistan's Nuclear and Missile Facilities Revealed," *Federation of American Scientists Public Eye*, 15 Mar. 2000, Federation of American Scientists, 24 Nov. 2000 <http://www.fas.org/eye/indo-pak.html>. Pakistani officials have claimed that their country has developed and shock tested a warhead design or use on the *Ghauri* missile, though it is unclear whether actual warheads are available for use. See Umer Farooq, "Pakistan Ready to Arm Ghauri with Warheads," *Jane's Defense Weekly* 3 June 1998: 4. For other comments on the status of Pakistani weaponization, see Joeck, "Weaponization in South Asia," Koch "Nuclear Friction" 23; Pravin K. Sawhney, "Pakistan Scores Over India in Ballistic Missile Race," *Jane's Intelligence Review* Nov. 2000: 31-35; and Zhara.

[74] Other types of aircraft possessed by the two countries (including bomber derivatives such as India's Tu-142 maritime patrol aircraft) are few in number, might require costly modifications to convert for use as nuclear delivery systems, and are unlikely to be as survivable in an over-land strike role as smaller jet fighter-bombers.

for nuclear missions, while Pakistan might be forced to employ some relatively older types alongside its handful of F-16s.[75]

Comparative data on the most likely Indian and Pakistani aircraft to be used for nuclear weapons delivery is shown below in Table 2. Aircraft inventories are approximate, with numbers shown reflecting open literature reports of aircraft sales, indigenous construction, and operational attrition. As it displays data on only those aircraft most likely to be employed in a nuclear role, Table 2 may give a misleading impression as to the relative sizes and capabilities of the Indian and Pakistani air forces. In addition to the fighter-bombers shown in the table, India possesses over 700 MiG-21, MiG-23, MiG-27, and MiG-29 aircraft. Pakistan, by contrast, has only about 220 fighter-bomber aircraft besides those shown in the table, most of which are Chinese-built copies of the elderly MiG-19 and the MiG-21. This disparity in aerial strength is likely to contribute to Pakistani desires to base at least a part of the country's nuclear deterrent upon a force of ballistic missiles.

[75] Among the aircraft of the IAF, the French-built Mirage 2000 stands out in various accounts as the aircraft most likely designated for use in the delivery of nuclear weapons. Unconfirmed reports have indicated that the avionics of India's existing Mirages are optimized for strike missions. Another report states that India has concluded negotiations for the purchase of 40 new Mirage 2000D aircraft. The 2000D is a conventional strike variant of the Mirage 2000N, an aircraft employed by the French air force in a nuclear attack role. See Rahul Bedi, "Indian Ties with France Will Soar with Mirage Buy," *Jane's Defense Weekly* 1 Sep. 1999: 13, and "Dassault Mirage 2000," *Jane's All the World's Aircraft 2000-2001*.

Table 2. Potential South Asian Nuclear Delivery Aircraft

Country	Aircraft	Inventory*	Performance	
			Max. External Payload (kg)	Combat Radius** (km)
India	Jaguar	125	4763	1408
	Mirage 2000	40	6300	1205
	Su-30	18	> 8000	3000
Pakistan	A-5	50	2000	600
	Mirage III/5	165	4000	1200/1300
	F-16	32	8256	1252

* Totals include combat capable trainers, but not dedicated maritime strike variants of the Jaguar and Mirage 5.

** Combat radii given are for high altitude-low altitude-high altitude ("hi-lo-hi") mission profiles with aircraft in typical conventional strike configurations.

Sources: *Defense & Foreign Affairs Handbook 1999*; Jane's Information Group; Pakistan Institute for Air Defense Studies.

If the decision is made to do so, both India and Pakistan have the ability to add ballistic missiles to their nuclear forces in substantial numbers during the next decade. India's Integrated Guided Missile Development Program (IGMDP) has produced two series of missiles with potential for use as nuclear delivery vehicles, designated *Prithvi* and *Agni*. The initial production version of the *Prithvi* is already in service with an Indian army unit (though the operational readiness of this unit has been questioned) and the IAF is conducting trials with an extended range variant.[76] In the past, the Indian government

[76] "Prithvi Garrison [Probable] Research Center Imarat (RCI) 17°14' N 78°29'E," *Federation of American Scientists Nuclear Forces Guide*, Federation of American Scientists, 10 Nov. 2000 <http://www.fas.org/nuke/guide/india/facility/hyderabad-rci-p.htm>; Sawhney 33-34. At least one sea-based version of the *Prithvi* is also being developed, but seems unlikely to become an operational weapon system in the near term: the *Dhanush*, intended for shipboard use, crashed into the sea shortly after launch during its only test in April of 2000. Stabilization of the launch platform may have been a problem, and use of the *Prithvi's* volatile fuel makes the missile far from ideal for service at sea. A missile called *Sagarika*,

has emphasized that these missiles are conventional weapons, though they should have a sufficient payload capacity to carry some nuclear cargoes.[77] Use of the *Prithvi* in a nuclear role would be constrained by its short range and the limitations imposed by its volatile liquid fuel system. The missiles would have be moved close to the Indo-Pakistani border before firing, would require significant preparation time prior to launch (reportedly as much as two hours), and the large number of vehicles apparently needed to support a *Prithvi* battery might make its prolonged deployment in the field difficult.[78]

India's *Agni*, by contrast, might be produced and fielded more easily as part of an operational nuclear force. The *Agni* 2, the most sophisticated version of the missile tested thus far, uses solid fuel in each of its two rocket stages, is designed to be road- or rail-mobile, and may utilize a Global Positioning System (GPS) receiver to improve its accuracy.[79] With a claimed design range of 3,000 kilometers, the *Agni* 2 could reach targets throughout Pakistan from anywhere in India, though it lacks the range

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reportedly under development for use aboard submarines, has been alternately described as either a *Prithvi* derivative or a cruise missile. See Kanti Bajpai, "India's Nuclear Posture After Pokhran II," *International Studies* (New Delhi) 37.4 (Oct.-Dec. 2000): 23; Rahul Bedi, "Crash Ends Maiden Flight of India's Dhanush Missile," *Jane's Missiles and Rockets* June 2000 and "India's Missiles to be Nuclear Armed," *Jane's Missiles and Rockets* June 1998, both available at <http://www.janesonline.com>; Andrew W. Hull, "In Search of the Real Sagarika," *Jane's Intelligence Review* July 2000: 24; and "Sagarika/Dhanush," *Federation of American Scientists Nuclear Forces Guide,* Federation of American Scientists, 13 Nov. 2000 <http://www.fas.org/nuke/guide/india/missile/sagarika.htm> .

[77] Neil Joeck, *Maintaining Nuclear Stability in South Asia*, International Institute for Strategic Studies Adelphi Paper 312 (New York: Oxford University Press, 1997): 68.

[78] These qualities impose serious limitations on the employment of the Prithvi in a conventional role as well, and reportedly have contributed to the missile's unpopularity with senior Indian military officers. See "Prithvi (SS-150/-250/-350)," *Jane's Strategic Weapon Systems.* (Alexandria: Jane's Information Group, 2000); Sawhney, "Pakistan Scores" 33-34.

[79] "Agni 1/2/3/4," *Jane's Strategic Weapons Systems* (Alexandria: Jane's Information Group, 2000); "South Asian Missile Development," Oct. 2000, Arms Control Association, 14 Oct. 2000 <http://www.armscontrol.org/FACTS/agni.htm>.

to threaten much of China, India's other strategic rival.[80] This limitation may be another reason that India has yet to mass-produce the missile, with officials awaiting the development of the even longer-range *Agni* 3.[81]

The assortment of ballistic missiles that Pakistan might employ as nuclear delivery vehicles is even more varied than that available to India. Tracking missile developments in Pakistan is difficult, in part because a number of Pakistani missiles appear to have multiple designations (making it unclear whether new names always refer to new systems) and also because some missiles described in official Pakistani statements may be entirely fictitious. Pakistan is believed currently to possess significant numbers of short-range missiles, including the *Hatf* 1 and Chinese-designed M-11. The latter missile may have been re-designated *Hatf* 2 or *Tarmuk* (borrowing the former name from an improved version of the *Hatf* 1 whose development appears to have been cancelled) and now probably is being produced in Pakistan.[82] In 1997, the government of Pakistan reported the testing of an extended range *Hatf* 3 (which may have been either a *Hatf* 1 or M-11 derivative), but there has been no official mention of the missile since this test was

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[80] Sawhney, "Pakistan Scores" 33.

[81] Koch "Nuclear Friction" 22. Cruise missiles are another possible future nuclear delivery system for India, with the Indian navy having taken delivery of its first 3M54E "Club" missiles from Russia late in 2000. Although the missiles purchased reportedly lack a land attack capability and have a maximum range of only 220km, the transfer of these advanced weapons might further Indian efforts to develop a nuclear-capable cruise missile. If the development of such missiles is undertaken, service introduction before the end of the present decade seems unlikely given financial constraints, demanding technical requirements (including the need to develop miniaturized warheads and missiles with much greater range) and the generally slow pace of indigenous missile development efforts associated with India's Integrated Guided Missile Development Program (IGMDP). See A.D. Baker "Combat Fleets," *United States Naval Institute Proceedings* Nov. 2000: 92; Gopi Rethinaraj and Clifford Singer, "Going Global: India Aims for a Credible Nuclear Doctrine," *Jane's Intelligence Review* Feb. 2001: 50-51; and Steve Zaloga, "India Joins the Russian Naval Missile System Club," *Jane's Intelligence Review* Dec. 2000: 43-45.

[82] Mark Hewish, "Ballistic Missile Threat Evolves: Missiles Have Become Instruments of 'Coercive Diplomacy,'" *Jane's International Defense Review* Oct. 2000: 41; Sawhney, "Pakistan Scores" 35; United States, Department of Defense, *Proliferation: Threat and Response* (Washington: U.S. Government Printing Office, 1997): 20.

announced.[83] As with the Indian government and the *Prithvi*, Pakistani officials have denied that the M-11 has a nuclear role, though the U.S. intelligence community estimated in the mid-1990s that Pakistan's scientists probably had at least attempted to design a nuclear warhead for the missile.[84] The M-11 reportedly entered service with a Pakistan army unit in 1997.[85]

Given the limited range of the M-11, it is hardly surprising that Pakistan's efforts to develop nuclear-armed ballistic missiles appear to have shifted in recent years towards work on newer and more capable types, the *Ghauri* and *Shaheen* series. The original *Ghauri* is a liquid-fueled missile (believed by most analysts to be the North Korean *No Dong* or a derivative) for which the Pakistani government already claims to have developed and shock tested a warhead. U.S. intelligence reports suggest that a small number of these missiles may be available for immediate introduction into operational service.[86] Pakistan claims to have flight-tested an improved version called the *Ghauri* 2, and scientists have reportedly tested the engines of a further-improved *Ghauri* 3.[87] The

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[83] As the alleged *Hatf* 3 launch has never been confirmed by other sources, and coincided with a public outcry in Pakistan over reports that India had deployed *Prithvi* missiles near the Indo-Pakistani border, it seems likely that the test was faked. See "Hatf-3/Shaheen-I/M-11," *Federation of American Scientists Nuclear Forces Guide*, Federation of American Scientists, 13 Nov. 2000 <http://www.fas.org/nuke/guide/pakistan/missile/hatf-3.htm>.

[84] Joeck, *Maintaining Nuclear Stability* 69; Jones, et al. 136.

[85] Sawhney, "Pakistan Scores" 35.

[86] Paul Beaver, "Pakistan 'Faked Ghauri Missile Pictures,'" *Jane's Missiles and Rockets* June 1998, 24 Nov. 2000; "Pakistan's Missile 'Was a Nodong'," *Jane's Missiles and Rockets* May 1998, 29 Nov. 2000 <http://www.janesonline.com>.

[87] At least one U.S. intelligence official is skeptical as to whether the *Ghauri* 2 exists. The *Ghauri* 2 was reportedly tested the day after India first launched its *Agni* 2, but details provided by Pakistani officials do not indicate an increase in performance over the *Ghauri* 1. This suggests that the missile tested (if any) may have been the latter, and that the primary reason for announcing the test may have been to maintain the appearance that Pakistan was keeping pace with its neighbor in the field of missile development. While the existence of a *Ghauri* 2 is implied by more recent announcements that Pakistani scientists are testing the *Ghauri* 3, no further testing of the *Ghauri* 2 has been reported. See Howard Diamond. "India, Pakistan Test

Shaheen 1 and *Shaheen* 2, meanwhile, are solid-fuel, mobile systems that may be further derivatives of the M-11 or perhaps other Chinese missiles.[88] U.S. intelligence analysts believe that Pakistan is capable of indigenously producing most of the components required to build the *Shaheen* 1.[89]

Comparative data on Indian and Pakistani ballistic missiles is displayed below in Table 3. The information presented is speculative, based upon open-source analyses and the unverifiable claims of the Indian and Pakistani governments. Where the information available in unclassified literature is contradictory, the numbers shown reflect the author's assessment of source credibility.

New Missiles; U.S. Urges Restraint," *Arms Control Today* Apr.-May 1999, 14 Oct. 2000 <http://www.armcontrol.org/ACT/aprmay99/ipam99.htm>; "Pakistan Completes 'Trials' of Ghauri-III Missile Engine," *News* (Islamabad) 30 Sep. 1999: 10.

[88] Sources have indicated that the *Shaheen* series missiles may be derived from the Chinese M-11 series, M-9, or M-18. Photographs of the Shaheen 1 and its Transporter-Erector-Launcher (TEL) show a particularly strong resemblance to the M-11. The Shaheen 2 is much larger than and otherwise visually dissimilar to the Shaheen 1, and may have different design origins. See entries "CSS-6 (DF-15/M-9)," "CSS-7" (DF-11/M-11), and "Hatf 4 (Shaheen 1)" in *Jane's Strategic Weapons Systems* (Alexandria: Jane's Information Group, 2000) and "Pakistan Shows Off New Shaheen 2 Ballistic Missile...," *Jane's Missiles and Rockets* May 2000, 24 Nov. 2000 <http://www.janesonline.com>.

[89] Koch "Nuclear Friction" 22.

Table 3. South Asian Ballistic Missile Systems

Country	System*	Type**	Inventory	Status†	Performance		
					Payload (kg)	Range (km)	CEP‡ (m)
India	*Prithvi* (P-1; SS-150)	SRBM	< 75	O?	1000	150	150-200
	Prithvi (P-2; SS-250)	SRBM	< 25	D/T	500	250	?
	Agni 1	MRBM	5-10	C	1000 500	1500 2000	40
	Agni 2	MRBM	few	D/T	1000 500	2000 2500	45
	Agni 3	IRBM	few to none	D	1000	3000-5000	?
Pakistan	*Hatf* 1	SRBM	< 20	O?	500	80-100	?
	Hatf 2 (Shadoz)	SRBM	few to none	C	500	300	?
	Hatf 3	SRBM	fictitious?	C?	500	800	?
	M-11 (Hatf 2? Tarmuk?)	SRBM	30-85	O	800	300	200-600
	Shaheen 1 (Hatf 4; Tarmuk?)	SRBM	5-10	O?	750	600	200
	Shaheen 2	MRBM	few	D	1000	2000-2500	350
	Ghauri 1 (Hatf 5; Ghaznavi?)	MRBM	5-10	O?	700	1300	?
	Ghauri 2 (Hatf 6?)	MRBM	fictitious?	D/T?	1000 700	2000 2300	?
	Ghauri 3	IRBM	few to none	D?	?	3000	?

* Alternate system names are listed in parenthesis. Where uncertainty exists, alternate designations are followed by a question mark.

** Missile types are by range according to the following standards: SRBM < 1000 km; MRBM 1000-3000 km; IRBM 3000-5500 km.

† Status of missile programs is as follows: O = Operational; C = Program Cancelled (some missiles may remain available); D/T = Development/Flight Testing; D = Development.

‡ CEP = Circular Error Probable, a measure of missile accuracy. In general terms, a missile with a CEP of 200m has a fifty percent probability of landing within a 200m radius of its target.

Sources: Arms Control Association; Carnegie Endowment for International Peace; Federation of American Scientists; Jane's Information Group; United States Department of Defense; United States National Intelligence Council.

b. Impact of Aircraft-Delivered Weapons

What impact will the types of nuclear delivery systems available to India and Pakistan have upon regional perceptions of first strike vulnerability? If India and Pakistan maintain nuclear delivery capabilities based solely on aircraft-delivered gravity bombs, the vulnerability of both nations' nuclear forces will be significant. In such an environment, the survivability of both countries' nuclear forces would hinge upon the vulnerability of their airfields to attack, whether or not their nuclear warheads were dispersed or hidden elsewhere. A preemptive attack that destroyed or incapacitated either state's air bases would render that nation's arsenal impotent, even if all of its nuclear weapons survived. As John R. Harvey has noted, airfields and other support facilities upon which modern strike aircraft depend occupy fixed sites whose locations are generally well known, making them ready targets for preemptive attack.[90]

In South Asia, pressures for preemption would be exacerbated by geographic circumstances. Because India and Pakistan share a common border, the flight times required for aircraft from either nation to reach targeted airfields in the other would be short, particularly if aircraft were operated from forward bases. With flight times so short, the amount of warning available to the victim of an attack would be brief, increasing force vulnerability. This holds especially true for Pakistan, which has relatively few air bases, most of which are less than 200 km (under ten minutes' flying time) from Indian territory.[91]

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[90] John R. Harvey, "Regional Ballistic Missiles and Advanced Strike Aircraft: Comparing Military Effectiveness," *International Security* 17.2 (Fall 1992): 47.

[91] The Pakistan Institute for Air Defense Studies, an independent research organization, reports that the country has a total of 30 military airfields, including only ten "major operational bases" that are fully functional in peacetime, eleven "forward operational bases" that can be activated during wartime or crisis,

Perceptions of first-strike vulnerability arising from complete reliance on aircraft for nuclear missions would be offset somewhat by certain operational characteristics of these weapons systems. Strike aircraft can be tracked and shot down in flight by opposing air defenses, whether in the form of interceptors, surface-to-air missiles, or antiaircraft artillery, a fact that reduces the vulnerability of a defender and complicates the planning of an attacker. While flight times for attacking aircraft in South Asia would be short, the airspace over the Indo-Pakistani frontier is well monitored by both nations, and the victim of a preemptive attack by large numbers of aircraft would almost certainly have some tactical warning of the inbound strike (especially a large one) before it crossed the frontier, perhaps enough to increase warning time by a factor of two or three.[92] Finally, India and Pakistan's air defense organizations are undoubtedly quite familiar with the operating patterns of each other's air forces. The changes in these patterns that would probably precede a nuclear first strike (such as a detectable increase in the number of aircraft being operated from forward airfields) would be likely to provide the prospective victim of air attack with a measure of strategic warning that could be used to place nuclear forces on alert and to prepare air defenses.

From the perspective of crisis instability theory, reliance on warning for force survivability is an imperfect solution to the problem of vulnerability because forces

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and nine emergency "satellite" landing strips. Arnett cites a similar figure, and also notes that Pakistan has nine commercial airports capable of handling high-performance jet aircraft. A preemptive strike that targeted the ten major operating bases with a combination of nuclear weapons and conventional runway denial munitions (bombs designed to disperse mines or create especially large craters) might conceivably paralyze the Pakistan Air Force long enough to permit the complete destruction of its capability to deliver nuclear weapons. See Arnett and "PAF Organization & Structure: PAF Bases," Pakistan Institute for Air Defense Studies 23 Jan. 2001 <http://www.paids.com.pk/users/piads/bases.htm>.

[92] In discussions of nuclear warfare, *tactical warning* refers to warning of an attack in progress. *Strategic warning*, by contrast, is warning of an impending attack, received before the attack is executed. These definitions are given by Bracken in *The Command and Control of Nuclear Forces*, page 5.

dependent upon warning for their survival would have to be used before an enemy attack could be confirmed with certainty. "Launch-on-warning" nuclear postures are destabilizing because early warning systems can provide ambiguous or erroneous information, and so acting upon such information involves a risk of inadvertence.[93] Reliance on warning, in short, leaves open the possibility of being misled by false perceptions of inevitable war.[94]

The best that can be said for the dependence of aircraft-delivered arsenals upon warning for their survival in an "aircraft only" nuclear environment is that authorities could choose to refrain from an actual launch decision until relatively late in the warning process, when the least ambiguous type of warning information would be available. The receipt of strategic warning information would necessitate increased alert levels to ensure force survival, but a decision to use nuclear weapons could wait until the enemy's attack began to materialize, that is, until the receipt of tactical warning. While a decision to wait would entail giving up chances for damage limitation through preemption (ready air defenses might still be expected to blunt the enemy's attack somewhat), decision makers could at least be reasonably sure that their own nuclear-capable aircraft, properly alerted, could be sent aloft in time to prevent their destruction.

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[93] Launch-on-warning doctrines, as their name implies, involve the rapid release of permission to use nuclear weapons in the event that warning of an adversary's nuclear attack is received. A decision to launch an attack on the basis of strategic warning would be synonymous with preemption, while doctrine that authorizes nuclear release upon receipt of tactical warning has also been described as "launch-under-attack."

[94] In fact, a dependence on warning for force survival can serve to *generate* perceptions of imminent conflict, as is discussed in the next section of this chapter.

c. *Impact of Nuclear-Armed Ballistic Missiles*

In view of the level of first strike force vulnerability associated with exclusive reliance on aircraft-delivered weapons, a number of analysts have argued that the addition of ballistic missiles to regional nuclear arsenals would enhance crisis stability. Karl, Lavoy, and Seng expect the mobility of most missile systems to enhance the viability of force survival strategies that employ dispersal and decoys to prevent counterforce targeting.[95] They rightly cite the inability of the United States to locate and destroy Iraq's Scud missiles during the 1991 Persian Gulf War, despite U.S. possession of the most advanced reconnaissance and surveillance equipment in the world, as evidence of the difficulties that preemptive strike planners would face in attempting to target nuclear forces that employed similar delivery systems. "Anything less than very extensive and fairly immediate targeting intelligence [of the kind that regional nuclear powers are highly unlikely to have]," Seng writes, "will be too uncertain to support counterforce strikes."[96] In such an environment, these scholars suggest, pressures for preemption derived from either the perceived vulnerability of an adversary's forces (encouraging preemption in the name of achieving significant damage limitation) or the perceived vulnerability of a nation's own forces (encouraging the same for the purpose of force preservation) should be minimal.

Seng anticipates the arguments of proliferation pessimists that ballistic missiles will still create pressures for preemption among regional nuclear adversaries because they render C^2 structures highly vulnerable to decapitating attacks. Even if these

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[95] Karl 108-10; Lavoy, et al. 726-28; Seng 69-74.

[96] Seng 69.

nations' C^2 systems are themselves vulnerable to preemptive attack by ballistic missiles, he argues that a simple doctrinal choice can eliminate pressures for preemption. C^2 vulnerability only matters, he asserts, if nations adopt employment doctrines that require the destruction of "time critical" targets. Typically, these are military targets that must be struck quickly to limit damage to the attacking state (such as nuclear counterforce targets) or because other characteristics make their destruction difficult once the attacking state's C^2 systems are degraded (targets such as conventional military forces in the field, which are mobile, or large numbers of infrastructure targets, which must be attacked in a coordinated fashion if the damage inflicted upon them is to be maximized). Since the mobility of ballistic missiles should make counterforce attacks all but impossible, Seng contends, regional nuclear powers should have little need for time critical targeting, and can instead adopt nuclear doctrines based entirely upon their ability to retaliate against countervalue targets such as cities, discarding destabilizing launch-on-warning doctrines in favor of "ride-it-out-and-retaliate" strategies.[97] While such a posture would require the conditional pre-delegation of launch authority to the commanders of nuclear units (the permission to use nuclear weapons in the event of a decapitating attack), such pre-delegation would not entail an increase in crisis instability because these commanders would be under little time pressure to use their weapons:

> Fortunately, with concealment strategies, launch operators do not have to rush, and leaders can design and implement procedures for central consultations and confirmations. Operators could take the time to check with central leaders before pulling the trigger, opting to launch on their own authority only if and when it has become clear that central leaders have been eliminated. Central leaders, on their part, could analyze all relevant information before the order to launch was given. Misunderstandings between central authorities and field observers could

[97] Seng 79. Hagerty makes the same argument in "Nuclear Deterrence" 87-91.

> be sorted out. Failures in communications lines could be solved or circumvented. The lack of important intelligence could be addressed through careful analysis, human confirmation, supplementation of electronic signals, or perhaps through appeals to technologically advanced third-party states which could confirm attack conditions and extent.[98]

Though pessimists might argue that the deployment of mobile, survivable nuclear forces will prove difficult for states like India and Pakistan because of the limitations of their C^2 systems and concerns about warhead theft or unauthorized use, Seng believes that these problems should not be insurmountable. Here again, the small size of these nations' arsenals is expected to be an advantage, reducing the need for complex, multi-layered communications channels and also number of personnel who must be screened for and entrusted with nuclear duties, thereby simplifying the C^2 arrangements needed to maintain both positive and negative control over nuclear forces.[99]

The applicability to South Asia of arguments regarding the feasibility and survivability of simple C^2 arrangements is seemingly bolstered by the credence given to them by some security analysts in the region. A number of Indian government officials and strategic theorists have indicated their belief in the viability of "retaliation after ride out" nuclear doctrines for small, mobile nuclear forces. Kanti Bajpai notes that in the mid-1990s General K. Sundarji and analyst K. Subrahmanyam allowed for delays of 24

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[98] Seng 79.

[99] Seng 72-74. In the parlance of nuclear strategy, *positive control* describes the level of assurance provided by a C^2 system that nuclear weapons can be used when desired by the proper authorities. A failure of positive control would occur, for example, if a nation's leadership found itself unable to communicate an "attack" or "launch" order to its nuclear forces. *Negative control*, by contrast, refers to the ability of a C^2 system to prevent the use of nuclear weapons when the proper authorities do not desire such use. A failure of negative control would be represented by the unauthorized use of nuclear weapons by a rogue military officer, or even the "proper" use of such weapons by a commander with pre-delegated authority acting under the *mis*perception that an enemy attack was in progress (when no attack was actually occurring, such a commander would be unwittingly exceeding his authority). The problem, as Bradley A. Thayer notes, is that "positive and negative control must be accomplished simultaneously, but there is a tradeoff between the two: an effort to increase one generally decreases the other." See "The Risk of Nuclear Inadvertence: A Review Essay," *Security Studies* 3.3 (Spring 1994): 429-30.

hours or more in launching retaliatory strikes.[100] In a more recent interview, Foreign Minister Jaswant Singh reiterated this view, noting that so long as forces are survivable, "retaliation does not have to be instantaneous."[101] The Indian government's standing commitment to "no-first-use" of nuclear weapons, of course, is the most significant indicator of official confidence in C^2 first-strike survivability and the feasibility of a "retaliation-only" nuclear doctrine.

Unfortunately, there are serious deficiencies in arguments regarding the stabilizing effects of nuclear-armed ballistic missiles, especially when applied to potential Indo-Pakistani nuclear crisis dynamics. For a number of reasons, the addition of nuclear-armed ballistic missiles to the arsenals of India and Pakistan would increase perceptions of first-strike vulnerability when compared with an environment where both states instead relied exclusively upon aircraft, and especially so from a Pakistani perspective. Ballistic missile deployments in South Asia would thus enhance pressures for preemption and thereby increase chances for inadvertent nuclear war.

To begin with, ballistic missiles, even if nominally road- or rail-mobile, are unlikely to make South Asian arsenals as invulnerable to preemptive attacks as the analysts cited above presume. If introduced into service, missile warheads will account for only a portion of the already small nuclear arsenals that India and Pakistan deploy during the next decade. In peacetime, few of these missiles are likely to be deployed in a mobile mode, with most instead remaining in fixed garrisons. There are a variety of reasons for this, including the negative control challenges associated with routinely

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[100] Bajpai, "India's Nuclear Posture" 292.

[101] C. Raja Mohan, Interview with Jaswant Singh, *Hindu* 29 Nov. 1999, 31 Jan. 2001 <http://www.indiaserver.com/thehindu/1999/11/29/stories/02290003.htm>.

having significant numbers of nuclear weapons deployed in the field, the fuel and repair costs that constant mobile operations entail, the need to perform periodic maintenance on warheads, missiles, and transporter-erector-launchers (TELs) and to provide rest for missile crews, and even domestic or international political difficulties that may arise from deploying nuclear weapons in an overt manner.[102] Even during periods of crisis, when dispersing missiles from their garrisons would make sense for survivability reasons, the desire to avoid provocative actions that might contribute to perceptions of imminent conflict would probably keep the majority of these weapons at their storage sites.

Missiles remaining in garrison, nuclear capable aircraft, and C^2 structures would all be highly vulnerable to an attack by the missiles of an adversary. India and Pakistan currently lack the early warning systems needed to detect and track missiles launched by the other, and even if such warning systems were to be constructed, the short flight times that missiles require to reach their targets would make the tactical warning that these systems provide of little use.[103] Forces that could not be made survivable against first strikes would have to be used preemptively (on the basis of more ambiguous strategic warning) or not at all. India and Pakistan currently lack the hardening

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[102] Some combination of these factors led the Soviet Union to keep only 15-20 percent of its mobile land-based missiles deployed away from their garrisons during the Cold War, and the movements of those that were deployed were reportedly restricted to limited, well-defined areas. The United States, meanwhile, was unable to adopt a mobile peacetime posture for any of the Pershing II missiles that it deployed in Europe during the 1980s because of the public outcry in Germany that accompanied their introduction into service. Mobile land-based missiles in this way appear to offer fewer force survivability benefits than those deployed aboard submarines, for which the United States maintained about a 30 percent availability rate through the 1980s (and then only by employing two crews per submarine). See Blair 152; Bracken 63; and David S. Yost, "The History of NATO Theater Nuclear Force Policy: Key Findings from the Sandia Conference," *Journal of International Strategic Studies* 15.2 (June 1992): 228-61.

[103] See Gregory S. Jones. On the basis of published data from India and Pakistan's tests, a ballistic missile with a range of 1000 km can be expected to cover that distance in less than ten minutes and flight times for short ranged missiles would be even less. See Rahul Bedi, "India Tests Extended Range Agni," *Jane's Missiles and Rockets*, May 1999, <http://www.janesonline.com>; "Pakistan's Missile 'Was a Nodong'."

technologies needed to deploy missiles in individual silos, and garrisons that included concrete hangars or underground storage bunkers would not be invulnerable to attacks by missiles with accuracies and warhead yields on the order of those claimed for South Asian systems.[104] Even if missiles in bunkers were to survive an attack by an adversary's missiles, blast damage to a garrison's above-ground components (such as bunker access doors and road or rail links) and the effects of electromagnetic radiation on equipment and personnel might delay their use long enough to allow enemy follow-on attacks with more accurate aircraft-delivered nuclear or conventional bombs.[105] C^2 systems would be similarly vulnerable, since even if command bunkers were numerous and well hidden enough to survive attack, communications equipment (especially that needed to communicate with mobile forces) would be susceptible to both direct attack and the atmospheric effects associated with nuclear detonations.[106] Airfields, necessarily being large, fixed, "soft" targets, would be most vulnerable to surprise missile attack. Absent the possibility of sufficient tactical warning, few (if any) nuclear delivery aircraft could be expected to escape destruction.

Seng's argument that the dangers of C^2 vulnerability and pre-delegation of launch authority are much less serious when states adopt countervalue doctrines has some

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[104] Indian scientists, for example, report a 45m CEP for the *Agni* 2, and also claim the ability to manufacture warheads with a design yield of up to 200kt. In the second test of the Agni 2, the missile's mock warhead reportedly landed within 100m of its target at a range of 2200km. While journalists and extra-regional security analysts can afford to be skeptical of such claims, a prudent nuclear planner in Pakistan cannot. See Rahul Bedi, "India's Second Successful Test of Agni II Missile," *Jane's Defense Weekly* 24 Jan. 2001: 4; "India Can Build 200kt Nuclear Weapons," *Jane's Defense Weekly* 8 Nov. 2000: 6.

[105] Gregory S. Jones.

[106] Blair's study of Cold War C^2 indicates that the Soviet Union's centralized command system would have had great difficulty in surviving and responding to a missile attack launched from positions close to its periphery, and that the United States only "solved" this problem by arranging for the delegation of launch authority to certain military commanders during crises. See pages 125-39. A summary of Blair's findings also appears in Thayer 445-48.

merit, but the deployment of mobile ballistic missiles is actually unlikely to buy much time for the victim of a first strike to perform "confirmations" and "careful analysis" before retaliating. The officers in charge of the few missiles in the field that survived a first strike would in all likelihood find themselves completely cut off from higher authority for some time. Exactly how would they confirm that their inability to communicate with central authorities was due to an adversary's nuclear attack, and not equipment failures, atmospheric conditions, or a host of other possibilities? Redundant communications channels, radiation sensors, and the like would provide an increased level of confidence that an actual attack had taken place, but field commanders would undoubtedly feel some pressures to make a launch decision. In the event of an actual attack, the air force of the attacking nation would be searching for the defender's remaining mobile missiles, and its odds of finding and destroying them might be higher than the Gulf War analogy suggests. Missile commanders could not be sure that years of peacetime intelligence gathering had not revealed the locations of their operating areas or pre-surveyed launch sites, and would have to consider the possibility that the electromagnetic effects of a few nuclear weapons dropped nearby might disable their missiles or the equipment needed to launch them. Even when relying on a countervalue nuclear doctrine, the officers in charge of mobile ballistic missiles would face the "use them or lose them" pressures that contribute to the danger of inadvertent war.

India and Pakistan are unlikely to be able to reap the stability-enhancing rewards of mutual reliance on countervalue nuclear doctrines for a more fundamental reason: Pakistan has not adopted a pure countervalue doctrine because such a doctrine would fail to meet its strategic needs. Pakistan's nuclear arsenal serves in part as a means

of redressing the imbalance between India and Pakistan's conventional military forces. Nuclear weapons are the ultimate insurance against an Indian invasion, the guarantor of Pakistan's territorial integrity.[107] To fulfill this counterforce role without generating crisis instability, Pakistan's weapons must be sufficiently invulnerable to a first strike as to still be usable against Indian army formations, the type of time-critical target that necessitates both survivable C^2 structures and delivery systems capable of attacking mobile forces. In this light, the vulnerability of Pakistan's airfields to surprise missile attack would be particularly alarming, drastically increasing pressures for preemption in the event that war was believed to be imminent. As Harvey notes:

> Ballistic missiles are best suited for striking targets of known location. The remote reconnaissance, assessment, and retargeting capabilities of most regional states are not sufficient to permit effective ballistic missile attacks against mobile or emerging battlefield targets... Aircraft are better suited for striking such targets. Sophisticated sensor systems, or even visual sighting, coupled with the ability to linger near the battlefield (although at risk of being shot down), give pilots a better opportunity to locate and attack these targets.[108]

While it would not be impossible for Pakistan to employ short-ranged missiles with nuclear warheads against battlefield targets, targeting would still require the use of aircraft, especially against the type of dispersed armored formations that the Indian army has been developing since the 1980s specifically for use in a nuclear environment.[109]

However remote the prospect of a large-scale Indian military incursion into Pakistan seems, indications are that Pakistan's government takes this threat very

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[107] Bajpai, "India's Nuclear Posture" 5; Cheema 169; Zafar.

[108] Harvey 52.

[109] Rahul Bedi, Interview with General Sunderajan Padmanabhan, *Jane's Defense Weekly* 17 Jan. 2001: 32; Sidhu, "India's Doctrine" 135-38.

seriously. The efforts of the Indian army to develop tactics for fighting in a nuclear environment confirm that Indian generals have not discounted the possibility that their conventional forces might someday need to operate against a nuclear-armed Pakistan. Pakistani officials do not rule out an Indian attempt to preempt Pakistan's nuclear forces in the event of such a conflict.[110] Analysts in Pakistan have little confidence in India's nuclear no-first-use declaration, and believe that India's draft nuclear doctrine provides evidence that conventional forces would be used in a nuclear counterforce role as well.[111]

C. SOUTH ASIAN FORCE STRUCTURES AND PERCEPTIONS OF IMMINENT WAR

1. Compound Effects of Force Vulnerability

The level of force vulnerability associated with emerging Indian and Pakistani nuclear force structures is made doubly significant to an assessment of the likelihood of inadvertent war by a second effect of vulnerability. Force vulnerabilities generate not only perceptions of value in striking first, but can contribute also to perceptions of imminent war, potentially fulfilling both of the necessary conditions for inadvertent conflict.

The idea that perceptions of vulnerability can contribute to perceptions that war is inevitable has its roots in studies of the causes of the First World War, where interlocking mobilizations in the autumn of 1914 defeated the best efforts of diplomats to diffuse international tensions and avert conflict. According to Paul Bracken:

> No dictator single-handedly pushed Europe into war in 1914; indeed, the national leaders of the major countries did not even want a conflict. Some even searched for last-minute alternatives to war. But during the preceding

[110] Zarah.

[111] Cheema 176-77; Sidhu, "India's Doctrine" 128-29. See note 65 for language in India's draft doctrine that might imply the use of conventional forces in a nuclear counterforce role.

> decade an institutionalized potential for catastrophe had been built on interlocking alerts and mobilizations that swamped the political process... It was a disaster waiting to happen.[112]

The "interlocking alerts" that Bracken describes were not the product of the whims of political leaders or senior military officers, but rather by the vulnerabilities associated with the types of military forces that Europe's great powers fielded at the time – relying upon reserve manpower for much of their fighting strength, European armies where vulnerable to catastrophic defeat if caught partially mobilized by a fully mobilized foe. Military leaders were keenly aware of the time needed to recall reservists to active service, equip them, and transport them to the likely fronts of combat. The great irony is that the mobilization schedules and alert postures necessitated by the vulnerabilities of these military forces served to make war even more likely by tending to make the suspicions of decision makers as to the likelihood of war self-confirming. Mobilizations resulted in counter-mobilizations, alerts in counter-alerts, in exactly the pattern described in Jervis's model of crisis instability.[113] The vulnerabilities generated by South Asian nuclear forces may create even stronger pressures for inadvertent war along these lines.

2. Dangers of Reliance on Warning

The link between force vulnerability and perceptions of imminent war is formed by the early warning mechanisms developed to provide opportunities for preemption or rapid response by detecting impending attacks. Warning systems can contribute to misperceptions of imminent war in at least three ways:

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[112] Bracken 2.

[113] See chapter 2, page 14.

1. Action taken to reduce force vulnerability following the receipt of warning information, such as enhancing the readiness of those forces, can appear threatening to an adversary, causing it to respond in a similar fashion and initiating a self-confirming spiral of misperceptions regarding the likelihood of war.

2. The cycle just described may be uncontrollable even when decision makers are aware of this danger, because adversaries' complex warning systems may act or interact in ways that senior leaders do not anticipate. In particular, the "vertical integration" of warning systems and operational forces – the organizational coupling of warning systems to the forces they protect in order to reduce vulnerability to surprise – can contribute to routinized responses to warning indications that feed misperceptions and can be difficult to interrupt. When the nuclear organizations of both adversaries are constructed in such a fashion, their alert postures become tightly coupled, producing interactive outputs of the kind and at a rate that may defeat all attempts at control.[114]

3. The data that warning systems collect for indications of imminent attack is itself subject to error, both because of imperfections in the way that warning information is gathered and due to errors in the way that such information is interpreted.

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[114] The term "vertically integrated" is that used by Bracken to describe this type of organizational structure; he borrows the phrase "tightly coupled" from Perrow's normal accidents theory. The dangers associated with vertically integrated nuclear organizations that are tightly coupled to those of an adversary form the principal subject of *The Command and Control of Nuclear Weapons*.

The potential for each of above factors is enhanced by changes in military technology that reduce the amount of time available for warning systems to perform their role. In the South Asian case, the availability of aircraft-delivered weapons alone limits warning time sufficiently to contribute to misperceptions of imminent war, and the addition of ballistic missiles to nuclear arsenals would make this danger worse.

With respect to the potential for a cycle of misperceptions, an increase in the speed with which a crippling attack may materialize enhances the possibility for perceptions of inevitable war by reducing (or even eliminating) the opportunity for preventive diplomacy. When defensive response times are measured in minutes rather than hours or days, leaders may lose the chance to confer with one another to clarify misunderstandings and discuss measures to diffuse crises. In this way, the technologies of the nuclear age institutionalize the "potential for catastrophe" in this dynamic to an even greater extent than did the mass conscription and railroad timetables of a century ago.

While acknowledging that the development of vulnerable nuclear forces by regional powers might create pressures for reinforcing alerts that could contribute to perceptions of imminent war, analysts have argued that the small nuclear arsenals of these states should be inherently less susceptible to routinized organizational outputs that help make such spirals difficult to control. Small nuclear forces, they assert, need rely upon less complex warning and C^2 organizations than those constructed by the superpowers, minimizing the number of personnel involved in nuclear decision making, simplifying oversight by central leaders, and allowing for less reliance on potentially

dangerous standard operating procedures. In theory, both vertical integration and tight coupling should be less of a problem for regional powers.[115]

While it is certainly reasonable to expect that the warning systems and nuclear forces of states like India and Pakistan will not attain the complexity of those of the United States and Soviet Union, even the nuclear forces of these nations will be susceptible to the same pressures that drove the superpowers towards vertically integrated nuclear organizations and tightly coupled alert postures. Both Bracken's work and more recent research by Bruce Blair have shown that the coupling of warning systems to operational forces during the Cold War was the result of the need to protect vulnerable arsenals and command and control systems from surprise attack, and not merely the complexity of the superpowers' arsenals. Developments that reduced the amount of time available for alerting and directing nuclear forces – such as the Soviet Union's deployment of SLBMs off the U.S. coast in the late 1960s and improvements to NATO's theater nuclear forces during the 1980s – resulted in attention to improving warning systems and alert procedures in a manner that increased their complexity and interconnectedness, enhancing the potential for reactive alerting during crises.[116] The minimal tactical warning time available to South Asian nuclear forces even in the absence of ballistic missile deployments will in all likelihood create similar pressures for the integration of warning systems and operational forces. If ballistic missiles are ultimately added to India and Pakistan's nuclear arsenals, this process is likely to go even

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[115] Seng, 73-78.

[116] This theme runs throughout the work of both authors; the specific examples given are from Blair 124-27 and Bracken 34-35.

further, since (as discussed earlier in this chapter) their nuclear forces would become almost entirely dependent upon strategic warning for their survival.[117]

The limited amount of time available to warning systems in South Asia would also magnify the impact of errors in the gathering and interpretation of information, further increasing the probability of misperceptions of imminent war. A loss of time in the decision making process induces stress, limits time for deliberation, and may force leaders and organizations to act on less information than would ordinarily be deemed necessary for a decision as momentous as the use of nuclear arms.[118] Moreover, under such conditions the significance of "false alarms" that result from equipment failures, miscommunication, improper interpretation of data, and other sources is enhanced. Blair has shown that as the number of information gathering cycles that tactical warning systems can perform decreases, two distinct phenomena increase the probability of misperceptions of imminent or actual attack: greater weight is attached to initial expectations of the likelihood of war (which are generally based upon the less reliable outputs of strategic warning systems), and false alarms that are generated by the system are more likely to be evaluated as genuine (fewer information gathering cycles are

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117 Controlling the interactions of India and Pakistan's nuclear arsenals might also be more difficult than optimists would predict for another reason: the interactions that drive escalatory spirals during crises are not only the product of interactions between nuclear forces, C^2, and warning systems, but of contact between the conventional forces of adversaries as well. The activities of conventional forces may either be indistinguishable from nuclear forces or may directly threaten the nuclear forces of an adversary in ways that decision makers fail to appreciate. Moreover, the conventional forces of states like India and Pakistan *are* large, complex organizations of the kind whose outputs can be difficult to control according to organizational theory. Barry R. Posen develops these arguments in the context of a Cold War clash in Europe in *Inadvertent Escalation: Conventional War and Nuclear Risks* (Ithaca: Cornell UP, 1991).

118 Blair reports, for example, that during the 1970s the North American Aerospace Defense Command (NORAD) lowered the "standard of evidence" it required for confirmation of a Soviet nuclear attack in response to the time stress imposed by increasing Soviet capabilities and launch-on-warning posture. See pages 187-91.

available to correct errors).[119] When initial expectations as to the likelihood of war are sufficiently high, a single error may result in a "high confidence" assessment as to the probability of conflict.

In summary, the levels of force vulnerability associated with South Asian nuclear arsenals, whether or not they include ballistic missile delivery systems, will have as negative an impact upon the possibility for misperceptions of imminent war as they will for perceptions of advantage in being the first to strike. As they would maximize the mutual vulnerability of India and Pakistan to preemptive attack and minimize the time available to warning systems, however, the introduction of ballistic missiles would represent the most dangerous possible force structure development, contributing most significantly to the potential for both of the conditions necessary for inadvertent war.

D. NET IMPACT OF EMERGING SOUTH ASIAN FORCE STRUCTURES UPON THE DANGER OF INADVERTENT WAR

Given the limited numbers of nuclear weapons that India and Pakistan will possess during the next decade, perceptions of force vulnerability, and hence value in being the first to attack in the event of war, may be substantial even if both countries continue to rely only on aircraft for the delivery of nuclear weapons. In such an environment, pressures for preemption would exist in the form of both the opportunity for achieving damage limitation by striking first and in the need to protect nuclear forces from preemptive destruction. Pakistan's lack of geographic depth would tend make the former a more tempting option for India and the latter more significant concern for

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[119] Blair's model of early warning system performance utilizes Bayes's Rule to determine percentage-based expectations of nuclear attack that would result from a combination of the outputs of a tactical warning system and the system operator's initial estimate of the likelihood of war. The model also accounts for the operator's perceptions as to the error rate inherent in the warning system. See pages 219-54.

Pakistan. These pressures would be offset somewhat by the fact that attacking aircraft could be shot down and tactical warning systems would provide some hope of force survival for the recipient of a first strike.

Should India and Pakistan deploy ballistic missiles, however, the importance of being the first to attack in a nuclear exchange is likely to increase dramatically. Not only will the mobility from which missiles benefit do little to enhance the survivability of nuclear arsenals as a whole, but the utility of these weapons for conducting surprise attacks upon missiles in garrison, C^2 systems, and airfields will provide additional incentives for preemptive strikes. Pakistan especially, with the strategic need to employ nuclear weapons as part of a warfighting strategy, will be hard pressed to refrain from preemption in the event that war seems imminent.

The increase in vulnerability that would be associated with the operationalization of ballistic missiles as nuclear delivery systems would be made all the more dangerous by the compounding effect that increases in force vulnerability have with respect to perceptions of imminent war. The time stress that such weapons would place upon regional nuclear organizations would contribute to the importance of strategic warning systems in such a way as to encourage the development of vertically integrated force structures, with the alert posture of each adversary tightly coupled to the activities of the other. In this kind of environment, both the potential for misperception and the impact of specific misperceptions would be magnified, enhancing the potential for the second condition necessary for crisis instability and inadvertent conflict.

How can the overall potential for inadvertent nuclear war in South Asia be characterized? Absent a quantitative scale against which the level of danger can be

judged, a qualitative assessment must suffice. It is clear from the analysis above that even in their present form, South Asian arsenals are sufficiently vulnerable to first strikes to generate the possibility of both sets of perceptions required for the initiation of inadvertent war during a crisis. For the time being, the potential for an unintended nuclear war between India and Pakistan can at least be called significant. Contrary to arguments made by some proliferation optimists, it is equally clear that the addition of ballistic missiles to South Asian nuclear arsenals, a process that may well already be in progress, would represent an unfavorable development for regional crisis stability. In the event that such weapons are deployed, the danger of an inadvertent nuclear catastrophe will be even greater.

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IV. CONCLUSIONS

A. CENTRAL FINDINGS

The analysis conducted in the preceding chapters supports two main conclusions:

1. *The deterrent value of nuclear weapons is not sufficient to preclude the danger of inadvertent war between regional adversaries. South Asia is not distinctive in this regard.*

The first conclusion flows from the discussion of proliferation optimism, nuclear deterrence, and crisis instability theory conducted in Chapter 2. Even if one accepts a minimalist formulation of the requirements for deterrence – that fears of even a slight possibility of nuclear retribution should be sufficient to prevent the premeditated initiation of nuclear conflict – inadvertent nuclear war between nuclear-armed adversaries remains a possibility because of specific situational pressures that may come to exist under conditions of crisis instability. When an adversary's use of nuclear weapons is believed to be imminent and a significant advantage is perceived to accrue to the nation that strikes first, pressures for preemption may exist in the form of a desire to limit the damage caused by the adversary's attack and/or the need to employ one's own nuclear weapons before they are destroyed or otherwise rendered unusable.

The potential for both of the necessary conditions for inadvertent war is strongly influenced by the force structures adopted by nuclear adversaries. The nuclear force structures adopted by such nations (and, to a degree, their conventional force structures as well) play a fundamental role in shaping perceptions of how vulnerable nuclear forces and their supporting infrastructures are to counterforce first strikes. Perceptions of

vulnerability, in turn, may contribute to both perceptions of first strike advantage and beliefs of the inevitability of war.

2. *There is already a significant potential for inadvertent nuclear war between India and Pakistan during the next decade. This potential will be increased if the two nations elect to operationalize ballistic missiles as nuclear delivery systems.*

There exists a significant potential for inadvertent war between India and Pakistan even if these nations elect not to incorporate ballistic missiles as a part of their nuclear arsenals. The combination of small nuclear arsenals, the operating characteristics of aircraft (especially their dependence upon fixed airfields), the geographic proximity of India and Pakistan, and Pakistan's reliance on nuclear weapons as a counter to the conventional superiority of India's army creates a significant potential for perceptions of vulnerability that could lead to inadvertent nuclear conflict in the event of crises. Although ballistic missiles possess some characteristics that might be expected to reduce the potential for perceptions of vulnerability to nuclear first strikes, the net impact of their introduction in the context of an Indo-Pakistani confrontation would be to increase first-strike vulnerability. Nuclear-armed ballistic missiles both exacerbate many of the first-strike vulnerabilities that exist in an "aircraft only" environment and create new potential for perceptions of first-strike advantage and beliefs of imminent war.

B. POLICY IMPLICATIONS

The threat of inadvertent war provides a strong supporting rationale for continued U.S. opposition to the proliferation of nuclear capabilities to South Asia. Yet while the elimination of these capabilities would certainly eliminate the danger of inadvertent nuclear conflict, such a goal is unlikely to provide the basis for an effective U.S. policy

toward the region. Whatever the complex motivations that led India and Pakistan to conduct nuclear tests in 1998, prospects for nuclear "unproliferation" in South Asia in the near term are not good.[120] The Indian government insists that the security concerns that drive its nuclear weapons program extend beyond the subcontinent (most notably to its long-standing rivalry with China) and conditions India's commitment to the eventual elimination of nuclear weapons upon negotiations for a Nuclear Weapons Convention that will apply globally.[121] Meanwhile, so long as India possesses nuclear weapons, Pakistan is unlikely to renounce them either. Official U.S. policy pronouncements since the 1998 tests have done well to recognize these facts, maintaining an opposition to India and Pakistan's possession of nuclear weapons in principle, but acknowledging the realty of their security concerns and expressing a willingness to work to reduce nuclear dangers by less total means than the elimination of the weapons themselves.[122]

Although an elimination of the danger of inadvertent nuclear war in South Asia is unlikely in the near term, there may be much that the United States can do to help reduce the potential for perceptions of vulnerability that give rise to the necessary conditions for inadvertent conflict or to otherwise lessen the danger of unintended war. The following policy prescriptions offer some hope of limiting the threat of inadvertent nuclear war

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[120] The term "unproliferation," perhaps a less insulting term to Indians and Pakistanis than "rollback," is borrowed from Perkovich 455.

[121] "India Not to Engage."

[122] For two examples, see United States, Department of State, Strobe Talbott, Deputy Secretary of State, "On-the-Record Briefing on India and Pakistan," 28 May 1998 Washington D.C., Washington D.C., 12 Sep. 2000 <http://www.state.gov/www/policy_remarks/1998/980528_talbott_nuclear.html> and United States, The White House, Office of the Press Secretary, "U.S.-India Relations: A Vision for the 21st Century," 21 Mar. 2000, Agra, India, 12 Sep. 2000 <http://www.state.gov/www/global/human_rights/democracy/fs_000321_us_india.html>.

between India and Pakistan until a more lasting solution to their political and military rivalry can be found:

1. *Improve the balance of incentives and disincentives that encourage restraint with respect to the deployment of nuclear-armed ballistic missiles.*

As the procurement and operationalization of nuclear-armed ballistic missiles would significantly increase the potential for inadvertent war in South Asia, policies designed to encourage India and Pakistan to refrain from such activities are an imperative. The threat of punitive measures alone, however, is unlikely to influence South Asian decision-making decisively. The existence of disincentives such as the potential for economic sanctions can contribute to restraint, but target nations may choose to accept the costs such measures impose when issues of overriding national importance are believed to be at stake. Sanctions may even be counterproductive insofar as they tend to produce a "rally around the flag effect," especially likely in a region as sensitive to perceptions of foreign imperialism as South Asia.[123] While the use of incentives to encourage ballistic missile restraint may seem to be only the reverse side of the sanctions coin – merely increasing what the United States can take away in the event of undesired behavior – the differences in perceptions associated with positive incentives may make them far better tools for promoting stabilizing decision-making.

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[123] Foran 48. For more detailed discussions of the relative merits of sanctions and incentives for achieving foreign policy goals see also Patrick Clawson, *How has Saddam Hussein Survived? Economic Sanctions, 1990-1993*, McNair Paper 22 (Washington D.C.: National Defense University, 1993); Kimberly Ann Elliott, "The Sanctions Glass: Half Full or Completely Empty?," *International Security* 23.1 (Summer 1998): 50-65; Aaron Karp, "Indian Ambitions and the Limits of American Influence," *Arms Control Today*, May 1998, 14 Aug. 2000 <http://www.armscontrol.org/ACT/may98/kpmy98.htm>; and Robert A. Pape, "Why Economic Sanctions Do Not Work," *International Security* 22.2 (Fall 1997): 90-136 and "Why Economic Sanctions Still Do Not Work," *International Security* 23.1 (Summer 1998): 66-77.

Etel Solingen's research indicates that domestic pressures are as important as external constraints (such as security concerns or international treaty regimes) in determining the nuclear postures of regional powers. She notes that liberalizing coalitions, composed of domestic actors that "strive to maximize their gains from international economic exchange," tend to favor nuclear restraint, since a state's pursuit of nuclear capabilities often has negative repercussions for the access to the global economy upon which these groups depend.[124] Liberalizing coalitions are typically opposed, however, by inward-looking constituencies that benefit from state-supported approaches to economic development. These inward-looking coalitions often adopt nationalist rhetoric to bolster the popular appeal of their support for the development of nuclear weapons capabilities.[125]

Solingen's findings suggest that ongoing efforts to promote private economic contacts between India and the United States may be among the most effective methods of encouraging Indian restraint with respect to the deployment of nuclear-armed ballistic missiles.[126] The economic growth that is likely to result from such contacts should enhance the voice of liberalizing coalitions in Indian politics and illustrate the positive consequences of ballistic missile forbearance. If economic cooperation can be extended to benefit the public sector of India's economy as well, domestic coalitions favoring

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[124] Etel Solingen, "The Political Economy of Nuclear Restraint," *International Security* 19.2 (Fall 1994): 138. Solingen cites evidence from India and Pakistan specifically in support of her arguments.

[125] Solingen 138-41. See pages 138 and 140 for descriptions of the typical members of each type of coalition.

[126] In March of 2000, Indian Prime Minister Atal Vajpayee and U.S. President Bill Clinton announced a number of initiatives designed to promote Indo-U.S. economic cooperation, including the formation of a high-level economic Coordinating Group, a U.S.-India Financial and Economic Forum, a regularized U.S.-India Commercial Dialogue, a U.S.-India Working Group on Trade, and a U.S.-India Science and Technology Forum. See United States, Department of State, "U.S.-India Relations."

ballistic missile restraint may even expand to incorporate actors that previously opposed them.[127] To the extent that Pakistan's stance on ballistic missile deployments is likely to be strongly influenced by that of India, success in these efforts may encourage ballistic missile restraint on the part of both nations.[128]

2. *Address security concerns that encourage the growth of South Asian nuclear capabilities.*

Whatever the actual role of security concerns in determining South Asian force structures and nuclear postures, efforts to discourage India and Pakistan from deploying ballistic missiles will have to take such concerns into account. If nothing else, security justifications allow for powerful "mythmaking" by domestic elites with an interest in the further development of nuclear capabilities.[129] The methods that the United States has employed in other parts of the world to help alleviate such concerns are unlikely to be

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[127] Notable among the Indian public sector industries that could benefit from either private investment or direct assistance is the energy sector. By all accounts, India faces a massive deficit in its ability to distribute and produce electricity, and it is significant that this field was the first mentioned by External Affairs Minister Jaswant Singh when discussing possibilities for Indo-U.S. cooperation during a recent interview. Current energy cooperation is hampered by U.S. restrictions on Indian access to nuclear technology, but expanded cooperation in this field (with appropriate use of safeguards) should be seriously considered in the event that Indian restraint in the production and deployment of ballistic missiles continues. The tradeoff associated with such cooperation would be the danger of generating perceptions that the United States was rewarding nuclear proliferation; energy cooperation might also have to be offered to non-nuclear weapon states (NNWS) in good standing that face dilemmas similar to India's. See Seema Gahlaut, "Reenergizing the Debate: Indo-U.S. Nuclear Issues," *Engaging India: U.S. Strategic Relations with the World's Largest Democracy,* eds. Gary K. Bertsch, Seema Gahlaut, and Anupam Srivastava (New York: Routledge, 1999): 109-134; Mohan.

[128] Not only have Pakistani officials frequently linked their nation's prospective nuclear posture to that adopted by India, but opinion polls taken in Pakistan after the 1998 tests indicate that public support for the further pursuit of nuclear weapons capabilities depends more upon what India does than upon any preconceived notion what capabilities Pakistan ought to have. See Nazir Kamal, *Pakistani Perceptions and Prospects for Reducing the Nuclear Danger in South Asia*, Cooperative Monitoring Center Occasional Paper 6 (Albuquerque: Sandia National Laboratory, 1999) <http://www.cmc.sandia.gov/issues/papers/pakisperc/index.html>.

[129] Lavoy presents this argument in "Nuclear Myths and the Causes of Nuclear Proliferation," *Security Studies* 2.3-4 (Spring/Summer 1993): 192-212.

effective in South Asia. Substantial sales of conventional arms sales to India and Pakistan are as likely to enhance perceptions of first strike vulnerability as they are to reduce them, and would probably contribute to general pressures for arms racing.[130] Meanwhile, the United States lacks the political will needed to extend positive security guarantees to India and Pakistan, two countries that would have historical cause to doubt the credibility of such arrangements even if they were to be offered.[131] Policymakers in India are also likely to see the acceptance of positive security guarantees as inappropriate for a state with an independent foreign policy and great power aspirations of its own.

A stronger case can be made for the potential value of negative security assurances (nuclear no-first-use guarantees) in discouraging India and Pakistan from the construction of ballistic missile-equipped nuclear arsenals. It is a great irony that the Indian government, which places such great emphasis on the stabilizing effects of its own no-first-use pledge, has so little faith in the credibility of China's similar declaratory policy.[132] If the credibility of China's no-first-use guarantee could be enhanced, the primary security rationale for India's construction of nuclear-armed ballistic missiles would be eliminated (missiles currently are seen as the only way of threatening retaliation in the event of a Chinese first strike), contributing to the likelihood of Indian restraint and corresponding restraint by Pakistan.

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[130] See note 65.

[131] For descriptions of India and Pakistan's past disappointments with positive security guarantees, especially those sought from the United States, see Ahmed 182, 186-90; Perkovich 86-105; Šumit Ganguly, "India's Pathway to Pokhran II," *International Security* 23.4 (Spring 1999): 153-55, 156-7.

[132] China has vowed not to be the first state to use nuclear weapons "at any time or under any circumstances." See "Nuclear Weapons Declaratory Policy," *China Profiles Database,* Dec. 1998, Center for Nonproliferation Studies, Monterey Institute of International Studies, 4 Oct. 2000 <http://cns.miis.edu//db/china/ndeclar.htm>.

The United States thus far has been among the least willing of the five NWS to sign a legally binding no-first-use treaty, though China has repeatedly issued calls for the NWS to reach such an accord. A number of security analysts have argued that the current U.S. policy of "calculated ambiguity" with respect to the possibility of nuclear weapons use in response to biological, chemical, or conventional attack is both outmoded and dangerous. As the United States and its primary alliance partners in NATO possess an overwhelming superiority in conventional weaponry over virtually any potential adversary, it is difficult to imagine any circumstance in which the use of nuclear weapons would be warranted other than in response to a nuclear attack. U.S. retention of a first-use option merely serves to underscore the importance of nuclear weapons in the eyes of would-be NWS, and may even create a "commitment trap," in which the United States could feel forced to use nuclear weapons in response to biological or chemical attack in order to maintain its international credibility.[133] Serious consideration should be given to abandoning this policy in favor of a legally binding and unambiguous commitment to no-first-use.

Although India would presumably have to be excluded from no-first-use treaty negotiations between the NWS to preserve the distinctions of the Nonproliferation Treaty (NPT), the existence of a no-first-use treaty might encourage India to write its own pledge into national law. Such a move could render India's guarantee more credible in the eyes of Pakistan's leaders, and thus further reduce pressures for ballistic missile

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[133] See George Bunn, "Moving Toward 'Legally Binding' Negative Security Assurances," Arms Control Today, Mar. 1998, 14 Aug. 2000 <http://www.armscontrol.org/ACT/march98/lettermr.htm>; Jack Mendelsohn, "NATO's Nuclear Weapons: The Rationale for 'No-First-Use.'" *Arms Control Today* Jul.-Aug. 1999. 14 Aug. 2000 <http://www.armscontrol.org/ACT/julaug99/jmja99.htm>.; and Scott D. Sagan, "The Commitment Trap: Why the United States Should Not Use Nuclear Threats to Deter Biological and Chemical Weapons Attacks," *International Security* 24.4 (Spring 2000): 85-115.

deployments in South Asia. In the event of a crisis, the existence of a binding no-first-use pledge could limit the potential for perceptions of inevitable nuclear war, reducing the likelihood inadvertent conflict even if nuclear-armed ballistic missiles are ultimately deployed in the region.

3. *Reduce the salience of nuclear weapons in international politics.*

Besides signing a no-first-use treaty, there is much that the United States and the other NWS could do to de-emphasize the role of nuclear weapons in international affairs, minimizing the prestige attached to the acquisition of nuclear weapons and advanced delivery systems such as ballistic missiles, and thereby further reducing pressures for arms racing in South Asia. Of all the NWS, the United States is technologically positioned to suffer the least from ratification of the Comprehensive Test Ban Treaty (CTBT), a move that would contribute strongly to this goal. An even clearer signal could be sent to India and Pakistan by renewed U.S. support for an expansion of the permanent membership of the United Nations Security Council through the addition of several non-NWS in good standing. The admission of states such as Brazil, Germany, and Japan would be of particular value by virtue of their obvious technological capabilities but demonstrated restraint in nuclear matters. The significance of this step would be especially apparent to India, which desires a Security Council seat of its own, and would provide a powerful incentive for nuclear restraint and even unproliferation in the long term.

4. *Act to defuse emergent Indo-Pakistani crises in a manner that both reduces the danger of inadvertent conflict and discourages the initiation of further confrontations.*

The United States can act to reduce the threat of inadvertent war in South Asia without compromising its claim to impartiality in Indo-Pakistani disputes or encouraging nuclear confrontation as a means for either nation to advance its foreign policy goals. The current U.S. position on Kashmir, which states that the United States will only offer its services as mediator if requested by both parties, helpfully serves to blunt hopes in Pakistan that repeated crises will provoke international intervention that might strengthen Pakistan's bargaining position.[134] The United States must do more to encourage India to participate in useful bilateral negotiations with its neighbor to avoid giving Pakistanis the impression that military avenues offer the only paths to a resolution of the Kashmir question.

In the event of actual military confrontations between India and Pakistan, the United States can play a highly constructive role without taking sides on the merits of their disputes. U.S. diplomacy can serve to make the military activities of each side more transparent and less threatening in appearance, and may enable regional leaders to de-escalate crises in a face-saving manner.[135] When the activities of one nation clearly

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[134] United States, Department of State, Strobe Talbot, Deputy Secretary of State, "Dialogue, Democracy, and Nuclear Weapons in South Asia," 16 Jan. 1999, Palo Alto, 12 Sep. 2000 <http://www.state.gov/www/policy_remarks/1999/990116_talbott_sa.html>.

[135] U.S. military attachés were able to report a general lack of offensive preparations on both sides of the LOC at one point during the 1990 Kashmir Crisis; attachés or U.S. national technical means could be employed to similar effect during future confrontations. The diplomatic mission led by U.S. Deputy National Security Advisor Robert Gates during the same crisis may have served to remind Indian and Pakistani decision makers of the devastation that a general war would have caused, and appears at least to have offered leaders a face-saving way to back down. See Hagerty, *Consequences* 161-62 and "Nuclear

precipitate a confrontation, as did Pakistan's infiltration of insurgents across the LOC near Kargil in 1999, a clear identification of the responsible party by U.S. officials can reduce pressures in the other nation for escalation.[136]

C. THE STAKES FOR SOUTH ASIA AND THE WORLD

The threat of inadvertent nuclear war in South Asia is unlikely to disappear in the near future, however energetic U.S. or multilateral initiatives aimed at reducing this danger may be. As new nuclear capabilities become available to India and Pakistan, further research will be required to assess the impact of such developments upon the potential for inadvertent conflict in the region.[137] Additional studies are also needed to determine whether the NWS can offer technical assistance to reduce dangers of nuclear weapons accidents or unauthorized use without encouraging the deployment of destabilizing weapons systems.

The very real danger of inadvertent conflict between India and Pakistan highlights the need for redoubled efforts to prevent the spread of nuclear capabilities to other parts of the world. While the balance of incentives and disincentives that work to support the global nonproliferation regime have failed to prevent the nuclearization of South Asia, the fact that an overwhelming proportion of the world's nations remain signatories to the NPT is testimony to the continued appeal of nonproliferation norms. Maintaining the

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Deterrence" 87-91.

[136] Bajpai, Kanti, "Testing the Limits: Indian Restraint vs Pak Brinksmanship," *Times of India* 6 July 1999. 24 Aug. 2000 <http://www.timesofindia.com>.

[137] The earlier than expected deployment by India of nuclear-capable cruise missiles is one potential development with implications for the threat of inadvertent war. Recently published information also suggests that India may pursue a program to construct ballistic missile defenses using a network of sensors and missile systems purchased from Israel and Russia. See Prasun K. Sengupta, "India Firms up Contracts for National BMD Network," *Asian Defense Journal* Nov. 2000: 32-34.

resiliency of these norms will entail real costs and risks for the NWS, requiring these states to move away from the reliance on nuclear weapons that seems increasingly hypocritical to those nations that have forsworn them. The evidence presented here suggests that these costs and risks are worth bearing. The alternative is a world in which the danger of inadvertent nuclear war threatens millions who need not yet fear it.

LIST OF REFERENCES

"Agni 1/2/3/4." *Jane's Strategic Weapons Systems*. Alexandria: Jane's Information Group, 2000.

Ahmed, Samina. "Pakistan's Nuclear Weapons Program: Turning Points and Nuclear Choices." *International Security* 23.4 (Spring 1999): 178-204.

Albright, David. "India's and Pakistan's Fissile Material and Nuclear Weapons Inventories, end of 1999." *Institute for Science and International Security Online*. 11 Oct. 2000. Institute for Science and International Security. 24 Oct. 2000 <http://www.isis-online.org/publications/southasia/stocks1000.html>.

"...and the Federation of American Scientists Displays Pakistan's Secret Missile Base." *Jane's Missiles and Rockets* May 2000. 24 Nov. 2001. <http://www.janesonline.com>.

Arnett, Eric. "Nuclear Stability and Arms Sales to India: Implications for U.S. Policy." *Arms Control Today* Aug. 1997. 14 Aug. 2000 <http://www.armscontrol.org/ACT/august/arnett.html>.

Bajpai, Kanti. "India's Nuclear Posture After Pokhran II." *International Studies* (New Delhi) 37.4 (Oct.-Dec. 2000): 267-301.

- - - . "Testing the Limits: Indian Restraint vs Pak Brinksmanship." *Times of India* 5 July 1999. 24 Aug. 2000 <http://www.timesofindia.com>.

Baker, A. D. "Combat Fleets." *United States Naval Institute Proceedings*. Nov. 2000: 92.

Beaver, Paul. "Pakistan 'Faked Ghauri Missile Pictures.'" *Jane's Missiles and Rockets* June 1998. 24 Nov. 2000. <http://www.janesonline.com>.

Bedi, Rahul. "Crash Ends Maiden Flight of India's Dhanush Missile." *Jane's Missiles and Rockets* June 2000. 29 Nov. 2000 <http://www.janesonline.com>.

- - - . "Indian Taskforces Submit Security Recommendations." *Jane's Defense Weekly* 8 Nov. 2000: 15.

- - - . "India's Second Successful Test of Agni II Missile." *Jane's Defense Weekly* 24 Jan. 2001: 4.

- - - . "Indian Ties with France Will Soar with Mirage Buy." *Jane's Defense Weekly* 1 Sep. 1999: 13.

- - - . Interview with General Sunderajan Padmanabhan. *Jane's Defense Weekly* 17 Jan. 2001: 32.

Blair, Bruce G. *The Logic of Accidental Nuclear War*. Washington: Brookings Institution, 1993.

Blight, James G. and David Welch. "The Cuban Missile Crisis and New Nuclear States," *Security Studies* 4.4 (Summer 1995): 811-50.

Bose, Sumantra. "Kashmir: Sources of Conflict, Dimensions of Peace." *Survival* 41.3 (Autumn 1999): 149-71.

Bracken, Paul. *The Command and Control of Nuclear Weapons*. New Haven: Yale UP, 1983.

Bunn, George. "Moving Toward 'Legally Binding' Negative Security Assurance." *Arms Control Today* Mar. 1998. 14 Aug. 2000 <http://www.armcontrol.org/ACT/march98/lettermr.htm>.

Chari, P. R. "India's Slow-Motion Nuclear Deployment." *Proliferation Brief* 3.26. 7 Sep. 2000. Carnegie Endowment for International Peace. 9 Nov. 2000. <http://www.ceip.org>.

Chellaney, Brahma. "After the Tests: India's Options." *Survival* 40.4 (Winter 1998-1999): 93-111.

Cheema, Zafar Iqbal. "Pakistan's Nuclear Use Doctrine and Command and Control." *Planning the Unthinkable: How New Powers Will Use Nuclear, Biological, and Chemical Weapons*. Eds. Peter R. Lavoy , Scott D. Sagan and James J. Wirtz. Cornell Studies in Security Affairs. Ithaca: Cornell UP, 2000.

Clawson, Patrick. *How Has Saddam Hussein Survived? Economic Sanctions, 1990-1993*. McNair Paper 22. Washington D.C.: National Defense University, 1993.

"CSS-6 (DF-15/M-9)." *Jane's Strategic Weapon Systems*. Alexandria: Jane's Information Group, 2000.

"CSS-7 (DF-11/M-11)." *Jane's Strategic Weapon Systems*. Alexandria: Jane's Information Group, 2000.

"Dassault Mirage 2000." *Jane's All the World's Aircraft 2000-2001*.

"Dassault-Breguet Mirage 5." *Jane's All the World's Aircraft 1985-1986*.

"Dassault-Breguet Mirage III." *Jane's All the World's Aircraft 1985-1986*.

"DF-11 [CSS-7]." *Federation of American Scientists Nuclear Forces Guide.* Federation of American Scientists. 13 Nov. 2000 <http://www.fas.org/nuke/guide/china/theater/df-11.htm>.

"DF-15 [CSS-6/M-9]." *Federation of American Scientists Nuclear Forces Guide.* Federation of American Scientists. 13 Nov. 2000 <http://www.fas.org/nuke/guide/china/theater/df-15.htm>.

Diamond, Howard. "India, Pakistan Test New Missiles; U.S. Urges Restraint." *Arms Control Today* Apr.-May 1999. 14 Oct. 2000 <http://www.armcontrol.org/ACT/aprmay99/ipam99.htm>.

Elliot, Kimberly Ann. "The Sanctions Glass: Half Full or Completely Empty?" *International Security* 23.1 (Summer 1998): 50-65.

Farooq, Umer. "Pakistan Ready to Arm Ghauri with Warheads." *Jane's Defense Weekly.* 3 Jun. 1998: 4.

Feaver, Peter D. *Guarding the Guardians: Civilian Control of Nuclear Weapons in the United States.* Ithaca: Cornell UP, 1992.

Foran, Virginia I. "Indo-US Relations after the 1998 Tests: Sanctions versus Incentives." *Engaging India: U.S. Strategic Relations with the World's Largest Democracy.* Eds. Gary K. Bertsch, Seema Gahlaut, and Anupam Srivastava. New York: Routledge, 1999. 40-76.

Gahlaut, Seema. "Reenergizing the Debate: Indo-U.S. Nuclear Issues." *Engaging India: U.S. Strategic Relations with the World's Largest Democracy.* Eds. Gary K. Bertsch, Seema Gahlaut, and Anupam Srivastava. New York: Routledge, 1999. 109-34.

Ganguly, Šumit. "India's Pathway to Pokhran II: The Prospects and Sources of New Delhi's Nuclear Weapons Program." *International Security* 23.4 (Spring 1999): 148-177.

- - - . *The Crisis In Kashmir: Portents of War, Hopes of Peace.* Cambridge: Cambridge UP, 1997.

Gordon, Michael R. "War Over Kashmir is Feared by U.S." *New York Times* 17 Jun. 1990, late ed.: A15.

Graham, Thomas. "South Asia and the Future of Nuclear Nonproliferation." *Arms Control Today* May 1998. 14 Aug. 2000 <http://www.armscontrol.org/ACT/may98/grmy98.htm>.

Hagerty, Devin T. "Nuclear Deterrence in South Asia: The 1990 Indo-Pakistani Crisis." *International Security* 20.3 (Winter 1995/96): 79-114.

---. *The Consequences of Nuclear Proliferation: Lessons from South Asia.* Cambridge: MIT Press, 1998.

"HAL (SEPECAT) Jaguar International." *Jane's All the World's Aircraft 2000-2001.*

Harvey, John R. "Regional Ballistic Missiles and Advanced Strike Aircraft: Comparing Military Effectiveness." *International Security* 17.2 (Fall 1992): 41-83

"Hatf 1/2/3." *Jane's Strategic Weapon Systems.* Alexandria: Jane's Information Group, 2000.

"Hatf 4 (Shaheen 1)." *Jane's Strategic Weapon Systems.* Alexandria: Jane's Information Group, 2000.

"Hatf 5/6 (Ghauri 1/2)." *Jane's Strategic Weapon Systems.* Alexandria: Jane's Information Group, 2000.

"Hatf-3/Shaheen-I/M-11." *Federation of American Scientists Nuclear Forces Guide.* Federation of American Scientists. 13 Nov. 2000 <http://www.fas.org/nuke/guide/pakistan/missile/hatf-3.htm>.

Heisbourg, Francois. "The Prospects for Nuclear Stability between India and Pakistan." *Survival* 40.4 (Winter 1998-1999): 77-92.

Hewish, Mark. "Ballistic Missile Threat Evolves: Missiles Have Become Instruments of 'Coercive Diplomacy.'" *Jane's International Defense Review* Oct. 2000: 38-44.

Hull, Andrew W. "In Search of the Real Sagarika." *Jane's Intelligence Review* July 2000: 24.

"India Can Build 200kt Nuclear Weapons." *Jane's Defense Weekly* 8 Nov. 2000: 6.

India. Government of India. *Kargil Review Committee Report.* New Delhi: Government of India, 2000.

---. *Report of National Security Advisory Board on Indian Nuclear Doctrine.* 17 Aug 1999. 13 Mar 2000. <http://www.indianembassy.org/policy/CTBT/nuclear_doctrine_aug_17_1999.html>.

"India." *Defense & Foreign Affairs Handbook 1999.* Alexandria: International Strategic Studies Association, 1999.

Jervis, Robert. *Perception and Misperception in International Politics.* Princeton: Princeton UP: 1976.

- - - . *The Meaning of the Nuclear Revolution: Statecraft and the Prospect of Nuclear Armageddon*. Ithaca: Cornell UP, 1989.

Joeck, Neil. "Weaponization in South Asia." *Proliferation Brief* 3.20. 20 Jul. 2000. Carnegie Endowment for International Peace. 9 Nov. 2000. <http://www.ceip.org>.

- - - . *Maintaining Nuclear Stability in South Asia*. International Institute for Strategic Studies Adelphi Paper 312. New York: Oxford University Press, 1997.

Jones, Gregory S. *From Testing to Deploying Nuclear Forces: The Hard Choices Facing India and Pakistan*. RAND Project Air Force Issue Paper 192 <http://www.rand.org/publications/IP/IP192>.

Jones, Rodney W., et al. *Tracking Nuclear Proliferation: A Guide in Maps and Charts, 1998*. Washington: Carnegie Endowment for International Peace, 1998.

Kamal, Nazir. *Pakistani Perceptions and Prospects for Reducing the Nuclear Danger in South Asia*. Cooperative Monitoring Center Occasional Paper 6. Albuquerque: Sandia National Laboratory, 1999 <http://www.cmc.sandia.gov/issues/papers/pakisperc/index.html>.

Kapur, Ashok. *Pakistan's Nuclear Development*. New York: Croom Helm, 1987.

Karl, David J. "Proliferation Pessimism and Emerging Nuclear Powers." *International Security* 21.3 (Winter 1996/97): 87-119.

Karp, Aaron. "Indian Ambitions and the Limits of American Influence." *Arms Control Today* May 1998. 14 Aug. 2000 <http://ww.armscontrol.org/ACT/may98/kpmy98.htm>.

Koch, Andrew. "India, Pakistan: Nuclear Arms Race Gets Off to a Slow Start." *Jane's Intelligence Review*. January 2001: 36-40.

- - - . "Nuclear Friction." *Jane's Defense Weekly*. 13 Dec. 2000: 21-24

Lancaster, John. "Kashmir Crisis Was Defused on the Brink of War; As U.S. Reviews Showdown, Nuclear Danger Looms Large." *Washington Post* 26 July 1999. national ed.: A01.

Lavoy, Peter R. "Nuclear Myths and the Causes of Nuclear Proliferation." *Security Studies* 2.3-4 (Spring/Summer 1993): 192-212.

Lavoy, Peter R. et al. "The Kenneth Waltz – Scott Sagan Debate, The Spread of Nuclear Weapons: Good or Bad?" *Security Studies* 4.4 (Summer 1995): 695-753.

LePoer, Barbara Leitch. *India-US Relations*. Congressional Research Service Issue Brief IB9307. Washington: Congressional Research Service, 27 Apr. 1999.

"Lockheed Martin F-16 Fighting Falcon." *Jane's All the World's Aircraft 2000-2001.*

Manor, James, and Gerald Segal. "Taking India Seriously." *Survival* 40.2 (Summer 1998): 53-70.

Mendelsohn, Jack. "NATO's Nuclear Weapons: The Rationale for 'No-First-Use.'" *Arms Control Today* Jul./Aug. 1999. 14 Aug. 2000 <http://www.armscontrol.org/ACT/julaug99/jmja99.htm>.

"MiG-23." *Jane's All the World's Aircraft 1994-1995.*

"MiG-25." *Jane's All the World's Aircraft 1994-1995.*

"MiG-27." *Jane's All the World's Aircraft 1994-1995.*

"MiG-29." *Jane's All the World's Aircraft 2000-2001.*

Miller, Judith, and James Risen. "A Nuclear War Feared Possible over Kashmir." *New York Times on the Web.* 8 Aug. 2000. 8 Aug. 2000. <http://www.nytimes.com/library/world/global/080800india-pakistan.html>.

Mohan, C. Raja. Interview with Jaswant Singh. *Hindu* 29 Nov. 1999. 31 Jan. 2001 <http://www.indiaserver.com/thehindu/1999/11/29/stories/02290003.htm>.

"No Mass Production of Prithvi, Says India." *Times of India* 9 Sep. 2000. 11 Nov. 2000 <http://www.timesofindia.com/090900/09indi13.htm>.

Norris, Robert S. and William N. Arkin. "After the Tests: India and Pakistan Update." Natural Resources Defense Council Nuclear Notebook 54.5 (Sep/Oct. 1998).

Novichkov, Nikolai. "India to Receive First Su-30MKIs in Late 2001." *Jane's Defense Weekly.* 1 Nov. 2000: 12.

"Nuclear Weapons Declaratory Policy." *China Profiles Database.* Dec. 1998. Center for Nonproliferation Studies, Monterey Institute of International Studies. 4 Oct. 2000 <http://cns.miis.edu/db/china/ndeclar.htm>.

"PAF Inventory & Order of Battle." 16 Jun. 1999. Pakistan Institute for Air Defense Studies. 23 Jan. 2001 <http://www.paids.com.pk/users/piads/invent1999.html>.

"PAF Organization & Structure: PAF Bases." Pakistan Institute for Air Defense Studies. 23 Jan 2001 <http://www.paids.com.pk/users/piads/bases.html>.

"Pak May Have Tested Ghauri III on Aug 15." *Times of India* 24 Aug. 2000. 25 Jan. 2001 <http://www.timesofindia.com/240800/24indi18.htm>.

"Pakistan Completes 'Trials' of Ghauri-III Missile Engine." *News* (Islamabad). 30 Sep. 1999: 10.

"Pakistan Shows Off New Shaheen 2 Ballistic Missile...." *Jane's Missiles and Rockets* May 2000. <http://www.janesonline.com>.

"Pakistan." *Defense & Foreign Affairs Handbook 1999.* Alexandria: International Strategic Studies Association, 1999.

"Pakistan's Missile 'Was a Nodong'." *Jane's Missiles and Rockets* May 1998. 29 Nov. 2000. <http://www.janesonline.com>.

"Pakistan's Nuclear and Missile Facilities Revealed." *Federation of American Scientists Public Eye.* 15 Mar. 2000. Federation of American Scientists. 24 Nov. 2000 <http://www.fas.org/eye/indo-pak.html>

Panofsky, Wolfgang K. H. "Dismantling the Concept of 'Weapons of Mass Destruction.'" *Arms Control Today* Apr. 1998. 12 Jul. 2000. <http://www.armcontrol.org/ACT/april98/wkhp98.htm>.

Pape, Robert A. "Why Economic Sanctions Do Not Work," *International Security* 22.2 (Fall 1997): 90-136.

- - - . "Why Economic Sanctions Still Do Not Work," *International Security* 23.1 (Summer 1998): 66-77.

Perkovich, George. *India's Nuclear Bomb: The Impact on Global Proliferation.* Berkeley: University of California Press, 1999.

Perrow, Charles. *Normal Accidents: Living with High-Risk Technologies.* New York: Basic Books, 1984.

Posen, Barry R. *Inadvertent Escalation: Conventional War and Nuclear Risks.* Ithaca: Cornell UP, 1991.

"Prithvi (SS-150/-250/-350)." *Jane's Strategic Weapon Systems.* Alexandria: Jane's Information Group, 2000.

"Prithvi Garrison [Probable] Research Center Imarat (RCI) 17°14' N 78°29'E." *Federation of American Scientists Nuclear Forces Guide.* Federation of American Scientists. 10 Nov. 2000 <http://www.fas.org/nuke/guide/india/facility/hyderabad-rci-p.htm>.

Rethinaraj, Gopi, and Clifford Singer. "Going Global: India Aims for a Credible Nuclear Doctrine." *Jane's Intelligence Review* Feb. 2001: 48-52.

Sagan, Scott D. "The Commitment Trap: Why the United States Should Not Use Nuclear Threats to Deter Biological and Chemical Attacks." *International Security* 24.4 (Spring 2000): 85-115.

- - - . "Correspondence: Proliferation Pessimism and Emerging Nuclear Powers." *International Security* 22.2 (Fall 1997): 193-201.

- - - . *The Limits of Safety: Organizations, Accidents, and Nuclear Weapons* Princeton: Princeton UP, 1993.

- - - . "Nuclear Safety and Security in South Asia." *Proliferation Challenges and Nonproliferation Opportunities for New Administrations*. Monterey Nonproliferation Strategy Group Occasional Paper No. 4. Ed. Michael Barletta. Monterey: Monterey Institute of International Studies, 2000.

Sagan, Scott D. and Kenneth N. Waltz. *The Spread of Nuclear Weapons: A Debate*. New York: W. W. Norton, 1995.

Sagarika/Dhanush." *Federation of American Scientists Nuclear Forces Guide*. Federation of American Scientists. 13 Nov. 2000 <http://www.fas.org/nuke/guide/india/missile/sagarika.htm>

Sanger, David E. and Eric Schmitt. "Reports Say China is Aiding Pakistan on Missile Project." *New York Times* 2 July 2000. 12 Sep. 2000 <http://nytimes.qpass.com>.

Sawhney, Pravin K. "Evolving Nuclear Environment Moulds India's Military Strategy." *Jane's Intelligence Review* Aug. 2000: 40-43.

- - - . "Pakistan Scores Over India in Ballistic Missile Race." *Jane's Intelligence Review* Nov. 2000: 31-35.

Seng, Jordan. "Less Is More: Command and Control Advantages of Minor Nuclear States." *Security Studies* 6.4 (Summer 1997): 50-92.

Sengupta, Prasun K. "India Firms up Contracts for National BMD Network." *Asian Defense Journal* Nov. 2000: 32-34.

Shah, Aamir. "Pakistan Produces New Missile." *United Press International Wire Service*. 17 Sep. 2000.

Sidhu, Waheguru Pal Singh. "India's Nuclear Use Doctrine." *Planning the Unthinkable: How New Powers Will Use Nuclear, Biological, and Chemical Weapons*. Eds. Peter R. Lavoy, Scott D. Sagan and James J. Wirtz. Cornell Studies in Security Affairs. Ithaca: Cornell UP, 2000.

- - - . *Enhancing Indo-US Strategic Cooperation*. International Institute for Strategic Studies Adelphi Paper 313. Oxford: Oxford UP, 1997.
Snyder, Glenn. "The Balance of Power and the Balance of Terror," *The Balance of Power*. Ed. Paul Seabury. San Francisco: Chandler, 1965.

Solingen, Etel. "The Political Economy of Nuclear Restraint." *International Security* 19.2 (Fall 1994): 126-69.

"South Asian Missile Development." Oct. 2000. Arms Control Association. 14 Oct. 2000 <http://www.armscontrol.org/FACTS/agni.htm>.

"Sukhoi Su-30M." *Jane's All the World's Aircraft 2000-2001*.

Synnott, Hilary. *The Causes and Consequences of South Asia's Nuclear Tests*. International Institute for Strategic Studies Adelphi Paper 332. New York: Oxford University Press, 1999.

Thapar, Vishul. "'ICBMs Any Day,' Says Kalam." *Hindustan Times* 17 Sep. 2000.

Thayer, Bradley A. "The Risk of Nuclear Inadvertence: A Review Essay." *Security Studies* 3.3 (Spring 1994): 428-93.

United States. Bureau of Economic and Agricultural Affairs. *Fact Sheet: India and Pakistan Sanctions*. 18 Jun. 1998. 12 Sep. 2000.
<http://www.state.gov/www/regions/sa/fs_980618_india_pak.html>.

- - - . Central Intelligence Agency. National Intelligence Council. *Foreign Ballistic Missile Developments and the Ballistic Missile Threat to the United States Through 2015*. Sep 1999. 3 Nov. 2000.
<http://www.cia.gov/cia/publications/nie/nie99msl.html>.

- - - . Department of Defense. *Proliferation: Threat and Response*. Washington D.C.: U.S. Government Printing Office, 1997.

- - - . Department of State. Strobe Talbott, Deputy Secretary of State. "Dialogue, Democracy, and Nuclear Weapons in South Asia." 16 Jan. 1999. Palo Alto. 12 Sep. 2000 <http://www.state.gov/www/policy_remarks/1999/990116_talbott_sa.html>.

- - - . Department of State. Strobe Talbott, Deputy Secretary of State. "On the Record Briefing on India and Pakistan." 28 May 1998. Washington D.C. 12 Sep. 2000. <http://www.state.gov/www/policy_remarks/1998/980528_talbott_nuclear.html>.

- - - . The White House. Office of the Press Secretary. "Statement by the Press Secretary: India Sanctions." 13 May 1998. Berlin. 21 Sep. 2000.
<http://www.state.gov/www/regions/sa/980513_wh_india_sanctions.html>.

- - - . The White House. Office of the Press Secretary. "U.S.-India Relations: A Vision for the 21st Century." 21 Mar. 2000. Agra, India. 12 Sep. 2000. <http://www.state.gov/www/global/human_rights/democracy/fs_000321_us_india.html>.

Windrem, Robert, and Tammy Kupperman. "Pakistan Nukes Outstrip India's, Officials Say: U.S. Reverses Assessment of South Asia Nuclear Balance" *MSNBC News* 4 Sep. 2000. 4 Sep. 2000. <http://www.msnbc.com/news/417106.asp>.

Wirsing, Robert G. *India, Pakistan, and the Kashmir Dispute: On Regional Conflict and Its Resolution*. New York: St. Martin's, 1994.

Wortzel, Larry M., and Dana R. Dillon. "Improving Relations with India Without Compromising U.S. Security." *The Heritage Foundation Backgrounder No. 1402.* 11 Dec. 2000. The Heritage Foundation. 17 Jan. 2001. <http://www.heritage.org/library/backgrounder/bg1402.html>.

Yost, David S. "The History of NATO Theater Nuclear Force Policy: Key Findings from the Sandia Conference." *Journal of International Strategic Studies* 15.2 (June 1992): 228-61.

Zaloga, Steve. "India Joins the Russian Naval Missile System Club." *Jane's Intelligence Review* Dec. 2000: 43-45.

Zhara, Farah. "Pakistan's Road To a Minimum Nuclear Deterrent." *Arms Control Today* Jul./Aug. 1999. 14 Aug. 2000. <http://www.armcontrol.org/ACT/julaug99/fzja99.htm>.

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