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Stabilizing the Option: Deterrence, Confidence Building, and Arms Control in South Asia

Susan M. Burns
Program in Arms Control, Disarmament, and International Security
University of Illinois at Urbana–Champaign

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Susan M. Burns
Visiting Project Coordinator
Program in Arms Control, Disarmament, and
International Security
University of Illinois at Urbana–Champaign

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Dedication

To my father, Walter Simon Burns, and Hobbes, a feline friend

Acknowledgments

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Executive Summary

While concepts of formal arms control are fairly new to the region, South Asia has not been empty of efforts at conflict resolution and confidence building. Though many such efforts have been declaratory and symbolic in nature, without associated verification regimes, the complete record of India–Pakistan relations evinces that conflict has not precluded cooperation. That both countries have seen fit to settle some disputes reveals a mutual awareness of the costs of unrestrained antagonism. Since the 1972 Simla agreement India or Pakistan have not lacked "incentives" for war, particularly in recent years. The dispute over the disposition of Kashmir has greatly intensified in the last several years, in the form of a sort of proxy war through assistance to secessionist rebels and charges of human rights violations. During the 1987 Brasstacks episode India and Pakistan came closer to actual war than at anytime since 1972. Yet amidst the rancor some notable cooperative ventures have been attempted, though some proposals, such as Indian "no-war pacts" and Pakistani nonproliferation schemes, have been more exercises in public-relations diplomacy than genuine arms control efforts. Some of the formal India–Pakistan efforts at conciliation and cooperation offer valuable precedents and models for future agreements.

This study explores potential arms control measures relevant to South Asia, primarily India and Pakistan, two neighboring states with a history of conflict and admitted capabilities to build nuclear weapons. Some of these measures are also applicable to India–China arms control, or might be implemented as multilateral regional efforts. Without judging the political desirability of helping threshold or newly declared nuclear weapons states to develop safe and secure nuclear forces, this study suggests measures which might be adopted by India and Pakistan to enhance regional deterrence and crisis stability, and prevent the use of nuclear weapons. This survey of arms control measures necessarily draws heavily from the extensive Western (mainly U.S.–Soviet) historical experience with arms control, a crucial source of arms control concepts and models. Two approaches to arms control are considered: (1) arms management, or efforts (such as confidence building measures) to reduce the incentives to engage in military conflict by enhancing deterrence and crisis stability, and (2) arms limitations, comprised of weapons reductions, eliminations, prohibitions, or renunciations of the ability to make certain kinds of weapons. Some may view this study as a mere catalogue of arms control measures, about most of which American arms control experts know more than could ever be included here. While I enthusiastically embrace an audience of American nonproliferation and arms control specialists, the study's primary mission is educational. In particular, it is hoped that, as they think about their region, South Asian scholars and policy makers will see in its pages arms control *possibilities.*

Preventing Nuclear War

Should India and Pakistan covertly deploy deliverable nuclear weapons, the ambiguity surrounding such capabilities may actually encourage their use in grave crises such as conventional military conflict. Secrecy would not permit the adoption of crisis and deterrence stabilizing measures prior to a conflict. In a serious crisis, doctrine and employment policies for nuclear weapons will likely be ad-hoc, driven by worst-case conjecture. Pakistani leaders, for example, could perceive their country's lack of geographic depth and conventional military inferiority vis-à-vis India as compelling justification for adopting "use them or lose them" nuclear strategies such as launch-on-warning. Effective implementation of arms management measures aimed at remedying such instabilities requires each country to acknowledge the status and extent of nuclear capabilities. If admission of military nuclear capabilities is done *in the context of a mutually agreed and verifiable arms control regime*, it need not entail an irrevocable commitment to status as a nuclear weapons state.

"Nonweaponized deterrence" (keeping nuclear warheads separate from their means of delivery) is unlikely to reduce the instabilities of ambiguity, unless nonweaponization is assured through an effective, negotiated verification regime. A formal and verifiable nonweaponization agreement would allow India and Pakistan to retain a nuclear "option," while reducing much of the uncertainty inherent to such a posture.

South Asian nuclear war prevention measures should focus on reducing the incentives for the initiation of conventional military conflict, the most likely route to the use of nuclear weapons. Confidence building measures (CBMs) are an important means of decreasing the most gratuitous incentives for initiating military conflict: accident, miscalculation, and misperception. CBMs increase predictability about the actions of the other side by constraining the actual or potential use of weapons in three ways: communications and information exchanges, observation and inspection, and restraints on operations and deployments. CBMs can thus help remove the "element of surprise" from prospective plans for attacking a counterpart.

Even before decisions to deploy nuclear weapons are made, the development of the relevant technologies and procedures for war prevention and conflict deescalation must be a top priority in both India and Pakistan. Negotiations for a conventional CBM regime, however, can begin now, and in fact may be an important first step toward the conclusion of more ambitious nuclear arms limitations agreements.

One nuclear war prevention measure, requiring relatively little technical and economic investment, that India and Pakistan can implement promptly, is to adopt enhanced security procedures at nuclear facilities. Moreover, should India and Pakistan commit to the deployment of nuclear weapons, the development of technical and procedural mechanisms to *divorce nuclear weapons access from use* must be a top priority. Additional measures will be critical to both preventing and reducing incentives for use of nuclear weapons in a crisis. Specifically:

• Reducing the vulnerability of missiles and aircraft to preemptive attack would decrease incentives for such attack while concurrently relieving pressures for adoption of launch-on-warning policies.

• Nuclear risk reduction centers (NRRCs) linking New Delhi and Islamabad can serve as additional communications links between policy makers in the absence of crisis, as conduits for relaying concerns about military or civilian nuclear activities that could be potential sources of conflict.

• The avoidance of strategies that demand early use of nuclear weapons would be integral to preventing escalation of conventional military conflict.

• It is important that India and Pakistan avoid the trap of treating nuclear weapons as simply more powerful conventional weapons; i.e., abstain from assigning to nuclear weapons the achievement of conventional military objectives. The magnitude of difference between nuclear and conventional weapons must be emphasized at all levels of military doctrine and operations. Tactical nuclear weapons are especially dangerous in this regard because they make such thinking possible.

• One of the most significant escalation-prevention measures that each country could implement is to develop and maintain stringent command, control, and communications for guiding the use of both conventional and nuclear weapons. Final authorization for use of nuclear weapons should originate with the highest levels of civilian authority.

Verifying Arms Limitations

For "covert" nuclear weapons states, nuclear weapon development and production are closely integrated with ostensibly civilian nuclear energy and space programs. Verification regimes for South Asian arms limitations measures must be capable of identifying and distinguishing between treaty limited activities and permitted peaceful applications. Furthermore, monitoring for verification regimes must not unduly interfere with legitimate activities.

The very small size of Indian and Pakistani nuclear arsenals, if they exist at all, means that the perceived political and military significance of noncompliance with nuclear arms limitations could be great. For a South Asian fissile materials production restriction regime effective monitoring must be capable of detecting with a reasonable probability the diversion of kilogram quantities over a period of weeks to months. In other words, detection capability for this type of agreement must be on the same order of magnitude as specified for IAEA safeguards' "significant quantities" and "timely detection."

For verification purposes, the most effective points of application of South Asian arms limitations measures are at the production, testing, and deployment stages of the nuclear weapons life cycle, with an emphasis on production monitoring:

- IAEA materials accounting, containment and surveillance methods provide a useful model for a South Asian fissile materials production restriction regime. However, the effective application of IAEA methodology requires modifications specific to the regional or bilateral South Asian context. For example, pilot-scale research facilities are often more amenable to secret nuclear weapons research and production and therefore must be subject to verification procedures.

- INF Treaty production monitoring and on-site inspection procedures comprise the most relevant model for a South Asian missile production restriction regime, especially because the INF regime was designed to accommodate dual use missile production facilities.

- Portal and perimeter monitoring could comprise an effective means of verifying an India–Pakistan nonweaponization agreement. Continuous monitoring of missile base and/or assembly plant and airfield perimeters via remote, short-distance sensors like those used for the 1975 Israel–Egypt Sinai Disengagement agreement and monitoring vehicles for the presence of radioactive materials at facility entrances and exits could ensure that warheads are kept separate from their means of delivery. Not only would monitoring the perimeters of delivery-vehicle deployment or assembly sites be much simpler and less intrusive than for fissile materials production–diversion at nuclear facilities but also presumably more acceptable politically. Monitoring nuclear facilities to detect diversion of warheads or fissile materials would entail the same level of complexity and intrusiveness as IAEA safeguards.

- The most significant threat to a nonweaponization regime would be the installation of warheads at missile assembly plants and deployment of these and nuclear capable aircraft at clandestine sites. Redundant monitoring is thus crucial to a nonweaponization agreement. Since it is unlikely that such an agreement would cover all possible deployment sites, access to remote sensing capabilities (such as third-party satellite imagery) is imperative. Many of the same remote-sensing technologies used by satellites can also be carried by aircraft. The 1992 Open Skies Treaty serves as a model of a possible India–Pakistan airborne monitoring regime for a nonweaponization agreement.

- For a South Asian comprehensive nuclear testing ban, a verification regime must be capable of detecting and identifying low-yield nuclear explosions. The effective detection and identification of low-magnitude seismic events will require provisions for limitations on chemical explosions and on-site inspections of suspect nuclear test sites. A recent study by Lawrence Livermore National Laboratory concluded that India and Pakistan would together need approximately

twenty-eight high-quality seismic stations to detect a one kiloton decoupled nuclear explosion.

• Other than for fixed-base land deployments of ballistic missiles, a ban on nuclear weapons deployments will likely be the most difficult arms limitations regime to monitor. Just as for nonweapization, this situation demonstrates well the necessity of synergistic monitoring for verification purposes: the more varied the foci and means of monitoring, the higher the overall probability of detection and accurate identification of noncompliant activities. Redundant monitoring is essential for arms limitations that are difficult to monitor at one or more stages but easier at another. For example, ensuring the nondeployment of nuclear weapons on South Asian dual-capable aircraft would be most effectively attained through simultaneous bans on production and testing of warheads, though production monitoring entails the use of more intrusive OSI methods. However, perimeter monitoring of airfields in conjunction with limited inspection of suspect aircraft, and access to remote-sensing technologies, could ensure nondeployment on aircraft while avoiding more onerous fissile materials production restrictions.

A South Asian Nuclear Weapons Free Zone regime would be an ineffectual means of ensuring nonproduction and nonpossession of nuclear weapons by zonal states if India and Pakistan were to remain outside treaty verification mechanisms. The inclusion of China would most certainly be a precondition for Indian accession to a NWFZ regime. India and Pakistan might, however, accede to a "second tier" of less intrusive NWFZ verification consisting of a regional seismic and satellite monitoring regime.

Various unilateral and negotiated measures can enhance the ease of monitoring specific types of nuclear weapons activities. In the South Asian context, OSI will constitute the most important negotiated cooperative measure. Routine and short-notice inspections of declared facilities carry the least potential for politically motivated abuse, but provisions for incorporating newly "discovered" or constructed treaty-relevant facilities into the OSI regime are essential.

A South Asian arms limitations regime may also establish mechanisms for effective resolution of noncompliance charges or disputes over treaty language, and specify sanctions in the event of treaty breaches. Additionally, whether an agreement is a formal treaty or tacit understanding, the specificity of treaty language, and its adaptability to new technological developments are all factors which impinge on the efficacy of compliance. The most important of these considerations is the necessity of a permanent consultative institution. Within South Asia, the Permanent Commission established by the 1960 India–Pakistan Indus Waters Treaty for resolving disputes over the use of the Indus River and its tributaries offers an unparalleled model for potential India–Pakistan arms control agreements. U.S.–Soviet experience with the SALT Standing Consultative Commission also provides an excellent source of "lessons" about the usefulness and pitfalls of compliance diplomacy.

I

Introduction: The South Asian Context

Nuclear Proliferation and Regional Arms Control

Since the Treaty on the Nonproliferation of Nuclear Weapons (NPT) was opened for signature in 1968, India has been the only additional state to demonstrate a nuclear explosive capability. Although initial forecasts of dozens of new nuclear states have failed to materialize, the emergence of one or more "new," declared nuclear weapons states before the end of the century is not improbable, Three states outside the NPT regime, including India,[1] and one state party to the Treaty (North Korea) are either widely thought to possess nuclear weapons or are very close to developing them. Traditionally, unilateral and international approaches to proliferation have stressed prevention, through efforts to decrease incentives for acquiring nuclear weapons (e.g., "Atoms for Peace," the granting of security guarantees to nonnuclear weapons states, and provision of conventional arms "substitutes") in conjunction with policies of restricted access to nuclear technology and materials (e.g., imposition of IAEA safeguards and export controls).[2] *Barring accession to the NPT by all states not party to that treaty, however, the preventive approach is inherently limited.* Its limitations become especially apparent when viewed against an emerging tier of non-NPT nuclear supplier states. Despite its limitations, the imposition by NPT states of strict controls on nuclear materials and technology exports must nonetheless remain the bedrock of the international nonproliferation regime.

Should any of the states outside this regime "go nuclear"[3] (or have already gone nuclear) various international and unilateral efforts might be undertaken to moderate the most destabilizing global and regional aspects of a world of additional nuclear weapons states. Proliferation management efforts remain largely theoretical though, primarily because they include such controversial proposals as the provision of technical assistance to new nuclear weapons states in developing nuclear arsenals that

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1. The other two non-NPT "threshold" nuclear states are Israel and Pakistan. South Africa announced its accession to the NPT in January 1994. See Leonard S. Spector, *The Undeclared Bomb* (Cambridge, Mass.: Ballinger, 1988) for a survey of nuclear activities in these and other states of proliferation concern.

2. For discussions of "traditional" preventive approaches to nuclear proliferation see Benjamin Schiff, *International Nuclear Technology Transfer: Dilemmas of Dissemination and Control* (London: Croom Helm, 1984); and William Potter, "On Nuclear Proliferation," in Edward A. Kolodziej and Patrick Morgan, eds., *Security and Arms Control*, Vol. I (New York: Greenwood Press, 1989). Potter also briefly examines "management" approaches.

3. See Figure 1.1 for definitions of terminology used in this study.

are secure from unauthorized use and preemptive attack.[4] The prevention of nuclear war at the regional level at least, demands that new nuclear weapons states develop survivable nuclear forces with adequate command and control, and technical and procedural safeguards against unauthorized use. Whether established nuclear weapons states should actively assist them in doing so is questionable if it means erosion of the international nonproliferation consensus. More specifically, technical assistance relating to nuclear weapons themselves is likely a violation of Article I of the NPT.

Industrially developed nations and international agencies such as the IAEA could certainly assist and encourage newly declared or threshold nuclear weapons states in undertaking arms control efforts as a means of promoting regional and global nuclear stability. In fact, providing technical and educational assistance for these efforts could comprise one of the most effective means of promoting U.S. nonproliferation policy. Examples of assistance that would not violate NPT obligations include provision of technology for crisis hotlines or monitoring arms control agreements and confidence building measures, help in devising physical security and materials management systems for civilian nuclear facilities, and advice on the effective implementation of arms control agreements. Regional nuclear arms control agreements might consist of indigenous "nonproliferation" regimes, such as restrictions on fissile materials production, bans on nuclear testing and deployment, as well as nuclear war prevention measures.

This study explores potential arms control measures relevant to South Asia, primarily India and Pakistan, two neighboring states with a history of conflict and admitted capabilities to build nuclear weapons. Some of these measures are also applicable to India–China arms control, or might be implemented as multilateral regional efforts. Without judging the political desirability of helping threshold or newly declared nuclear weapons states to develop safe and secure nuclear forces, this study suggests measures which might be adopted by India and Pakistan to enhance regional deterrence and crisis stability, and prevent the use of nuclear weapons. Some may view this study as a mere catalogue of arms control measures, about most of which American arms control experts know more than could ever be included here. While I enthusiastically embrace an audience of American nonproliferation and arms control specialists, the study's primary mission is educational. In particular, it is hoped that, as they think about their region, South Asian scholars and policy makers will see in its pages arms control *possibilities.*

4. See, for example, Shai Feldman, "Managing Nuclear Proliferation" in Jed C. Snyder and Samuel F. Wells, eds., *Limiting Nuclear Proliferation* (Cambridge, Mass.: Ballinger, 1985) and Lewis Dunn, *Controlling the Bomb* for discussions of the merits and drawbacks of such forms of assistance.

Going nuclear is often used to describe states that "announce" their nuclear weapons status by demonstrating a nuclear explosive capability, such as by conducting a test. Here, it will be used to refer to states that have acquired a militarily meaningful nuclear weapons capability (i.e., a warhead mated to an appropriate means of delivery) whether or not they have overtly demonstrated or declared their status as a nuclear weapons state.

Proliferation will refer here to the acquisition of the technology and materials necessary to enable development of a nuclear weapons capability by states other than the five declared nuclear weapons powers (the U.S., Russia, China, France, and Britain). A state can be a proliferator without having "gone nuclear." India, Pakistan and Israel are examples of states that have gone nuclear or are very close to doing so.

A more formal term for such states is *threshold nuclear weapons state*. Even if, as in the Indian case, a threshold nuclear weapons state has demonstrated a nuclear explosive capability, it is not a *declared* nuclear weapons state unless it has made an overt, official commitment to deployment of nuclear weapons. Threshold nuclear weapons states might therefore also be called *covert* nuclear weapons states. Rasul Rais (1985) refers to Pakistan as a *static threshold nuclear power*. Other terms frequently employed to refer to such status include *nuclear ambiguity* (Feldman, 1985), *deliberate ambiguity* (Steinberg, 1986) or *opaque proliferation* (Hagerty, 1993). This study will generally use the terms "covert" and "nuclear ambiguity" to describe the status of the Indian and Pakistani nuclear programs.

Recessed- (Jasjit Singh, 1993), *existential-* (Hagerty, 1993) or *nonweaponized deterrence* (Perkovich, 1993) have been used to describe the putative strategy behind nuclear ambiguity. Here, we will simply use "deterrence," because we believe the logic (or illogic) of deterrence holds whether weapons are overt or covert. "Nonweaponization" will refer specifically to the separation of warheads from their means of delivery. *Weaponization*, of course, will refer to the mating of nuclear explosive devices (warheads) to delivery vehicles.

The term *production* is used here to describe the processes of creating essential components and/or assembling them as a finished product, be it fissile materials in various forms (such as low-enriched uranium, reactor fuel, or finished warheads), machining of individual missile parts and their assembly into a finished missile system. Its use in reference to India and Pakistan does not mean that these countries have in fact "produced" nuclear explosive devices or weapons.

FIGURE 1.1 Going, Going, Gone Nuclear: A Proliferation Lexicon.

Conflict Resolution in South Asia: Antecedents and Precedents

While concepts of formal arms control are fairly new to the region, South Asia has not been devoid of efforts at conflict resolution and confidence building, though many such efforts have been declaratory and symbolic in nature, without associated verification regimes. The complete record of India–Pakistan relations evinces that conflict has not precluded cooperation. That both countries have seen fit to settle some disputes reveals a mutual awareness of the costs of unrestrained antagonism. Since the 1972 Simla agreement India or Pakistan have not lacked "incentives" for war, particularly in recent years. The dispute over the disposition of Kashmir has greatly intensified in the last several years, in the form of a sort of proxy war through assistance to secessionist rebels and charges of human rights violations. During the 1987 Brasstacks episode India and Pakistan came closer to actual war than at anytime since 1972. Yet amidst the rancor some notable cooperative ventures have been attempted, though some proposals, such as Indian "no-war pacts" and Pakistani nonproliferation schemes, have been more exercises in public-relations diplomacy than genuine arms control efforts. Some of the formal India–Pakistan efforts at conciliation and cooperation offer valuable precedents and models for future agreements. The following discusses important proposals and attempts at conflict resolution through 1988. More recent confidence building measures and their prospects are discussed in a later section.

Proposals for No-war Pacts

Nehru was the first to suggest, in a letter to Liaquat Ali Khan in November 1949, that India and Pakistan join in a renunciation of war. Following an exchange of letters between Nehru and Liaquat, India's "no-war" idea was rejected by Liaquat in November 1950. Pakistan's rationale for rejecting the proposal was two-fold. First, any agreement lacking provisions for referring stalemated disputes to neutral arbitration was essentially futile. Second, both countries' membership in the UN constituted the equivalent of a renunciation of war. Pakistan's counter-offer of a no-war pact consequently suggested formation of an "arbitral tribune" composed of nominees from three friendly countries.[5] Nehru replied that such arbitration by outsiders was both counterproductive and unnecessary. Nehru had, however, conceded that evacuee-property and canal waters disputes might be amenable to "judicial determination"[6] by a tribunal of two Indian and two Pakistani judges but

[5]. S. M. Burke, *Pakistan's Foreign Policy: An Historical Analysis* (London: Oxford University Press, 1973), p. 49.

[6]. A. Appadorai, ed., *Selected Documents on India's Foreign Policy and Relations*, Vol. I (Delhi: Oxford University Press, 1982), p. 226.

refused to consider the presence of even a single neutral judge. This formulation was rejected by Pakistan as conducive to hopeless deadlock.

India's present insistence that bilateral disputes be dealt with in bilateral fora thus had a genesis predating the Simla Agreement by more than two decades. India's avowed opposition to external-actor meddling in subcontinental affairs formed part the basis of its rejection of multilateral resolution of disputes with Pakistan, with Indian regional-power aspirations being the other significant factor. When Pakistan accepted U.S. military aid in 1954 Nehru responded that such an act effectively ruled out a no-war pact with India. Had a no-war declaration been subscribed to by both countries, Nehru believed, external military aid would have been unnecessary.[7] Moreover, Nehru argued that India could not be irrevocably bound to a rigid formulation for resolution of disputes.[8]

Pakistan, too, proposed no-war declarations of its own in subsequent years. Prime Minister Choudhoury Muhammad Ali put forth such a proposal in a March 1956 session of Parliament, as did Ayub Khan in December 1965 and Yahya Khan in October 1970. Further, until 1963, every Pakistani leader had suggested joint India–Pakistan defense of the subcontinent. All of the Pakistani offers were predicated on peaceful resolution of Kashmir, as, for example, Foreign Minister Bhutto stated in June 1963: "Let India arrive at an equitable and honorable settlement with Pakistan over Kashmir. We can then have not one but a dozen no-war pacts with her."[9] In a letter to Yahya Khan in June 1969 Indira Gandhi set forth suggestions for "normalization and improvement of relations"[10] as part of a larger proposal to ease restrictions on travel and cultural exchanges. Kashmir was not mentioned as a potential topic for negotiation, which led to an unsurprising Pakistani rejection of Mrs. Gandhi's offer.

Beginning in 1981, Pakistan took the no-war initiative. Its announcement on September 15 of that year of acceptance of a $3.2 billion U.S. aid package included an offer to "enter into immediate consultations with India for the purpose exchanging mutual guarantees of nonaggression and non-use of force in the spirit of the Simla Agreement."[11] Mrs. Gandhi repudiated the offer in an October 24 reply as "lacking in 'genuineness.'" Both the unusually informal and public nature of the proposal's presentation and its concurrence with Pakistan's acceptance of a large U.S. aid package contributed to Indian doubts about Pakistan's ultimate intentions. Was it merely a gesture to placate U.S. Congressional critics, or a device to lull India into complacency vis-à-vis its rival? Attempting to assure India of the proposal's sincerity

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7. Ibid.
8. Ibid., p. 280.
9. Burke, *Pakistan's Foreign Policy*, p. 51.
10. Appadorai, *Selected Documents*, p. 392.
11. Naveed Ahmad, "Recent Developments in Indo–Pakistani Relations," *Pakistan Horizon* 35 (2) (1982): 76.

Pakistan offered a formalized version to India on November 22. This date was the eve of an Indian Parliamentary session, leading India to suspect that the offer's timing was premeditated to maximize publicity. India's December 22 reply preconditioned acceptance of Pakistan's offer on the latter's renunciation of foreign military aid, denial of base rights to external powers, and restriction of bilateral disputes to bilateral negotiations. [12] The last, of course, referred to Pakistan's ritual raising of the Kashmir issue in UN fora, an action India contends is prohibited under the terms of the Simla Agreement. India also has interpreted the Simla Agreement's renunciation of the use of force to settle the Kashmir dispute as making a no-war pact superfluous.

India subsequently stole some of Pakistan's diplomatic thunder in late when Mrs. Gandhi casually suggested an India–Pakistan Treaty of Friendship at a news conference during Pakistani Foreign Minister Agha Shahi's New Delhi visit.[13] Meeting with Shahi the next day Mrs. Gandhi further proposed an India–Pakistan Joint Commission to periodically review the two countries' relations. Shahi agreed to this last proposal. However, India–Pakistan relations would soon return to their customary abyss after the Pakistani ambassador to the UN Human Rights Commission, Aga Hilaly, raised the Kashmir issue in its mid-February session.[14] India consequently postponed a round of talks between both countries' foreign secretaries scheduled for early March. An India–Pakistan Joint Commission was subsequently established in March 1983 mainly for expansion of trade relations but potentially for promotion of political cooperation as well (it does not deal with military or defense matters). The Commission was suspended in 1984 amidst tension arising from Indian allegations of Pakistani support for pro-Khalistan Sikh terrorism in the Punjab, but meetings were resumed in 1985. No-war proposals continued to feature prominently in Pakistan's diplomatic repertoire, the most recent being a March 16, 1988, offer by President Zia al-Haq while visiting Bahrain.[15] That the offer was revived in the wake of India's lease of a nuclear submarine from the Soviet Union prompted Indian queries about its source of inspiration (the submarine was returned by India in January 1991—Indian officials cited high maintenance costs as the reason[16]). Zia denied any link between the two events. The Agreement Prohibiting Attacks on Nuclear Facilities, formally signed in 1988, was first discussed by President Zia and Prime Minister Gandhi in 1985. While a quite serious crisis in 1986–87 (Brasstacks) did not stand in the way of the no-attack agreement's implementation, renewed conflict over Kashmir and Kashmiri separatist terrorism, which began in the spring of 1990 as a less-

12. Jyotirmoy Banerjee, "Hot and Cold in India–Pakistan Relations," *Asian Survey* 23 (3) (March 1983): 288.

13. Ibid., p. 290.

14. Ahmad, "Recent Developments," p. 82.

15. "Zia Renews Offer of No-war Pact," *Times of India,* March 16, 1988, p. 1.

16. Rahul Bedi, "India Returns Soviet SSGN," *Jane's Defence Weekly,* 15 (8) February 23, 1991, p. 254.

serious internal political crisis, has intensified to such a level that expanded confidence building and arms control measures likely have been shelved indefinitely by both countries.

Formal Agreements

Nehru–Liaquat Pact of 1950. This agreement merits attention because it exemplifies a successful bilateral effort to avert escalation of a crisis into war. In the spring of 1950 communal unrest in West Bengal, Assam, and Tripura in India and East Bengal in Pakistan reached explosive proportions, exacerbating mass migrations in both directions. The Indian territories were especially affected by the increasingly violent disturbances and unmanageable ingress of people, prompting a variety of threatening remarks to Pakistan from several Indian officials, including Nehru.[17] Nor were similarly provocative remarks lacking on the Pakistani side. On April 2, Liaquat Ali Khan arrived in New Delhi to discuss the situation with Nehru. Six days later, both prime ministers announced an agreement to stem the reciprocal flows of migrants, provide procedures for disposition of migrant property, and investigate the cause of the disturbances.[18] The agreement is notable for considerably abating the migrations, particularly of Hindus from East Bengal.

Indus Waters Treaty. One of the many loose ends resulting from the hasty British departure was the question of India–Pakistan administration and sharing of the Indus River waters and associated irrigation works. The boundaries drawn by partition placed the river's two British-constructed irrigation headworks on Indian territory. In meetings of the British Arbitral Tribunal, formed to mediate disputes arising from partition, both India and Pakistan assured its president , Sir Patrick Spens, that neither would interfere with the river's flow.[19] But on April 1, 1948, India cut off the supply of water to Pakistan. India's justification for doing so was plans to divert water to irrigation projects in the Punjab and Rajasthan.[20] Both countries signed an interim agreement which resumed the flow of water to Pakistan. In 1952 India and Pakistan accepted an offer by the International Bank for Reconstruction and Development (IBRD) to mediate resolution of the dispute; the negotiations culminated in the signing of the Indus Waters Treaty on September 19, 1960.

The treaty provided[21] that during a transitional period of up to thirteen years Pakistan would retain unrestricted use of three western rivers, the Indus, the Jhelum,

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17. Burke, *Pakistan's Foreign Policy*, p. 57.

18. Appadorai, *Selected Documents*, p. 89.

19. Burke, *Pakistan's Foreign Policy*, p. 12.

20. Craig Baxter, " India and Pakistan: Continued Conflict or Emerging Cooperation?" *Journal of South Asian and Middle Eastern Studies*, 11 (1) (Fall–Winter, 1987): 39.

21. Appadorai, *Selected Documents*, p. 106–119.

and the Chenab. Concurrently, Pakistan was to construct a replacement irrigation works to be paid for by an IBRD fund totaling more than $1 billion and to which India would contribute $174 million. The treaty set up a Permanent Indus Waters Commission consisting of one representative from each country. Stalemated disputes regarding use of the Indus waters would be referred to a "neutral expert" for arbitration.

The Indus Waters Treaty is remarkable not only for its durability but because it was the first major India–Pakistan accord reached through outside arbitration, and to establish a permanent commission for referral and resolution of disputes. Second, the scope of bilateral cooperation required for the treaty's implementation was unprecedented. Third, adherence to the treaty's terms has been the norm: even in the midst of war in 1965, India never reneged on its payments to the Indus Development Fund. Until the recent conflict over India's alteration of a barrage, or dam, on the Wular Lake, affecting the flow of water from the Jhelum River into Pakistan, disputes regarding Indus waters use have been successfully resolved via the Permanent Commission.[22] The Wular Barrage issue has been referred to the Permanent Commission but as of this writing is still under deliberation.

Rann of Kutch Agreement. This agreement provides another illustration of successful resolution of India–Pakistan conflict through neutral arbitration. Disputes over territory in the Rann of Kutch, a marshy region located along the Gujarat–Sind border, led to border clashes in April 1965 with Pakistan gaining some minor territorial victories. British Prime Minister Harold Wilson was instrumental in engineering a cease-fire between India and Pakistan on June 30, 1965.[23] The agreement provided a design for a final settlement: a tribunal composed of two non-Indian or Pakistani members, one nominated by each country and a jointly-selected chairman. The UN Secretary-General would choose the tribunal's chairman should India and Pakistan reach an impasse. The tribunal would take up all questions regarding the Rann of Kutch unresolved through bilateral negotiations at the ministerial level. Tense relations between India and Pakistan over Kashmir at the time (which led to a short war in September 1965) precluded meaningful deliberations; a foreign minister's meeting scheduled for August 20 was canceled. The tribunal thus went to work and in February 1969 announced the award of 10 percent of the disputed territory to Pakistan and the remainder to India. On July 4 of that year, the final documents and maps were approved by India and Pakistan in Islamabad. Neither side has since questioned the settlement, or more importantly attempted to alter it by force.

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22. Baxter, "India and Pakistan," p. 40.
23. Appadorai, *Selected Documents,* p. 131.

Tashkent Declaration. This agreement, announced in Tashkent, Soviet Union, on January 10, 1966, was yet another which had its origins in neutral mediation. Soviet Premier Alexei Kosygin interceded between India and Pakistan in their negotiations of a settlement of the 1965 Kashmir conflict. Among the accord's provisions were withdrawals of both sides' troops to positions held prior to August 5, 1965, proposals for re-establishment of trade and diplomatic relations, and promotion of "the development of friendly relations between the two countries."[24] Substantial trade activity, however, remained suspended until 1976.[25] The withdrawals of troops to prewar positions was accomplished without objections, and effectively meant that each country relinquished substantial portions of captured territory. The declaration also reaffirmed India's and Pakistan's "obligations under the [UN] charter not to have recourse to force and to settle their disputes through peaceful means." Though both countries agreed to "continue meetings at the highest and other levels on matters of direct concern to both" the first (and last) ministerial-level meeting, held in Islamabad in March 1966 ended in stalemate. Both countries, of course, would abrogate their UN "obligations" renouncing the use of force in 1971.

Simla Agreement. This accord was the eventual product of an Indian initiative, presented to the UN Secretary-General on February 14, 1972, proposing direct talks with Pakistan "at any time, any level, and without preconditions."[26] In April, senior Indian and Pakistani representatives met in Muree, Pakistan, to prepare for a Gandhi–Bhutto summit, a suggestion proffered by Mrs. Gandhi in a letter to her Pakistani counterpart. Such a meeting commenced in Simla on June 28. Five days later, Mrs. Gandhi and Bhutto announced an accord designed to guide their countries' bilateral relations. The accord continues to set the tone for India–Pakistan relations, with frequent reference by both sides to its provisions during periods of tension. Several of these provisions are significant: both would "refrain from the threat or use of force. . . in accordance with the Charter of the UN"[27]; measures such as restoration of communications, postal and air links, expansion of trade and travel, cultural exchanges, etc., would be progressively implemented to "restore and normalize relations"; each country's troops would be withdrawn behind the international border. The agreement also established a new "line of actual control" (LAC) in Kashmir based on the cease-fire line accepted on December 17, 1971. Minor changes in territory as a result of the new LAC were strategically advantageous to India, alterations which did not evoke Pakistani complaint.[28] Indian and Pakistani troops alone would patrol the LAC (though a UN observer force would be posted in the

[24]. Ibid., p. 388.
[25]. Surjit Mansingh, *India's Search for Power* (New Delhi: Sage Publications, 1984), p. 232.
[26]. Ibid., p. 226.
[27]. Appadorai, *Selected Documents,* p. 443.
[28]. Mansingh, *India's Search,* p. 229.

area) and were responsible for maintaining the peace. Portions of the LAC remain ill-defined, however, precipitating periodic clashes between each country's forces in the area. Fighting over the remote Siachen Glacier comprises the most serious ongoing conflict over ill-defined Kashmir territory, a low-level military conflict that has persisted since the mid-1980s. Siachen, according to Kanti Bajpai and Stephen P. Cohen, has become more a "test of wills over Kashmir"[29] and less a struggle for territory with significant strategic worth. Its apparent symbolic value to both countries virtually precludes an end to this wasteful conflict.

The language with the greatest import for future India–Pakistan relations incorporated India's preference for bilateralism: "the two countries are resolved to settle their differences by peaceful means mutually agreed upon between them." India has rigidly interpreted this to imply that outstanding differences, particularly Kashmir, cannot be referred to or raised in international fora such as the UN. India's interpretation would also appear to preclude neutral mediation on not only Kashmir but possibly other issues as well, including restrictions on nuclear weapons production. Not surprisingly, Pakistan construes the wording differently. As noted in the earlier discussion of no-war proposals, these contradictory interpretations have engendered chronic irritation between the two countries and Pakistan's periodic references to Kashmir, most recently consisting of allegations human-rights abuses by Indian Border Security Forces in Kashmir, have scuttled many a diplomatic overture to India.

Agreement Prohibiting Attacks on Nuclear Facilities. Signed by Rajiv Gandhi and Benazir Bhutto in December 1988 and ratified by both countries in early 1990, this agreement obligates each to refrain from "undertaking, encouraging or participating in, directly or indirectly, any action aimed at causing the destruction of, or damage to, any nuclear installation or facility in the other country.[30]" Rajiv Gandhi and President Zia of Pakistan had discussed the need for such an agreement as early as 1985, perhaps realizing after Israel's 1982 attack on Iraq's Osirak reactor that nuclear facilities were likely to be high-priority targets in a war. The no-attack agreement, which requires each country to annually exchange lists specifying "the latitude and longitude of its nuclear installations and facilities" and inform each other of additions to the list, was not implemented until 1991, one year after its ratification, largely because of escalating tensions over unrest in Kashmir. Since its implementation each side has adhered to its provisions, though following the first exchange of lists on

29. Kanti P. Bajpai and Stephen P. Cohen, "Introduction," in K. P. Bajpai and S. P. Cohen, eds., *South Asia After the Cold War: International Perspectives* (Boulder, Colo.: Westview Press, 1993), p. 7.

30. "Agreement on the Prohibition of Attack Against Nuclear Installations and Facilities between the Republic of India and the Islamic Republic of Pakistan," text published in *Programme for Promoting Nuclear Non-proliferation Newsbrief,* No. 6 (July, 1989): 12.

January 1, 1992, Pakistan accused India of leaving some facilities off its list.[31] The agreement's facility-list exchange provision brings an unprecedented element of transparency to Indian and Pakistani nuclear activities, because by implication no "clandestine" facilities should now (ideally) exist in the region.

The record of India–Pakistan conflict resolution suggests two important conclusions. First, India's preference for bilateralism in resolving disputes with Pakistan will likely persist as an important feature of the two countries' relationship, despite notable successes with external arbitration in the Indus Waters and Rann of Kutch cases. Second, what is remarkable about past India–Pakistan agreements, whether achieved via external mediation or bilateral negotiation, is the relative soundness of each side's record for honoring them amidst an enduring rivalry. Even the intensifying conflict over Kashmir in recent years has not erupted into overt war; while some attribute this to each country's seeming possession of nuclear weapons, it may also be that neither side wishes to be the first to abrogate the Simla Agreement, preferring instead to engage in low-intensity proxy war via Kashmiri secessionists and local police forces.

The most significant exception to this rather impressive record of treaty-keeping was the Tashkent Declaration's commitment to the renunciation of the use of force. It proved unsustainable when both were confronted with the East Pakistan crisis in 1971. The difficulty with high-minded declarations of nonaggression is that they tend to be tossed aside when either country perceives its interests to be sufficiently threatened to justify military force. No-war declarations may be morally righteous but are not especially realistic. What is perhaps more realistic to expect, is adherence to issue-specific settlements in concrete terms. Even if it has become rather frayed around the edges by the most recent downturn in India–Pakistan relations and conflicts over Kashmir, Simla has worked reasonably well enough since 1972 because it demands a very specific commitment: maintaining the mutually agreed-upon LAC. Where the line is ill-defined, as in Siachen, military clashes continue to occur. Because Simla did not specify a process for an ultimate settlement of the disputed territory, an eventual resurgence of conflict over Kashmir was perhaps inevitable. Whether Simla can withstand the ongoing low-intensity warfare of insurgency and Indian military presence in Kashmir will be a crucial factor in determining the course of India–Pakistan relations—and perhaps their nuclear programs as well.

In the decade and a half since India's 1974 Pokhran nuclear test various schemes have been suggested for limiting or halting the production of nuclear weapons in South Asia. Not long after the Pokhran explosion Pakistan submitted to the UN General Assembly a proposal for the creation of a South Asian nuclear weapons free zone. Though Pakistan has resubmitted the proposal on an almost yearly basis since then, it has met with equally persistent Indian rejection, ostensibly because the plan

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[31]. *Arms Control Reporter 1992* (Cambridge, Mass.: Institute for Defense and Disarmament Studies), p. 454.B 147.

fails to include China's nuclear arsenal within its ambit.[32] Subsequent Pakistani proposals, including comprehensive mutual inspections of nuclear facilities and an offer to sign the NPT simultaneously with India, have been similarly unacceptable to India because the latter claims that such arrangements would severely constrict its nuclear option vis-à-vis China.

India has historically protested what it perceives as the NPT's discriminatory sanctioning of nuclear weapons states' arsenals, and further objects to being treated on a political par with Pakistan, its smaller rival. Pakistan Prime Minister Mohammad Khan Junejo's 1987 offer of a bilateral test ban treaty was dismissed as "not serious" by Indian officials; India has refused to enter into test ban negotiations with Pakistan.[33] All such nuclear restraint offers by Pakistan, according to many Indian critics, are motivated by a cynical desire to deflect attention from its own nuclear ambitions by putting India in the difficult position of repeatedly having to reject unacceptable proposals.

A gradual softening of New Delhi's stance on bilateral and global nuclear restraints and confidence building measures was apparent (coincident with a steady and continuing improvement in India–China relations) until the start of the most recent conflict over Kashmir. Substantial (or even minimal) progress is unlikely in the near term given the currently abysmal state of India–Pakistan relations. But neither India nor Pakistan seems to desire being the first to commence an overt and systematic program of nuclear weapons development. R.V.R. Chandrasekhara Rao has suggested that such de facto voluntary restraint "may be the key to defusing the [nuclear] situation."[34] Rao believes both countries' apparent unwillingness to overtly produce nuclear weapons may eventually translate to a willingness to negotiate prohibitions

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[32]. Some Indian analysts, notably P. R. Chari of the Centre for Policy Research (New Delhi), dismiss the importance of the China threat as a continuing motive for Indian nuclear activities in recent years given the steady improvement in relations between India and China. Chari pointed out to the author in a recent interview in New Delhi that the 1993–1994 Indian Ministry of Defence *Annual Report* devotes only four paragraphs to China and a dozen to Pakistan in its summary of the Indian "national security environment." Interview, New Delhi, September 8, 1994. See also, Ministry of Defence *Annual Report 1993–1994* (Government of India: New Delhi, 1994), pp. 1–5. Three of the four paragraphs referring to China note improvements in India–China relations, including progress in reaching agreements on border issues and confidence-building measures. While the fourth paragraph notes that "China has embarked on an ambitious modernization of its armed forces" no mention is made of its nuclear arsenal. Chari believes that, particularly since the mid-1980s, official statements attributing continuing Indian nuclear research to the need for a deterrent against the Chinese nuclear threat to be mainly for Western consumption. For an analysis and summary of improvements in India–China relations since Rajiv Gandhi's 1988 visit to Beijing see Surjit Mansingh, "India–China Relations in the Post-Cold War Era," *Asian Survey* 34 (3) (March 1994): 285–300.

[33]. "Pakistan Proposes Nuclear Test Ban in South Asia," *New York Times*, September 25, 1987.

[34]. R. V. R. Chandrasekhara Rao, "India, Pakistan, Racing to be Last," *Bulletin of the Atomic Scientists* (November 1987): 33.

on the first construction of nuclear weapons. A similar arrangement has been more recently suggested by George Perkovich in the form of "nonweaponized deterrence."

Prior to the current deterioration in India–Pakistan relations, New Delhi evinced an apparent interest in deescalating regional tension over nuclear issues. Most notable perhaps was New Delhi's December 31, 1988, signing of a nuclear nonaggression agreement with Islamabad, barring attacks on each other's nuclear facilities. This agreement requires that each country exchange lists of nuclear facilities and the locations, with annual updates to include new facilities, an unprecedented sharing of information about their nuclear programs, however limited. Further, a new Indian willingness to consider alternative approaches to nonproliferation was apparent in Prime Minister Gandhi's June 1988 address to the UN Third Conference on disarmament. Gandhi's proposal for *concurrent* restraints on the production of nuclear weapons by both nuclear and nonnuclear weapons states represents a significant departure from past Indian insistence that nuclear weapons states dismantle their arsenals *prior* to commitment by nonnuclear weapons states to remain nonnuclear. Despite the U.S.–Russia START agreements imposing deep cuts in superpower nuclear arsenals, India has yet to officially commit its support for more recent U.S. and Russian initiatives for global testing and fissile materials production bans. Ongoing conflict with Pakistan over Kashmir, and continued nuclear testing by a China intent on modernizing its nuclear arsenal[35] may be contributing factors to this noncommittal stance, but of likely greater significance is an Indian unwillingness to forgo the "option" strategy. The ambiguity with which India and Pakistan enshroud their nuclear capabilities has conferred some real (and some perceived) strategic benefits, particularly a kind of "deterrence on the cheap." Many fear that, regarding deterrence, South Asia will ultimately get what it pays for. Preliminary findings of a forthcoming study[36] of crisis decision making by the top Indian and Pakistani participants in the 1987 Brasstacks episode (at the time neither country was believed to have a usable nuclear weapons capability) indicate that escalating misperceptions about capabilities and intentions brought the two countries closer to war than at any time since 1971. Is nuclear uncertainty sufficient to deter future military action or will it merely compound the escalating misperceptions of the next crisis? This is perhaps one of the most critical questions, behind virtually all concern about the proliferation of weapons of mass destruction, addressed by this study.

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35. Patrick E. Tyler, "China Upgrades Nuclear Arsenal as it Re-examines Guns Vs. Butter," *New York Times*, October 26, 1994.

36. Stephen P. Cohen, *Beyond Brasstacks: Crisis Management and Perception in South Asia*, Research Report (Urbana, IL.: Program in Arms Control, Disarmament, and International Security, January 1995).

The Role of Verification and U.S.–Soviet "Models"

Verification—a means of monitoring a counterpart nation's military activities and assessing whether these activities are in compliance with the terms of a negotiated agreement—cannot be considered in isolation from its essentially arms-controlling function. The verification of compliance with a negotiated arms control agreement, based on information collected through various monitoring methods, is fundamentally a task of determining whether the goals of the *agreement*, not the verification regime itself, are being met.

The following sections consequently survey a range of possible arms control options, including many not requiring verification, of greatest relevance to South Asia, primarily India and Pakistan. Arms control measures and their objectives are described, past experience with similar arrangements in other contexts and applicability to South Asia are discussed. This survey necessarily draws heavily from the Western arms control literature, a crucial source of arms control concepts and models.

The liberal emphasis here on Western, primarily U.S.–Soviet, conceptions and examples should not be construed to imply that these are the only, "correct" kinds of arms control measures that might be adopted by South Asia or that they could be transferred to other regions without modification. Much of the subsequent discussion describes modifications that would be essential if U.S–Soviet or other arms control "models" are to be effectively adapted to the South Asian context. Simply put, U.S.–Soviet efforts to define and refine arms control comprise the most extensive body of arms control experience to date. The lessons of forty years of "nuclear learning," including several serious crises, could forestall similar crises and facilitate arms control successes in other regions. The success and effectiveness of regional arms control regimes ultimately depends, of course, on the political willingness of their parties to make them work. Moreover, only duly-appointed representatives of negotiating states can decide which kinds of arms control provisions and measures are in their government's best national security interests.

Arms Control Definitions, Objectives and Approaches

In the U.S.–Soviet context, arms control efforts have recognized the importance of managing a relationship of mutual and stable deterrence, in which the disincentives to initiate military conflict outweigh the incentives, even in a crisis. For example, a premise of the 1972 Antiballistic Missile Treaty (ABM) is that ABM systems could seriously threaten a counterpart's ability to retaliate in the event of a strategic first

strike, weakening mutual deterrence.[37] Two definitions of arms control are especially pertinent:

> [By arms control w]e mean to include all the forms of military cooperation between potential enemies in the interest of reducing the likelihood of war, its scope and violence if it occurs, and the political and economic costs of being prepared for it.[38]

> Arms control is the process by which nations with adversary interests agree that their individual national security is better served if the arms competition between them is managed by agreed covenants.[39]

By emphasizing cooperation between adversaries these definitions imply that arms control consists of mutually negotiated agreements. But unilateral actions to promote crisis and deterrence stability, such as implementing command and control or permissive-action-link mechanisms, can be considered significant arms control measures. Also implicit in these definitions are the objectives of arms control. This study opts for a similarly broad approach, derived from Schelling and Halperin's formulation of "classic" arms control objectives as:[40]

- The avoidance of military conflict, i.e., war prevention.
- Reducing the destructiveness of military conflict, should it occur.
- Reducing the economic and other costs associated with preparing for military conflict.

Since nations do not generally enter into arms control agreements solely, or even primarily, for the sake of reducing the economic burdens of arming, this objective is not discussed here. Arms limitations, by attempting to eliminate or reduce the existence of weapons as a potential source of conflict, could produce the added benefit of decreased expenditures on eliminated weapons. Whatever economic savings accrue from eliminations of weapons, however, are probably offset by increased expenditure on monitoring and verification.

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37. The preamble to the ABM Treaty states, "effective measures to limit anti-ballistic missile systems . . . would lead to a decrease in the risk of outbreak of war involving nuclear weapons." ABM Treaty reprinted in Jozef Goldblat, *Arms Control Agreements: A Handbook* (New York: Praeger, 1983), p. 166–171.

38. Thomas Schelling and Morton Halperin, *Strategy and Arms Control* (New York: Twentieth Century Fund, 1962), p. 2.

39. Gloria Duffy, *Compliance and the Future of Arms Control* (Stanford, Calif.: Stanford University Center for International Security and Arms Control, 1988), p. 1.

40. Schelling and Halperin, *Strategy and Arms Control*, p. 2. For recent restatements of these objectives and discussion of types of arms control see also Michael Intriligator and Dagobert L. Brito, "On Arms Control," in Edward A. Kolodziej and Patrick Morgan, eds., *Security and Arms Control*, Vol. I (New York: Greenwood Press, 1989), pp. 213–232; and Patrick Morgan, "Elements of a General Theory of Arms Control," in Paul Viotti, ed., *Conflict and Arms Control: An Uncertain Agenda* (Boulder, Colo.: Westview, 1986), pp. 283–310.

Approaches to arms control can be subdivided into two major types: (1) measures to reduce the incentives to engage in military conflict by enhancing deterrence and crisis stability, and (2) measures aimed at weapons reduction, eliminations, prohibitions, or renunciations of the ability to make certain kinds of weapons. The first type will be referred to here as *arms management* and the latter as *arms limitations*. Both kinds of arms control are intended to meet the three objectives above, but represent two very distinct approaches to doing so. Either type could unilateral or negotiated, though most arms limitations are negotiated because they generally require participant states to relinquish something.

A state does not usually "need" to ascertain whether its adversaries have adopted unilateral arms management measures, such as making nuclear weapons invulnerable to preemptive attack or using permissive action links. However, awareness that adversary states have done so can significantly reduce incentives for using nuclear weapons in a crisis by enhancing the credibility of deterrent threats. The imperatives of national security are usually sufficient to motivate nuclear weapons states to do whatever is politically, technically and economically feasible to ensure a reliable nuclear deterrent secure from preemptive attack and unauthorized use. Illustrative of arms management measures requiring verification are negotiated confidence building measures (CBMs) involving observation and inspection of military maneuvers.

Some Provisos

This survey of ways in which India and Pakistan could promote deterrence and crisis stability, i.e., lessen the probability of nuclear weapons use, is not meant to imply that these countries currently possess nuclear weapons, intend to develop them, or should be "encouraged" to do so.

The following discussion examines the prospects for a stable, mutual deterrence relationship between India and Pakistan should they covertly deploy "militarily meaningful" (deliverable) nuclear weapons. It attempts to answer the question, "would effective arms control designed to establish a system of mutual deterrence by reducing the incentives to use nuclear weapons in crisis or conflict require each country to acknowledge possession of nuclear weapons?" The nuclear arms management measures described subsequently are primarily relevant to a South Asia in which India and Pakistan have declared possession of nuclear weapons, though many nonnuclear confidence-building and nuclear-facility security measures can be undertaken regardless of military nuclear status.

It is argued that, *should* both countries opt for deployment, deterrence and crisis stability is best enhanced by mutual acknowledgment of nuclear weapons capabilities *within an arms control framework* aimed at the objectives stated earlier. Mutual acknowledgment of nuclear weapons capabilities for arms control purposes is *not* equivalent to an irrevocable commitment to status as a nuclear weapons power.

Reductions, or even eliminations, of nuclear weapons could be effected within an arms control framework simultaneously with management of existing nuclear capabilities to reduce incentives for their use.

Nor is discussion of the kind of crisis thinking which could inspire use of nuclear weapons by India and Pakistan meant to imply that these countries should or even will use nuclear weapons in such circumstances. It is assumed here that the political leaders of a nuclear-weaponized India or Pakistan will be as rational in their crisis decision making as the leaders of any nuclear weapons state. Indian and Pakistani leaders, to paraphrase Stephen P. Cohen, will be at least as rational as U.S. and Soviet leaders have been in managing their nuclear relations.[41]

Rationality, moreover, should not be confused with morality or sanity; it can be justifiably argued that the extreme magnitude of destructiveness peculiar to nuclear weapons makes any use of them immoral, and hence, "insane." But decision makers severely constrained by time and erroneous perceptions of adversary behavior and capabilities could quite "rationally" conclude that striking first with nuclear weapons is their "best" or rather, only, option. Understanding the circumstances that could inspire such decisions is vital to ensuring, or at least maximizing the probability, that a nation's leaders are never put in a position of having to make them. Encouraging efforts to prevent nuclear war should no more promote Indian or Pakistani production and use of nuclear weapons, than providing clean hypodermic needles to prevent the spread of AIDS encourages the use of heroin.

Nuclear Deterrence and South Asia

Defining Deterrence Stability

Before describing possible conventional and nuclear war-prevention firebreaks that might be adopted by South Asian states, deterrence stability requires definition, since it essentially forms the foundation on which war prevention rests. Thomas Schelling and Morton Halperin provide a definition that is useful for South Asian arms control purposes:

> A "balance of deterrence"—*a situation in which the incentives on both sides to initiate war are outweighed by the disincentives*—is described as "stable" when it is reasonably secure against shocks, alarms, and perturbations. That is, it is stable when political events, internal or external to the countries involved, technological change, accidents, false alarms, misunderstandings, crises, limited wars, or changes in the intelligence available to both sides, *are unlikely to disturb the incentives sufficiently to make deterrence fail.* [42] (emphasis added)

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41. Stephen P. Cohen, "Solving Proliferation Problems in a Regional Context: South Asia," in *New Threats: Responding to the Proliferation of Nuclear, Chemical and Delivery Capabilities in the Third World* (Aspen Strategy Group Report: University Press of America, 1990), p. 177.

42. Schelling and Halperin, *Strategy and Arms Control,* p. 50.

Deterrence stability is sometimes considered to be composed of three essential elements: crisis stability, arms-race stability, and political stability. The first refers to absence of incentives to strike first with nuclear weapons in a crisis, the second to absence of incentives for rapid qualitative or quantitative expansion of a state's nuclear arsenal vis-à-vis that of an adversary, while the last refers to "the effectiveness of deterrence in reducing incentives for major coercive political changes."[43] Deterrence is as much a product of politics and perceptions as technology; this is likely to hold true in South Asia as elsewhere.

Deterrence Stability and Covert Nuclear Forces

In the absence of significant perturbations in each state's perceptions of the security threats posed by extraregional states and each other, India and Pakistan are likely to continue their pursuits of military nuclear capabilities covertly; the current state of nuclear ambiguity may well persist for the next few years. Presently, no evidence of Indian or Pakistani nuclear weapons deployments exists. Yet some contend that mutual awareness of abilities to produce air-deliverable fission weapons in a short period of time enables a rudimentary deterrence relationship between these countries.[44]

Before assessing the efficacy and stability of such a crude deterrence system, however, it is essential to distinguish between two types of "nuclear ambiguity." The first type is characterized by pairs of potentially hostile states, such as India and Pakistan, which demonstrate no evidence of actual deployment of militarily meaningful (i.e., deliverable) nuclear weapons, but do show a continuing pattern of limited, unacknowledged nuclear weapons research and fissile materials production. Potentially hostile states officially disavowing possession of nuclear weapons but for which some evidence exists that one or the other has actually deployed them comprise the second type of ambiguity. For states of the first type, such as India and Pakistan, a deliberate and mutual nuclear ambiguity, marked by "tacit bargaining,"[45] may be

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43. Joseph S. Nye, Jr., "The Impact of Technology on Nuclear Deterrence and Strategic Arms Control," in F. Stephen Larrabee, ed., *Technology and Change in East–West Relations*, East–West Monograph Series, No. 6 (New York: Institute for East–West Security Studies, 1988), pp. 65–71.

44. For example, see P. R. Chari, "How to Prevent a Nuclear Arms Race Between India and Pakistan," in Bhabani Sen Gupta, ed., *Regional Cooperation in South Asia*, Vol. 1 (New Delhi: South Asia Publishers, 1986), p. 141; Akhtar Ali, *South Asia: Nuclear Stalemate or Conflagration* (Karachi: Research on Armament and Poverty, 1987), p. 107; Brahma Chellaney, "South Asia's Passage to Nuclear Power," *International Security* 16 (1) (Summer 1991): 69; Devin T. Hagerty, "The Power of Suggestion: Opaque Proliferation, Existential Deterrence, and the South Asian Nuclear Arms Competition," *Security Studies* 2 (3–4) (Spring–Summer 1993): 256–283; and George Perkovich, "A Nuclear Third Way in South Asia," *Foreign Policy* 91 (Summer 1993): 88–90.

45. According to Neil Joeck, India–Pakistan nuclear relations are characterized by a tacit communication of thresholds which each is unlikely to cross as long as the other similarly refrains,

quite stable as long as neither side possesses sufficient incentive to move toward the latter form of nuclear ambiguity. Should India, Pakistan or both covertly *deploy* nuclear weapons,[46] there is ample reason to believe that their "nuclear relations" will be characterized by considerable instability in crisis situations. Crisis misperceptions could easily be magnified and threats dangerously exaggerated in the absence of certainty about an adversary's true capabilities or intentions. Further, uncertainties about adversary capabilities may provide impetus for arms racing. The U.S. bomber- and missile-gap hysteria in the late 1950s is illustrative.[47]

Uncertainty about the *outcome* of military conflict (for example, being unsure about whether one's probable losses will outweigh any potential gains) may enhance deterrence. Uncertainty about an adversary's *ability* to carry out deterrent threats, in contrast, most likely does not. Analyses of India–Pakistan deterrence often fail to make this distinction, contending that deterrence stability is inherent to ambiguity per se. Mere suspicion that an adversary possesses nuclear weapons (however "crude") or could build them quickly is thought to be adequate disincentive to engage in conflict, conventional or nuclear. According to Devin T. Hagerty, "...mutual calculations about the efficacy of nuclear deterrence in such a situation are based not on the details of relative nuclear weapon capabilities, which are beyond the national technical means of each side, but on the shared notion that each side is or can soon become weapon capable, and thus that any outbreak of conflict might lead to a nuclear exchange."[48]

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because each ultimately desires to avoid an uncontrolled nuclear arms race. This may explain why India has thus far conducted only one nuclear test, and apparently has not deployed nuclear weapons. See Neil Joeck, "Tacit Bargaining and Stable Proliferation in South Asia," *CISA Working Paper No. 66* (Los Angeles, Calif.: UCLA Center for International and Strategic Affairs, April 1989).

46. It is very probable that "covert" deployment of nuclear weapons would be covert only as a matter of official policy. Evidence of such activities would be difficult to suppress indefinitely, though it would be relatively easy to suppress information crucial to the development of deterrence stability, such as numbers and survivability of weapons. Why states should choose to deploy a *militarily meaningful* nuclear weapons capability in secrecy is not entirely clear; the above discussion implies that "secret" nuclear weapons may actually have considerably less credible deterrent value.

47. These events demonstrate the utility of even unilateral monitoring arrangements for moderating misperceptions of adversary capabilities. A new strategic reconnaissance satellite, launched in 1960, revealed previous estimates of Soviet ICBM numbers to have been grossly exaggerated. For a detailed discussion of the genesis of the U.S. bomber- and missile-gap controversies see Fred Kaplan, *The Wizards of Armageddon* (New York: Touchstone Books, 1983), chaps. 10 and 19.

48. Hagerty, "Opaque Proliferation, Existential Deterrence, and the South Asian Nuclear Arms Competition," pp. 271–272. Scott D. Sagan, in "The Perils of Proliferation," *International Security* 18 (4) (Spring 1994): 66–107 presents very cogent arguments about the organizational and technical impediments to deterrence stability existing in "new" nuclear weapons states, overt or covert. Much of his skepticism about what he terms the "proliferation optimist" school, i.e., that nuclear weapons will stabilize relations between long-time enemies, arises from a survey of early U.S. nuclear

Inaccurate assessment, particularly underestimation, of a counterpart's true retaliatory capabilities vis-à-vis one's own has been implicated as a likely motive for surprise attack.[49] Whether "some doubt" deters as well as "no doubt" would depend on a state's perceptions of both the gravity of the crisis or conflict (e.g., "is national survival at stake"—a question that could be prompted by the perception that a rival state is about launch a preemptive attack, or a sense that an ongoing conventional conflict will be irrevocably lost) and the vulnerability to attack of its nuclear weapons.[50] Many crises or issues that in the past would have provoked war in South Asia are probably seen as less compelling by Indian and Pakistani leaders now that each assumes its counterpart possesses some form of a nuclear weapons capability.[51] Perhaps in common with military and security planners in most every country, Indian and Pakistani decision makers may rely heavily on worst-case assumptions about their counterparts regarding nuclear or military matters. During a visit to South Asia in September 1994, a senior Pakistani Foreign Ministry official told the author, "[w]e prepare as if India has a nuclear weapon capability—we must." He acknowledged the importance of worst-case analysis in Pakistani military, and by extension, nuclear strategic planning, stating that he believes Indian nuclear and military decision makers similarly stress such worst-case assumptions about Pakistani nuclear capability and intentions. In a crisis-driven environment, exaggerated and erroneous notions about a rival's intentions and capabilities could inspire prudence—or foolhardiness.

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military decision making, and doubts about long-term military-organizational stability in many of the threshold nuclear states. Further, he argues, the militaries of these generally resource-poor states are likely to view the costs and complexities of ensuring survivability of nuclear forces as prohibitive and adopt strategies of preemption or launch-on-warning instead.

[49]. Robert Jervis, "Deterrence Theory Revisited," *ACIS Working Paper No. 14* (Los Angeles, Calif.: UCLA Center for Arms Control and International Security, May 1978), pp. 39–40; and Patrick Morgan, "The Opportunity for a Strategic Surprise," in Klaus Knorr and Patrick Morgan, eds., *Strategic Military Surprise: Incentives and Opportunities* (New York: National Strategy Information Center, 1983), pp. 196–197.

[50]. In Pakistan's case, because of its lack of geographic depth, even a conventional war with India could leave it without adequate means to deliver (and thus retaliate) nuclear *or conventional* weapons.

[51]. Other factors may be relevant here. Many of the present generation of South Asian military officials and policy makers may have particularly strong memories of the severity of the 1971 war. Also, most likely neither country was capable of more than "nuclear bluffing" until the last few years. However, the continuing crisis over Kashmir, the cause of three of the four India–Pakistan military conflicts, has considerable potential to escalate to war. During a visit to South Asia in September 1994, a senior Pakistani Foreign Ministry official told the author, "[w]e prepare as if India has nuclear weapons—we must." He acknowledged the importance of worst-case analysis in Pakistani military, and by extension, nuclear strategic planning, stating that he believes Indian nuclear and military decision makers similarly stress such worst-case assumptions about Pakistani nuclear capability and intentions.

The fact that the 1987 Brasstacks episode did not lead to war (however close it came—this event was replete with escalating misperceptions and reactive worst-case planning) and the apparent restraint during the 1990 crisis (at which point many believed India and Pakistan had attained a nuclear weapons capability) do not mean that intractable conflicts, such as the ongoing crisis over Kashmir, are immune to escalation to conventional war and, possible use of nuclear weapons. Peter D. Feaver summarizes the dangers of nuclear ambiguity nicely: "[w]hen war is unlikely, existential deterrence is cheap. As war becomes more likely, the pressures to assure retaliation will mount."[52] What Feaver terms "level two opacity"—that is, minimal weaponization— "is at best a temporary condition, decaying sooner or later into level three," or delaying weaponization *until* the advent of crisis or war. Much deterrence theory analysis justifiably centers on how states can credibly *communicate* their possession of sufficient capability to back up deterrent threats. If a state is to successfully deter its adversaries from undertaking actions that threaten its most vital interests it must effectively communicate both a willingness and capability to respond in ways that would make such adventurism unprofitable for its initiator. Nuclear ambiguity, by definition, entails a lack of formal communication about just what constitutes "vital interests," willingness to retaliate with nuclear weapons against threats to vital interests, and most importantly, possession of the capability to do so.

Even if India and Pakistan were to acknowledge possession of nuclear weapons, the transitional phase to mutual deterrence is likely to be characterized by significant deterrence *instability*.[53] However, the prospects for evolution of a stable system of mutual deterrence in a situation of covert nuclear weapons deployments are doubtful, because any existing incentives for preemption during a serious crisis or conventional war would effectively be frozen in place. Secrecy would preclude communicating the adoption of even unilateral nuclear deterrence and crisis stabilizing measures. For example, Pakistan could secretly adopt measures to ensure the survivability of a larger fraction of its nuclear delivery systems (most likely aircraft) under attack. But it would have to credibly communicate its ability to retaliate sufficiently in order to successfully deter preemption by an adversary, even under conditions of a serious crisis.

In either the case of covert deployment or post-declaration of nuclear weapons status, both India and Pakistan may well perceive strong incentives to strike first in a severe crisis or conventional war in anticipation of preemption by the other, given two factors: first, significant asymmetries in capabilities and vulnerability will likely exist

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[52]. Peter D. Feaver, "Proliferation Optimism and Theories of Nuclear Operations," *Security Studies* 2 (3–4) (Spring–Summer 1993): 176–177.

[53]. For a more detailed examination of the technical requirements of maintaining a stable deterrence relationship between India and Pakistan, see Zalmay Khalilzad, "Proliferation and Stability in Southwest Asia," in Dagobert L. Brito, Michael D. Intriligator, and Adele E. Wick, eds., *Strategies for Managing Proliferation* (Lexington, Mass.: Lexington Books, 1983), pp. 189–197.

TABLE 1.1 Nuclear Weapons and Crisis Instability in South Asia

	India	*Pakistan*
Incentives for First Use in a Crisis		
Geographic Vulnerability (Depth)*	Weaker	Stronger
Asymmetry of (Nuclear) Forces Between Adversaries*	Weaker	Stronger
Perception of Adversary Vulnerability to Preemption	Stronger	Weaker
Perception of Own Vulnerability to Preemption	Weaker	Stronger
Strategic Response to Perceived Vulnerabilities		
Launch on Warning Strategies	Possibly	Likely
First Strike in Anticipation of Preemption	Possibly	Likely
Dispersal of Warheads**	Possibly	Likely

Notes: *Both of these factors determine ability to retaliate after a first strike. **Including forward deployment of tactical nuclear weapons. Dispersal and forward deployment can diminish weapons security and safety; forward deployment of tactical weapons can degrade effective command and control, increasing the likelihood of their use in a military conflict.

between India and Pakistan in the early stages of nuclear weapons deployments,[54] and second, each country is very likely to be aware of such asymmetries between them. In a crisis or conventional war, incentives to use nuclear weapons first could arise under the following conditions (see Table 1.1 for a summary of these arguments):

- The country with "inferior" capabilities (in terms of vulnerability to preemption and retaliatory "insufficiency") anticipates preemption of a significant fraction of its nuclear capabilities by its adversary. This would most likely comprise Pakistan's situation.

- The country with "superior" capabilities is aware of its counterpart's vulnerabilities and, in a crisis, has reason to believe the latter is anticipating preemption and thus likely to use its nuclear weapons first. India could well be confronted with this dilemma.

A nuclear weapons-capable Pakistan may thus give serious consideration to adopting a launch-on-warning policy. Air distances from Indian bases to potential targets are so short that Pakistan may not wait to absorb an Indian preemptive strike before acting, especially if preemption could destroy most of Pakistan's retaliatory capability. A policy of launch-on-warning under these circumstances would be dangerously hair-trigger.[55] Strategies of preemption apparently dominated much of Pakistani military

54. See Rashid Naim's discussion of likely India–Pakistan nuclear force asymmetries and vulnerabilities, and probable incentives for use of nuclear weapons in a crisis. S. Rashid Naim, "Aadhi Raat Kebaab: After Midnight" in Stephen P. Cohen, ed., *Nuclear Proliferation in South Asia: The Prospects for Arms Control* (Boulder, Colo.: Westview Press, 1991), pp. 23–61.

55. Khalilzad, "Proliferation and Stability," p. 194. There is some question as to whether a Pakistani "anticipatory" strike would target Indian cities, military capabilities, or some combination of both; striking Indian cities would most certainly t rigger a similar Indian response. Pakistani counter value attacks would be militarily "useful" only to the extent that Indian command and

decision making in previous wars with India,[56] and there is little evidence that, among current Pakistani military leaders, such thinking has changed.

Again, such incentives may continue to exist even if nuclear weapons status is declared, especially if such declaration is made in the absence of arms control aimed at reducing vulnerability to preemption and enhancing crisis stability. But, because of the greater certainty regarding the capabilities of an overtly nuclear adversary, a much stronger element of caution would be introduced, substantially decreasing incentives to engage in provocation that might lead to lead to the kind of serious crisis that inspires nuclear first-use. Overt status may thus enhance "pre-crisis" deterrence stability. The explicit unilateral and bilateral adoption of arms management measures, however, would be essential to enhancing deterrence stability under crisis conditions.

Arms management can be both a means of mitigating many of the uncertainties that feed threat perceptions and of recognizing the requirements of a stable deterrence relationship, should Indian and Pakistani nuclear weaponization and deployment become a fait accompli. By formalizing, in December 1988, an agreement not to attack each other's nuclear facilities, Rajiv Gandhi and Benazir Bhutto recognized that the destruction of one state's nuclear option by the other is a highly probable action in a war, or even a less serious crisis. By doing so, both also acknowledged the "logic of instability" inherent in an ambiguous nuclear relationship. Each also seemed to implicitly accept the right of the other to retain a nuclear option (mutual recognition of the right to exercise the option—go nuclear—may be another matter altogether). A regional nuclear monopoly, such as Israel attempted to impose on the Middle East with its destruction of Iraq's Osirak reactor, is probably not in the long term interests of either state, even if in the form of an ambiguous option.[57]

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control capabilities are disrupted or destroyed. Counterforce attacks would be limited to targets within range of Pakistani aircraft, and Indian air defense superiority would make such attacks a dubious prospect. It is thus doubtful that Pakistan would initiate large-scale attacks with nuclear weapons, *unless* it received warning of an imminent Indian attack. Pakistani early-warning systems could not, of course, ascertain whether incoming Indian planes were nuclear or conventional armed; decisions would likely be made on the assumption that Indian aircraft carried nuclear weapons.

[56]. Sumit Ganguly, *The Origins of War in South Asia* (Boulder, Colo.: Westview Press , 1986), pp. 57–95.

[57]. Of course, in practical terms China has a nuclear monopoly vis-à-vis India "Unilateral" deterrent systems are prone to crisis instability because they are highly dependent on the intentions of the state possessing a preponderance of deterrent capabilities, i.e., on whether or not that state is a "status quo" power. Such states may be tempted to settle every score in their favor, giving lesser rivals strong and unremitting incentive to match the capabilities of their more powerful adversary in order to move toward a system of mutual deterrence. Arms racing is thus a likely consequence of unilateral deterrent systems, with the transition to a system of mutual deterrence being characterized by strong incentives for preemption on the part of the more powerful state. See Patrick Morgan, *Deterrence: A Conceptual Analysis* (Beverly Hills, Calif.: Sage Publications, 1983), pp. 84–92.

Deterrence and Small Nuclear Forces

If they indeed possess nuclear weapons, India and Pakistan most certainly possess them in small numbers. Small absolute force size means that the relative importance of disparities in nuclear force capabilities between India and Pakistan, or India and China, is much greater than in the U.S.–Soviet context.

Pakistan could attain an assured second strike capability by either expanding its nuclear forces to achieve parity with India or by substantially reducing the vulnerability of its retaliatory forces.[58] Even in an arms control context, however, measures aimed at achieving numerical parity between India and Pakistan (or India and China) would likely be destabilizing. Bringing India and Pakistan to parity would require that Indian nuclear forces be frozen numerically while Pakistan is permitted to "catch up." India would view this with alarm, especially because its development of a nuclear capability vis-à-vis China would be constrained. Moreover, India has consistently rejected any formula of equation with its smaller neighbor. Under these circumstances arms control would better focus on a combination of confidence building measures, restrictions on deployments of particularly destabilizing nuclear weapons, and enhancing Pakistani second strike survivability, or negotiated elimination of nuclear weapons.

Arms Management and Covert Nuclear Forces

Before considering the compatibility between effective arms control and "nuclear ambiguity," we must first distinguish between declaration of nuclear weapons *possession* and declaration of *commitment* to nuclear weapons-state status. Conceivably, both India and Pakistan could declare possession within the context of an arms control regime, while refraining from *official commitment* to nuclear weapons-state status. Declaration of capabilities within an arms control context need not commit threshold nuclear states such as India and Pakistan to the linear nuclear evolution of the established nuclear weapons states (i.e., ever-expanding nuclear arsenals, and the development of advanced nuclear weapons designed for war fighting). Such states could just as well negotiate verifiable restrictions on the size of arsenals, modes of deployment and technical characteristics of existing nuclear weapons while abstaining from additions to military nuclear capabilities. By refraining from additional testing after Pokhran, India demonstrated that states can indeed control the rate at which they acquire nuclear weapons capabilities, and postpone official commitment to nuclear-weapons state status.

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58. Richard Rosecrance, "Strategic Deterrence Reconsidered," *IISS Adelphi Papers*, No. 116 (1975): 4–7. Even a numerical parity between Indian and Pakistani nuclear forces may not provide Pakistan with retaliatory sufficiency, given its lack of territorial depth.

Mutual acknowledgment of military nuclear capabilities would be essential for arms control efforts that aim to institutionalize a stable relationship of mutual deterrence. If India and Pakistan should decide to deploy nuclear weapons, declarations of such intent would permit the explicit adoption of measures to ensure nuclear weapons safety, security, and survivability under attack. Moreover, admitting military nuclear capabilities would enable each side to communicate clearly the circumstances under which it would resort to the use of nuclear weapons, and the will and capability to do so or retaliate in response to nuclear first use. Without such communication one or the other side may be tempted to press on in a crisis, believing its opponent incapable of initiating the use of nuclear weapons or retaliating should the aggressor initiate their use. This would be especially likely if an aggressor were to initiate the use of tactical nuclear weapons in the mistaken belief that it could keep a conflict limited because its victim lacked the means to respond in a similar fashion.[59]

Rationale for Overt Nuclear Status. It has already been noted that covert nuclear status impedes the adoption of arms management measures aimed at remedying deterrence instabilities. There are a number of persuasive reasons in favor of a covert nuclear weapons state declaring its status, *if it has deployed militarily usable nuclear weapons*. Shai Feldman describes four principal reasons why secretive nuclear weapons capabilities are more dangerous than overt nuclear status, some of which have been alluded to previously:[60]

- The circle of relevant decision makers is necessarily kept small in the interests of secrecy. Little or no accountability thus exists in the formulation of strategic doctrine or nuclear targeting plans. The intensity and pace of a crisis would not allow for a reexamination of faulty targeting plans or doctrines dictating at what point in a conflict nuclear weapons would be introduced. Only during a crisis could the existence and plans for use of nuclear weapons become known to those outside the limited circle of decision makers. In 1989–1990, Pakistani Prime

[59]. Because they blur the line between conventional and nuclear warfare, the initial use of tactical nuclear weapons in a conflict that started out conventional, even for "demonstration shot" purposes, makes escalation to a "strategic" nuclear exchange much more likely, especially if command and control is limited. See Richard Rosecrance, "Strategic Deterrence Reconsidered," *IISS Adelphi Papers*, No. 116 (1975): 22–23. Moreover, for reasons of geography, climate, and population distribution, the use of tactical nuclear weapons in an India–Pakistani war is unlikely to be limited to "tactical" consequences. See Rashid Naim, Aadhi Raat Kebaab: After Midnight." For discussion of possible Indian military strategies involving the use of tactical nuclear weapons in a conventional war with China or Pakistan, see Rodney Jones, "India's Nuclear Strategy," *Nuclear, Biological, and Chemical Defense and Technology International* 1 (2) (May 1986): 66–72.

[60]. Shai Feldman, "Managing Nuclear Proliferation," pp. 304–307. See also Peter D. Feaver, "Proliferation Optimism and Theories of Nuclear Operations," *Security Studies* 2 (3–4) (Spring–Summer 1993): 175–178.

Minister Benazir Bhutto was reportedly kept uninformed about progress in her country's nuclear weapons research.[61]

• Doctrine for covert nuclear forces is likely to be formulated exclusively by the military. Consequently, doctrines and plans for use of nuclear weapons are likely to be of an offensive, war-fighting nature, increasing the probability that the weapons will actually be used in a serious crisis or conflict. Command and control capabilities are likely to be limited because of secrecy, severely impeding efforts to terminate the use of nuclear weapons, especially tactical, once begun. It is improbable that technical and procedural mechanisms to guard against premature or unauthorized use of nuclear weapons will have been implemented. Even if field commanders have their doubts about the reliability of covertly developed tactical nuclear weapons, if command and control is limited, they might be more inclined to use such weapons indiscriminately in battle, attempting to reverse a situation that appears to be going badly.

• Covert nuclear weapons states cannot communicate the intentions regarding circumstances likely to provoke the use of nuclear weapons that are the basis of stable deterrence. NATO's doctrine of willingness to initiate the use of nuclear weapons in the event of imminent conventional defeat, whatever its merits on other grounds, conveys an unambiguous message about what actions by a potential adversary could well provoke the use of nuclear weapons. The intentions and capability communications function of arms control has been discussed earlier. Of this Feldman writes:

> The transmission of messages regarding capabilities and intentions must be an ongoing activity; if it is delayed until the actual occurrence of war escalation may be unavoidable.[62]

• Finally, widespread domestic awareness of the existence of nuclear weapons capabilities sensitizes elites to the dangers of aggression. Knowledge of the existence of such weapons is likely to induce considerable trepidation among both elites who might otherwise encourage policies of aggression and naively overconfident adversaries.

These are not arguments in favor of "going nuclear." Rather, they are strong cautionary notes to states with an extant covert nuclear weapons capability (such states have already gone nuclear) about the obligations of safely maintaining such an arsenal. If India and Pakistan are currently *in possession of nuclear weapons*, effective arms management undertaken in the interests of deterrence and crisis stability demands that the bombs be brought up from the basement, under the controls imposed by formal,

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61. Apparently U.S. CIA Director William Webster knew more than Bhutto about the Pakistani program. Webster had briefed her on details of the program, of which she claimed to have no knowledge. Seymour Hersh, "On the Nuclear Edge," *The New Yorker*, March 29, 1993, p. 61.

62. Shai Feldman, "Managing Nuclear Proliferation," p. 306.

verifiable arms control. To reiterate, making nuclear capabilities more transparent for the purposes of effective arms control is *not* equivalent to declaring commitment to permanent status as a nuclear weapons state

Reasons for Keeping Covert. Certainly, states which have yet to deploy nuclear weapons should be strongly encouraged to abstain from doing so. For states that have covertly deployed nuclear weapons, there are several compelling "strategic" justifications for not acknowledging nuclear weapons capabilities:

- Perhaps most significantly, covert status can itself be an implicit form of arms control, because its successful maintenance imposes severe restraints on weapons development and size of arsenals. Obviously, only zero-yield and nonnuclear component testing is permissible under such conditions, constraining the development of tactical nuclear weapons and the mating of warheads to ballistic missiles because the former require confidence in expected yield and the latter requires that warheads be relatively miniaturized.[63]

- Covert status can preserve diplomatic and domestic political flexibility by enabling quiet retreat from commitment to nuclear weapons-state status.[64] Once nuclear weapons status is acknowledged, renunciation of nuclear weapons may prove highly improbable or even impossible. However, if renunciation is done unilaterally in a context of secrecy, rival states may continue to hold now-erroneous perceptions that the "renouncing" state still possesses some form of nuclear weapons capability. Ideally, covert nuclear rivals would mutually renounce commitment to nuclear weapons status, though this may be extremely difficult to effect in practice, if "negotiated" tacitly.[65]

- Official acknowledgment of nuclear weapons possession, even in the context of arms management or for verification purposes, may inspire states considering nuclear weapons to push ahead with developing them. Even states which had given little thought to a nuclear weapons program prior to another's acknowledgment of possession might be encouraged to undertake such a program. In the case of rival "threshold" states, such as India and Pakistan, which have *probably* not yet deployed nuclear weapons, a declaration of commitment to status as a nuclear weapons state by one would most certainly be followed by a similar declaration by the other. On the other hand, mutual acknowledgment of such capabilities within an arms control framework could avert costly arms racing and "copycat" nuclear programs by other states.

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63. A. F. Mullins, "Proliferation in South Asia: The Military Dimension" (Livermore, Calif.: Lawrence Livermore National Laboratory, Manuscript, n.d.), p. 6.

64. Joeck, "Tacit Bargaining and Stable Proliferation in South Asia," p. 2.

65. See subsequent discussion in this study of the difficulties of verifying "tacit" arms control agreements or understandings.

• In many ways, covert nuclear weapons states command some of the prestige of the declared nuclear weapons states in the international arena with minimal investment, particularly if they are considered by the latter to be "outlaw" or "renegade" states. As evident from recent events regarding North Korea, the intentions of states suspected of developing nuclear weapons can occupy a disproportionate share of other states' policy and security concerns. Unfortunately, for policy makers and military officials of many covert nuclear weapons states (*and* nonnuclear weapons states), weapons of mass destruction are still perceived as the sine qua non of international influence. How attentive are the media of the declared nuclear states to Indian and Pakistani events unrelated to proliferation issues?

"Nonweaponized" Deterrence

In recent years, some have attempted to devise a region-specific "doctrine" for enhancing the stability of South Asia's ambiguous "option" approach to nuclear weapons. Indeed, a mutual commitment to keep warheads separate from delivery vehicles may be a way around the covert–overt dilemma. Called "nonweapized deterrence" by George Perkovich,[66] such an arrangement could preserve the real and perceived benefits of nuclear ambiguity for India and Pakistan, provided effective verification exists to ensure each country's nonweapization. Without the certainty regarding the status of each country's arsenal afforded by a formal verification regime however, nonweaponized deterrence is at best a symbolic gesture. The dangers associated with ambiguity, the incentives for possibly using nuclear weapons in a serious crisis (such as a conventional war), remain.

The purpose of a nonweapization regime is two-fold: first, not necessarily to eliminate Indian and Pakistani nuclear "potential" but rather to accomplish what regional geography cannot: buy time for crisis resolution and breathing room for decision makers. Through verification and monitoring, each country could be adequately assured that its counterpart's weapons are not poised in a "use them or lose them" mode of deployment, reducing incentives for preemption. Further, the probability of detecting a country's intent to weaponize is greatly improved with a formal verification regime than without it. Some warning would thus be available to its counterpart and extraregional actors to initiate mediation of the crisis or conflict that inspired withdrawal. Second, India and Pakistan would not be obligated to commit to a traditional arms control regime that requires declaration and renunciation

66. George Perkovich, "A Nuclear Third Way in South Asia," *Foreign Policy* 91 (Summer 1993): 85–104. The term *weaponization* is used here to refer to the mating of nuclear warheads with delivery vehicles, such as missiles or aircraft. *Nonweaponization* will refer specifically to the arms control proposal discussed here.

of nuclear capabilities. Blocking weaponization but preserving the option leaves open the possibility of a quiet retreat from development of a nuclear arsenal, and lessens the impact of domestic pronuclear constituencies in both countries. Though nuclear proponents do not comprise a majority of Indians or Pakistanis, they can be politically potent.

Regarding nonweaponization, General Krishnaswami Sundarji, former Indian Army Chief of Staff states:

> [M]inimum nuclear deterrence in South Asia can be made to stick without weaponization or deployment in the classic sense, providing that certain tacit understandings are arrived at regarding the continued maintenance of capped but live capabilities of weaponizing at short notice, and having the requisite vectors for effective delivery, but not marrying with warheads and deploying them in advance. (emphasis added)[67]

If, by "tacit understandings," Sundarji is referring to a formal, verifiable nonweapization regime, the stability of an India–Pakistan relationship of mutual deterrence, based on the knowledge that each country could "weaponize" within a relatively short period, would be significantly reinforced by the assurance provided by effective verification. A nonweapization arrangement could be devised for each phase of the warhead-to-weapon assembly process in order to lengthen "strategic warning time"—the time necessary to transport, assemble and deploy nuclear weapons in a crisis.

Because it may be unacceptably intrusive to inspect and account for warhead cores and components, effective verification schemes for a nonweapization agreement would be very similar in scope and nature to those for limitations on the production of fissile materials, testing and deployment of overtly declared nuclear capabilities. Presumably, each country would be permitted to keep the warhead components and weapons-grade fissile materials it had accumulated prior to concluding a nonweapization agreement, effectively capping its arsenal.

A nonweapization regime focused only on testing and deployment requires less intrusive verification than an agreement to restrict the production and disposition of fissile materials. Nuclear warhead "cores" could be stockpiled, but not tested or diverted from storage for mating to potential delivery vehicles. Verifying nonweaponization might be no more complicated than perimeter monitoring of vehicles entering air bases and missile sites to detect the presence of radioactive materials. Test-ban monitoring, though not essential to a nonweaponization

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67. General K. Sundarji, "A Proposed Approach for a Solution of the South Asian Nuclear Conundrum," Paper presented at Workshop on Possible Interlinked South Asian and Worldwide Nuclear Arms Control and Disarmament Initiatives, Fudan University, Shanghai, February 23–26, 1994, p. 18. Private delegations from India, Pakistan, China, and the United States participated in this conference on regional arms control. See also "Arms Control in South Asia," *Federation of American Scientists Public Interest Report* 47 (2) (March–April 1994) for a summary and analysis of the Shanghai conference.

agreement, would provide added assurance that nuclear capabilities are indeed "capped." By focusing on delivery vehicles and testing, a nonweaponization agreement would circumvent politically difficult inspections of nuclear production and research facilities altogether. Verification methods and technology for an agreement banning the mating of warheads to delivery vehicles are discussed in a subsequent section.

Alternatively, arms control measures may be aimed solely at reducing the opportunities for initiation of conventional military conflict and its subsequent escalation to nuclear weapons use, rather than at the existence of the weapons themselves. Such confidence building measures (CBMs) would permit each country to retain nuclear weapons covertly while attempting to eliminate motivations for their use in a conflict. But if a serious crisis or conventional military conflict did develop in the absence of arms control aimed at explicit management of nuclear weapons capabilities, the uncertainties surrounding each country's covert nuclear options and will to use them may likely overshadow the best of crisis management efforts. Indian temptations to preemptively attack possible warhead storage depots, air bases, or vulnerable missile launchers, and Pakistani incentives to use nuclear weapons in anticipation of a preemptive strike would be no less. Conventional arms confidence building measures are nonetheless a valuable starting point for countries thinking about nuclear arms control. Additionally, they may be easier to negotiate than more comprehensive forms of arms limitations that necessitate detailed and sometimes rather intrusive verification measures. Trust is an essential element of mutual commitment to arms control regimes requiring verification; confidence building and conventional war prevention measures could provide positive steps toward its development.

Summary of Main Points: Chapter I

U.S.–Soviet efforts to define and refine arms control comprise the most extensive body of arms control experience to date. *The lessons of forty years of "nuclear learning," including several serious crises, could forestall similar crises and facilitate arms control successes in other regions.*

• *It is argued that,* should *both countries opt for deployment, deterrence and crisis stability is best enhanced by mutual acknowledgment of nuclear weapons capabilities* within an arms control framework *aimed at the objectives stated earlier.* Declaration of capabilities within an arms control context need not commit threshold nuclear states such as India and Pakistan to the linear nuclear evolution of the established nuclear weapons states (i.e., ever-expanding nuclear arsenals, and the development of advanced nuclear weapons designed for war fighting). *Effective, verifiable arms control can help ensure that "horizontal" proliferators do not become "vertical" proliferators.*

• *However, retaining covert nuclear status (the "option" strategy) confers several significant benefits for both threshold states and advocates of stronger nonproliferation policy.* Covert

status can itself be an implicit form of arms control, because its successful maintenance imposes severe restraints on weapons development and size of arsenals. Once nuclear weapons status is acknowledged, renunciation of nuclear weapons may prove highly improbable or even impossible. Official acknowledgment of nuclear weapons possession, even in the context of arms management or for verification purposes, may inspire states considering nuclear weapons to push ahead with developing them. In many ways, covert nuclear weapons states command some of the prestige of the declared nuclear weapons states in the international arena with minimal investment.

• Some contend that mutual awareness of abilities to produce air-deliverable fission weapons in a short period of time enables a rudimentary deterrence relationship between these countries. *However, should India, Pakistan or both make the transition to covert* deployment *of nuclear* weapons, *there is ample reason to believe that their "nuclear relations" will be characterized by a great deal of instability in crisis situations. Because secrecy would preclude communicating the adoption of deterrence and crisis stabilizing measures, keeping nuclear weapons covert would effectively "freeze in place" any existing incentives for preemption during a serious crisis or conventional war.*

• Uncertainty about the *outcome* of military conflict (for example, being unsure about whether one's probable losses will outweigh any potential gains) may enhance deterrence. Uncertainty about an adversary's ability to carry out deterrent threats, in contrast, most likely does not. *Analyses of India–Pakistan deterrence often fail to make this distinction, contending that deterrence stability is inherent to ambiguity* per se.

• Even if India and Pakistan were to acknowledge possession of nuclear weapons, the transitional phase to mutual deterrence is likely to be characterized by significant deterrence *instability. Overt status* may *enhance "pre-crisis" deterrence stability. The explicit unilateral and bilateral adoption of arms management measures, however, would be essential to enhancing deterrence stability under crisis conditions.*

• In either the case of covert deployment or post-declaration of nuclear weapons status, *both India and Pakistan may well perceive strong incentives to strike first in a severe crisis or conventional war in anticipation of preemption by the other, given two factors: first, significant asymmetries in capabilities and vulnerability will likely exist between India and Pakistan in the early stages of nuclear weapons deployments and second, each country is very likely to be aware of such asymmetries between them.* Pakistan especially may perceive its nuclear weapons to be highly vulnerable to preemptive attack. Geographic distances to potential targets are so short that Pakistan may not wait to absorb an Indian preemptive strike before acting, especially if preemption could destroy most of Pakistan's retaliatory capability. A policy of launch-on-warning under these circumstances would be dangerously hair-trigger.

• *A mutual commitment to keep warheads disassembled or separate from delivery vehicles may be a way around the covert–overt dilemma. Blocking weaponization would preserve the option strategies adopted by India and Pakistan and leave open the possibility of a future retreat from development of a nuclear arsenal.* With a formal, verifiable "nonweapization"

regime, the stability of an India–Pakistan relationship of mutual deterrence, based on the knowledge that each country could "weaponize" within a relatively short period, *would be significantly reinforced by the assurance provided by effective verification.* A nonweapization arrangement could be devised for each phase of the warhead-to-weapon assembly process in order to lengthen "strategic warning time"—the time necessary to transport, assemble and deploy nuclear weapons in a crisis.

• *Verifying nonweapization might be no more complicated than perimeter and portal monitoring of vehicles entering air bases and missile sites to detect the presence of radioactive materials.(with some provision for limited "special "on-site inspections).* Test-ban monitoring, though not essential to a nonweaponization agreement, would provide added assurance. By focusing on delivery vehicles and testing, a nonweaponization agreement would circumvent politically difficult inspections of nuclear production and research facilities altogether.

II

Arms Management Measures

Earlier, it was noted that arms management is designed to enhance and maintain deterrence stability. In the U.S.–Soviet arms control context, deterrence stability primarily means reducing the incentives to resort to the use of nuclear weapons in a crisis situation, but it can also refer to reducing the incentives to initiate a conventional military conflict that may lead to the use of nuclear weapons. Making such a distinction permits arms controllers to focus on establishing "firebreaks" between political conflict and the initiation of conventional military conflict as well as between the initiation of the latter and escalation to nuclear weapons use. For reasons discussed previously, nuclear deterrence between India and Pakistan may not be so robust as to withstand serious crises such as conventional war. *South Asian nuclear war prevention measures should therefore focus on reducing the incentives for the initiation of conventional military conflict as the "first line of defense" against the potential use of nuclear weapons.* Measures to prevent the escalation of conventional conflict to the nuclear level comprise a crucial second line of defense.

Conventional War Prevention

In the U.S.–Soviet–European context, arms management aimed at preventing the outbreak of conventional war generally refers to the use of confidence-building measures (CBMs).

The importance of CBMs as a potential means of war prevention cannot be understated. The Indian Working Paper submitted to the 1983 session of the UN Disarmament Conference disparaged CBMs as being of "marginal significance" and a distraction from the more urgent task of global nuclear disarmament.[68] Rather than

[68]. Charles C. Floweree, "CBMs in the UN Setting," in John Borawski, ed., *Avoiding War in the Nuclear Age* (Boulder, Colo.: Westview, 1986), pp. 107–108. The Indian view of deterrence is equally disparaging; the Indian government professes not to abide by a doctrine of deterrence. See speech by Indian Minister of Defense K. C. Pant at Massachusetts Institute of Technology, Cambridge, "Comments on Philosophy of Defense," reprinted in *FBIS-South Asia*, July 21, 1989, p. 39. As with CBMs, concepts of deterrence are often considered as justification for superpower evasion of nuclear disarmament obligations under the NPT. Deterrence should not, however, be thought of as a matter of choice, or even doctrine, motivated by any particular cultural, political or ideological position. For the purposes of this study, deterrence is considered a condition that results from the existence of a mutual desire to avoid military conflict, arising from a mutual awareness

mere distractions, however, CBMs can in actuality be a constructive approach to mitigating the factors that could easily lead to the use of weapons (conventional or nuclear) until substantial weapons reductions or eliminations are, if ever, effected. Furthermore, institutionalizing "mutual reassurance," which might be achieved through a system of CBMs, is probably essential for maintaining long-term deterrence stability.[69] In a related vein, Richard K. Betts notes that "War is never absolutely inevitable. The challenge to . . . deterrence is to cover the situation where war seems almost inevitable."[70]

Johan Holst and Karen Melander have defined *confidence building* as "[t]he communication of credible evidence of the absence of feared threats."[71] Confidence building *measures* have been defined by Jonathan Alford as "measures that tend to make military intentions explicit."[72] CBMs aim to lessen opportunities for the initiation of war either through accidental miscalculation and misperception, or by surprise attack. Reducing opportunities for the latter comes primarily from the use of CBMs as a means of removing the element of surprise. CBMs can obstruct the secretive, large-scale planning required for a successful surprise attack. Enhancing states' abilities to detect deviations in adversary military actions that may be indicative of war preparations, or accurately interpret adversary military actions not intended as war preparations are thus the most important objectives of CBMs. In other words, CBMs increase predictability (or transparency) about the actions of the other side by "Facilitat[ing] recognition of the 'normal' pattern of military activities."[73] They attempt to do so by constraining the actual or potential use of weapons in three ways: communications and information exchange, observation and inspection, and restraints on operations and deployments. Table 2.1 presents examples of these major types of CBMs.

For a region-specific illustration of the potential usefulness of CBMs for moderating war incentives, consider the crisis precipitated by India's extensive "Brasstacks" maneuvers along the India–Pakistan border in 1986–87. By January 1987 India had placed its troops on full alert, citing a massive buildup of Pakistani troops along the border. Reportedly, each side had together amassed more than

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that the potential destructiveness of war for *both* sides outweighs any possible benefits to be gained from it by *either* side.

69. Edward A. Kolodziej, "Limits of Deterrence Theory," *Journal of Social Issues* 43 (4) (1987): 132.

70. Richard K. Betts, "Hedging Against Surprise Attack," *Survival* 23 (4) (July–August 1981): 155.

71. Johan Holst and Karen Melander, "European Security and Confidence Building Measures," *Survival* 19 (4) (July–August 1977): 147.

72. Jonathan Alford, "The Usefulness and Limitations of CBMs," in William Epstein and Bernard Feld, eds., *New Directions in Disarmament* (New York: Praeger, 1981), p. 134.

73. Johan Holst, "Confidence Building Measures: A Conceptual Framework," *Survival* 25 (1) (January–February 1983): p. 2.

200,000 troops in the area.[74] The Pakistani troop buildup represented a classic "action-reaction" escalation response to the massive Indian maneuvers. The existence of a crisis hotline linking New Delhi and Islamabad seems to have done little good: H.K. Dua, an editor of the *Hindustan Times*, remarked that "[n]o one had even tried to talk on the hotline with the other the other."[75] The hotline in fact, had been disconnected. Compounding the lack of accurate information available to either side were exaggerated figures and misleading maps of the Pakistani troop buildup printed in the Indian press. Sadly, the source of such distorted information was reportedly "high-level defense briefings."[76] Moreover, there were indications that the Indian maneuvers were undertaken at least partly as a warning to Pakistan not to acquire AWACs radar aircraft from the U.S. The gravity of the crisis was evinced by former Pakistani President Zia ul-Haq's remark that "[n]either India or Pakistan wanted to go to war but we could have easily gone into war."[77]

TABLE 2.1 Types of Conventional Confidence Building Measures

Communications and Information Exchange	*Observation and Inspection*	*Restrictions on Deployment and Operations*
Disclosure of military budgets, major unit and command location and organization, force levels and doctrine	Exchange of observers at major maneuvers	Maneuver, movement, and exercise ceilings
Notification of conventional weapons accidents or unauthorized use that could adversely affect security of other side	On-site inspections (OSI)	Thinning of forces within designated border zones
Notification of major military maneuvers, especially. those near sensitive border areas	Remote and manned permanent monitoring and observation posts	Ban on forward basing of offensive conventional weapons support equipment
Ban on coded radio traffic	Nonconcealment and transparency measures (to enhance observation by inspectors or NTM)	Designated troop entry and exit points Ban on "simulated attack" maneuvers
Crisis "hotline" communications links		Agreement not to use maneuvers for political signaling and intimidation

Sources: J. Borawski, ed., *Avoiding War in the Nuclear Age*, p. 11 and Appendix A: "A CBM Handbook"; J. Alford, "The Usefulness and Limitations of CBMs," in Epstein and Feld, eds., *New Directions in Disarmament,* p. 136.

74. Matt Miller, "Tensions Escalate Between Old Enemies, India and Pakistan," *Wall Street Journal*, March 4,1987, p. 30. For a detailed account of the Brasstacks episode see Ravi Rikhye, *The War That Never Was* (Delhi: Chanayaka Publications, 1988).

75. Sanjoy Hazarika, "India Puts Military on Full Alert, Citing a Pakistani Troop Buildup," *New York Times*, January 24, 1987.

76. Miller, "Tensions Escalate."

77. Ibid.

The escalation of fears and misperceptions and the resultant massing of troops by both sides might have been avoided had certain kinds of CBMs been adopted by India and Pakistan prior to the initiation of the Brasstacks maneuvers (assuming, of course, that neither side actually wanted a war; even in this case, CBMs would have made it very difficult to mobilize for war under the guise of training exercises). At least four types of CBMs might have contributed to averting this near blunder into war:

- Advance notification of impending maneuvers above a specified ceiling, in particular those held near sensitive border areas. Notification well in advance would prevent the use of military maneuvers for political intimidation, a potential precipitant of military conflict, especially if the intimidation is blatant. Notification data should include: general purpose of the maneuver, numerical strength of forces involved, area, and duration of the exercise.[78]
- Ceilings on size of maneuvers held near sensitive border areas.
- The presence of Indian observers or inspectors at Pakistani military exercises and vice versa, to confirm data provided by notification.
- Active, early use of the crisis hotline by each side to clarify intentions should evidence of misperception by a counterpart become evident. Obviously, for communications measures to be effective, communication must take place.

A subsequent incident involving India and China later in 1987 resulted in the massing of a total of 400,000 troops by both countries along the Chinese border with Arunachal Pradesh in northeastern India.[79] China claimed that Indian troops had crossed into the Chinese-controlled Tibetan Autonomous District. The basis for such conflict between India and China stems from contested territory along the border, a dispute that has its origins in Anglo–Chinese treaties of the nineteenth century and contributed to the 1962 Sino–Indian war. India and China may be reluctant to implement CBMs until such territorial issues are resolved to the satisfaction of both sides. However, establishing a crisis hotline between Beijing and New Delhi, and verifiable agreement to abstain from conducting military exercises in contested territory might be two useful measures that both countries could adopt for the duration of negotiations to resolve border claims.

Lessons From the Sinai

A non-European context in which CBMs have worked especially well is the inspection and monitoring regime established by the Israeli–Egyptian Sinai Disengagement Agreement of 1975. Verification of this agreement involved the use of

78. See, for example, 1986 Stockholm Accords, NATO CSCE proposal.
79. Sanjoy Hazarika, "Border of China and India is Tense," *New York Times*, May 8, 1987, p. A7.

unmanned sensor fields located at the entrances to the Giddi and Mitla Passes, Egyptian and Israeli manned surveillance posts at opposite ends of the Giddi Pass, and a demilitarized buffer zone monitored by the United Nations Emergency Force.[80] The unmanned sensor fields provided an electronic early warning system capable of detecting and identifying intruding vehicles and even people. Monitoring technology for the sensor fields was provided by the U.S. as a guarantor of the agreement. The United States also conducted SR-71 reconnaissance overflights of the area on a weekly basis. Information obtained by U.S. aerial surveillance was relayed directly to Egypt, Israel, the U.S., and the UNEF command. U.S. on-site inspection teams performed an additional verification function. The Sinai regime is particularly relevant to South Asia because the rather simple but effective sensors[81] enabled monitoring of cross-border infiltrations. Such monitoring was instrumental in allaying fears of surprise attack and preventing cross-border artillery and rocket bombardments.

The sensor-field technology was especially applicable to the short geographic distances encompassed by the Sinai Peninsula. While disputed territories and boundaries in South Asia range over much larger distances, sensor fields and manned observation posts could be placed at key mountain passes or locations with a high frequency of cross-border infiltrations.

The success of the Sinai verification and monitoring regime is evident in the lack of reported or detected treaty violations considered serious enough jeopardize the accord. Nor were any significant complaints of attempts to collect "collateral" military intelligence registered with the Egyptian–Israeli Joint Military Commission, a mechanism established by the agreement for consultation purposes. Apparently, all compliance questions were resolved satisfactorily by the Commission.

In South Asia the obvious candidates for a similar confidence-building and verification regime would be disputed territories and boundary lines in Kashmir, such

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80. David Barton, "The Sinai Peacekeeping Experience: A Verification Paradigm for Europe," in *1985 SIPRI Arms and Disarmament Yearbook* (Oxford: Oxford University Press, 1985), pp. 541–563; Sergey Koulik, "The 'Sinai Experience'," in Richard Kokoski and Sergey Koulik, eds., *Verification of Conventional Arms Control in Europe: Technological Constraints and Opportunities* (Boulder, Colo.: Westview Press, 1990).

81. Sensors used included strain sensitive cables, acoustic, magnetic and infrared sensors, miniature seismic intrusion detectors, and commercial low-light TV cameras. Incidents of sensor activation were confirmed visually at manned watch stations, using commercially available binoculars and telescopes (range: 20 kilometers in daylight, 5 kilometers at night, though vision was periodically obstructed by dust and fog. Intruders were stopped by UNEF forces if they could not be clearly identified by watchmen). Larry Trost, "Sensors in the Sinai," Sandia National Laboratory (Albuquerque, N.Mex.), presentation given at Workshop on Verification of Regional Arms Control and CBM Agreements, Program in Arms Control, Disarmament, and International Security, University of Illinois at Urbana–Champaign, March 3, 1994; Sergey Koulik, "The 'Sinai Experience,'" pp. 220–221.

as the Siachen Glacier, Aksai Chin[82], and the Kashmir cease-fire Line of Actual Control (LAC) established in 1972. Territory in dispute between India and China in the northeast is an added possibility. The most serious political obstacle to implementing such a monitoring regime is, of course, the need for agreement to militarily disengage from disputed areas; neither India or Pakistan officially recognizes the line of control as the status quo in Kashmir, and China rejects India's interpretation of the MacMahon Line as the latter's international border. Nonetheless, a monitoring and inspection regime could serve to effectively verify temporary disengagement agreements during negotiations over contested territories. Such an arrangement could effectively avert hostilities or "accidents" that might derail a delicate negotiating process. It could also provide a trial run of verification systems for a more permanent settlement. In addition to demonstrating the merit of rather low-cost, low-maintenance CBM monitoring technology, the Sinai disengagement experience illustrates a number of lessons with relevance to South Asia:[83]

- Successful verification can itself contribute to easing political tensions between adversaries. The confidence building afforded by the Sinai monitoring regime facilitated the Middle East peace process, culminating in the Egypt–Israel Peace Accord of 1979.[84]
- Trusted third-party states can provide significant technical and administrative assistance for implementing a verification regime.
- On-site inspections can be intensive, yet not offensively intrusive.
- A joint, high-level military (or civilian) commission can act effectively as a compliance and consultation mechanism.
- Formal treaties and agreements provide a legal framework for implementing effective verification.
- A graduated thinning of military forces closer to sensitive border areas reduces the opportunities for military conflict.

Lieutenant Colonel Itshak Lederman of the Israeli Defense Force concisely summarized the utility and effectiveness of the Sinai monitoring regime: "It . . . proved that a complex verification regime can be operated successfully where there is a political will on the signatories' part in addition to an appropriate mechanism of coordination between all the parties. Too, the right combination of technical measures and manned operations proved to be vital to the successful operation."[85]

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82. In many of these areas, low-maintenance sensors impervious to extreme cold would be required.

83. Barton, "The Sinai Peacekeeping Experience: A Verification Paradigm for Europe," pp. 551–556.

84. Trost, "Sensors in the Sinai."

85. Quoted in Ibid.

Recent India–Pakistan and India–China Confidence Building Measures

In contrast to earlier attitudes, and even despite the current downturn in their relations, India and Pakistan have become increasingly receptive to the role of conventional CBMs in war prevention. Partly because of the Brasstacks episode, and partly because of fears that renewed conflict over Kashmir could erupt into war, both states have agreed to several measures, aimed at military operations, since 1990.[86]

The Indian and Pakistani Director Generals of Military Operations resumed the hotline between them that had been established after the 1971 war, agreeing to use it to maintain weekly contact. Western sector commanders along the Kashmir Line of Control are also linked via hotline. Since many of these measures were agreed to however, escalating conflict over Kashmir has all but obstructed their implementation. In September 1994 a senior official of the Indian Ministry of External Affairs characterized both the implementation of already-agreed CBMs and discussions of future measures between India and Pakistan as "going nowhere," in contrast with steadily improving India–China relations and progress on their CBM agreements.[87] Both India and Pakistan have used CBM agreements as yet another venue for leveling accusations of untrustworthiness. Aside from the obvious difficulties arising from tensions over Kashmir, the effectiveness of recent CBMs is seriously hampered by these agreements' lack of a dispute resolution mechanism , e.g., a joint commission to deal with suspected noncompliance and exchange of required data. An official of the U.S. Arms Control and Disarmament Agency has characterized these problems as stemming from a lack of a "sense of ownership;" the hasty adoption of CBMs under international pressure following Brasstacks created measures without much commitment to their success or thought to their design.[88] The necessity of a formal agreement-mandated institution for resolution of disputes and suspected noncompliance is discussed in a later section.

In April 1991 both countries agreed to prior notification of military exercises beyond a 10,000 troop threshold to be held in specified areas. Military activities are prohibited within five kilometers of the international border, as are maneuvers

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86. Michael Krepon, Dominique M. McCoy, and Mathew C. J. Rudolph, eds., *A Handbook of Confidence-Building Measures for Regional Security* (Washington, D.C.: The Henry L. Stimson Center, September, 1993), pp. 46–49. See also Moonis Ahmar, "Indo–Pakistan Normalization Process: The Role of CBMs in the Post-Cold War Era," *ACDIS Occasional Paper* (Urbana–Champaign, IL.: Program in Arms Control, Disarmament, and International Security, October 1993) for discussion of nonmilitary CBMs between India and Pakistan.

87. Interview with the author, New Delhi, September 7. Nonetheless, this same official believes the present deterioration in India–Pakistan relations to be temporary and that with eventual improvement will come an expansion of CBMs, encompassing economic, cultural, and scientific as well as military activities. A expansion of the definition of confidence building measures to the nonmilitary sphere, he believes, is essential before military CBMs can be effectively employed.

88. Caroline Russell, ACDA, personal communication.

directed toward the border. Corp-level and division-level maneuvers are banned within forty-five and twenty-five kilometers of the border respectively. Also in April 1991 agreement was reached concerning airspace violations. This measure prohibits armed fixed-wing aircraft within ten kilometers of the international border, armed rotary craft within one kilometer, and aircraft of any type within one thousand meters of the border. Both the prior-notification and airspace-violation agreements were concluded in a series of "Foreign Secretary-Level Discussions," which replaced the Indo–Pakistani Joint Commission established in 1982 to discuss economic, cultural, technology and other issues.

Observers were invited to monitor two major military exercises conducted by each country. In 1989, Indian and foreign military attaches were present at Pakistan's *Zarb-e-Momin* maneuvers. Indian plans for major military exercises in the spring of 1990 had exacerbated tensions arising over Kashmir; to assure Pakistan of its nonhostile intentions, India invited U.S. observers and refrained from deploying tanks near a canal close to the Pakistani border.

India and China have similarly undertaken a limited set of confidence building measures. An India–China Joint Working Group (JWG) was established shortly after Rajiv Gandhi's visit to Beijing in 1988, to discuss border issues. Between 1988 and August 1993, the JWG had met six times; both countries signed an agreement in 1993, during Prime Minister P.V. Narasimha Rao's 1993 visit to Beijing, on the "maintenance of peace and tranquillity" along the India–China Line of Actual Control.[89] The JWG is next scheduled to convene in Beijing in mid-1994. CBMs negotiated by the JWG since its inception include: Twice-per-year military-to-military meetings along the eastern and westerns sectors of the border; establishment of hotlines between military headquarters; exchange of information about the locations of military positions along the LAC; prior notification of exercises and troop movements near the border; and agreement on the prevention of airspace violations.[90]

The Limitations of Conventional CBMs

CBMs do not ultimately remove the deep causes of conflict between adversarial states even if, as demonstrated by the Sinai experience, effectively verifiable agreements can contribute to a process of political confidence-building. Ascribing to CBMs a lofty goal of cessation of all, or even most, conflict is a prescription for disappointment and cynicism about any type of arms control.

CBMs can certainly help to confine unresolvable political conflict to the political and diplomatic arena by curtailing its transformation to military action. As amply demonstrated by recent India–Pakistan efforts at implementing CBMs, their success in

89. "India, China Talks Progress," *India Abroad,* February 11, 1994.
90. Krepon, et. al., *Handbook of Confidence-Building Measures for Regional Security,* p. 49.

doing so, however, is at least as dependent on the political willingness of adversaries to make them work as they are on effective verification.

Whether CBMs actually prevent surprise attack is questionable; any state determined to undertake offensive military action will likely find clever routes of deception.[91] In any arms control situation states intent on violating the terms of an agreement will ferret out whatever opportunities may exist for evasion. What CBMs can do, for states committed to the avoidance of war, is remove the most gratuitous reasons for initiating it, namely, accident, miscalculation, and misperception. They can also inhibit the deployment of military forces for political intimidation by obligating each side to notify the other of impending maneuvers. Even if a state is intent on initiating a military attack under cover of an announced maneuver, the need to overcome CBM-induced obstacles in order to maintain true deception will likely present the target state with several clues indicative of an impending attack. This assumes, of course, that the target state interprets clues correctly. U.S. military intelligence certainly had sufficient evidence of a probable attack on Pearl Harbor but fell victim to its own disbelief. To again quote Betts: "Inadequacies in warning are rarely due to absolute failure to ring an alarm. Usually the problem is a conceptual consensus that rejects the alarm."[92] An added value of CBMs in denying the element of surprise to an attacker is that they can help focus the prospective victim state on where it should look for signs of impending attack.[93] Military officers train to recognize deception (Pearl Harbor notwithstanding); they could just as well train to recognize evidence of deviations from CBM procedures.

Care must be taken by the drafters of CBM accords to prescribe in sufficient detail the conditions under which observation and inspection activities will take place, and what information shall be collected.[94] Otherwise, observation–inspection CBMs might degenerate to exercises in guided tourism, restricted to "maneuvers" staged for the benefit of inspectors. Provisions for challenge inspections might allay some of these difficulties but, as will be seen later, challenge OSI is not without significant political risk.

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91. Jim E. Hinds, "The Limits of Confidence," in Borawski, ed., *Avoiding War in the Nuclear Age.*

92. Betts, "Hedging Against Surprise Attack," p. 147.

93. Alan Vick and James Thompson, "The Military Significance of Restrictions on the Operations of Strategic Nuclear Forces," in Barry Blechman, ed., *Preventing Nuclear War* (Bloomington, Ind.: Indiana University Press, 1985), pp. 101–102.

94. Effective OSI and observation provisions should specify: extent of inspector or observer access, freedom of movement, size of area covered, number of inspectors and frequency of inspections, "sensitive areas" to be excluded, obligations of the inspected party to accept inspection teams, and how far in advance notification of inspection must be given. Additionally, provisions to prevent harassment of inspectors should be implemented as well. See Hinds, "The Limits of Confidence," for this and related discussion pertaining to Soviet treatment of Western military liaison officers and observers.

CBMs must also avoid interference with states' defensive preparedness. Perhaps the most significant objection to CBMs involving demilitarization of border zones is that troops are denied the opportunity to gain familiarity with the ground they must defend. Unfamiliarity with ground puts a defender at a much greater disadvantage relative to a prospective attacker. Jonathan Alford suggests one solution to this problem may be to permit limited exercises by single divisions in border areas. Under such an arrangement, careful planning would allow successive "generations" of divisions to gain familiarity with border territory over time.[95] Deceptive attack would be extremely difficult to carry out with only a single division.

In the South Asian context, an India–Pakistan or India–China CBM regime would also have to allow for a limited military presence along borders for management of internal unrest. A significant potential for secessionist rebellion and communal unrest in border areas exists in all of these countries (in India, the Punjab and Kashmir primarily; in Pakistan, Sind and Kashmir; in China, Tibet). A South Asian CBM regime must incorporate procedures for distinguishing between troops deployed for external offensive action and those dispatched to quell domestic disturbances. Finally, Indian, Pakistani, and Chinese leaders may question the value of restrictions on their military movements within their own territories. Though CBMs require some limitation of sovereignty in this regard, each country would likely experience a net gain in security if the military activities of potential adversaries are similarly restrained.

Nuclear Arms Management Measures

The intent of the earlier discussion of conventional CBMs was to examine ways of ultimately reducing the probability of nuclear conflict by effectively blocking one route to its inception: conventional military conflict. But this represents only one possible path to nuclear war:

- What if, despite conventional war prevention measures, it nevertheless occurs? Can its escalation to the nuclear level be averted?
- What if misperceptions deriving from a political conflict, a nuclear weapons accident, or terrorist nuclear threat inspired one country to strike preemptively with nuclear weapons, skipping the conventional war-escalation step altogether?

Both of these questions imply a need for measures to reduce the incentives for nuclear weapons use by increasing the disincentives, i.e., institutionalizing a "balance of stable deterrence." Possession of nuclear weapons by either India or Pakistan is *not* presumed here, nor do I wish to speculate about the technological sophistication or size of Indian and Pakistani nuclear arsenals, should they exist. Rather, the attempt

95. Jonathan Alford, "CBMs in Europe," *IISS Adelphi Papers*, No. 149 (1979): 12.

TABLE 2.2 Nuclear War Prevention Measures

Unilateral	*Bilateral*
Implement national nuclear materials accounting systems, physical protection and security measures at nuclear facilities from terrorism, insider sabotage	Establish nuclear risk reduction centers for communication of threats and incidents, exchange of nuclear forces data, notifications of civilian or military nuclear accidents
Abstain from using nuclear alerts or threats for political signaling or intimidation	Notifications of missile test and space launches, "mass" take-offs of dual-capable aircraft in direction of other country
Abstain from adoption of launch-on-warning systems or policies	Exchange of observers at missile test and space launches, and at military exercises involving nuclear weapons training
Ensure physical security of nuclear weapons from unauthorized access and use—develop PAL-type mechanisms	Ban on encryption of missile and space launch vehicle telemetry
Increase survivability of nuclear forces to extent possible, and avoid collocation of warhead storage depots with air bases, missile launch facilities	Crisis hotline linking heads of government

here is to anticipate potential arms control "needs" if these countries decide to actively deploy nuclear weapons.

Some potential nuclear weapons management measures (e.g., EMP-hardening of command, control and communications centers) may well be beyond the current technological and economic capabilities of either country (Pakistan especially) and thus cannot be considered short-term remedies. Longer-term capital and technology intensive measures are considered briefly; emphasis is otherwise on rather low-technology actions that can be implemented fairly readily to mitigate the transitional instability inherent in the initial stages of nuclear weapons programs.

Preventing Nuclear War

Unilateral Measures. Table 2.2 summarizes possible unilateral nuclear war prevention measures that might be adopted by an overtly nuclear India or Pakistan.

• *Civilian Nuclear Security*. One measure, requiring relatively little technical and economic investment, that each country can implement promptly is to *adopt enhanced security procedures at all nuclear-related facilities*. Paul Leventhal and Brahma Chellaney report that current security measures, with the exception of the most sensitive facilities (Pakistan's Kahuta and India's BARC nuclear complexes) are generally

lax.[96] The possibility of unauthorized access to materials usable in nuclear explosive devices is significant. Secessionist, ethnic, and communal interests have been sources of terrorist activity in the past and will continue to be so in the future. Nuclear terrorism is thus a threat that cannot be discounted by either Indian or Pakistani political authorities; a terrorist device exploded in an urban area might, through confusion about its source, be interpreted as the opening round of an adversary nuclear strike. More probable is the accusation of a counterpart government of having sponsored the terrorists that detonated the device, should a determination be made that it was indeed a terrorist weapon. Prevention of these or similar incidents demands rigorous protection of nuclear facilities from insider sabotage or unauthorized possession and diversion of sensitive nuclear materials. A strict national system of nuclear material accounting and control is imperative (the U.S. Nuclear Materials Management and Safeguards System required of U.S. civilian nuclear facilities provides a good example). Additionally, both countries should implement IAEA guidelines for physical protection and security of nuclear facilities.[97] These are measures that can be adopted regardless of current or anticipated nuclear weapons status. Apparently, neither India or Pakistan has undertaken such measures to date.[98]

• *Military Nuclear Security.* Prevention of unauthorized access to and use of nuclear weapons themselves will pose a problem of correspondingly greater magnitude as increasing numbers of these are deployed. The unauthorized or accidental explosion of a military nuclear device on foreign territory would undoubtedly appear to carry the imprimatur of an adversary government, much more so than a crude terrorist device. Dispersal of weapons to enhance survivability in war could conversely degrade their security by increasing opportunities for unauthorized access. Indian and Pakistani civilian and military authorities are certainly conscious of the imperatives of averting terrorist access to nuclear weapons. But unauthorized access to or use of nuclear weapons by mutinous military personnel or enemy seizure in war pose equally hazardous threats.

For both countries then, should they commit to deployment of nuclear weapons, the development of technical and procedural mechanisms to *divorce nuclear weapons access from use* must be a top priority. Permissive Action Links (PALs), electro-mechanical combination locks incorporated into the arming circuitry of most U.S. warheads, require the entry of correct "enabling codes" before warhead arming can proceed. Newer U.S. PALs have a "limited try" feature; a few attempts at insertion of

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96. Paul Leventhal and Brahma Chellaney, "Nuclear Terrorism: Threat Perception and Response in South Asia," *Terrorism* 11 (1988): 447–470.

97. For a comparison of IAEA safeguards with the U.S. NMMSS see Sidney Moglewer, "IAEA Safeguards and Nonproliferation," *Bulletin of the Atomic Scientists* (October 1981): 24–29. For a discussion of IAEA physical protection and security guidelines see *Nonproliferation Issues*, (Washington, D.C.: Congressional Research Service; Library of Congress, 1977), pp. 328–329.

98. Leventhal and Chellaney, "Nuclear Terrorism," pp. 453–454.

invalid codes triggers a locking mechanism that disables the warhead. U.S. strategic bombers employ a Bomber Coded Switch System (BCSS) which locks the bomb-bay release mechanism until the aircraft commander enters a valid code.[99]

While such technical mechanisms are designed to control warhead enablement, procedural safeguards aim to restrict the actions of those having access to nuclear weapons. Sensitive U.S. nuclear weapons operations are guided by a "two-man rule"; nuclear weapon enablement additionally requires the simultaneous execution of a strict sequence of actions by two individuals of similar training and authority.[100] U.S. ICBM launch procedures illustrate the concept most vividly. Not only must each of the two launch officers in a Minuteman launch capsule insert and turn launch keys simultaneously but so also must the two man crew of another capsule within the same squadron before any missiles can launch. Each capsule within a squadron is equipped with inhibit switches that can be used to "veto" an unauthorized launch by crews in other capsules.[101]

U.S. nuclear weapons operations are further predicated on centralized civilian control over decision making. Emergency Action Messages (EAMs) containing warhead and weapon enablement codes (such as might be received by a Minuteman launch crew, who must then decode and authenticate its validity) are released only by the highest civilian authorities: the National Command Authority is composed only of the President and Secretary of Defense, or their authorized deputies or successors.[102] In India and Pakistan, similar highest-level civilian control over decisions regarding nuclear weapons use and release of authorization would be integral to both precluding unauthorized use and consolidating escalation firebreaks between conventional and nuclear conflict. In India the Prime Minister apparently has final authority in decisions and policies regarding civilian and military nuclear activities. The role of civilian authorities in Pakistani nuclear decision making is much less clear;

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99. See Donald R. Cotter, "Peacetime Operations," in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, eds., *Managing Nuclear Operations* (Washington, D.C.: Brookings, 1987), pp. 46–51; Peter Stein and Peter Feaver, "Assuring Control of Nuclear Weapons: The Evolution of Permissive Action Links," *CSIA Occasional Paper*, No. 2 (Cambridge, Mass.: Harvard University Center for Science and International Affairs, 1987) for discussions of PAL development and technologies.

100. Cotter, "Peacetime Operations," p. 50; Stein and Feaver, "Assuring Control of Nuclear Weapons."

101. See Daniel Ford, *The Button* (New York: Simon and Schuster, 1985), pp. 117–119 for a brief description of Minuteman launch procedures and operations. For more detailed discussion of U.S. military nuclear operations and procedures, see Paul Bracken, *The Command and Control of Nuclear Forces* (New Haven, Conn.: Yale University Press, 1983); for a history of the evolution of U.S. military nuclear operations, see Bruce G. Blair, *Strategic Command and Control: Redefining the Nuclear Threat* (Washington, D.C.: Brookings Institution, 1985).

102. William Arkin and Richard Fieldhouse, "Nuclear Weapons Command, Control and Communications," in Marek Thee, ed., *Arms and Disarmament: SIPRI Findings, 1986* (Oxford: Oxford University Press, 1986), p. 118.

in 1989, at least, Prime Minister Benazir Bhutto was reportedly unaware of crucial developments in the Pakistani nuclear program.

We can expect that much of the same debate about compromising security versus inhibiting readiness that accompanied initial U.S. implementation of PAL mechanisms and code-release procedures will arise among Indian and Pakistani nuclear decision makers. While force readiness and survivability are given high priority in the U.S. (e.g., naval nuclear warheads, considered to be in an environment providing almost no opportunity for unauthorized use, are not equipped with PAL devices), the President retains final authority over decisions regarding employment of U.S. strategic forces.[103]

Electrical and mechanical safeguards against accidental detonation of a weapon exposed to fire, mishandling, or aircraft crashes, have also been incorporated into U.S. nuclear warheads. The use of insensitive high explosives (IHE), and the design of warheads for "one-point safety"[104] are two examples of U.S. warhead "safing" mechanisms. Arming mechanisms are also designed for weapon safety. For example, gravity bombs utilize sensors that detect the presence of an external environment characteristic of a released weapon; arming will proceed only if sensors indicate that the weapon is following a trajectory identical to that of a bomb in free fall. Once arming is "okayed" by PAL and safing devices, fusing mechanisms ensure that the warhead detonates at its preprogrammed destination or point in space.[105]

• *Avoid Use of Alerts for Signaling, and Launch-On-Warning Policies*. Two other unilateral measures for prevention of nuclear weapons use are doctrinal in nature, entailing political, rather than technical or procedural, decisions by nuclear-weapon policy makers. First, use of nuclear alerts or threats of nuclear weapons use for political signaling or intimidation should be scrupulously avoided. Such actions would tend only to exacerbate tensions and crisis misperceptions more than encourage accommodation.[106] Second, both India and Pakistan should abstain from adoption of launch-on-warning systems or policies. Bombers might be recalled if scrambled in response to a false alarm but determination that the alarm was indeed false would not likely be made before the planes had penetrated adversary airspace, given the short

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[103]. Security and control of use of NATO nuclear weapons was the joint responsibility of NATO allies and the U.S.

[104]. "One-point safety" is defined as "the probability of achieving a nuclear yield greater than four tons of TNT equivalent shall not exceed one in a million in the event of a detonation initiated at the single most sensitive point in the high explosive system," Thomas B. Cochran et. al., eds., *Nuclear Weapons Databook, Vol. II: U.S. Nuclear Warhead Production* (Cambridge, Mass.: Ballinger, 1987), p. 48, note 42.

[105]. See Cotter, in Carter, et. al., eds., *Managing Nuclear Operations,* pp. 42–46 for details.

[106]. Graham T. Allison, Albert Carnesale, and Joseph Nye, eds., *Hawks, Doves, and Owls: An Agenda For Avoiding Nuclear War* (New York: W. W. Norton, 1985), p. 234; chapter 7 provides an overview of nuclear war prevention measures.

flight times between Indian and Pakistani targets. Time constraints for missile launch decisions would be even more severe. Missiles, of course, cannot be recalled.[107]

• *Reducing Vulnerability of Nuclear Forces*. Reducing the vulnerability of missiles and aircraft to preemptive attack would decrease incentives for such attack while concurrently relieving pressures for adoption of a launch-on-warning policy. Aside from dispersal of weapons, (which can seriously degrade security by creating more opportunities for unauthorized access) reinforced concrete shelters for aircraft and underground silos for missiles are options. Egypt employs concrete shelters for aircraft protection.[108] Construction of hardened missile silos and underground launch control facilities, while not an impossibility for either India or Pakistan, are capital and technology intensive options not likely to be available for a number of years following decisions to overtly deploy nuclear weapons. An inexpensive partial solution might be to adopt the Chinese example of basing some missiles in caves,[109] or on ships at sea. Mobile basing of missiles on trucks, railcars, submarines or surface ships, presumes, of course, the implementation of stringent technical and procedural safeguards against unauthorized access and use. Maintaining a certain percentage of nuclear-armed aircraft on a high alert level (U.S. SAC bombers had previously maintained a 30 percent rate of alert),[110] prepared for dispersal in the event of an attack, is a further alternative. Mass dispersal of aircraft, especially in a crisis, however, can be provocative if an adversary perceives such action as prelude to preemptive attack. Abstaining from collocating warhead storage depots with bomber or missile bases would additionally reduce the attractiveness of the latter as targets for preemption.

Bilateral Measures. Bilateral nuclear war prevention measures are summarized in Table 2.2.

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107. Bombers could be sent to "fail-safe" points inside the international border, awaiting further instructions. Given the very short distances involved, however, this may prove logistically difficult. In theory at least, devices for receiving a "self-destruct" code could be installed on missiles to thwart accidental or unauthorized launch. Alternatively, such a device could be designed to automatically initiate destruction of a missile in the event of launch, unless a coded transmission were simultaneously received at the time of launch disenabling the self-destruct mechanism. Sherman Frankel, "Unauthorized and Accidental Launch of Nuclear Systems," talk presented to University of Illinois Program in Arms Control, Disarmament, and International Security, March 30, 1990.

108. Khalilzad, "Proliferation and Stability in Southwest Asia," p. 194. Reportedly, Pakistan does keep some of its military aircraft in mountain caves. Stephen P. Cohen, personal communication.

109. Alistair I. Johnston, "China Enters the Arms Control Arena," *Arms Control Today* (July–August 1987): 13.

110. Vick and Thomson, "Military Significance of Restrictions on the Operations of Strategic Nuclear Forces," p. 105.

• *Nuclear Risk Reduction Centers.* For communication of concerns about strategy and doctrine, collaborative efforts toward prevention of nuclear terrorism, or exchanging baseline data on nuclear forces, nuclear risk reduction centers (NRRCs) linking Indian and Pakistani capitals might be established. In September 1987, the U.S. and Soviet Union agreed to the establishment of similar centers in Moscow and Washington, primarily for the purpose of exchanging information and notifications required by various arms control agreements.[111]

In the South Asian context, however, arms control verification data and compliance questions might be more profitably dealt with by compliance-arbitration and consultative mechanisms established by agreement for such purposes. NRRCs should instead function as additional communications links between counterpart policy makers in the absence of crisis, as conduits for relaying concerns about nuclear weapons or civilian nuclear activities that could be potential sources of conflict. In other words, the primary function of NRRCs is to *identify and permit collaboration on mitigating concerns before they reach the crisis level*. Nevertheless, NRRCs might also serve as a clearinghouse for exchange of CBM notifications and data.

The original U.S. proposal for NRRCs, introduced as an amendment to the 1982 Defense Authorization Act by Senators John Warner and Sam Nunn, called for the centers to "maintain a twenty-four hour watch over any events with the potential to lead to nuclear incidents."[112] NRRCs linking Islamabad and New Delhi could be staffed by military and civilian liaison officers having direct access to the counterpart country's highest civilian authorities. Nunn and Warner envisioned several functions for U.S.–Soviet NRRCs[113], with direct relevance to the South Asian context:

• Discuss and establish procedures for coping with such incidents as a missing nuclear weapon, unexplained nuclear explosions, terrorist nuclear incidents and the like.

• To facilitate close communications during incidents of nuclear terrorism in order to implement collaborative action to deal with them. Collaborative efforts might include exchange of technical and intelligence information regarding acquisition of nuclear weapons or weapons materials and equipment by subnational groups.

• For exchange of information about military nuclear activities that could be subject to misinterpretation by the other side. Provision of such information

111. David K. Shipler, "U.S. and Russians Sign Pact to Limit Nuclear War Risk," *New York Times,* September 16, 1987; See also David K. Shipler, "Shevardnadze-Shultz Talks Started," *New York Times*, March 23, 1988, p. A6 for additional discussion of arms control functions of U.S.–Soviet NRRCs.

112. "Interim Report of the Nunn-Warner Working Group on Nuclear Risk Reduction," in Blechman, ed., *Preventing Nuclear War,* Appendix A, p. 169.

113. Ibid., pp. 170–171.

would be voluntary and procedures must be implemented to avoid the use of NRRCs for transmitting deliberately deceptive information.

• For discussion of nuclear doctrines or strategic practices that elicit suspicions or anxiety. As with the above, care must be taken to ensure that discussions don't become fora for hectoring and relaying disinformation.

The second function, that of maintaining close contact during terrorist nuclear incidents, is really a crisis control measure. The suspicions and confusion likely to be generated by a nuclear terrorist incident in South Asia would demand that the top leadership of both India and Pakistan maintain constant communications until the nature of the incident is clarified by NRRC technical staff. Upgrading any existing crisis hotline links between regional heads of government to include high speed facsimile transmission would facilitate crisis resolution efforts. Upper-echelon military commanders could maintain contact through NRRC liaison officers if decisions regarding potential military action are involved. They should especially do so if the incident concerns unauthorized use or "hijacking" of nuclear weapons by military personnel.

• *Notification and Observation Measures, Bans on Telemetry Encryption*. Other negotiated nuclear war prevention measures might include notifications of missile test and space vehicle launches, and multiple take-offs of dual-capable aircraft above a threshold number in the direction of the other country.[114] Depending on the type, sophistication, and coverage provided by early warning systems employed by South Asian states, either of these activities could trigger alarm in a counterpart country. Exchange of observers at missile test and space vehicle launches, or military nuclear training maneuvers, much like the observation and inspection activities of conventional CBMs, might be additional means of allaying misinterpretations and preventing false alarms. A related measure could be a negotiated ban on encryption of missile test and space vehicle telemetry data.

Preventing Escalation of Conventional War to Nuclear Weapons Use

Much of the earlier discussion about prevention of nuclear war by decreasing the chances of its initiation via routes other than conventional war escalation is equally germane to the latter context. The peacetime implementation of the series of measures

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[114]. In 1970 the Soviet Union had proposed, during the SALT negotiations notification of mass aircraft take-offs but difficulty over defining "mass" led to U.S. rejection of the proposal. See Raymond L. Garthoff, "The Accidents Measures Agreement," in J. Borawski, ed., *Avoiding War in the Nuclear Age,* pp. 61–62. The 1991 India–Pakistan Agreement on Airspace Violations prohibits armed fixed-wing aircraft within 10 kilometers of the international border and aircraft of any type within 1000 meters of the border. See earlier discussion on recent India–Pakistan and India–China confidence building measures.

TABLE 2.3 Preventing Escalation of Conventional War to Nuclear Weapons Use

Unilateral	*Bilateral*
Maintain stringent command and control procedures, especially if tactical nuclear weapons have been deployed. Authorization codes for arming and use of nuclear weapons should be released only at the highest levels of civilian authority.	Negotiate a ban on forward deployment of tactical nuclear weapons.
Avoid doctrines or strategies demanding early use of nuclear weapons. Keep conventional "tripwire" high.	Implement crisis hotline communications early in conflict.
Avoid treating tactical nuclear weapons—or any nuclear weapons—as simply more powerful conventional weapons.	Coordinate development and implementation of conventional conflict termination procedures through Nuclear Risk Reduction Centers.
During peacetime, devise procedures for early termination of conventional military conflict.	

just described could certainly foster moderation of the escalatory "action-reaction" spiral that might lead to nuclear weapons use in a crisis.

It is arguable that, in a military conflict that has remained strictly conventional, relevant decision makers would continue to hold strong psychological aversions to initiating the use of nuclear weapons. The precedent created by the first use of nuclear weapons, however, could seriously weaken inhibitions against subsequent use by either side.[115] The most important conventional war escalation-prevention measures will be those that strengthen the aversions, or disincentives, to initiating the first use of nuclear weapons. Table 2.3 lists possible unilateral and bilateral escalation and prevention measures.

Unilateral Measures.

• *Need for Deescalation Procedures.* It is a truism that climbing back down the escalation ladder is much more difficult than climbing up.[116] Nevertheless, Indian and Pakistani

115. Herman Kahn, *On Escalation: Metaphors and Scenarios* (New York: Praeger, 1965), p. 98.

116. Kahn warns of the limits of the escalatory "ladder" metaphor; crisis escalation and deescalation do not consist of a simple sequence of "stopping points". "In many ways, escalation is an irreversible process. Moreover, there are aspects of deescalation that do not correspond in any way to 'escalation in reverse'," pp. 230–231. For similar criticisms of the ladder metaphor, see Colin S. Gray, "Strategic Deescalation," in Stephen Cimbala and Joseph Douglas, Jr., eds., *Ending a Nuclear War: Are the Superpowers Prepared?* (Washington, D.C.: Pergamon-Brassey's, 1988), pp. 60–78; and Fred C. Ikle, *Every War Must End* (New York: Columbia University Press, 1971), pp. 39–58. For a more general critique of the idea that nuclear crises can be successfully "managed," see Richard Ned Lebow, *Nuclear Crisis Management: A Dangerous Illusion* (Ithaca, N.Y.: Cornell University Press, 1987).

strategic planners and leaders should seriously contemplate devising procedures for deescalation and early termination of conventional military conflict. Much of the literature on war termination (nuclear or conventional) is necessarily speculative and theoretical: instances of deescalation are rarer than those of escalation and, of course, no example of nuclear conflict deescalation exists. Deescalation in the case of conventional war, at least, appears to hinge on the communication by each side of thresholds it will not cross, i.e., on the establishment of ground rules of engagement both prior to and during conflict. Certainly, leaders and relevant policy makers of India and Pakistan are aware that possession of nuclear weapons magnifies the imperative of limiting future conventional conflict. Any damage Pakistan might inflict on India with nuclear weapons, however "limited," would be far more devastating than might be achieved with a strictly conventional attack. Under such circumstances, traditional notions of conventional military superiority enabling the kind of decisive victory that ends conflict quickly are tenuous at best.

• *No Early Use versus No First Use*. One doctrinal measure is to avoid strategies that demand early use of nuclear weapons in an as-yet conventional war. A general policy of no *first* use of nuclear weapons in the face of imminent conventional defeat would be far more acceptable to India than Pakistan, because of the former's superior conventional military capabilities.[117] Pakistan might consider any uncertainty surrounding its willingness to initiate nuclear weapons use in the event of conventional conflict with India as enhancing deterrence of Indian military adventurism. For similar reasons NATO has resisted officially adopting a policy of nuclear no-first use.[118] *Pakistan could commit to a policy of no* early *use of nuclear weapons without degrading the credibility of its nuclear deterrent. However, no early use or no first use policies entail much more than simple declaration.* Effective communication of such policies requires a commensurate structuring of military forces and doctrine such that the worst of an Indian conventional assault could be staved off long enough to buy time for crisis resolution and negotiation of a cease-fire. In sum, the aim here is to raise the conventional "tripwire" to a height where moves toward early termination of a conventional war become both plausible and worth pursuing. Ideally, no-early or no-first use policies would be coupled with negotiated conventional arms limitations and CBMs aimed at addressing or rendering unimportant the real and perceived disparities in conventional military capabilities that motivate adoption of first-use strategies.[119]

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[117]. India might, however, find itself in such a position vis-à-vis China.

[118]. Carl H. Amme, *NATO Strategy and Nuclear Defense* (New York: Greenwood Press, 1988), pp. 11–17.

[119]. Daniel J. Arbess and Andrew M. Moravcsik, "Lengthening the Fuse: No First Use and Disengagement," in Joseph Nye, Graham Allison, and Albert Carnesale, eds., *Fateful Visions: Avoiding Nuclear Catastrophe* (Cambridge, Mass.: Ballinger, 1988), p. 83.

• *Emphasize Distinction Between Nuclear and Conventional Weapons.* It is important that both Indian and Pakistani military planners avoid the trap of treating nuclear weapons as simply more powerful conventional weapons, i.e., abstain from assigning to nuclear weapons the achievement of conventional military objectives but only on a larger scale. The fundamental difference between nuclear and conventional weapons must be emphasized at all levels of military doctrine and operations. Tactical nuclear weapons, as noted earlier, are especially dangerous in this regard because they make such thinking possible, as do highly accurate, relatively low-yield, nuclear ballistic missiles designed for counterforce missions. Concepts of fighting a purposefully limited nuclear war are dubious and fraught with uncertainty; the nature of South Asian geography and population distribution virtually ensures that "collateral" damage resulting from even limited tactical nuclear weapons use could be extreme.

• *Command, Control, and Communications*. One of the most significant unilateral escalation-prevention measures that each country could implement is to *develop and maintain stringent command, control, and communications capabilities for guiding the use of both conventional and nuclear weapons.* Command, control, and communications (C^3) can be defined as "a system of input processing, decision making and execution for military forces and operations."[120] It cannot be emphasized enough that tight control over the authorization of release and use of nuclear weapons is crucial. Field commanders should not be granted discretionary power regarding even tactical nuclear weapons. Lower-level commanders and officers need not be shut out of the nuclear weapons chain of command, but the final authorization for use should originate with the highest levels of civilian authority.

Collateral damage to C^3 capabilities in a conventional military conflict might be reduced by not collocating major C^3 centers with nuclear weapons bases. Separating major C^3 centers and nuclear weapons bases would potentially facilitate an adversary's deliberate abstention from "decapitation" strikes. No U.S. ICBMs were deployed in Nebraska for similar reasons—the U.S. Strategic Air Command is headquartered in Omaha.[121] However, it is far more difficult to avoid reliance on civilian telecommunications switching centers, which are necessarily located in or near large cities for military communications even if major C^3 centers themselves are located away from urban areas. The U.S. Department of Defense, for example, relies heavily on domestic telephone switching centers for emergency communications with

[120]. Arkin and Fieldhouse, "Nuclear Weapons Command, Control, and Communications," p. 115.

[121]. Paul Bracken, "War Termination," in Carter, et. al., eds., *Managing Nuclear Operations* ; William Arkin and Richard Fieldhouse, *Nuclear Battlefields* (Cambridge, Mass.: Ballinger, 1985), pp. 146–147.

strategic nuclear forces.[122] Destruction of switching centers either deliberately or collaterally would fragment communications and isolate C^3 centers.

Bilateral Measures.

• *Ban on Forward Deployment of Tactical Nuclear Weapons*. As noted previously, tactical nuclear weapons pose perhaps the greatest threat to conventional war escalation-prevention. If India and Pakistani were to develop such weapons, a negotiated ban on their forward deployment, if not a total prohibition of production and deployment, would enhance escalation prevention.

• *Communications*. Bilateral escalation prevention measures, other than negotiated restrictions on deployments of particularly destabilizing weapons, consist primarily of enhancing communications essential for crisis resolution and war termination. A direct communications link (DCL, or "hotline") between heads of government is an obvious measure. Crisis hotlines function best, however, when used sparingly and not for routine communications. Paul Bracken states it succinctly: "Messages sent over [The U.S.–Soviet DCL] will be taken seriously because the line is used *only* in emergencies."[123] A crisis hotline must also be designed such that messages will always get through; the hotline design must preclude "the possibility that the other side does not answer the telephone." The use of the hotline between the Indian and Pakistani Director Generals of Military Operations to convey misleading information during the Brasstacks episode demonstrates the need for a hotline between high-level civilian authorities check the veracity of information provided via lower-level hotlines. India and Pakistan could additionally implement the use of common, well-defined "crisis codes" in their hotline systems, to ensure rapid and accurate communications in the event of specific incidents, such as theft of a nuclear warhead.[124]

Nuclear risk reduction centers might provide a second tier of contacts. Though crisis management was not the intent of NRRCs as proposed by Nunn and Warner[125], facilitating the control of crises by heads of government and top officials could

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[122]. Ashton B. Carter, "Communications Technologies and Vulnerabilities," in Carter, et. al., eds., *Managing Nuclear Operations*, pp. 250–252.

[123]. Paul Bracken, "War Termination," in Carter, et. al., eds., *Managing Nuclear Operations*, p. 204. The U.S.–Soviet DCL does not use a telephone, or any other form of voice communications. Voice communications are thought to be more easily subject to misinterpretation or mistranslation. Moreover, printed messages permit heads of state to confer with advisors prior to sending a reply, and provide a permanent record of communications.

[124]. In 1985 the U.S. proposed in the SALT Standing Consultative Commission, and the Soviet Union accepted, the use of hotline "crisis codes" and preformatted messages in the event of nuclear incidents involving terrorism, accidental or unauthorized use, or third-party nuclear threats. Raymond L. Garthoff, "The Accidents Measures Agreement," in Borawski, ed., *Avoiding War in the Nuclear Age*, p. 68.

[125]. Crisis management functions would inevitably be expropriated by upper-echelon executive decision makers and their staffs. See Richard K. Betts, "A Joint Nuclear Risk Control Center," in Blechman, ed., *Preventing Nuclear War*, p. 73.

certainly comprise a legitimate activity of an India–Pakistan (or India–China) NRRC. Knowledgeable technical staff could provide data and information as needed by top decision makers. While the highest civilian officials would retain authority to finalize cease-fire agreements and the like, NRRC staff could be empowered to offer suggestions and options to counterparts on the other side. The familiarity and working relationships established during peacetime between Indian and Pakistani military and civilian NRRC staffs could potentially expedite crisis management and, ultimately, resolution.

Summary of Main Points: Chapter II

• *South Asian nuclear war prevention measures should focus on reducing the incentives for the initiation of conventional military conflict as the "first line of defense" against the potential use of nuclear weapons. Measures to prevent the escalation of conventional conflict to the nuclear level comprise a crucial second line of defense.*

• *Confidence Building Measures (CBMs) can be a constructive approach to mitigating the factors that could easily lead to the use of weapons (conventional or nuclear) until substantial weapons reductions or eliminations are, if ever, effected.* Furthermore, institutionalizing "mutual reassurance," which might be achieved through a system of CBMs, is probably essential for maintaining long-term deterrence stability.

• CBMs can certainly help to confine unresolvable political conflict to the political and diplomatic arena by curtailing its transformation to military action. Their success in doing so, however, is at least as dependent on the political willingness of adversaries to make them work as they are on effective verification.

• *The escalation of fears and misperceptions and the resultant massing of troops by both sides might have been avoided had certain kinds of CBMs been adopted by India and Pakistan prior to the initiation of the Brasstacks maneuvers* (assuming, of course, that neither side actually wanted a war; even in this case, CBMs would have made it very difficult to mobilize for war under the guise of training exercises).

• A non-European context in which CBMs have worked especially well is the inspection and monitoring regime established by the Israeli–Egyptian Sinai Disengagement Agreement of 1975. In South Asia the obvious candidates for a similar confidence-building and verification regime would be disputed territories and boundary lines in Kashmir, such as the Siachen Glacier, Aksai Chin, and the Kashmir cease-fire "line of actual control" established in 1972. Territory in dispute between India and China in the northeast is an added possibility. The most serious political obstacle to implementing such a monitoring regime is, of course, the need for agreement to militarily disengage from disputed areas.

• *A Sinai-type monitoring and inspection regime could serve to effectively verify temporary disengagement agreements during negotiations over contested territories in South Asia.* Such an arrangement could effectively avert hostilities or "accidents" that might derail a

delicate negotiating process. It could also provide a trial run of verification systems for a more permanent settlement.

• *In contrast to earlier attitudes, India and Pakistan have become increasingly receptive to the role of conventional CBMs in war prevention*. Partly because of the Brasstacks episode, and partly because of fears that renewed conflict over Kashmir could erupt into war, both states have agreed to several measures, aimed at military operations, since 1990. These include resumption of the hotline between the

Directors General of Military Operations, agreements on notification of military maneuvers and preventing airspace violations. China and India have agreed in principle to adopt some similar measures.

• In the South Asian context, an India–Pakistan or India–China CBM regime would also have to allow for a limited military presence along borders for management of internal unrest.

• One nuclear war prevention measure, requiring relatively little technical and economic investment, that each country can implement promptly is to *adopt enhanced security procedures at all nuclear-related facilities*.

• Should India and Pakistan commit to deployment of nuclear weapons, the development of technical and procedural mechanisms to *divorce nuclear weapons access from use* must be a top priority. Additionally, centralized highest-level civilian control over decisions regarding nuclear weapons use and release of authorization would be integral to both precluding unauthorized use and consolidating escalation firebreaks between conventional and nuclear conflict

• Two other unilateral measures for prevention of nuclear weapons use are doctrinal in nature, entailing political, rather than technical or procedural, decisions by nuclear-weapon policy makers:

(i) *Use of nuclear alerts or threats of nuclear weapons use for political signaling or intimidation should be scrupulously avoided*. Such actions would tend only to exacerbate tensions and crisis misperceptions more than encourage accommodation.

(ii) *Both India and Pakistan should abstain from adoption of launch-on-warning systems or policies*. Bombers might be recalled if scrambled in response to a false alarm but determination that the alarm was indeed false would not likely be made before the planes had penetrated adversary airspace, given the short flight times between Indian and Pakistani targets. Time constraints for missile launch decisions would be even more severe.

• Reducing the vulnerability of missiles and aircraft to preemptive attack would decrease incentives for such attack while concurrently relieving pressures for adoption of a launch-on-warning policy. *Dispersal of warheads, however, can seriously degrade security by creating more opportunities for unauthorized access.*

• Abstaining from collocating warhead storage depots with bomber or missile bases would additionally reduce the attractiveness of the latter as targets for preemption.

• *For communication of concerns about strategy and doctrine, collaborative efforts toward prevention of nuclear terrorism, or exchanging baseline data on nuclear forces, nuclear risk reduction centers (NRRCs) linking Indian and Pakistani capitals might be established.*

• The primary function of NRRCs is to *identify and permit collaboration on mitigating concerns before they reach the crisis level*. Secondarily, NRRCs might serve as a clearinghouse for exchange of CBM notifications and data

• Other negotiated nuclear war prevention measures might include notifications of missile test and space vehicle launches, and multiple take-offs of dual-capable aircraft above a threshold number in the direction of the other country. Exchange of observers at missile test and space vehicle launches, or military nuclear training maneuvers, much like the observation and inspection activities of conventional CBMs, might be additional means of allaying misinterpretations and preventing false alarms. A related measure could be a negotiated ban on encryption of missile test and space vehicle telemetry data.

• Indian and Pakistani strategic planners and leaders should seriously *contemplate devising procedures for deescalation and early termination of conventional military conflict*. Deescalation in the case of conventional war, at least, appears to hinge on the communication by each side of thresholds it will not cross, i.e., on the establishment of ground rules of engagement both prior to and during conflict.

Certainly, leaders and relevant policy makers of India and Pakistan are aware that possession of nuclear weapons magnifies the imperative of limiting future conventional conflict. Under such circumstances, traditional notions of conventional military superiority enabling the kind of decisive victory that ends conflict quickly are tenuous at best.

• One doctrinal measure is to *avoid strategies that demand early use of nuclear weapons in an as-yet conventional war*. A general policy of no *first* use of nuclear weapons in the face of imminent conventional defeat would be far more acceptable to India than Pakistan, because of the former's superior conventional military capabilities. *Pakistan could commit to a policy of no early use of nuclear weapons without degrading the credibility of its nuclear deterrent.* However, no early use or no first use policies entail much more than simple declaration. Effective communication of such policies requires a commensurate structuring of military forces and doctrine such that the worst of an Indian conventional assault could be staved off long enough to buy time for crisis resolution and negotiation of a cease-fire. In sum, the aim here is to raise the conventional "tripwire" to a height where moves toward early termination of a conventional war become both plausible and worth pursuing.

• *Ideally, no-early or no-first use policies would be coupled with negotiated conventional arms limitations and CBMs aimed at addressing or rendering unimportant the real and*

perceived disparities in conventional military capabilities that motivate adoption of first-use strategies.

• *The fundamental difference between nuclear and conventional weapons must be emphasized at all levels of military doctrine and operations.* Tactical nuclear weapons, as noted earlier, are especially dangerous in this regard because they make such thinking possible, as do highly accurate, relatively low-yield, nuclear ballistic missiles designed for counterforce missions. *The nature of South Asian geography and population distribution virtually ensures that "collateral" damage resulting from even limited tactical nuclear weapons use could be extreme.*

• *One of the most significant unilateral escalation-prevention measures that each country could implement is to develop and maintain stringent command, control, and communications capabilities (C^3) for guiding the use of both conventional and nuclear weapons. Final authorization for use of any nuclear weapons should originate with the highest levels of civilian authority within India and Pakistan.*

• Collateral damage to C^3 capabilities in a conventional military conflict might be reduced by not collocating major C^3 centers with nuclear weapons bases. Separating major C^3 centers and nuclear weapons bases would potentially facilitate the other country's deliberate abstention from "decapitation" strikes in a conventional conflict.

• *Again, "tactical" nuclear weapons pose perhaps the greatest threat to conventional war escalation-prevention.* If India and Pakistani were to develop such weapons, a negotiated ban on their forward deployment, if not a total prohibition of production and deployment, would enhance escalation prevention.

• Bilateral escalation prevention measures, other than negotiated restrictions on deployments of particularly destabilizing weapons, consist primarily of enhancing communications essential for crisis resolution and war termination.

• India and Pakistan could additionally implement the use of common, well-defined "crisis codes" in their hotline systems, to ensure rapid and accurate communications in the event of specific incidents, such as theft of a nuclear warhead. More important would be to establish a second hotline between high-level civilian authorities, to provide a check on information provided via the DGMO hotline.

• Nuclear risk reduction centers might provide a second tier of contacts for dealing with crises and cease-fire negotiations The familiarity and working relationships established during peacetime between Indian and Pakistani military and civilian NRRC staffs could potentially expedite crisis management and, ultimately, resolution.

III

Arms Limitations Measures

The previous section noted that the primary purpose of arms limitations is to remove the existence of *weapons* as a potential cause of conflict. Further, by reducing or eliminating especially pernicious weapons, negotiated limitations may ultimately restrain the violence and destructiveness of wars that do occur. This section will emphasize verification arrangements, including cooperative measures for enhancing monitoring effectiveness and treaty compliance, integral to the effective implementation of various bilateral and multilateral arms limitations measures relevant to South Asia. Like the previous section discussion here will survey past experience with a variety of arms control measures in other contexts, notably that of the U.S. and Soviet Union. This section similarly poses arms control *possibilities*, by attempting to answer the question, "what kinds of arms limitations regimes could India and Pakistan implement given the requisite technological capabilities and political will?" Many of the measures described here undoubtedly require monitoring technologies not presently available to either country; the aim here is only to examine what *could* be done if both countries had access to these technologies, either through indigenous development or provided by multilateral arrangement.

Before surveying potential arms limitations regimes it is essential to examine those features distinguishing the South Asian arms control context from that of the U.S. and Soviet Union or other regions. Three features of the South Asian arms control environment, namely, the covert nature of military nuclear activities, their integration with ostensibly civilian power and space programs, and small (if any) nuclear weapons stockpiles, will significantly shape the character of arms-limitation verification regimes.

Arms Limitations and Nuclear "Covertness"

Arms limitations agreements anticipate the existence of something to limit. Parties to such agreements must at least implicitly acknowledge whether they possess the objects or engage in the activities that the agreement aims to control—and submit to verification procedures capable of detecting whether they do. For India and Pakistan the most comprehensive forms of regional arms limitations aimed specifically at nuclear weapons could obligate them to do one of the following, depending on what stage of development each is at in its military nuclear program:

(i) Agree not to produce, in the future, any nuclear warheads (assuming none now exist—verification methods should be capable of determining this with a reasonable certainty).

(ii) Agree to dismantle such warheads as already exist and not produce any more.

(iii) Explicitly recognize the other's possession of a limited number (the number that exist at the signing of the agreement) of warheads and weapons (warheads mated to delivery vehicles) while agreeing not to produce more warheads or deploy more weapons. Unilateral and negotiated measures are necessary in this case to manage deployments of existing weapons to enhance crisis and deterrence stability.

(iv) Explicitly recognize the nuclear status of the other while mutually working toward controlling both quantitative and qualitative aspects of current and future weapons deployments to enhance crisis and deterrence stability.

Any of these approaches to arms control essentially means an end to the possession of a nuclear "option." Either India and Pakistan will have renounced a nuclear capability (approaches i and ii) or explicitly accepted each other's possession of such a capability (approaches iii and iv). Another option, a mutual agreement to keep warheads separate from their means of delivery, would allow retention of an ambiguous option (by monitoring delivery vehicles rather than fissile materials or warheads) but would entail formal verification arrangements to be anything more than symbolic. Verification and monitoring for such a "nonweapization" agreement is discussed in a subsequent section.

One of the most compelling reasons, in an arms control sense, for keeping covert nuclear weapons covert[126] is that such status imposes severe restraints on both the quantitative and qualitative development of arsenals.[127] Were India and Pakistan to declare nuclear weapons status, a close and interactive linkage between arms control efforts and weapons technology development would be essential to manage their nuclear forces through a potentially very precarious transition from newly emergent status to a relationship of stable deterrence, while limiting the incentives to arms race. In lieu of retaining covert status, arms imitations measures aimed specifically at production and testing could serve an essentially similar restraining function.

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[126]. For discussions of why covert nuclear weapons capabilities should remain covert see Lewis A. Dunn, *Controlling the Bomb* (New Haven, Conn.: Twentieth Century Fund Report; Yale University Press, 1982), pp. 135–138; Alan Dowty, "Going Public With the Bomb: The Israeli Calculus," and Gerald M. Steinberg, "Deliberate Ambiguity: Evolution and Evaluation," in Louis Rene Beres, ed., *Security or Armageddon: Israeli Nuclear Strategy* (Lexington, Mass.: Lexington Books, 1986). See also previous discussion.

[127]. A. F. Mullins "Proliferation in South Asia: The Military Dimension" (Lawrence Livermore National Laboratory; Manuscript, n.d.), p. 6.

Arms Limitations and Small Nuclear Forces

What do small, or even nonexistent, nuclear forces imply for arms limitations measures aimed at restricting their production and deployment? The most important consequence is that the potential military significance (in terms of gaining a "strategic" advantage) of noncompliance is much greater than for similar noncompliance against a background of very large forces. Small absolute force numbers mean that the relative significance of incremental additions to force size is potentially very large. Figure 3.1 illustrates mathematically the relationship between absolute force size (in terms of stockpiled warheads) and the relative significance of incremental increases. Here, "relative significance" is defined as the percentage change resulting from incremental additions of ten to an existing stockpile of *n* warheads. What is apparent from Figure 3.1 is that as *n* grows very large the relative significance of additional increments of ten warheads approaches zero, i.e., grows very small.[128]

Representative of this situation are proposals for a superpower fissile materials production ban. Frank von Hippel and Barbara Levi posit that verification capable of detecting at least a 10 percent clandestine increase in the size of current fissile materials stockpiles over a ten year period would be sufficient for such purposes. Diversions over a ten year period comparable to 10 percent of the current U.S. stockpile, von Hippel and Levi contend, would amount to a diversion of six metric tons per year of weapons-grade uranium or one metric ton per year of plutonium.[129] Von Hippel and Levi note that fissile materials diversions of such magnitude could conceivably enable the clandestine production of hundreds of warheads but conclude that "measured against the existing stockpiles such increments could not be considered [strategically] significant." In contrast, the South Asian case demands that verification for fissile materials production limitations be capable of detecting with a reasonable probability the diversion of kilogram quantities of fissile materials over a period of weeks to months. In other words, verification in this context should be

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[128]. Figure 3.1 represents a purely mathematical expression of relative significance as percentage change; it says nothing about changes in actual military usefulness of incremental additions to force size, nor does it presume to measure the perceived political significance of evidence of noncompliance with arms-limitations agreements. Further, it assumes that new warheads are added to existing stocks in constant increments of ten (in reality, additions are likely to be variable) and that no dismantling of previously added warheads occurs. Nonetheless, Figure 3.1 can be said to represent a quantification of the perception that a small numerical increase in a small weapons stockpile is much more significant militarily than a comparable, or even somewhat larger, increase in an already large arsenal.

[129]. Frank von Hippel and Barbara Levi, "Controlling Nuclear Weapons at the Source: Verification of a Cutoff in the Production of Plutonium and Highly Enriched Uranium for Nuclear Weapons," in Kosta Tsipis, et. al., eds., *Arms Control Verification: The Technologies That Make It Possible* (Washington, D.C.: Pergamon-Brassey's; 1986), pp. 356–357.

capable of detecting fissile materials diversions on the same order of magnitude as specified for IAEA safeguards "significant quantities" and "timely detection."[130]

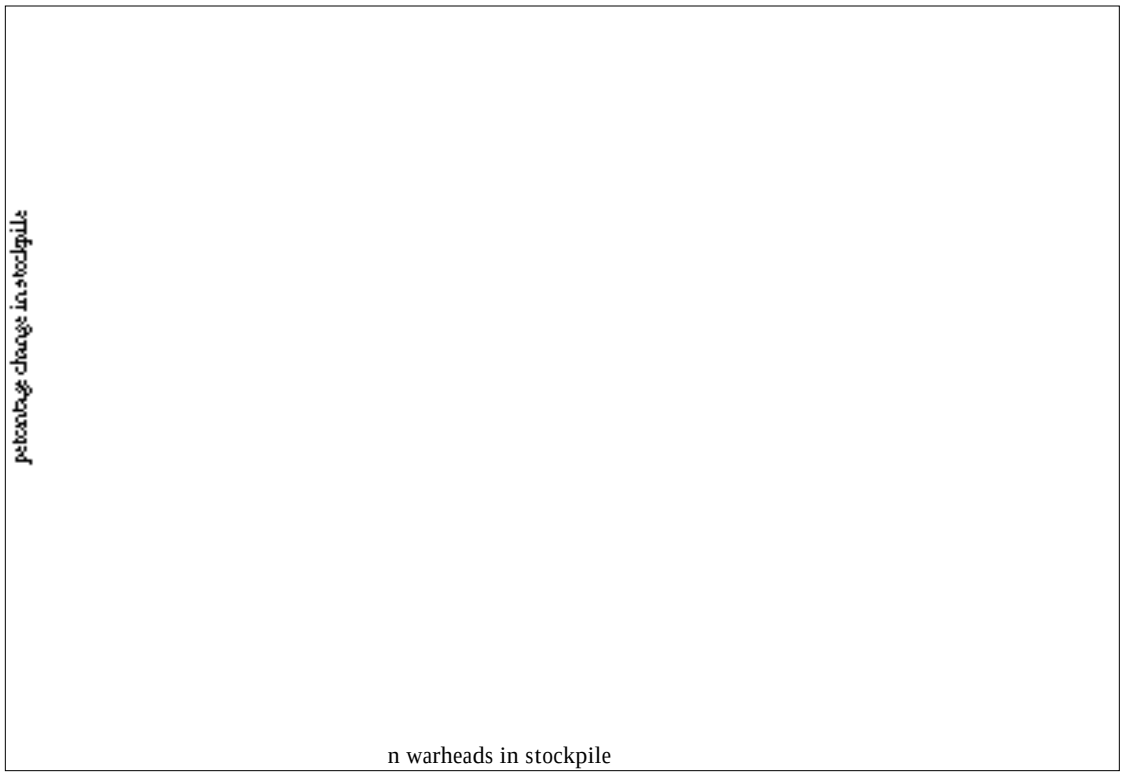

FIGURE 3.1 Percentage Change (Relative Significance) of Incremental Additions of Ten to a Stockpile of *n* Warheads. Values for percentage change in stockpile resulting from incremental additions of ten warheads were calculated according to the following:

Percentage change = $\left(\frac{n}{n+10} - \frac{n-10}{n}\right) \times 100$ where n = number of warheads.

This allows for a comparison of the percentage change resulting from an addition of 10 to a stockpile of *n* warheads *relative* to the percentage change resulting from an addition of 10 to a stockpile of *n*-10 warheads.

For example, in a stockpile of 40 warheads:

Percentage change = $\left(\frac{40}{50} - \frac{30}{40}\right) \times 100 = 5\%$

With smaller constant incremental additions, the percentage change approaches zero more rapidly. With greater constant incremental additions the percentage change approaches zero more slowly. In general, $\left(\frac{n}{n+k} - \frac{n-k}{n}\right) \times 100$ = percentage change resulting from constant incremental additions of k units to a "stockpile" of n units.

130. IAEA "significant quantities" and "timely detection" criteria are given in "The Present Status of IAEA Safeguards on Nuclear Fuel Cycle Facilities," *IAEA Bulletin* 22 (3–4) (August 1980): 4, 6.

The strategic, or military, importance of violations of an arms-limitation agreement is somewhat more easily defined (but still rather problematic) than is "political" significance.[131] Generally, militarily significant violations are considered to be those that enable a violator to gain a military advantage over a counterpart. Defining the military significance of violations of agreements banning the production of fissile materials for weapons use is not very difficult in the South Asian context (detecting violations is another matter) if the diversion of a single weapon's worth of material is considered to enable the development of a military advantage by permitting the production of a nuclear warhead. Looking again at Figure 3.1, it can be inferred that the production of even a single nuclear warhead could translate to military advantage if existing stockpiles of warheads are small enough—assuming, of course, warheads are subsequently mated to suitable delivery vehicles.[132]

Obviously, arms limitations aimed at halting the future production of warheads, in the context of small or nonexistent nuclear forces, require much more intrusive and stringent verification measures than in the context of large nuclear arsenals, where the production of a single warhead, or even tens or hundreds, is "trivial" by comparison. In 1961, Jerome Weisner postulated an inverse relationship between the extent of necessary inspection and levels of armaments in a situation of progressively deeper reductions in force levels.[133] The premise from which Weisner derived this relationship is that, as progressive reductions in the absolute numbers of armaments proceed, the *minimum acceptable* compliance uncertainty similarly decreases. The phenomenon depicted by Figure 3.1 can be said to represent a restatement of this premise; if small increases have a larger relative significance for smaller arsenals, parties to an agreement covering such arsenals will require (and expect) more accurate evidence of compliance. Weisner proposed his model before the advent of sophisticated satellite reconnaissance capabilities enabled nonintrusive observation of nuclear weapons deployments, but its essence remains relevant to the case of fissile materials production bans for countries possessing limited stocks of such materials or nuclear warheads.

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131. Alan Krass, *Verification: How Much is Enough?* (London: Taylor & Francis; SIPRI, 1985), pp. 202–204.

132. This situation illustrates the verification principle that violations are much more clearly defined for outright bans of specified weapons systems or agreements obligating parties not to do something (e.g., production of nuclear explosive devices, atmospheric nuclear testing) than for agreements specifying numerical limitations. See Herbert Scoville, Jr., "Verifying a Nuclear Freeze," in William T. Parsons, ed., *Arms Control and Strategic Stability* (Lanham, Md.: University Press of America, 1986), p. 88. This concept is more fully discussed subsequently.

133. The "Weisner curve" is discussed in Alan S. Krass, "Nuclear Verification in the Post-Cold War Era," in J. B. Poole and R. Guthrie, eds. *Verification 1993: Peacekeeping, Arms Control and the Environment* (Verification Technology Information Centre; London: Brassey's, 1993), pp. 69–76.

Arms Limitations and Dual-Use Nuclear Programs

The production of weapons-usable fissile materials in covert nuclear weapons states such as India and Pakistan poses particular verification and monitoring difficulties. Dual use pervades the nuclear programs of such states. Military nuclear production activities as might exist are necessarily closely integrated with civilian nuclear energy, space, and conventional military production activities. Figure 3.2 represents a generic flowchart of nuclear weapons production in a covert nuclear state and illustrates the extent of integration between civilian nuclear, conventional military and space program activities with clandestine nuclear weapons production.

Figure 3.2 also indicates the most obvious points of application of arms limitations agreements: production, testing, and deployment. These points constitute the most effective monitoring foci of arms limitations, relative to "hidden" processes such as design, research and development. The following discussion approaches possible South Asian arms limitations regimes in terms of these three foci. Finally, provisions for the effective implementation of a regional nuclear weapons free zone are considered.

Ease of Monitoring and Type of Arms Limitations Regime

Table 3.1 compares in a very general way the relative ease of monitoring restrictions on specific kinds of weapons systems and activities. Those listed in the left-hand column are "easier" to monitor relative to the entry opposite on the right. Ease of monitoring is defined here in terms of the presence of "direct observables," i.e., how amenable certain kinds of restrictions on weapons or related activities are to less intrusive means of monitoring such as satellite surveillance.[134] Harder-to-monitor restrictions, in contrast, demand greater counting or measurement accuracy, or rely on the observation and inference of "hidden" characteristics or activities. For monitoring situations of this nature more intrusive methods such as on-site inspection (OSI), or on-site automated sensors, are often necessary.

Eliminations of complete weapons systems (but not their parts, such as warheads) are usually easiest to monitor. Though the possibility of clandestinely produced or residual hidden weapons remains, compliance determination in this case is straightforward. The observance of a single weapon of the banned category suffices as

[134]. Dean A. Wilkening, "Monitoring Bombers and Cruise Missiles," in William C. Potter, ed., *Verification and Arms Control* (Lexington, Mass.: Lexington Books, 1984), pp. 107–124.

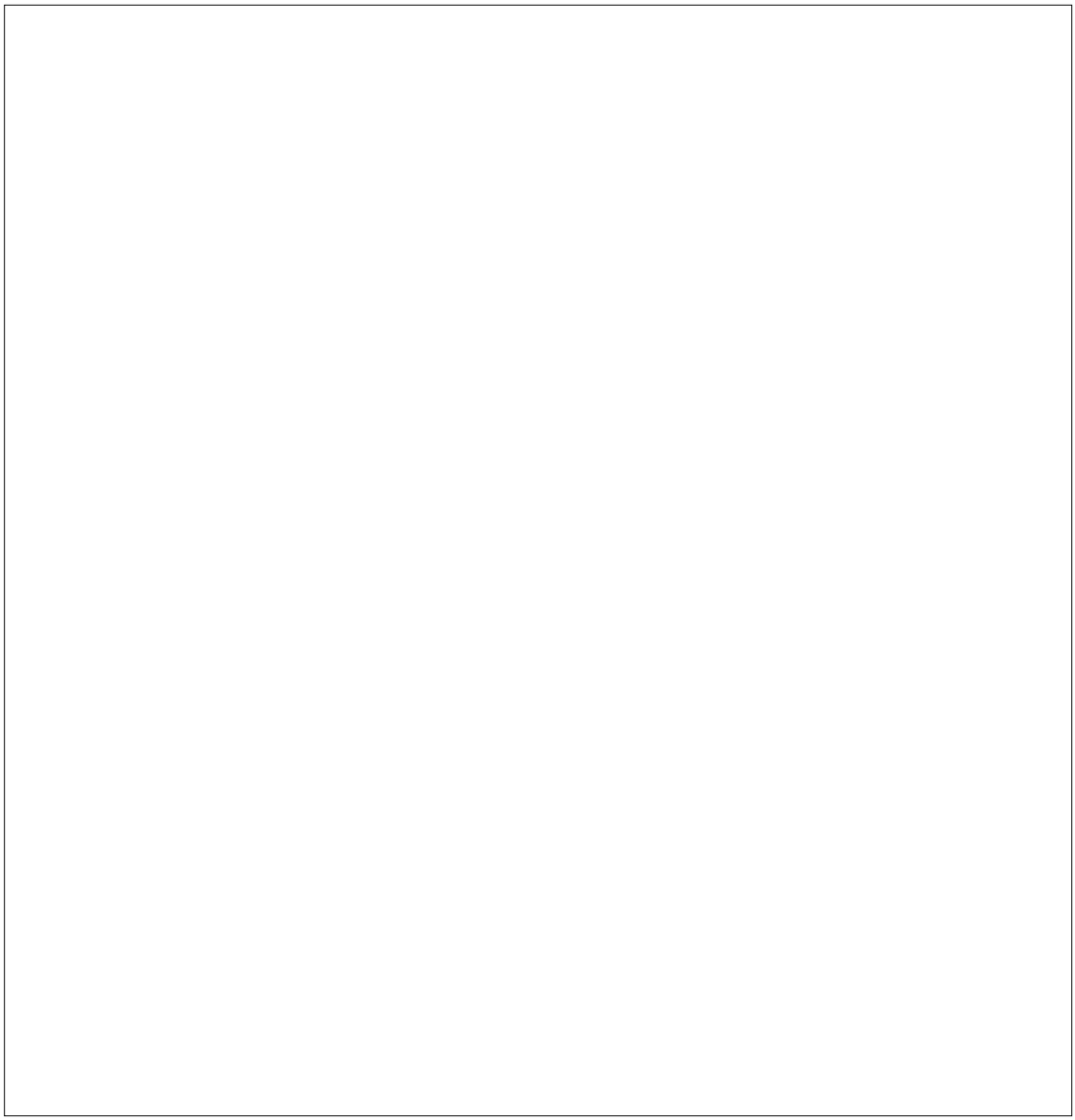

FIGURE 3.2 Nuclear Weapons Production in a "Covert" Nuclear State. The placement of the number '1' at the "exit" of the fissile material production process is not meant to imply that monitoring should take place only at the exit of fissile material production facilities; rather, it is meant to signify the application of monitoring and verification activities at all points of the fissile material production cycle for which diversion could be significant including, for example, uranium enrichment, reactor, and reprocessing facilities. Again, Figure 3.2 is intended to illustrate *processes* in the nuclear weapons life-cycle, rather than specific *facilities* housing such processes.

evidence of noncompliance. Monitoring and compliance for comprehensive nuclear explosive testing bans, however, is not necessarily easier than for threshold testing

TABLE 3.1 Ease of Monitoring Various Weapons Systems and Activities

Easier to Monitor	*Example*	*Harder to Monitor*	*Example*
Elimination of complete weapons systems	INF Treaty	Numerical limits or thresholds	SALT Treaty specifications on launcher or "platfor numbers
Numerical limits or thresholds	Aircraft or missile numbers, TTBT	Qualitative limits	Guidance accuracies, MIRVed missiles, missile flight range
Testing	Missile flight testing, nuclear explosive testing	Production, R & D	Fissile materials production, warhead design and assembly design and productio of missiles
Deployment	Ban on missile deployments	Production, R & D	
Single function platforms	Silo-based missiles	Dual function platforms	Some nuclear capable aircraft, possibly IRBMs, cruise missi
Large weapons systems	ICBMs, IRBMs, nuclear capable aircraft	Small weapons systems	Tactical nuclear weapo cruise missiles

Source: Adapted from discussion in Dean A. Wilkening, "Monitoring Bombers and Cruise Missiles," in William C. Potter, ed., *Verification and Arms Control*, (Lexington, MA: Lexington Books, 1984), pp. 107–124 .

bans.[135] Testing and deployment restrictions, whether involving complete bans or numerical thresholds, are in turn more directly monitored than are restrictions on warhead or delivery-vehicle production. But compliance determination for testing and deployment restrictions is not always more straightforward than it is for production limitations.[136]

[135]. The detection and identification of very low magnitude seismic events for the purposes of monitoring compliance with a complete nuclear testing ban is more difficult than is the detection and identification of larger nuclear explosions under a limited test ban regime specifying a relatively high threshold.

[136]. In some situations compliance can be monitored with greater certainty if more intrusive ("difficult") OSI measures are employed.

Production Monitoring Agreements

Ban on Production of Fissile Materials for Nuclear Explosive Use

In the South Asian context, the intent of an agreement prohibiting the production and use of fissile materials for nuclear explosive devices would be to ensure that materials usable in such devices are not diverted from legitimate civilian purposes. The IAEA, of course, has accumulated a vast experience with inspecting specific kinds of nuclear facilities and safeguarding fissile and source materials from diversion. Though the IAEA need not necessarily perform the monitoring and verification functions of regional or bilateral fissile materials restrictions, on-site inspection regimes for these agreements should logically employ IAEA materials accounting, containment, and surveillance methodology. However, because the IAEA system is designed to accommodate an extensive multilateral application, employing its methodology in a bilateral or regional context necessitates some modification.

The Dual Use Problem. Figure 3.2 illustrates possible diversion routes for fissile materials and the points in the nuclear weapon production process at which dual use is likely to be significant. As a flowchart of a generic covert nuclear weapons program, Figure 3.2 illustrates the linkage between discrete *processes* rather than specific facilities in which these processes take place. In a covert nuclear weapons state, several of the processes illustrated here as distinct may actually take place within one or two facilities having ostensibly peaceful functions.

Verification regimes for negotiated restrictions on use and production of fissile materials (other than complete shutdowns of designated nuclear facilities) in this context must simultaneously account for both civilian and potential nuclear explosive production activities. Because of the NPT and IAEA mandates to facilitate the development of peaceful nuclear technology in nonnuclear weapons states, IAEA safeguards have been designed as such a means of simultaneous accounting. The purpose of OSI and materials accounting methods employed by a South Asian regional or bilateral fissile materials restriction regime would be fundamentally identical to that of IAEA safeguards implemented under both the NPT (INFCIRC/153) and non-NPT (INFCIRC/66) systems. However, both of the IAEA safeguards systems leave open a number of potential "loopholes" and ambiguities.[137] Closing these loopholes would be a prerequisite for effective verification of a regional or bilateral fissile materials production-restriction agreement.

Modifications—Closing Loopholes. First, the language of a regional or bilateral South Asian agreement must explicitly prohibit the diversion of fissile materials for

[137]. David Fischer and Paul Szasz, *Safeguarding the Atom* (London: Taylor & Francis; SIPRI, 1985), pp. 75–86.

the fabrication of nuclear *explosive devices*. The IAEA's original model non-NPT safeguards document, INFCIRC/66, provided only that safeguards be administered to ensure that "special fissionable materials" are "not used in such a way as to further any military purpose."[138] Such wording allowed states to claim exemption of the development of "peaceful nuclear explosives," even though there is essentially no difference, in terms of technology and fissile materials required, between a nuclear explosive device for peaceful use and one for military purposes.[139] A second ambiguity in the IAEA's non-NPT safeguards systems relates to the extension of safeguards to materials produced from safeguarded source, or fertile, materials. The terms of INFCIRC/66 state only that the extension of safeguards to subsequent production of fissile materials from or modifications of source materials is "desirable."[140] A regional or bilateral fissile materials production restriction regime should include provisions for the continuance of safeguards regardless of subsequent transformation of treaty-limited fissile materials production potential. Provision should likewise be made for extending inspections and controls to new facilities constructed during negotiations or after the conclusion of an agreement.

No provisions exist for applying safeguards to facilities constructed indigenously on the basis of technology transferred under INFCIRC/66 agreements. The analog of this situation, in the context of a regional or bilateral fissile materials production restriction regime, would be secret facilities constructed to circumvent comprehensive monitoring of declared facilities or a more limited regime designating certain facilities for inspection. INFCIRC/153 (NPT) safeguards agreements, in contrast, obligate NPT parties to place all nuclear facilities under safeguards. IAEA inspectors, however, can legally inspect only declared facilities—they cannot search for and inspect suspected clandestine plants. A verification regime for a fissile materials production restriction agreement must additionally be capable of detecting clandestine nuclear production facilities and responding to the existence of such treaty violations, perhaps through the use of "challenge" or on demand inspections.

Effective verification of a limited, designated-facility on-site inspection and materials accounting regime would have to encompass more than simply accounting for the production of fissile materials within the facilities designated for inspection.[141]

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[138]. INFCIRC/66 in Ibid., p. 187.

[139]. This loophole has since been eliminated, however, for all safeguards agreements based on the original INFCIRC/66 document. Personal communication, Robert Rochlin, U.S. Arms Control and Disarmament Agency.

[140]. INFCIRC/66 in Fischer and Szasz, *Safeguarding the Atom*, p. 187.

[141]. There have been at least two proposals for an India–Pakistan limited or designated facility inspection regime. Peter Galbraith, then a staff member of the U.S. Senate Foreign relations Committee, proposed in 1988 that India and Pakistan each submit one currently unsafeguarded nuclear facility to safeguards, with Pakistan designating the Indian facility to be inspected, and India designating the Pakistani facility. See Peter Galbraith, "Nuclear Proliferation in South Asia: Containing the Threat," *Staff Report to the Committee on Foreign Relations, U.S. Senate* (Washington,

Ensuring nondiversion to nuclear explosive use entails a capability to account for the disposition of any nuclear materials that have passed through designated facilities at every point of potential use or diversion in the nuclear fuel cycle. A designated facility agreement should consequently provide for limited inspections and materials accounting at any facility whenever materials originating from or modified by the primary designated facilities are used. Some uncertainty also exists regarding IAEA rights to inspect inoperative facilities in states that are party to the NPT.[142] Both the extent of inspector access within certain facilities (e.g., access to the "commercially sensitive" cascade area of uranium enrichment plants) and the inspection status of inoperative plants are issues that must be resolved during the negotiation of a regional fissile materials production restriction regime.

Two additional factors relevant to such a regime, whether limited or comprehensive must be considered by its drafters. First, upper limits on the annual number of inspections should derive from an assessment of the "diversion potential" of the kind of nuclear facility subject to inspection as well as total facility throughput, or inventory. Current IAEA inspection limits are based on the latter. David Fischer and Paul Szasz point out that threshold nuclear weapons states have most frequently used research reactors in combination with pilot-scale reprocessing facilities to produce weapons-usable fissile materials.[143] India used its Canadian-supplied CIRUS research reactor to produce the plutonium for its 1974 Pokhran nuclear explosion.[144] The use of small research and test facilities is probably both more economical and amenable to secrecy than are commercial scale nuclear production facilities, for the clandestine production of small amounts of fissile materials for nuclear explosive use.

Finally, nonexplosive military uses of fissile materials, primarily production and use of HEU for nuclear submarine propulsion, must be addressed under a fissile materials restriction regime. In recent years India had leased a nuclear submarine from the Soviet Union, which provided the HEU fuel required for its operation (under the agreement providing the submarine, its spent fuel was returned to the Soviet Union).[145] India may wish to produce its own fuel in the future, should it develop a uranium enrichment capability. The use and transfer of HEU for submarine propulsion is covered by neither IAEA safeguards system. Reportedly, India is

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D.C.: GPO, 1988), p. 22–23. The Carnegie Task Force on Nonproliferation and South Asian Security proposed that India and Pakistan negotiate a regime of limited duration inspections of designated facilities. "Nuclear Weapons and South Asian Security," *Report of the Carnegie Task Force on Nonproliferation and South Asian Security* (Washington, D.C.: Carnegie Endowment for International Peace, 1988), pp. 88.

142. Fischer and Szasz, *Safeguarding the Atom*, p. 80.

143. Ibid., p. 82.

144. Leonard Spector, *Going Nuclear* (Cambridge, Mass.: Ballinger, 1987), pp. 84–85.

145. Spector, *The Undeclared Bomb*, p. 90.

conducting research on laser isotope separation methods and has built a pilot scale gaseous centrifuge enrichment plant at Trombay.[146]

Negotiated Shutdowns of "Sensitive" Nuclear Facilities. The 1988 Carnegie Task Force proposed that India and Pakistan negotiate temporary shutdowns of their most "proliferation prone" nuclear facilities.[147] The most useful targets of a facility shutdown agreement would be Pakistan's Kahuta uranium enrichment facility and India's largest reprocessing plant at the Bhaba Atomic Research Complex (BARC). The nonoperational status of these plants could probably be ascertained rather effectively by satellite surveillance technologies.[148] Detection of noncompliance would be virtually assured if periodic inspections were carried out in conjunction with NTM monitoring. Because India has an active breeder reactor research program it will likely object to any restrictions that significantly slow or halt its plutonium production capability. Since Pakistan has no apparent civilian need for a uranium enrichment capability it has less justification for objecting to a facility shutdown agreement applying to Kahuta. Mutual and verifiable (through baseline on-site inspection) data exchanges on stockpiled nuclear materials would facilitate assessment of Indian annual civilian plutonium production requirements. Additionally, materials accounting and inspection of India's smaller PREFRE reprocessing plant would be essential to ensure nondiversion from legitimate civilian use. "Sensitive" Pakistani research or pilot scale nuclear facilities other than Kahuta (inoperative under a facility shutdown agreement) could be similarly placed under a limited accounting and inspection regime.

Production Monitoring of Missile "Factories"

The U.S. Soviet Intermediate and Shorter Range Nuclear Forces (INF) Treaty, which aims to eliminate an entire class of ballistic missiles, provides the most salient verification "model" for a regional or bilateral agreement banning or restricting production of missiles for nuclear weapons use. The phrase "for nuclear weapons use" is significant; in the South Asian context a complete ban on missile production (or R&D and testing) would be infeasible if it were to imply a simultaneous ban on development of civilian space and conventional military technology. Dual use of missile technology is an especially significant problem in the region because, as with fissile materials production, "nuclear" missile research and development and, testing, exist side by side with civilian space and conventional military technology. A regional missile production monitoring regime must be capable of distinguishing among

146. Ibid., p. 113.

147. *1988 Report of the Carnegie Task Force on Nonproliferation and South Asian Security*, p. 89.

148. John A. Adam, "Special Report–Verification: Peacekeeping by Technical Means," *IEEE Spectrum* (July 1986): 33–80.

production for nuclear weapons, nonnuclear weapons, and civilian space applications.

The production of missiles or civilian space launch vehicles involves large scale, distinctive manufacturing processes that take place at specialized facilities amenable to both INF-type production monitoring and observation by NTM. For example, the static firing of solid rocket motors is performed at special outdoor test sites. Production monitoring is most effective for primarily "hand made" strategic-, and intermediate-range missiles with large components manufactured in limited production runs.[149] Tactical nuclear delivery vehicles, such as artillery shells or cruise missiles, are especially difficult to monitor at the production stage because first, components are produced in great quantities and are small in size, and second, such weapons are dual-capable with few outwardly distinguishing characteristics between conventional and nuclear armed variants. Tactical munitions factories might be used to produce weapons that may be later adapted to either a conventional or nuclear warhead.[150]

To be effective, a missile production monitoring regime must do two things: (1) ensure nonproduction of treaty limited items at declared facilities (or only production of agreed numbers at declared sites) and, (2) ensure nonproduction of treaty limited items elsewhere or at clandestine sites. Detection of the latter implies provisions for short-notice challenge inspections applicable at least to acknowledged potential sites, in conjunction with NTM monitoring. The INF Treaty commits the U.S. and Soviet to noninterference with each other's NTM capabilities, prohibits concealment measures that might impede monitoring by NTM or on-site inspection, and permits each side an annual quota of challenge inspections at sites other than primary missile elimination and production facilities subject to routine OSI.[151] Both the Soviet Union and the U.S. have found INF inspection arrangements both satisfactory and useful, despite their intrusiveness. In addition to challenge inspections, the INF Treaty specifies four

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149. Ivan C. Oelrich, "Production Monitoring for Arms Control," in Michael Krepon and Mary Umberger, eds., *Verification and Compliance: A Problem-Solving Approach* (Cambridge, Mass.: Ballinger, 1988), pp. 118–119.

150. Because of the relatively short geographic distances involved, distinctions between "tactical and "strategic" range missiles in the South may be merely semantic; here, "tactical" nuclear delivery vehicles refers primarily to weapons likely to be used on a conventional battlefield, e.g., artillery shells, atomic demolition mines, etc., manufactured in rather large numbers. Though dual-capable short-range missiles as the Indian Prithvi (described as a "battlefield support missile," with a range of 150 kilometers) and the Pakistani Hatf I and Hatf II missiles (with ranges of 80 and 300 kilometers respectively) can be considered as "tactical" weapons, they could also be used "strategically," i.e., targeted at cities or military targets well beyond battlefield limits.

151. "Summary and Text of the INF Treaty and Inspection Protocols," *Arms Control Today* (January–February 1988): 1–16.

types of OSI, two of which are particularly relevant for South Asian arms limitations purposes:[152]

- Baseline inventory OSI for verification of numbers and location of existing missiles. Both any existing conventional-armed missiles and space launch vehicles must be accounted for under a regional or bilateral missile production monitoring regime.
- Routine production monitoring of specified facilities. Since neither India or Pakistan produces nuclear-capable missiles in "quantity," production facilities in these countries probably also house research and development functions, and may be collocated with static firing test facilities. These multipurpose "factories" must be included for inspection under a regional or bilateral "INF" treaty.

The INF Treaty provides for the continuous presence of counterpart inspectors at missile production facilities in the U.S. and Soviet Union. Inspectors patrol the facility perimeter (which may encircle several buildings) and also observe the movement of objects and vehicles through designated portals of facilities within the perimeter. Inspectors are permitted to examine the interiors of containers or vehicles with dimensions greater than or equal to those of complete treaty limited missiles or their smallest stages. Covered objects of similar dimensions are only partly unshrouded for inspection, but it is the inspected party's responsibility to demonstrate to the satisfaction of the inspectors that the covered object is not a treaty limited item. Other items are subject only to external inspection, weighing, and linear measurement. INF inspectors carry out their tasks without benefit of actual access to the plant's interiors—they only monitor the movement of objects through designated portals or the facility perimeter.[153]

The INF Treaty delimits an extensive protocol for the conduct of inspections for two reasons: to restrict information gathered to that necessary only for treaty verification purposes, and to permit the use of inspected facilities for the production of missiles or missile components not covered by the treaty.[154] The Soviet missile factory designated for inspection, the Votkinsk Machine Building Plant, also manufactured and assembled SS-25 missiles, which were not limited by the treaty. Appropriately-modified INF Treaty inspection procedures are thus particularly relevant to the South Asian context, where missile production facilities designated for inspection might be concurrently used to produce components for conventional military munitions or shorter-range missiles, and space launch vehicles, items likely to be permitted under a negotiated regime of missile production restrictions. In addition

152. Elimination and close out are the other two types of OSI specified in the INF Treaty.

153. INF Treaty Inspection Protocol; Serge Sur, "Verification Problems of the Washington Treaty on the Elimination of Intermediate Range Missiles," *UNIDIR Research Paper*, No. 2 (New York: United Nations, 1988), p. 11.

154. Sur, "Verification Problems," p. 11–12.

to human inspection, continuous monitoring could be supplemented with automated sensors, such as cameras, motion or infrared detectors, capable of detecting the passage of objects of certain dimensions or characteristics through designated portals.[155]

Verifying "Nonweaponization"

Verification methods analogous to some of those employed by the INF Treaty, specifically perimeter and portal monitoring, could be an effective means of monitoring an India–Pakistan agreement banning the mating of warheads to delivery vehicles such as aircraft or missiles. The most significant differences in verification requirements between the INF Treaty and a nonweapization agreement relate to the nature of the objects being controlled; the former aimed to ensure nonproduction and assembly of items of such great size and weight (missile stages and motors) that these visually or directly measurable dimensions could used to define allowable limits. Moreover, size and weight dimensions of the banned stages and motors were missile-specific, easing the task of distinguishing between these and permitted items. Monitoring to ensure potential delivery vehicles remain nuclear warhead-free, conversely, requires the detection of much less tangible and directly measurable characteristics, primarily radioactivity. The detection of radioactivity of *any* type or level in places where it should not be (such as in a parts shipment to a missile factory) however, would be considered an instance of noncompliance under a nonweapization regime. This need for only gross detection of radioactivity, rather than characterization of it, considerably simplifies the inspector's job. Perimeter and portal monitoring for nonweapization would also entail greater emphasis on surveillance of objects entering, rather than exiting, a monitored site. Similar to INF procedures, the detection of ancillary activities (such as unexpected construction, or movement by unauthorized individuals across a perimeter) would comprise indirect evidence of possible noncompliance with a nonweapization agreement.

Portals, Perimeters, Sensors, and Tags. The focus of a nonweapization regime would be sites where aircraft or missiles are deployed or stored, and/or missile and artillery production factories. Similar monitoring arrangements to ensure nondeployment of tactical or longer-range nuclear missiles within a "nuclear free zone" adjacent to the international border might be undertaken between India and China. Relatively nonintrusive perimeter and portal monitoring can be applied to such sites and facilities. As noted by previous discussion of INF verification, perimeter and portal monitoring need not require routine inspector access to the interior of the monitored plant or facility, only to entrances and exits (portals). A fence enclosing the facility (the fence could even be a considerable distance from the

[155]. Oelrich, "Production Monitoring," pp. 114–117.

buildings themselves), as well as doors to facility buildings, could comprise a perimeter, or it could be defined by a ring of remote sensors designed to detect movement across it. Initial inspections of a facility, similar to the baseline inspections carried out under the INF Treaty, would ensure a "zero warhead" (or zero fissile materials) presence at the start of formal perimeter and portal monitoring. Sensitive production processes, research, equipment or nontreaty limited items housed in a facility would thus remain free of subsequent inspection. Materials and equipment entering or exiting the perimeter, however, are subject to inspection, in accordance with treaty specifications.

Because nuclear warheads or their cores, essentially discrete packages of radioactive materials, are the objects of interest for such an agreement, the simplest, most effective approach to a nonweapization regime is to monitor aircraft or missile production, storage and deployment sites for the presence of radioactivity in incoming vehicles, containers or individuals. Ideally, inspectors using neutron or gamma ray emission detectors, stationed continuously at entrances or exits to service roads or facility buildings of airfields, should also be granted controlled access to landing aircraft which may be carrying warheads or fissile materials. Installed along the perimeter of a base or airfield, a variety of remote motion detectors, seismic intrusion detectors, infrared sensors and cameras, comparable to those used in the Sinai, could provide a means of continuous monitoring. Perimeter sensor technology need not be overly complex; the task here is to detect movement across the perimeter at points other than continuously inspected portals.[156] It is essential that a nonweapization agreement provide for special inspections, in which portal inspectors are permitted to stop and inspect "intruders," should remote sensors detect a perimeter breach.

The utility and simplicity of remote monitoring via short-distance sensor technology is evident from previous applications, such as the Sinai disengagement process. "Verification problems" will most likely arise from differences in interpretation of treaty language, fears of spying by inspectors with access to sensitive military facilities and vehicles, intrusiveness of inspections and efforts to resolve apparent acts of noncompliance. These are matters of treaty mechanics that must be resolved at the negotiating table, and are discussed in detail in a subsequent section. Nonetheless, a sensor monitoring regime can incorporate several design features to minimize compliance problems.[157] Two principles integral to the design and successful implementation of any verification regime must be to (1) minimize intrusiveness and (2) increase, through the use of multiple monitoring methods, the probability of detecting noncompliance. The latter becomes especially crucial when objections to the "excessive" intrusiveness of some methods (such as on-site inspections) rule out their use. Synergistic monitoring is also important because ease

156. Ibid., p. 117.

157. Altmann, "Short-Distance Sensors," in Kokoski and Koulik, eds., *Verification of Conventional Arms Control in Europe: Technological Constraints and Opportunities*, pp. 135–136.

of monitoring (in terms of intrusiveness, cost, directness of measurement, definition of noncompliance, etc.) varies with the stage of a weapon's life cycle.

Sensors for monitoring a particular treaty restriction should be tailored as specifically as possible to that task. Sensors should collect only the minimum data necessary to ascertain compliance, and inspectors should employ the least intrusive methods and equipment available. Presumably, the goal of an India–Pakistan nonweaponization agreement would be to ensure that no nuclear warheads or material are brought to sites where they can be installed on aircraft or missiles. Neutron emission or gamma ray detectors do not require that inspectors actually see a warhead, though they can be used to determine the isotopic composition (e.g., the ratio of ^{239}Pu to ^{240}Pu) of fissile materials. Neutron detectors were able to detect neutron emissions from a ship-based Soviet warhead at a distance of up to seventy meters in a 1989 experiment.[158] Vehicle portal radiation monitors, in which a vehicle passes slowly through a pair of detector columns, have been shown to detect a minimum of 3 to 9 grams of low-burnup (i.e., weapons-grade) plutonium, and 1000 grams of HEU.[159] More complex vehicle monitoring stations that require a vehicle to stop for monitoring within a semi-enclosed structure for up to a minute, are significantly more sensitive: minimum amounts of low-burnup plutonium and HEU detected in a test were .03 grams and 40 grams respectively. The longer the time period allowed for monitoring and the greater a vehicle's proximity to sensors, the higher the detection sensitivity. Sensitive radiation dosimeters, akin to those employed by the IAEA to monitor passage of nuclear materials through materials balance areas or by U.S. civilian and military nuclear facilities to detect diversion of materials by individuals on foot, might also be installed at portals and along the perimeter. Though it is possible to shield fissile materials from detection using neutron absorbing materials (such as lead), "active" nondestructive assay techniques using a high-energy neutron source (the interaction of source neutrons with assayed materials

158. Thomas B. Cochran, "Black Sea Experiment Only a Start," *Bulletin of the Atomic Scientists* (November 1989): 15. The validity of these results has been challenged, however. Personal communication, Pauline Dobranich, Sandia National Laboratory.

159. P. E. Feblau, "Perimeter Radiation Monitors," in Doug Reilly, Norber Ensslin, and Hastings Smith, Jr., eds. *Passive Nondestructive Assay of Nuclear Materials* (Washington, D.C.: U.S. GPO; NUREG/CR-5550, 1991). pp. 563–587. These tests were conducted under "worst-case" conditions, defined as (1) a 1-ton van stationary except when moving (at 8 km/h) through the 5-meter wide portal, (2) background intensity is 20 mR/h, and (3)"shielding by vehicle structures is significant." Detection probability is 50 percent or higher. Under more normal operating conditions, performance is improved. Sensors designed to detect contamination are sensitive to many forms of radiation while sensors used to monitor for *diversion* of nuclear materials detect mainly gamma rays and neutrons. For the latter, detection capability is also affected by nuclear materials' internal absorption of their own gamma rays, i.e., the materials can act as their own shield. This phenomenon varies with the size and shape of the materials. For example, spheres of HEU absorb most of their own gamma ray emissions whereas foils emit most of theirs.

is measured)[160] may detect the presence of shielding, though active NDA analysis can impart radioactivity to assayed materials. Provision for inspection of questionable containers within a vehicle entering a portal must therefore be incorporated into a verification regime for this type of agreement.

Monitoring for this type of agreement might also include the use of electronic "tags," affixed to permitted conventional delivery vehicles or incorporated into key components during manufacture. Tagging technologies, under development for verifying both a possible Conventional Forces in Europe (CFE) Treaty and START II, could be employed to ensure that conventional weapons (including longer-range missiles) are not fitted with nuclear warheads. Here, each permitted conventional weapon would have a special deception-proof tag impervious to tampering or removal and affixed to a surface or incorporated into a key component during manufacture. Tagged aircraft, for example, might be remotely monitored via sensors embedded in runways at airfields, to monitor take-offs and landings, or to detect the presence of radioactivity.[161]

The simplest, most direct tag technology for both a nonweapization agreement and a ban on tactical nuclear weapons are dosimetric tags that can detect the presence of radioactivity within or near a weapon. Some types of these can be monitored remotely, others require the use of hand-held readers.[162] Monitoring methods for use with tag technologies are discussed in greater detail in a subsequent section on nuclear weapons deployment bans.

Commercial Satellites: Limited Usefulness. Detection of clandestine facilities and deployment sites would comprise the primary function of satellite monitoring. Commercial satellites such as the French SPOT system might be also be used to ascertain whether attempts were made to circumvent inspection via a secretly constructed entrance. (Presumably, however, remote perimeter sensors, such as seismic and motion detectors, will activate should the perimeter be breached during construction, prompting inspection of the site.) Lack of real-time availability, however, can pose a serious obstacle to the effective use of commercial satellite imagery for verification purposes, especially detection of imminent weaponization. Commercial satellites such as SPOT and Landsat must first be programmed to acquire image data for a particular geographic site. For Landsat satellites, the time between a customer request for imagery and programming the satellite to acquire it is

160. The use of such non-destructive assay technology for use in potential India–Pakistan confidence-building measures or a nonweaponization agreement will be examined in a future study by Clifford Singer (UIUC Department of Nuclear Engineering) and the author .

161. Steve Fetter and Thomas Garwin, "Tags," in Kokoski and Koulik, eds., *Verification of Conventional Arms Control in Europe*, p. 152.

162. A. DeVolpi, "Status of Tags and Seals for Arms Control Verification," in J. B. Poole, ed., *Verification Report 1991: Yearbook on Arms Control and Environmental Agreements* (Verification Technology Information Centre; London, 1991), p. 143.

approximately ten days. From the time of satellite data acquisition to delivery of images to customers, Landsat and SPOT typically require another three weeks. A SPOT customer may also have to "take a number," so to speak, depending on scheduling of previous customer orders, and weather conditions.[163]

Nonetheless, for "baseline" imaging of established sites and collection of data to determine future monitoring requirements, SPOT images can be quite useful. During the Persian Gulf War, the U.S. Air Force relied heavily on SPOT images of Iraq and the region for mission planning. Perhaps most notably, for its arms control monitoring implications, was the use of SPOT images to ferret out possible locations of Iraqi Scud missile launchers. Data from missile-launch warning systems was used to determine the general area from which a Scud was launched; SPOT images were then used to assess the area's terrain or man-made structures likely to hide a launcher. A number of Scud launchers were found and destroyed in this manner.[164]

With its own SPOT or Landsat ground station a nation can directly receive and process digital satellite data, sometimes requiring less than twenty-four hours to do so. India has ground stations for Landsat and SPOT imagery, and Pakistan reportedly also has SPOT and Landsat stations. Lack of control over the use of images from these ground stations poses another impediment to use of commercial imagery for verification; India's ground-station contract with SPOT permits it to receive only images of territory within its borders.[165]

As with any arms control agreement, a party intent on evading a monitoring scheme will likely find a variety of ways to do so. The most significant threat to effective monitoring of a nonweapization agreement would be the installation of warheads at missile assembly plants and deployment of these and nuclear-capable aircraft at clandestine bases or airfields. Redundant sensor systems provide the most effective means of monitoring.[166] Each country should have access to remote-sensing (satellites or airborne) images and data, preferably through the auspices of a third-party guarantor nation, to ensure timely availability in the event of suspected noncompliance. Because an effective nonweapization regime would require India and Pakistan to periodically exchange lists of existing missile and aircraft deployment sites (much like the 1988 agreement prohibiting attacks on nuclear facilities), satellite monitoring should be able to detect most clandestine deployments. Ideally, all potential deployment sites would be subject to perimeter and portal monitoring. However, expectations of such a comprehensive monitoring regime are probably

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163. Vipin Gupta, "Remote Sensing and Photogrammetry in Treaty Verification: Present Challenges and Prospects for the Future," *Photogrammetric Record* 14 (83) (April 1994): 737.

164. Craig Covault, "USAF Urges Greater Use of SPOT Based on Gulf War Experience," *Aviation Week and Space Technology,* July 31, 1992, pp. 61–65.

165. Leonard S. Spector, "Keep the Skies Open," *Bulletin of the Atomic Scientists* (September 1989): 19.

166. Altmann, "Short-Distance Sensors," in Kokoski and Koulik, eds., *Verification of Conventional Arms Control in Europe,* pp. 135–136.

overly ambitious. More realistic are inspection and sensor-monitoring of a limited number of sites, in conjunction with third-party satellite monitoring.[167]

Open Skies: A Model for Airborne Monitoring. Many of the same remote sensing technologies used by satellites can also be carried by aircraft. Indeed, aircraft designed primarily for civilian use can be modified and operated as cost-effective, time-efficient alternatives to satellite monitoring. For example, China's Institute of Remote Sensing Applications employs two Cessna Citation S2 light jets, modified to carry sensors for environmental and natural-disaster monitoring.[168] In some limited circumstances, unmanned aerial vehicles (UAVs) might also function effectively as sensor platforms. Images from airborne sensors are typically of much higher resolution than those produced by commercial satellite systems. As a trade-off for cost, clarity and detail, however, aircraft, particularly UAVs, can cover only limited territory.[169] For

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[167]. The newest French SPOT satellite, under development as of 1992, will employ multispectral sensors with a ground resolution of 5 meters, close to the 4.5-meter resolution necessary for adequate optical detection and recognition of aircraft on the ground. Identification, however, would require optical sensors with a 0.9 ground-resolution capability. See Péricles Gasperini Alves, "Access to Outer space Technologies: Implications for International Security," *UNIDIR Research Paper*, No. 15 (New York: United Nations, 1992), pp. 67–69. Earlier SPOT satellites, with a 10-meter optical ground resolution, were able to detect and identify a French IRBM silo complex, ostensibly showing such details as numbers and locations of missiles. Access roads were clearly visible. With a 5-meter resolution actual numbers and locations of missiles could be ascertained, the functions of different buildings and vehicles for transporting IRBMs could be identified. See William A. Kennedy and Mark G. Marshall, "A Peek at the French Missile Complex," *Bulletin of the Atomic Scientists* (September, 1989): 20–23.

Among the newest generation of Indian satellites, the IRS-1A and the IRS-1B employ multispectral sensors with 70 meters and 35 meters ground resolution, respectively. This degree of resolution can be used to detect and recognize, but not identify details of, military airfields. Among commercial third-party satellites, the Canadian RADARSAT, launched in 1993, possesses 8 to 10 meter synthetic aperture radar resolution capability (Alves, "Access to Outer Space Technologies," p. 67). For a description of satellite sensor technologies, including radar, and how they work, see John A. Adam, "Special Report-Verification: Peacekeeping by Technical Means," *IEEE Spectrum* 23 (7) (July 1986): 42–80. For discussion of the applicability of remote sensing technology to India and Pakistan, see Vipin Gupta, "Sensing the Threat: Remote Monitoring Technologies," in Stephen P. Cohen, ed., *Nuclear Proliferation in South Asia: The Prospects for Arms Control*, (Boulder, Colo.: Westview Press), pp. 225–264.

[168]. "Specially Modified Cessna Citations Assess Natural Disasters, Resources," *Aviation Week and Space Technology*, July 6, 1992, pp. 51–55. For another example of a civilian aircraft modified specifically for monitoring operations see David. A. Brown, "Fairchild, General Dynamics Team to Develop New Surveillance Aircraft," *Aviation Week and Space Technology*, August 31, 1992, p. 59. A "Multimission Surveillance Aircraft (MMSA), based largely on a modified Fairchild Metro 23 commuter equipped by General Dynamics with "of-the-shelf" sensor technologies, is under production for use in regional surveillance and narcotics control, among other possible missions.

[169]. Also called Remote Piloted Vehicles (RPVs), The range of UAVs is severely limited (typically 100 to 200 miles) because of requirements for line-of-sight operation between the UAV

Pakistan, a lack of "strategic depth" vis-à-vis India implies a much greater dependence on Indian goodwill when monitoring sites beyond the range of its aircraft. Consequently, the use of aerial monitoring requires greater cooperation, and thus more limitations on sovereignty, by participants. Each side, however, will very likely experience a net gain in security from an effectively verifiable agreement that places equivalent (but not necessarily identical) limits on the military activities of both sides.

The Open Skies Treaty serves as a model of a possible India–Pakistan airborne monitoring regime for a nonweapization agreement. The purpose of an Open Skies regime would be much the same as for satellite monitoring, the detection of clandestine facilities and deployment sites, and attempts to circumvent portal inspections. Secondarily, it could serve as a useful adjunct to conventional confidence building measures, such as a demilitarized zone. Twenty-six of the thirty Conventional Forces in Europe (CFE) states signed the Open Skies agreement in March 1992, which allows parties to conduct overflights over other parties' territories.[170]

Inspected countries are permitted to demand use of their own aircraft for such purposes. Aircraft are allowed to carry four types of sensors: sideways-looking synthetic aperture radar (SAR), video cameras with real-time display, optical panoramic and framing cameras, and infrared line-scanning sensors. The treaty specifies inspection quotas and parameters for sensor resolution capabilities. Sensors must be commercially available to all parties, and aircraft are inspected prior to overflights for prohibited sensor technologies. Because Open Skies is primarily a confidence building measure rather than a verification regime, states are required to notify host states three days in advance of intent to conduct an overflight. Additionally, the state must provide the host such data as airfield of origination, date and estimated time of arrival of the observation flight, point of entry, and details about the flight path. Flights take place twenty-four hours after landing in the host country. The time lag between

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and its ground control station. A new long-range, high-endurance UAV, under development by the U.S. Department of Defense will be controlled via a satellite relay, extending its range up to 6000 miles. It is expected to be available for regular operations by January 1995. For a description of the long-range UAV project, see David A. Fulghum, "Tier 2 Endurance UAV Nears First Flight," *Aviation Week and Space Technology*, May 16, 1994, pp. 20–21; and William B. Scott, "Tier-2 Plus UAV Bidders Enjoy New Flexibility," *Aviation Week and Space Technology*, May 16, 1994, pp. 22–23. For an example of the potential reconnaissance role of UAV-borne sensors see David A. Fulghum and John D. Morrocco, "CIA to Deploy UAVs in Albania," *Aviation Week and Space Technology*, January 31, 1994, pp. 20–22; and David A. Fulghum, " CIA to Fly Missions From Inside Croatia," *Aviation Week and Space Technology*, July 11, 1994, pp. 20–21.

170. Patricia M. Lewis, "The Treaty on Open Skies," *Bulletin of Arms Control* 10 (May 1993): 13–15. The ratification process began for most Parties in 1992, and entry into force was expected in 1993. Several trial overflights to test procedures and calibrate sensors were conducted in 1992. Richard Kokoski, "The Treaty on Open Skies," in *SIPRI World Armaments and Disarmament Yearbook, 1993* (Oxford: Oxford University Press, 1993), pp. 632–634. Open Skies Treaty text reprinted on pp. 653–671.

notification and take-off could give a host state opportunity to conceal many banned activities and equipment. It is doubtful, though, that four days would be sufficient time to remove all evidence of a clandestine airfield or missile base, or a secret entry road, especially if overflights are carried out in conjunction with satellite monitoring.

The Problem of Nuclear Facilities. A nonweapization verification regime that focuses on *nuclear* facilities presents a host of thorny monitoring challenges not raised by monitoring for warheads brought to military sites. First, monitoring incoming vehicles for the presence of radioactivity is much simpler and more straightforward than discriminating between legitimate and illegitimate end-uses of outgoing shipments of fissile materials. Simply detecting the presence of radioactivity in a vehicle exiting a nuclear facility portal is meaningless; the radioactivity could be emitted by spent fuel, contaminated equipment *or* a warhead. Further, fissile material leaving a facility must be followed to its destination and its ultimate use accounted for. Inspection and monitoring for nuclear facilities will thus be very similar in scope and nature to the inspection, monitoring, surveillance and materials accounting methods of IAEA safeguards. Inspectors would likely require access to the plant's interiors to effectively complete their task. The political sensitivity of Pakistan and India regarding inspection and monitoring of their nuclear facilities for a nonweapization agreement would be no less than for the comprehensive on-site inspection regimes required for a ban on production of fissile materials for nuclear explosive use.

The attractiveness of a nonweapization agreement that employs perimeter and portal monitoring of missile factories, airfields and missile deployment sites for the presence of warheads arises from its simplicity, *relative* nonintrusiveness, and the fact that it essentially leaves nuclear production facilities untouched. The keys to the effectiveness of such a verification scheme are its *comprehensiveness* (are all potential nuclear weapon—warhead plus delivery vehicle—deployment and assembly sites adequately covered by portal inspection and perimeter monitoring), and *synergistic monitoring* (a variety of sensors is used, around the perimeter and borne on satellites or aircraft). The less comprehensive the agreement (i.e., limited to one or a few sites), the more crucial are other means of monitoring, including satellite and/or airborne sensors. The necessity of verification synergism, several monitoring technologies and methods working in tandem, for a nonweaponization agreement cannot be stressed enough. Redundancy is a sound verification principle for almost any arms control regime. The goals of an arms control agreement dictate that any politically acceptable (obviously subject to negotiation) and technically feasible means be used to verify that these goals are being met. In addition to redundant sensor technologies and inspections for a nonweapization regime, a nuclear explosive test ban can provide extra "insurance" against development of more sophisticated, smaller warheads suitable for missile deployments.

Testing Restrictions

Nuclear Test Bans

Along with fissile materials production restrictions, one of the more effective routes to blocking the development of missile-deliverable nuclear warheads could be the implementation of complete ban on nuclear explosive testing. For states in the early stages of developing a nuclear weapons capability, a ban on nuclear testing would significantly impede the development of all but first-generation fission devices deliverable by aircraft and not requiring certainty of yield.[171] For development of boosted-yield fission devices utilizing small amounts of thermonuclear materials, fusion devices ignited by fission primaries, relatively miniaturized missile-deliverable warheads or tactical weapons requiring predictable yields and substantial reductions in weight, some level of nuclear "field testing" is necessary.[172]

The range of testing levels (in terms of yields) essential for assuring a reasonable reliability of design refinements beyond early 1950s fission explosive technology, while not wide, has significant implications for a comprehensive South Asian nuclear test ban. The minimal yield at which successful thermonuclear boosting will occur has been estimated as ranging from 0.4 kiloton to 1 kiloton.[173] For a fusion device ignited by a fission primary the minimum yield necessary for successful ignition ranges, depending on whether the fusion secondary is designed for a low or high total yield, from less than 1 kiloton up to 15 kiloton.[174] A significant fraction of U.S. nuclear testing from 1980 to 1984 falls within the 10 to 15 kiloton range, indicating that much testing in the U.S. is concerned with assessing the reliability of fission primaries for new or modified thermonuclear warhead designs.[175] Some analysts

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171. The reliability of implosion mechanisms for first generation fission devices could be assessed with laboratory testing using flash x-ray and "pin sensor" equipment. Field testing of implosion mechanisms, substituting chemical high explosives for fissile materials, is another alternative to full-scale nuclear testing. Uncertainty of yield for a fission device tested in these ways could be great, however. See Donald R. Westerveldt, "The Role of Laboratory Tests," in Jozef Goldblat and David Cox, eds., *Nuclear Weapons Tests: Prohibition or Limitations?* (Oxford: Oxford University Press; SIPRI, 1988), pp. 47–58.

172. J. Carson Mark, "The Purpose of Nuclear Test Explosions," in Goldblat and Cox, eds., *Nuclear Weapons Tests: Prohibition or Limitations?* pp. 31–46.

173. Frank Von Hippel, Harold Fieveson and Christopher Paine, "A Low Threshold Nuclear Test Ban," *International Security* (Fall 1987): 141.

174. Ibid., see also Mark, "The Purpose of Nuclear Test Explosions," pp. 32–34.

175. Steve Fetter, *Toward a Comprehensive Test Ban* (Cambridge, Mass.: Ballinger, 1988), p. 112; also Thomas Cochran, et. al., *Nuclear Weapons Databook Vol. II: U.S. Nuclear Warhead Production* (Cambridge, Mass.: Ballinger, 1987), p. 43.

believe, however, that even the smallest nuclear explosions may have military and scientific significance, especially for "beginner" states.[176]

To effectively halt, or at least significantly slow, the refinement of warhead size and predictability of yields, and the development of boosted and thermonuclear weapons, a regional test ban would require monitoring methods capable of detecting (and identifying) very low yield underground nuclear tests. Three negotiated provisions would be integral to enhancing the effective use of seismic monitoring of very low yield nuclear testing:

- Emplacement of in-country seismic monitoring systems in both India and Pakistan. Because of the two countries' geographical proximity, more accurate identification of seismic events is possible than for the teleseismic (> 2000 kilometers) distances relevant to a U.S.–Russia test ban.[177] In conjunction with the Incorporated Research Institutions for Seismology's (IRIS) Global Seismic Network, a regional network of seismic stations in India and Pakistan is being established. Data from these state-of-the-art stations are available to anyone through telephone links, satellite downlinks, or open data centers.[178]

- Characterization of the geology of regions in which testing is likely to be conducted. While accurate yield estimation would not be necessary for a complete nuclear test ban, this provision would enable more accurate *identification* of low-magnitude seismic events. However, accurate identification might not be

176. Ray Kidder, "Degree of Verification Needed," in Goldblat and Cox, eds., *Nuclear Weapons Tests: Prohibition or Limitations,?* pp. 267–269.

177. Current global seismic networks are capable of *detecting* with a 90 percent probability, at four or more stations, any well-coupled explosion, detonated anywhere on earth, equivalent to 1 to 2 kiloton *Identification* of such an explosion (that is, ability to discriminate between earthquakes, chemical explosions, and nuclear explosions) is considerably less certain at teleseismic distances. (*Coupling* refers to the efficiency with which energy of the explosion is transmitted to the surrounding rock. A decoupled explosion refers to one which is detonated under conditions that attenuate, or "muffle," the amplitude of seismic waves. Decoupling can be achieved, for example, by exploding a device in a large cavity, or in dry, porous geologic media. Signal reduction will also occur at seismic sensors emplaced in unstable substrates) U.S. Congress, Office of Technology Assessment, *Seismic Verification of Nuclear Testing Treaties* OTA-ISC-361 (Washington, D.C.: GPO, 1988), pp. 60–61, 69–70.

178. Keith Nakanishi, "Using Regional Seismology for Confidence Building in South Asia," Lawrence Livermore National Laboratory (Livermore, Calif.), presentation given at Workshop on Verification of Regional Arms Control and CBM Agreements, Program in Arms Control, Disarmament, and International Security, University of Illinois at Urbana–Champaign, March 3, 1994. Detection of a one-kiloton decoupled (exploded in a large cavity or in geologic media that reduce the amplitude of seismic waves) nuclear explosion, would require a regional seismic network consisting of approximately twenty-eight stations. India and Pakistan currently have five stations between them.

possible without calibration tests.[179] Joint India–Pakistan calibration tests (perhaps using nuclear test devices exploded for this purpose under the auspices of a multilateral scientific agency, such as UNESCO, or an international team of seismologists) could be carried out as a confidence building measure during negotiations for a test ban.

• Short-notice on-site inspection provisions for clarifying ambiguous seismic events, or for examining the site of a suspected clandestine test. For the former, inspections might be conducted by joint India–Pakistan, or multilateral inspection teams.

The uncertainties inherent in detecting and identifying ambiguous seismic events at low magnitudes (e.g., distinguishing large chemical explosions or small earthquakes from low yield nuclear tests) make provisions for OSI imperative for effective compliance determination for a comprehensive regional nuclear test ban. Additional negotiated "cooperative measures" for enhancing seismic detection and identification under a *comprehensive or very low-yield* nuclear test ban regime could include:[180]

• Limitations on the size and nature (e.g., salvo or ripple-fired) of chemical explosions. Ideally, advance notification of such explosions would be given and provisions made for short-notice inspections in the event of possible evasion by conduct of a low yield nuclear explosion simultaneously with or immediately following a chemical explosion. Large chemical explosions were found difficult to discriminate from small nuclear explosions during the recent U.S. Nonproliferation Experiment at the Nevada test site.[181]

• Jointly-conducted large chemical explosions in several potential nuclear testing sites for calibration purposes. Again, such tests can serve as a preliminary confidence building measure.

Missile Flight Testing Ban

Production monitoring regimes employing on-site inspections would likely be an essential means of accounting for the end uses of space launch and missile production activities. But production monitoring alone cannot entirely ensure that end use is restricted to permitted civilian space program applications. Production monitoring would be most effective if complemented with negotiated restrictions on testing.

Indian, and especially Pakistani, ballistic missile technology is still fairly embryonic; if implemented in the near term, a regional comprehensive flight test ban

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179. Willard J. Hannon, "In-Country Seismic Stations for Monitoring Nuclear Test Bans," in Goldblat and Cox, eds., *Nuclear Weapons Tests: Prohibition or Limitations?* p. 202.

180. U.S. Congress, Office of Technology Assessment, *Seismic Verification of Nuclear Testing Treaties*, pp. 106–107.

181. Keith Nakanishi, "Using Regional Seismology for Confidence Building in South Asia."

could effectively forestall the development and deployment of reliable IRBMs or ICBMs. Reliability would be prerequisite to confidence in ballistic missile performance. In addition to the research and development required for new models of IRBMs and ICBMs, periodic assessment of reliability necessitates operational flight testing of a statistically significant "sample" of deployed missiles. A single test, or even a few, of India's Agni IRBM provides an insufficient database for both assessing reliability and for developing methods of evaluation that could potentially substitute for subsequent operational flight testing. New types of U.S. ICBMs typically underwent some two dozen or more research and development flight tests prior to deployment. Prior to the START II agreement, 1 to 2 percent of the deployed Minuteman II and III missile force was operationally tested each year, for continuing reliability assessment[182] Even if India need not conduct this large a number of R & D and operational flight tests to assess reliability, establishing *confidence* (a subjective measure) in missile performance would likely require many more than one test. But many refinements of guidance and control system technology in Minuteman ICBM technology have been evaluated by testing of subsystem components, rather than through full flight tests.[183] Realistically, however, such alternative means of evaluating reliability of incremental improvements in its IRBMs will not be available to India for a number of years because that country lacks a broad base of experience with ballistic missile technology.

A comprehensive ban on flight testing of ballistic missiles would certainly be easier to monitor than a regime permitting some testing. The latter would be primarily relevant to arms control that aims to impede the development of missile accuracy and new models of IRBMs and ICBMs and will not be discussed here. A comprehensive ban would not be free of monitoring and compliance difficulties, however, mainly because of the potential dual use of missile technologies. Verification of compliance with a missile flight test ban in countries with an active civilian space research and launch program must be capable of:

- Distinguishing between the testing and launch of space launch vehicles and ballistic missile flight tests.
- Detecting the transfer of technology developed under the aegis of civilian space programs to the military sector.

Such distinctions, and hence their monitoring, are more easily made for nuclear energy and materials production than for rocket technologies. The U.S. used Titan II ICBMs for launching Gemini spacecraft in the early 1960s; the first stage of India's Agni IRBM was a modification of an indigenously produced satellite launch vehicle

182. Farooq Hussain, "The Impact of Weapons Test Restrictions," in James Schear, ed., *Nuclear Weapons Proliferation and Nuclear Risk* (Hampshire: Gower; International Institute for Strategic Studies, 1984), pp. 134–135.

183. Ibid., p. 144.

booster.[184] The Missile Technology Control Regime (MTCR) exemplifies the dual use problem. A set of guidelines agreed to by seven industrially advanced nations in April 1987 for restricting export of key ballistic missile technologies, the MTCR, while "not designed to impede national space programs" inevitably defines as "sensitive" many components equally essential for civilian space program applications.[185]

Civilian space launches can be distinguished from their ballistic missile counterparts by both their trajectory[186] and the absence of a reentry vehicle containing one or more warheads. An effective missile flight test ban that permits civilian space program activities might thus include:

- A specific ban on the testing of reentry vehicles. Adequate verification of a missile flight test ban would require at least a capability to detect and track reentry vehicles released from longer range missiles.[187]

- A means of monitoring the trajectory of a missile or space launch vehicle. Consequently a missile flight test ban agreement must include a provision prohibiting encryption of flight test telemetry.

- Advance notification of all missile and space launches, specifying time, purpose, and characteristics of the launch vehicle.

Because monitoring short range or tactical missile flight tests is decidedly more difficult than for longer range missiles, testing of the former (which have conventional military applications and are unlikely to covered by a missile flight test ban) could be restricted to a specified test range, as could civilian space launches. Restricting tests of permitted short range or tactical missiles and space launches to designated sites, in addition to requiring advance notification of tests, would facilitate their detection and identification.

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184. Pushpindar Singh, "India's Agni Success Poses New Problems," *Jane's Defense Weekly*, June 3, 1989, pp. 1052–1053; Dilip Bobb, "Agni: Chariot of Fire," *India Today*, June 15, 1989, pp. 10–13.

185. U.S. Arms Control and Disarmament Agency, *World Military Expenditures and Transfers, 1987*, p. 26; David Silverberg, "MTCR Imperfect, But Only Organized Attempt to Limit Proliferation," *Defense News*, September 4, 1989, p. 30; Aaron Karp, "The Frantic Third World Quest for Ballistic Missiles," *Bulletin of the Atomic Scientists* (June, 1989).

186. The final boost stage of ballistic missiles is terminated earlier, before the payload has enough velocity to enter orbit. See Kosta Tsipis, *Arsenal: Understanding Weapons in the Nuclear Age* (New York: Simon & Schuster, 1983), pp. 102–129 for a description of ballistic missile technology.

187. Even if flight tests of longer range missiles were prohibited, reentry vehicles could conceivably be tested on smaller, less detectable missiles which drive the reentry vehicle out of the atmosphere and return it to earth, simulating the conditions of reentry from a longer range missile. See Hussain, "Impact of Weapons Test Restrictions," p. 140.

Bans on Deployment of Nuclear Weapons

Deployment comprises the third most practical point of application for nuclear arms limitations. The most effective deployment restriction measures, however, are those implemented in conjunction with bans on production and testing of nuclear explosive devices (warheads) and ballistic missiles or other delivery vehicles. If the objective of regional nuclear arms limitations is a ban on possession of nuclear explosive devices of any kind for any purpose, the most effective verification regime would be one that focuses on all three "nodes" in the nuclear weapons life cycle. As noted earlier, monitoring is a synergistic processes; the more varied the foci and means of monitoring the higher the overall probability of detection and identification of noncompliant activities. The application of arms limitations to several stages in the nuclear weapons production cycle requires the potential violator of an agreement to successfully evade detection at each monitored stage. The probability of successful evasion of detection consequently decreases with the number of monitored stages. Redundant verification is especially necessary for arms control agreements that are difficult to monitor at one or more stages but easier at another.

Monitoring the possible deployment of nuclear capable aircraft in South Asia clearly illustrates the importance of verification synergism. Neither India or Pakistan has a dedicated force of nuclear armed heavy bombers easily distinguished from dual capable fighter-bomber aircraft. Arms control monitoring of potentially dual capable aircraft must be able to detect (primarily through NTM) direct observables indicative of a nuclear role. The SALT II Treaty specifies the use of "functionally related observable differences" (FRODs) as a means of determining whether an aircraft "can carry out the mission of a heavy bomber." [188] Even in the seemingly straightforward case of identifying dedicated nuclear heavy bombers, however, FRODs are few and their presence difficult to discern with certainty through NTM.[189] In the U.S.–Soviet context, the presence of bomb bay doors and wing-root extensions for cruise missile carriage are probably the most obvious FRODs identifying an aircraft as capable of performing a nuclear heavy bomber role.

In the South Asian context, dual capable fighter-bombers are the norm, not the fairly distinctive heavy bombers that are more appropriate for strategic nuclear missions. While the observation of aircraft external attachment points (pylons or "hardpoints") would permit the assumption of a bomb carriage capability, determining whether a bomb is conventional or nuclear is virtually impossible without on-site inspection. A possible nuclear role for such aircraft must be inferred from the detection of such rather ambiguous indicators as special C^3 links essential for

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188. SALT II Treaty, Art. II, reprinted in Jozef Goldblat, ed., *Arms Control Agreements: A Handbook* (New York: Praeger, 1983), p. 213.

189. Wilkening, "Monitoring Bombers and Cruise Missiles," p. 110; Michael Krepon, "Counting Rules," in Krepon and Umberger, eds., *Verification and Compliance,* pp. 127–128.

nuclear weapons operations or the observation of alerting procedures.[190] Ensuring the nondeployment of nuclear weapons on South Asian dual capable fighter-bombers would be most effectively attained through a ban on production and testing of warheads, activities that are considerably easier to monitor, though production monitoring entails the use of more intrusive OSI methods.[191] Nonetheless, a deployment restriction agreement should include a ban on aircraft deployment of nuclear weapons; the detection of apparent noncompliance could then legitimately be brought to the attention of the violator, and subject to clarification through treaty compliance and dispute arbitration mechanisms.

A South Asian agreement banning the deployment of IRBMs or similar nuclear capable ballistic missiles in fixed launchers such as silos can be monitored with high confidence using fairly modest NTM capabilities.[192] India and eventually Pakistan may deploy IRBMs on mobile launcher platforms such as trucks or railcars to enhance the survivability of their nuclear forces. The detection and identification of these would be considerably more difficult than for fixed-base missiles.[193] Partly in recognition of these verification difficulties, the SALT II treaty bans mobile deployments of heavy missiles.[194] Production monitoring of missile factories primarily and verification of a missile flight test ban secondarily would constitute more effective routes to ensuring nondeployment of mobile missiles.

Because of their small size and similarity to conventional munitions the deployment of tactical nuclear weapons would prove the most difficult of all to monitor.[195] Fissile materials production monitoring and nuclear testing bans (the latter capable of detecting very low yield testing) would comprise the most feasible means of ensuring nondeployment of tactical nuclear weapons. Additionally, because effective integration of tactical nuclear weapons into military strategy and planning would require the training of large numbers of soldiers in their use, the existence of tactical nuclear weapons might be inferred from the detection and observation of certain maneuvers or exercises. Both unilateral NTM (including, for example, the monitoring of radio traffic to detect C^3 associated with tactical nuclear weapons

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190. Wilkening, "Monitoring Bombers and Cruise Missiles," p. 114.

191. Roger Harrison, et. al., *Verifying a Nuclear Weapons Freeze* (Leamington Spa: Berg, 1986).

192. The commercial SPOT satellite system was able to detect and identify a French IRBM silo complex using a 10 meter ground resolution. Kennedy and Marshall, "A Peek at the French Missile Complex," pp. 20–23.

193. For discussions of verification problems associated with mobile missiles see Paul K. Davis, "Land Mobile ICBMs: Verification and Breakout," in Potter, ed., *Verification and SALT: The Challenge of Strategic Deception* (Boulder, Colo.: Westview, 1980), pp. 143–162; Harry Saurwein, "Mobile ICBMs," in Schear, ed., *Nuclear Weapons Proliferation and Nuclear Risk*, pp. 169–175; Albert Gore, "Verifying Mobile Missiles," in Krepon and Umberger, eds., *Verification and Compliance*, pp. 3–16.

194. SALT II Treaty, Art. IX.

195. Harrison, *Verifying a Nuclear Weapons Freeze*, p. 40.

operations) and observation by NTM or OSI legitimated by negotiated arms control provisions could be employed for detection of tactical nuclear weapons training and deployment.

Tagging systems could, for example, be incorporated into the arming circuitry of a conventional weapon such that attempts to modify the circuitry to accept a nuclear warhead would require damaging the tag or removing it altogether. Electronic tags could be remotely monitored on a routine basis, or could be programmed to emit a "beacon" of high-frequency radio signals if tampered with. Remote monitoring in this manner, however, could be employed to reveal the positions and movement of its counterpart's weapons, useful targeting information in a military crisis. [196] Only the most general position or movement data is probably needed for verifying whether a weapon is being modified to carry a nuclear warhead; the goal here is to detect any such modification efforts as they occur. Thus each treaty-limited item (TLI) could be installed with a tag capable of relaying only two pieces of information: (1) a unique coded signal that identifies a particular TLI as present and functioning as a conventional weapon and (2) a similarly coded signal that detects and relays efforts to tamper with or modify the arming circuitry. If a remotely monitored tagging system cannot be designed that does not also transmit potential targeting data, random sampling of the population of tagged TLIs for monitoring, and monitoring less frequently are possible solutions.[197] The system would also have to allow for removal and replacement of *conventional* warheads.

To ensure against secret stockpiling tactical nuclear weapons, perimeter and portal monitoring of conventional munitions as they leave production and assembly plants would ascertain that each exiting TLI bears a properly functioning tag. As with a nonweapization agreement, entering vehicles could also be checked for the presence of nuclear warheads (and possible shielding materials that may be hiding them) to prevent in-plant installation.

Nuclear Weapons Free Zones

Up to this point bilateral nuclear arms control arrangements between India and Pakistan, the two South Asian states of greatest proliferation concern, have been emphasized. Similar appropriately modified bilateral agreements between India and China, a nuclear weapons state of regional significance, are likewise conceivable. Multilateral regional arms control initiatives, specifically nuclear weapons free zone (NWFZ) regimes, are a third possibility. Shortly after India's nuclear test in 1974, Pakistan submitted to the UN General Assembly its proposal for a South Asian

196. Steve Fetter and Thomas Garwin, "Tags," in Kokoski and Koulik, eds., *Verification of Conventional Arms Control in Europe,* pp. 144–145.

197. Ibid.

NWFZ, a proposal Pakistan has subsequently resubmitted on an almost yearly basis.[198] With similar persistence India has repeatedly rejected Pakistani NWFZ overtures, not least because they fail to include China within their ambit.[199]

An exploratory survey of the mechanics of South Asian NWFZ implementation, notably its provisions for verification, is worthwhile even if the near-term probability of concluding such an agreement is remote. By examining UN deliberations and the records of implementation for the two NWFZs established in populated areas (the Treaty of Tlatelolco and the South Pacific Nuclear Free Zone) some general guidelines for devising an effective South Asian NWFZ regime may be derived.

Designing a South Asian NWFZ

Nuclear Weapons Free Zone or Nuclear Free Zone? Multilateral regimes seeking to proscribe nuclear weapons or nuclear weapons related activities within a geographically defined perimeter may also seek to restrict nonmilitary nuclear activities. The Treaty of Raratonga aims to prohibit certain nonmilitary nuclear activities (hence the official appellation South Pacific Nuclear Free Zone rather than Nuclear Weapons Free Zone[200]), notably Japanese disposal of low level radioactive wastes within the region[201]. The Treaty of Tlatelolco, in contrast, does not restrict peaceful nuclear activities, other than to ensure nondiversion of fissile materials to nuclear weapons use.[202] A NFZ or NWFZ may also impose restrictions on zonal state export of potentially dual usable nuclear technologies or materials. The Treaty of Tlatelolco enjoins its parties "to refrain from engaging in, encouraging, or authorizing, directly or indirectly, or in any way participating in the testing, use, manufacture, production, or possession or control of any nuclear weapon."[203]

Zonal states within the Tlatelolco regime are additionally required to conclude full-scope safeguards agreements with the IAEA whether or not they are parties to the NPT. Such agreements may provide that states require safeguards on exported nuclear materials and technology even if the recipient state is not a party to the

198. William Epstein," Nuclear Free Zones," *Scientific American* (November 1975): 32. Pakistan presented its latest South Asian NWFZ proposal to the United Nations in November 1989. For details of the 1988 proposal see *United Nations Disarmament Yearbook: 1988* (New York: United Nations, 1989), pp. 250–252.

199. For a summary of Indian objections to Pakistani NWFZ proposals see *United Nations Disarmament Yearbook: 1986* (New York: United Nations, 1987), pp. 208–209.

200. Greg Fry, "Toward a South Pacific Nuclear Free Zone," *Bulletin of the Atomic Scientists* (June–July 1985): 16.

201. David Freestone, "Nuclear Weapons Free Zones," in Istvan Pogany, ed., *Nuclear Weapons and International Law* (New York: St. Martin's, 1987), p. 195.

202. Treaty on the Prohibition of Nuclear Weapons in Latin America, Art. I, in Goldblat, *Arms Control Agreements*, p. 148.

203. Ibid.

NPT.[204] Even if it did not require its parties to conclude full-scope IAEA safeguards agreements (which it should), a South Asian NWFZ or NFZ agreement should obligate non-NPT zonal states exporting nuclear materials and technologies to impose IAEA safeguards on non-NPT recipient states. Ideally, zonal parties would also be obligated to adhere to the 1977 London Nuclear Suppliers Group guidelines for the export of nuclear technology, a code which is considerably stricter with regard to the extension of safeguards to nuclear technology replicated on the basis of imported and safeguarded technology than is the INFCIRC/66 system.[205]

Role of Extrazonal States. Both the Treaties of Tlatelolco and Raratonga mandate the exclusion of extrazonal state nuclear weapons or related activities from their zones of application. The 1975 UN expert group report on NWFZs stated in its list of recommendations for the effective administration of NWFZ regimes, "when a zone covering a region is envisaged, the participation of all militarily important states, and preferably all states, would reinforce the efficacy of the zone."[206] The only existing NWFZ adjacent to a nuclear weapons state, the Treaty of Tlatelolco, excludes U.S. continental territory and territorial waters from its zone of application. All five nuclear weapons states have ratified Additional Protocol II of the treaty, which obligates them not to use or threaten to use nuclear weapons against zonal parties to the Treaty (so-called "negative security guarantees").[207]

The inclusion of China in some form (even if its participation were to consist only of symbolic gestures, such as redeploying and targeting its missiles away from India) would most certainly be a precondition for Indian accession to an NWFZ regime. As a declared nuclear weapons state, China could hardly be included as a zonal state unless it were to renounce nuclear weapons. China could, however, adhere to a South Asian NWFZ negative security guarantee protocol, much as it has for the Treaties of Tlatelolco and Raratonga. Neither of these treaties, however, significantly impinges on possible Chinese plans for ocean deployments of nuclear weapons; a South Asian

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[204]. INFCIRC/153 reprinted in Fischer and Szasz, *Safeguarding the Atom*, pp. 197–211; see also Benjamin Schiff, *International Nuclear Technology Transfer: Dilemmas of Dissemination and Control* (London: Croom Helm, 1983).

[205]. London Nuclear Suppliers guidelines for report of nuclear materials and technologies transfers reprinted in Fischer and Szasz, *Safeguarding the Atom*, pp. 217–223.

[206]. Edmundo Fujita, "The Prevention of the Geographical Proliferation of Nuclear Weapons: Nuclear Weapons Free Zones and Zones of Peace in the Southern Hemisphere," *UNIDIR Research Paper*, No. 4 (New York: United Nations, 1989), p. 14.

[207]. UN Resolution 3472B calls upon nuclear weapons states to affirm the following obligations regarding established NWFZs "in a solemn international instrument having full legally binding force": (1) To respect in all its parts the statute of total absence of nuclear weapons defined in the treaty. . . ; (2) To refrain from contributing in any way to the performance in the territories forming part of the zone of acts which involve a violation of the . . . treaty; (3) To refrain from using or threatening to use nuclear weapons against the States included in the zone. Cited in Ibid., p. 45.

NWFZ substantially incorporating the Indian Ocean within its zone of application most probably would. An agreement by China to redeploy and retarget its ballistic missiles away from India could comprise a form of negative security assurance.

Assuming the acceptance and recognition of a South Asian NWFZ by all nuclear weapons states through the granting of negative security guarantees, several formidable questions complicate the implementation of all NWFZ agreements. Among these are: the disposition of existing security arrangements between zonal states and nuclear weapons states (e.g., ANZUS, the 1971 Indo–Soviet Treaty of Friendship), and conflicts with the International Law of the Sea (ILOS) conventions regarding military vessels' freedom of navigation on the high seas, rights of innocent passage and the granting of transit and port calls to nuclear armed vessels. Though rather ambiguous on this point, the Treaty of Tlatelolco appears to permit transit of shipborne nuclear weapons through the zone subject to permission of states whose territorial waters may be involved.[208]

Peaceful Nuclear Explosions. Article XVIII of the Treaty of Tlatelolco permits its parties to "carry out explosions of nuclear devices for peaceful purposes," subject to IAEA oversight.[209] As previously noted, however, no practical means exists of verifying distinctions between peaceful and military nuclear explosives because the technological base for both is essentially the same. In recognition of this, the South Pacific Nuclear Free Zone prohibits acquisition or testing of any form of nuclear explosive device. Because of the intractable verification and compliance difficulties involved, a South Asian NWFZ agreement should similarly impose a blanket prohibition on nuclear explosive devices of any type, for any purpose.

Verification Arrangements for a South Asian NWFZ

An "effective verification system" was suggested by the 1975 UN expert group report as being integral to a meaningful NWFZ regime.[210] During the UN General Assembly debate on the creation of the Treaty of Tlatelolco, the U.S. had similarly

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[208]. See discussions in Goldblat, *Arms Control Agreements*, pp. 64–65; Miguel Marin Bosch, "The Treaty of Tlatelolco and the NPT," in David Dewitt, ed., *Nuclear Nonproliferation and Global Security* (New York: St. Martin's, 1987), pp. 180–181. For discussion of the International Law of the Sea Convention see Patricia Birnie, "Law of the Sea and Nuclear Weapons: Legal Aspects," in Pogany, ed., *Nuclear Weapons and International Law*, pp. 160–161 especially.

[209]. See Julio Cesar Carasales, "The Future of Tlatelolco 20 years After its Signature," p. 81; and Alfonso Garcia Robles "20th Anniversary of the Treaty of Tlatelolco," p. 71 in *Disarmament* (Winter, 1987–1988); Goldblat, *Arms Control Agreements*, p. 64 for relevant discussion of this issue. That the Treaty of Tlatelolco expressly permits the development and use of PNEs is disputed by the U.S. and Soviet Union; both of these countries construe the Treaty's definition of a nuclear weapon (Art. 5) as precluding PNEs (Leonard S. Spector, personal communication).

[210]. Fujita, "The Prevention of the Geographical Proliferation of Nuclear Weapons," p. 14.

stipulated "effective verification coupled with provisions for resolution of noncompliance allegations" as requirements for establishment of an NWFZ.[211]

Both the Treaties of Raratonga and Tlatelolco establish safeguards as the means of verifying compliance by zonal state parties, with routine on-site inspections to be performed by the IAEA.[212] Each of the nine states encompassed by the Raratonga zone of application is also party to the NPT.[213] Each had thus concluded full-scope (INFCIRC/153) safeguards agreements with the IAEA prior to acceding to the Raratonga treaty. Special inspections carried out to investigate suspected noncompliance with the Treaty of Tlatelolco could commence, if requested, when all Latin American and Caribbean states within the treaty's zone of application become full parties. The IAEA currently conducts routine inspections for the purpose of verifying compliance with the treaty in states which are parties. Though a signatory, Brazil is not yet a party because it has not ratified the treaty. Argentina and Chile have recently ratified and waived the entry-into-force requirements as provided by Article XXVIII.[214] Full-scope IAEA safeguards, as required by the treaty, will not apply to Brazil until ratification and waiver provisions are satisfied.

Five[215] of the seven zonal states which would fall within the ambit of a South Asian NWFZ are party to the NPT. A NWFZ would likely obligate zonal states, regardless of NPT status, to conclude full-scope safeguards agreements with the IAEA but only upon NWFZ treaty ratification. Obviously, India and Pakistan could thus remain outside a NWFZ verification regime simply by withholding signature, ratification, or entry-into-force requirements should the agreement include a waiver provision. The effectiveness of any NWFZ regime for ensuring nonproduction and nonpossession of nuclear weapons by all zonal states is doubtful as long as India and Pakistan were excluded from treaty verification mechanisms.

A South Asian NWFZ treaty, assuming one is concluded, need not rely on IAEA safeguards as the sole means of verifying compliance, though they or something very similar would be the primary means. A "two-tiered" South Asian NWFZ is conceivable, in which states rejecting IAEA safeguards could accede to an "alternate

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211. Freestone, "Nuclear Weapons Free Zones," p. 184; Epstein," Nuclear Free Zones," *Scientific American,* p. 26.

212. Multilateral compliance and dispute resolution mechanisms are discussed in the following section.

213. Papadimitropoulos, "The Raratonga Treaty: A Regional Approach to Nonproliferation in the South Pacific," *IAEA Bulletin* (January 1988): 30.

214. The entry-into-force waiver of Article XXVIII permits immediate entry into force of the treaty for individual zonal states. Once a sufficient number of zonal states (eleven) had deposited such waivers institutional arrangements for verification and compliance (OPANAL) were initiated, even though all conditions for entry into force had not been met for all zonal states.

215. Bangladesh, Bhutan, Nepal, Maldives, and Sri Lanka. An eighth "regional" state, China, has recently signed the NPT. Prior to this it had concluded safeguards agreements with the IAEA applying to some of its civilian nuclear facilities.

verification protocol" until such time as they deem IAEA safeguards politically acceptable. An alternative verification protocol might employ relatively nonintrusive seismic and NTM monitoring, on a regional basis, for detection of nuclear or ballistic missile testing, and nuclear weapons deployments. More intrusive measures could include OSI, conducted by an acceptable regional verification body, of nuclear facilities, space launches, or suspect nuclear test sites. The usefulness of an alternative verification arrangement in bringing non-NPT states into the NWFZ fold assumes, of course, that a non-NPT state's rejection of IAEA safeguards is predicated on a rejection of the IAEA, rather than an ultimate intention to build nuclear weapons or retain an option to do so. In the latter case, the state will likely reject in toto any agreement or arrangement which aims to thwart its nuclear ambitions or retention of a nuclear "option." Additionally, a two-tiered verification scheme might be politically difficult to implement because it would seem to sanction asymmetries in application, in conflict with the nondiscriminatory tradition of NWFZ regimes.

For extrazonal nuclear weapons states adhering to negative security guarantee protocols of the Treaties of Tlatelolco and Raratonga, no truly satisfactory means of verifying their compliance exists.[216] Short of on-site inspection, the presence of nuclear weapons aboard suspect ships cannot be ascertained with any reasonable certainty. A recent U.S. Natural Resources Defense Council–USSR Academy of Sciences experiment has apparently shown gamma ray monitors to be inadequate for *off-ship* detection of the presence of nuclear weapons. However, helicopter-borne neutron detectors were able to detect neutron emissions at distances up to seventy meters from cruise missile warheads on a Soviet surface ship .[217]

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216. Carasales, "The Future of Tlatelolco," pp. 82–83.

217. Bill Keller, "Rare Test by U.S. Scientists of Soviet Missile at Sea," *New York Times,* July 6, 1989; Cochran, "Black Sea Experiment Only a Start," p. 15. For a discussion of the technical and political difficulties associated with monitoring to ascertain the presence of nuclear weapons on ships see "Potential Verification Provisions for Long-Range, Nuclear-Armed, Sea-launched Cruise Missiles," The Center for International Security Workshop Report, Stanford University, July 1988.

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Summary of Main Points: Chapter III

• *Three features of the South Asian arms control environment, namely, the covert nature of military nuclear activities, their integration with ostensibly civilian power and space programs, and small (if any) nuclear weapons stockpiles, will significantly shape the character of arms-limitation verification regimes.*

• For India and Pakistan, the most comprehensive forms of regional arms limitations aimed specifically at nuclear weapons could obligate them to do one of the following, depending on what stage of development each is at in its military nuclear programs:

(i) *Agree not to produce, in the future, any nuclear warheads* (assuming none now exist—verification methods should be capable of determining this with a reasonable certainty).

(ii) *Agree to dismantle such warheads as already exist and not produce any more.*

(iii) *Explicitly recognize the other's possession of a limited number (the number that exist at the signing of the agreement) of warheads and weapons (warheads mated to delivery vehicles) while agreeing not to produce more warheads or deploy more weapons.* Unilateral and negotiated measures are necessary in this case to manage deployments of existing weapons to enhance crisis and deterrence stability.

(iv) *Explicitly recognize the nuclear status of the other while mutually working toward controlling both quantitative and qualitative aspects of current and future weapons deployments to enhance crisis and deterrence stability.*

Any of these approaches to arms control essentially means an end to the possession of a nuclear "option. Either India and Pakistan will have renounced a nuclear capability (approaches i and ii) or explicitly accepted each other's possession of such a capability (approaches iii and iv).

• *Another option, a mutual agreement to keep warheads separate from their means of delivery, would allow retention of an ambiguous option (by monitoring delivery vehicles rather than fissile materials or warheads) but would entail formal verification arrangements to be anything more than symbolic.*

• *Were India and Pakistan to declare nuclear weapons status, a close and interactive linkage between arms control efforts and weapons technology development would be essential to manage their nuclear forces through a potentially very precarious transition from newly emergent status to a relationship of stable deterrence, while limiting the incentives to arms race.* In lieu of retaining covert status, arms imitations measures aimed specifically at production and testing could serve an essentially similar restraining function.

• *For the small or even nonexistent nuclear arsenals possessed by India and Pakistan the potential military significance (in terms of gaining a "strategic" advantage) of noncompliance with arms limitations is much greater than for similar noncompliance against a background of very*

large forces. Small absolute force numbers mean that the relative significance of incremental additions to force size is potentially very large. Arms limitations aimed at halting the future production of warheads, in the context of small or nonexistent nuclear forces, will thus require much more intrusive and stringent verification measures than in the context of large nuclear arsenals, where the production of a single warhead, or even tens or hundreds, is "trivial" by comparison.

• Defining the military significance of violations of agreements banning the production of fissile materials for weapons use is not very difficult in the South Asian context (detecting violations is another matter) if the diversion of a single weapon's worth of material is considered to enable the development of a military advantage by permitting the production of a nuclear warhead.

• The production of weapons-usable fissile materials in covert nuclear weapons states such as India and Pakistan poses particular verification and monitoring difficulties. Dual use pervades the nuclear programs of such states. Military nuclear production activities as might exist are necessarily closely integrated with civilian nuclear energy, space, and conventional military production activities.

Production Limitations

Fissile Materials Production Restrictions. Though the IAEA need not necessarily perform the monitoring and verification functions of regional or bilateral fissile materials restrictions, on-site inspection regimes for these agreements should logically employ IAEA materials accounting, containment, and surveillance methodology. However, because the IAEA system is designed to accommodate an extensive multilateral application, employing its methodology in a bilateral or regional context necessitates some modification.

• *Verification regimes for negotiated restrictions on use and production of fissile materials (other than complete shutdowns of designated nuclear facilities) in the context of covert nuclear weapons programs must simultaneously account for both civilian and potential nuclear explosive production activities. Because of the NPT and IAEA mandates to facilitate the development of peaceful nuclear technology in nonnuclear weapons states, IAEA safeguards have been designed as such a means of simultaneous accounting. The purpose of OSI and materials accounting methods employed by a South Asian regional or bilateral fissile materials restriction regime would be fundamentally identical to that of IAEA safeguards implemented under both the NPT (INFCIRC/153) and non-NPT (INFCIRC/66) systems.*

• The most useful targets of a facility shutdown agreement would be Pakistan's Kahuta uranium enrichment facility and India's largest reprocessing plant at the Bhaba Atomic Research Complex (BARC). *The nonoperational status of these plants could probably be ascertained rather effectively by satellite surveillance technologies. Detection of noncompliance would be virtually assured if periodic inspections were carried out in conjunction with NTM monitoring*. Because India has an active breeder reactor research program it

will likely object to any restrictions that significantly slow or halt its plutonium production capability. Since Pakistan has no current civilian need for a uranium enrichment capability it has less justification for objecting to a facility shutdown agreement applying to Kahuta.

Missile Production Limitations

• *The U.S. Soviet Intermediate and Shorter Range Nuclear Forces (INF) Treaty, which aims to eliminate an entire class of ballistic missiles, provides the most salient verification "model" for a regional or bilateral agreement banning or restricting production of missiles for nuclear weapons use.*

• *Dual use of missile technology is an especially significant problem in the region because, as with fissile materials production, "nuclear" missile research and development and, testing, exist side by side with civilian space and conventional military technology.* A regional missile production monitoring regime must be capable of distinguishing among production for nuclear weapons, nonnuclear weapons, and civilian space applications.

• To be effective, a missile production monitoring regime must do two things: (1) ensure nonproduction of treaty limited items at declared facilities (or only production of agreed numbers at declared sites) and, (2) ensure nonproduction of treaty limited items elsewhere or at clandestine sites.

• In addition to challenge inspections, the INF Treaty specifies four types of OSI, two of which are particularly relevant for South Asian arms limitations purposes:

(I) *Baseline inventory*. OSI for verification of numbers and location of existing missiles. Both any existing conventional-armed missiles and space launch vehicles must be accounted for under a regional or bilateral missile production monitoring regime.

(ii) *Routine production monitoring of specified facilities.* Since neither India or Pakistan produces nuclear-capable missiles in "quantity," production facilities in these countries probably also house research and development functions, and may be collocated with static firing test facilities. These multipurpose "factories" must be included for inspection under a regional or bilateral "INF" treaty.

Verifying "Nonweaponization"

• *Verification methods analogous to those employed by the INF Treaty might be an effective means of monitoring an India–Pakistan agreement banning the mating of warheads to delivery vehicles such as aircraft or missiles.* Ideally, the focus of a nonweapization regime would be sites where aircraft or missiles are deployed or stored, and/or missile production factories.

• *Relatively nonintrusive perimeter and portal monitoring can be applied to such sites and facilities.* As noted by previous discussion of INF verification, perimeter and portal

monitoring need not require routine inspector access to the interior of the monitored plant or facility, only to entrances and exits (portals). Initial inspections of a facility, similar to the baseline inspections carried out under the INF Treaty, would ensure a "zero warhead" (or "zero fissile materials") presence at the start of formal perimeter and portal monitoring. Sensitive production processes, research, equipment or nontreaty limited items housed in a facility would thus remain free of subsequent inspection. Materials and equipment entering or exiting the perimeter, however, are subject to inspection, in accordance with treaty specifications.

• *Presumably, the goal of an India–Pakistan nonweaponization agreement would be to ensure that no nuclear warheads are brought to sites where they can be installed on aircraft or missiles.* Because nuclear warheads, essentially discrete packages of radioactive materials, are the objects of interest for such an agreement, the simplest, most effective approach to a nonweapization regime is to monitor aircraft or missile production, storage and deployment sites. In this case, the detection of radioactivity in an inspected vehicle or shipment could be assumed to indicate presence of a nuclear warhead.

• Inspectors armed with neutron or gamma ray emission detectors, stationed continuously at entrances or exits to service roads or facility buildings, should be granted controlled access to landing aircraft which may be carrying warheads or fissile materials. Installed along the perimeter of a base or airfield, a variety of remote motion detectors, seismic intrusion detectors, infrared sensors and cameras, comparable to those used in the Sinai, could provide a means of continuous monitoring. Perimeter sensor technology need not be overly complex; the task here is to detect movement across the perimeter at points other than continuously inspected portals.

• Ideally, all potential deployment sites would be subject to perimeter and portal monitoring. However, expectations of such a comprehensive monitoring regime are probably overly ambitious. More realistic are inspection and sensor-monitoring of a limited number of sites, in conjunction with third-party satellite monitoring. Many of the same remote sensing technologies used by satellites can also be carried by aircraft. The Open Skies Treaty serves as a model of a possible India–Pakistan airborne monitoring regime for a nonweapization agreement.

• *The attractiveness of a nonweaponization agreement that employs perimeter and portal monitoring of missile factories, airfields and missile deployment sites for the presence of warheads arises from its simplicity, relative nonintrusiveness, and the fact that it essentially leaves nuclear production facilities untouched.* The keys to the effectiveness of such a verification scheme are its *comprehensiveness* (are all potential nuclear weapon—warhead plus delivery vehicle—deployment and assembly sites adequately covered by portal inspection and perimeter monitoring), and *synergistic monitoring* (a variety of sensors is used, around the perimeter and borne on satellites or aircraft). The less comprehensive the agreement (i.e., limited to one or a few sites), the more crucial are other means of monitoring, including satellite and/or airborne sensors.

Testing Restrictions

Nuclear Test Bans. Along with fissile materials production restrictions, one of the more effective routes to blocking the development of missile-deliverable nuclear warheads could be the implementation of complete ban on nuclear explosive testing. *For states in the early stages of developing a nuclear weapons capability, a ban on nuclear testing would significantly impede the development of all but first-generation fission devices deliverable by aircraft and not requiring certainty of yield.*

• To effectively halt, or at least significantly slow, the refinement of warhead size and predictability of yields, and the development of boosted and thermonuclear weapons, *a regional test ban would require monitoring methods capable of detecting (and identifying) very low yield underground nuclear tests.*

• Three negotiated provisions would be integral to enhancing the effective use of seismic monitoring of very low yield nuclear testing:

(i) *Emplacement of in-country seismic monitoring systems in both India and Pakistan.* Because of the two countries' geographical proximity, more accurate identification of seismic events is possible than for the teleseismic (> 2000 kilometers) distances relevant to a U.S.–Russia test ban. In conjunction with the Incorporated Research Institutions for Seismology's (IRIS) Global Seismic Network, a regional network of seismic stations in India and Pakistan is being established. Data from these state-of-the-art stations are available to anyone through telephone links, satellite downlinks, or open data centers.

(ii) *Characterization of the geology of regions in which testing is likely to be conducted.* While accurate yield estimation would not be necessary for a complete nuclear test ban, this provision would enable more accurate *identification* of low-magnitude seismic events. However, accurate identification might not be possible without calibration tests. Joint India–Pakistan calibration tests (perhaps using nuclear test devices exploded for this purpose under the auspices of a multilateral scientific agency, such as UNESCO, or an international team of seismologists) could be carried out as a confidence building measure during negotiations for a test ban.

(iii) *Short-notice on-site inspection provisions for clarifying ambiguous seismic events, or for examining the site of a suspected clandestine test.* For the former, inspections might be conducted by joint India–Pakistan, or multilateral inspection teams.

Missile Flight Testing. Indian, and especially Pakistani, ballistic missile technology is still fairly embryonic; if implemented in the near term, a regional comprehensive flight test ban could effectively forestall the development and deployment of reliable IRBMs or ICBMs.

• A comprehensive ban on flight testing of ballistic missiles would certainly be easier to monitor than a regime permitting some testing. The latter would be primarily relevant to arms control that aims to impede the development of missile

accuracy and new models of IRBMs and ICBMs. A comprehensive missile test ban would not be free of monitoring and compliance difficulties, however, mainly because of the potential dual use of missile technologies. Verification of compliance with a missile flight test ban in countries with an active civilian space research and launch program must be capable of:

(i) distinguishing between the testing and launch of space launch vehicles and ballistic missile flight tests; and

(ii) detecting the transfer of technology developed under the aegis of civilian space programs to the military sector.

• Civilian space launches can be distinguished from their ballistic missile counterparts by both their trajectory and the absence of a reentry vehicle containing one or more warheads. An effective missile flight test ban that permits civilian space program activities might thus include:

(i) A specific ban on the testing of reentry vehicles. Adequate verification of a missile flight test ban would require at least a capability to detect and track reentry vehicles released from longer range missiles.

(ii) A means of monitoring the trajectory of a missile or space launch vehicle. Consequently a missile flight test ban agreement must include a provision prohibiting encryption of flight test telemetry.

(iii) Advance notification of all missile and space launches, specifying time, purpose, and characteristics of the launch vehicle.

Because monitoring short range or tactical missile flight tests is decidedly more difficult than for longer range missiles, testing of the former (which have conventional military applications and are unlikely to covered by a missile flight test ban) could be restricted to a specified test range, as could civilian space launches. Restricting tests of permitted short range or tactical missiles and space launches to designated sites, in addition to requiring advance notification of tests, would facilitate their detection and identification.

Deployment Restrictions

Deployment comprises the third most practical point of application for nuclear arms limitations. *The most effective deployment restriction measures, however, are those implemented in conjunction with bans on production and testing of nuclear explosive devices (warheads) and ballistic missiles or other delivery vehicles.* If the objective of regional nuclear arms limitations is a ban on possession of nuclear explosive devices of any kind for any purpose, the most effective verification regime would be one that focuses on all three "nodes" in the nuclear weapons life cycle.

• Monitoring the possible deployment of nuclear capable aircraft in South Asia clearly illustrates the importance of verification synergism. Neither India or Pakistan

has a dedicated force of nuclear armed heavy bombers easily distinguished from dual capable fighter-bomber aircraft. Arms control monitoring of potentially dual capable aircraft must be able to detect (primarily through NTM) direct observables indicative of a nuclear role.

• In the South Asian context, dual capable fighter-bombers are the norm, not the fairly distinctive heavy bombers that are more appropriate for strategic nuclear missions. While the observation of aircraft external attachment points (pylons or "hardpoints") would permit the assumption of a bomb carriage capability, determining whether a bomb is conventional or nuclear is virtually impossible without on-site inspection. A possible nuclear role for such aircraft must be inferred from the detection of such rather ambiguous indicators as special C^3 links essential for nuclear weapons operations or the observation of alerting procedures. Ensuring the nondeployment of nuclear weapons on South Asian dual capable fighter-bombers would be most effectively attained through a ban on production and testing of warheads, activities that are considerably easier to monitor, though production monitoring entails the use of more intrusive OSI methods.

• *A South Asian agreement banning the deployment of IRBMs or similar nuclear capable ballistic missiles in fixed launchers such as silos can be monitored with high confidence using fairly modest NTM capabilities.* India and eventually Pakistan may deploy IRBMs on mobile launcher platforms such as trucks or railcars to enhance the survivability of their nuclear forces. The detection and identification of these would be considerably more difficult than for fixed-base missiles

• *Production monitoring of missile factories primarily and verification of a missile flight test ban secondarily would constitute more effective routes to ensuring nondeployment of mobile missiles.* Because of their small size and similarity to conventional munitions the deployment of tactical nuclear weapons would prove the most difficult of all to monitor.

• *Fissile materials production monitoring and nuclear testing bans (the latter capable of detecting very low yield testing) would comprise the most feasible means of ensuring nondeployment of tactical nuclear weapons.* Additionally, because effective integration of tactical nuclear weapons into military strategy and planning would require the training of large numbers of soldiers in their use, the existence of tactical nuclear weapons might be inferred from the detection and observation of certain maneuvers or exercises. Both unilateral NTM (including, for example, the monitoring of radio traffic to detect C^3 associated with tactical nuclear weapons operations) and observation by NTM or OSI legitimated by negotiated arms control provisions could be employed for detection of tactical nuclear weapons training and deployment.

• *Technologies such as tags, under development for verifying both a possible Conventional Forces in Europe (CFE) Treaty and START II, might also be employed to ensure that conventional weapons (including longer-range missiles) are not fitted with nuclear warheads.* Here, each permitted conventional weapon would have a special deception-proof tag impervious to tampering or removal and affixed to a surface or incorporated into a

key component during manufacture. Tagging systems could, for example, be incorporated into the arming circuitry of a conventional weapon such that attempts to modify the circuitry to accept a nuclear warhead would require damaging the tag or removing it altogether. Depending on the type of tag employed, monitoring could be carried out remotely or through on-site inspection.

• The simplest, most direct tag technology for both a nonweapization agreement and a ban on tactical nuclear weapons are "dosimetric" tags that can detect the presence of radioactivity. Some types of these can be monitored remotely, others require the use of hand-held readers.

A South Asian Nuclear Weapons Free Zone

• The inclusion of China in some form (even if its participation were to consist only of symbolic gestures, such as redeploying and retargeting its missiles away from India), would most certainly be a precondition for Indian accession to an NWFZ regime. As an extraregional nuclear weapons state adjoining South Asia, China's potential role in a South Asian NWFZ is significant. As a declared nuclear weapons state, China could hardly be included as a zonal state unless it were to renounce nuclear weapons. China could, however, adhere to a South Asian NWFZ negative security guarantee protocol, much as it has for the Treaties of Tlatelolco and Raratonga. Neither of these treaties, however, significantly impinges on possible Chinese plans for ocean deployments of nuclear weapons; a South Asian NWFZ substantially incorporating the Indian Ocean within its zone of application most probably would. An agreement by China to redeploy and retarget its ballistic missiles away from India could comprise a form of negative security assurance.

• Five of the seven zonal states which would fall within the ambit of a South Asian NWFZ are party to the NPT. A NWFZ would likely obligate zonal states, regardless of NPT status, to conclude full-scope safeguards agreements with the IAEA but only upon NWFZ treaty ratification. Obviously, India and Pakistan could thus remain outside a NWFZ verification regime simply by withholding signature, ratification, or entry-into-force requirements should the agreement include a waiver provision. The effectiveness of any NWFZ regime for ensuring nonproduction and nonpossession of nuclear weapons by all zonal states is doubtful as long as India and Pakistan were excluded from treaty verification mechanisms.

•A South Asian NWFZ treaty, assuming one is concluded, need not rely on IAEA safeguards as the sole means of verifying compliance, though they or something very similar would be the primary means. *A "two-tiered" South Asian NWFZ is conceivable, in which states rejecting IAEA safeguards could accede to an "alternate verification protocol" until such time as they deem IAEA safeguards politically acceptable.*

• An alternative verification protocol might employ relatively nonintrusive seismic and NTM monitoring, on a regional basis, for detection of nuclear or ballistic

missile testing, and nuclear weapons deployments. More intrusive measures could include OSI, conducted by an acceptable regional verification body, of nuclear facilities, space launches, or suspect nuclear test sites. *A two-tiered verification scheme might be politically difficult to implement because it would seem to sanction asymmetries in application, in conflict with the nondiscriminatory tradition of NWFZ regimes.*

IV

Negotiated Measures for Verification

Cooperative Measures for Enhancing Monitoring Effectiveness

The application of arms limitations measures to early stages (i.e., production) in the nuclear weapons life cycle can help thwart noncompliance with measures applied to later stages (testing and/or deployment). Analogously, various unilateral and negotiated measures can facilitate the monitoring of specific kinds of nuclear weapons activities. In the U.S.–Soviet arms control context "cooperative measures" have historically been considered supplementary to NTM, intended as they are to facilitate monitoring by such nonintrusive means. This preeminence of NTM in U.S.–Soviet arms control verification evolved both out of necessity and circumstance.[218] Prior to the INF Treaty, on-site inspection measures were a largely non-negotiable issue in U.S.–Soviet arms control efforts. Extensive deployment of nuclear weapons, moreover implied that the counting of *launchers* via satellite observation might provide an effective substitute for the counting of warheads. SALT I, and more particularly SALT II, incorporated cooperative measures for the purpose of facilitating accurate satellite reconnaissance counts of weapons as deployed on launchers.

While some cooperative measures are designed mainly to enhance monitoring of compliance with quantitative limitations of deployed weapons (e.g., counting rules for MIRVed missiles) and are irrelevant to South Asia, others (e.g., baseline data exchanges, transparency measures) are potentially very important. On-site inspection, considered by some to be an "active" cooperative measure designed to collect information unattainable through NTM[219] is, as described previously, a verification tool with special significance for a South Asian arms limitations regime.

Baseline Data Exchanges

The primary purpose of the mutual exchange of data relevant to the provisions of an arms control agreement is to create a baseline for comparison with data collected

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218. The Soviet Union has not always accepted the legitimacy of satellite reconnaissance as a verification tool. In 1962 the Soviet delegation to the United Nations sought to ban all spaced-based intelligence collection. See Stuart A. Cohen, "The Evolution of Soviet Views on SALT Verification," in Potter, ed., *Verification and SALT,* p. 57.

219. James Schear, "Cooperative Measures for Verification," in Potter, ed., *Verification and Arms Control,* p. 16.

through subsequent monitoring. SALT II required the U.S. and Soviet Union to exchange data on existing numbers of treaty limited weapons as well as " maintain an agreed data base" by notifying each other of changes in these numbers.[220] The Peaceful Nuclear Explosions Treaty (PNET) requires provision of information on the purpose of a PNE, its location in geographical coordinates, geological characteristics of the explosion site and certain technological features of the device. The 1988 India–Pakistan agreement banning attacks on nuclear facilities obligates each party to annually "inform the other. . .of the latitude and longitude of its nuclear installations and facilities and whenever there is any change."[221]

The mutual provision of data and its periodic updating can itself be a significant confidence building measure, subject to two provisos:[222]

- Databases do not stand alone as effective verification measures. Parties to an agreement should be able, either independently or through other cooperative measures such as OSI, to confirm the validity of data provided by a counterpart. Discrepancies will be inevitable, even if unintentional. Furthermore, the knowledge that an adversary has the means to check data provided is a significant disincentive to deception.
- Precise definition of what information is to be provided is essential. Vague or ambiguous descriptions not only facilitate exploitation of "gray areas" but can also encourage spurious charges of dishonesty or unwarranted suspicions.

Transparency Measures

These are mainly intended to enhance the visibility of treaty limited items or activities to NTM observation. Examples are provisions for advance notifications of military exercises or missile flight testing, uncovering missile silos during the periods of time when surveillance satellites pass overhead, and restrictions on missile telemetry encryption. Beginning with the 1972 Anti-Ballistic Missile (ABM) Treaty, U.S.–Soviet arms control agreements have incorporated a standard provision enjoining the signatories "not to interfere with the national technical means of verification of the other party" and "not to use deliberate concealment measures which impede verification by national technical means."[223] Because of its implications for mobile

220. SALT II Treaty, Art. XVII.

221. Text of India–Pakistan no-attack agreement reprinted in *Programme for Promoting Nuclear Nonproliferation Newsbrief* (July 1989): 12.

222. Alan Krass, *Verification: How Much is Enough?* pp. 208–210.

223. Both quotations from the ABM Treaty, Art. XII, para. 2 and 3, reprinted in Goldblat, *Arms Control Agreements;* see also SALT II, Art. XV, para. 2 and 3; INF Treaty, Art. XII.

ICBM basing the proscription of "deliberate concealment" (inherent in the concept of mobility) was an especially contentious issue for SALT II.[224]

In the South Asian context, transparency measures might be applied to agreements banning the production of ballistic missiles but permitting the production of space launch vehicles. The final assembly of space launch vehicles could be required to take place in open construction halls, or such vehicles could be purposely displayed at optimal times for satellite observation.[225] Restricting the encryption of space launch vehicle telemetry could comprise an important cooperative verification measure for assuring the peaceful intent of Indian or Pakistani space programs.

Designation Measures

If transparency measures enhance the "brightness" of what is observed by NTM "eyes," designation measures effectively focus them by localizing treaty limited items or activities. Designation measures have been employed in U.S.–Soviet arms control regimes primarily to facilitate counting of weapons. For example, designated deployment areas (DDAs) have been proposed as a way out of the land-mobile ICBM verification impasse; the concealment afforded by mobility is preserved because missiles are counted only as they pass through well defined DDAs.[226]

For South Asian arms control, designation measures are relevant for agreements covering the following activities or items:

- civilian space program activities;
- certain permitted conventional weapons, such as tactical munitions or very short range missiles having a dual capability. Designation measures might facilitate the counting of these if deployed in relatively large numbers; and
- confidence building measures restricting military exercises or troop deployments to areas circumscribed by agreement.

The occurrence of even permitted items or activities outside the perimeter of an agreed deployment area would constitute an instance of noncompliance. Moreover, restricting space program activities, for example, to well-defined designated sites could substantially ease the monitoring essential for discerning whether these activities are in compliance with a ban on IRBM production or testing.

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[224]. Paul K. Davis "Land-Mobile ICBMs," in Potter, ed., *Verification and SALT*, p. 147.

[225]. Schear, "Cooperative Measures for Verification," in Potter, ed., *Verification and Arms Control*, p. 21.

[226]. Ibid., p. 16–18.

INSERT TABLE 4.1 HERE

Seismic Monitoring Cooperative Measures

There are several means of enhancing the identification of ambiguous seismic events. These are described in the previous discussion of bans on nuclear explosive testing.

On-Site Inspection

India and Pakistan nuclear weapon activities are still largely confined to the production, rather than the testing or deployment, stage. Pragmatic and effective South Asian arms control aimed at ensuring nonpossession of nuclear weapons then, must logically focus on this stage. Detecting the diversion of fissile materials from peaceful application entails both accounting for rather small quantities of these materials and the isolation of restricted from unrestricted activities within the confines of buildings that are opaque to NTM. Ensuring nonproduction of ballistic missiles, while more amenable to NTM monitoring in many respects, would also be enhanced by an ability to look where NTM cannot. On-site perimeter and portal inspections would be essential to ensure that nuclear warheads are kept separate from delivery vehicles. In the South Asian context, for production agreements other than complete shutdowns of nuclear materials or ballistic missile "factories," on-site inspection would afford rather high monitoring confidence, especially if coupled with NTM. Though it can effectively compensate for many NTM shortcomings, on-site inspection carries with it potentially serious political risks because of its intrusive nature.

Routine OSI. Routine inspections are *expected* inspections; they are limited to declared facilities and are carried out in accordance with a predetermined, mutually agreed schedule.[227] In other words, participants in a routine OSI regime have advance knowledge of when and where counterparts intend to conduct inspections. Routine OSI are primarily for demonstrating continuing compliance with an agreement, rather than a means of confirming suspected noncompliance. Treaty parties need not furnish evidence to justify initiating routine inspection of a counterpart. Unlike inspections conducted on a challenge basis, routine inspections generally do not proceed from an a priori assumption of noncompliance.[228] Of all possible OSI regimes then, routine inspections are least prone to politically motivated abuse and the easiest to negotiate.

Nevertheless, routine OSI, like any cooperative venture obligating a degree of surrender of sovereignty, is not immune to "political abuse." Scheduled inspections may be subject to delays by the inspected state, inspectors harassed or their duties

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[227]. Krass, *Verification: How Much is Enough?*, pp. 213–214.

[228]. Sidney Graybeal and Michael Krepon, "On-Site Inspection," in Krepon and Umberger, eds., *Verification and Compliance*, pp. 93–94.

obstructed. Moreover, lack of cooperation in a routine OSI regime does not necessarily stem from a desire to see an agreement fail. The presence of foreign inspectors in sensitive facilities raises legitimate security concerns for any state.[229] A major objection advanced by the Soviet Union to past U.S. OSI proposals was the assumption that inspections would be used as intelligence "fishing expeditions."[230] Detailed specification of OSI procedures, inspector access and rights, permitted inspector equipment, escort arrangements, permitted time of arrival, and inspection duration, are essential if opportunities for obstruction and "collateral information" collection are to be lessened. These are issues that must be resolved by mutual agreement, preferably at the negotiation stage.

Depending on the goals of a South Asian production (of fissile materials or ballistic missiles) restriction agreement or any other arms limitation regime necessitating inspections, several types of routine OSI can be implemented.[231] Though described in terminology derived from the U.S.–Soviet INF Treaty, the following are equally relevant to a variety of South Asian production monitoring or other arms limitations regimes requiring OSI:

- *Baseline Inspections* are used to authenticate mutually exchanged data or to establish an initial database of treaty limited items. Baseline inspections can also be used to refine and elaborate subsequent inspection procedures. The IAEA, for example, conducts "initial inspections" to verify facility design information provided by the safeguarded state, establish material balance areas, and assess monitoring equipment needs.

- *Elimination Inspections* are used to confirm the destruction or disassembly of treaty limited items. Though negotiated shutdowns of specified production facilities can be fairly confidently monitored by NTM, provision might be made for initial and periodic elimination inspections to confirm observations made by NTM.

- *Closeout Inspections* are employed to verify that a specified facility has ceased production or storage of treaty limited items. In contrast to elimination inspections, closeout inspections are carried out in operative facilities that may continue to produce items or house activities not restricted by agreement.

- *Continuous Monitoring* can be accomplished either through the continuous presence of human inspectors and/or the installation of automated sensors and

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229. Schear, "Cooperative Measures for Verification", in Potter, ed., *Verification and Arms Control*; Lewis A. Dunn and Amy E. Gordon, "On-Site Inspection for Arms Control Verification: Pitfalls and Promises," *Harvard University Center for National Security Negotiations Occasional Paper,* 1 (2) (May 1989): 34–36.

230. Alan S. Krass, "The Soviet View of Verification," in Potter, ed., *Verification and Arms Control*, pp. 44–46.

231. Dunn and Gordon, *On-Site Inspection,* p. 3.

surveillance devices. The INF Treaty establishes a permanent inspector presence at designated U.S. and Soviet missile production sites. IAEA containment and surveillance devices (e.g., seals and video cameras) permit continuous observation and access prevention in the absence of inspectors. Short-distance sensors, such as motion detectors or infrared sensors installed along the perimeter of a facility for verifying a nonweapization agreement, can provide effective continuous monitoring.

Undeclared facilities, even if used for entirely legitimate purposes, are obviously not subject to inspection under a routine OSI regime and can thus be a valid source of compliance concerns. Treaty provisions for periodic updatings of databases and declared site lists would permit the incorporation of new facilities, including those detected by unilateral NTM, within the verification regime. Whether agreement can be reached about the inclusion of new or as-yet unacknowledged facilities would depend largely on the owner state's commitment to the overall success of the agreement. If a state is resolute in its use of clandestine facilities to violate the terms of an agreement while maintaining a pretext of compliance at declared sites, it will hardly be a willing negotiator. In such a situation both sides might reasonably question the value of the agreement as a whole and its breakdown may be unavoidable.

Special Inspections—Short Notice or Challenge Inspections. By definition, special inspections are those conducted on a nonroutine basis. Advance notification, if given at all, is measured in hours or days, and both declared and undeclared sites might be subject to inspection depending on treaty provisions. The sensitivity of short notice or challenge inspections to the prevailing political climate derives from their "nonroutine" nature. Whether or not a state is required to furnish justification for its request to inspect a counterpart, such a request may be perceived as implying guilt or noncompliance. Furthermore, security concerns about loss of sensitive collateral or proprietary information are intensified by the prospect of inspectors arriving at potentially any site with little warning.

Requiring justification for an inspection request could mitigate some of the most adversarial aspects of special inspections. The lack of such a requirement could encourage "harassment by inspection." But capricious demands for inspection will likely be met in kind. Annual inspection quotas could discourage unwarranted inspection demands, though an especially imaginative and uncooperative state might contrive to exhaust its counterpart's inspection quota by provoking it with "apparent" violations. Additionally, if the need to furnish evidence in order to justify an inspection request entails the revelation of sensitive intelligence assets, a state might be reluctant to request an inspection even if it possesses solid evidence of significant noncompliance.

Some special inspection regimes do not require justification of inspection requests. The INF Treaty, for example, accords the U.S. and Soviet Union the right to request

without justification short notice inspections (to be implemented within four to twenty-four hours after arrival of inspectors at "key entry points") of sites other than primary missile production facilities, which are covered by a continuous inspector presence. The 1986 Stockholm CSBM Accords contain similar provisions for unjustified short notice inspections.[232] The workability of both short notice OSI regimes appears to derive from the use of annual inspection quotas, ensuring that parties use inspections wisely. Most importantly, the parties to these agreements seem to genuinely desire to cooperate. The record of the usefulness of requiring justification for inspection requests thus appears to be mixed. Furthermore, the need to justify inspection requests could seriously hamper timely access, if this is important for effective verification.

In addition to quotas, two other negotiated qualifications can serve to mitigate potential political abuse of special inspections and allay fears of sensitive information loss. INF short notice inspections apply only to an extensive list of declared sites drawn up by mutual agreement. Such a provision ensures that inspection requests are limited to facilities relevant to treaty compliance issues. Again, for declared-site inspections to be maximally effective, provision must be made for periodic revision and expansion of declared-site lists as warranted by new developments.

For short notice or challenge inspection regimes applying to any suspect site, the inclusion of a right of refusal could obviate a potential source of harassment and discourage intelligence fishing expeditions of facilities with little direct treaty relevance. The inspection regime could additionally require a state refusing an inspection request to furnish alternative evidence or means of demonstrating compliance.[233] Such an arrangement, however, could pose a significant hindrance to timely-access requirements.

Invitational Inspections comprise a type of special inspection useful for compliance diplomacy purposes. Voluntary invitations to inspect can be extended by states desiring to allay compliance concerns about facilities not covered by routine or short notice inspection regimes. An example frequently cited in this regard is the Soviet Union's 1986 invitational tour, extended to a U.S. Congressional delegation, of the Krasnoyarsk radar facility. While the visit ultimately failed to resolve U.S. concerns about ABM Treaty compliance, it may have served significant confidence building purposes.[234] While the public diplomacy aspects of invitational inspections are especially susceptible to exploitation, these kind of inspections might be employed as an important compliance-dispute resolution mechanism.

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[232]. See Document of the Stockholm Conference on Confidence Building and Security Measures and Disarmament in Europe, excerpts reprinted in *Disarmament* (Fall 1986): 62–77.

[233]. Dunn and Gordon, *On-Site Inspection,* p. 9.

[234]. Graybeal and Krepon, "On-Site Inspection," in Krepon and Umberger, eds., *Verification and Compliance,* pp. 104–105. The Soviet Union has recently admitted that the Krasnoyarsk facility is indeed an ABM treaty violation.

TABLE 4.2. On-Site Inspection for South Asian Arms Control

Measure	*Types of OSI Employed*
Confidence Building Measures	
Exchange of Observers (at maneuvers, missile tests)	Special (invitational)
Arms Limitations	
Fissile Materials Production	Baseline (to assess current stockpiles)
Restrictions	Routine (IAEA-type)
	Special (challenge, and invitational)
	Closeout (for facility shutdowns)
Missile Production Ban	Routine (continuous inspector presence at entries and exits of facilities)
	Baseline, or initial Closeout
	Special: challenge and invitational
"Nonweapization"	Same as for missile production ban; including possible routine and special OSI to check "tags"
Nuclear Testing Ban	Special: challenge and invitational
Deployment Restrictions:	
Aircraft	Special: challenge and invitational
Tactical, "Battlefield," Nuclear Munitions	Baseline, to determine starting numbers, if any
	Routine, e.g., to check "tags"
	Special: challenge and invitational
	Closeout, for phased removal of weapons from an area

Notes: Not every agreement will utilize all of the forms of OSI listed for each type of arms control; this chart simply lists the most effective OSI arrangements previously employed for particular arms control measures. It is also assumed here that any negotiated arms control agreement would specify conditions under which inspections take place, and whether they are restricted solely to declared sites (i.e., whether challenge inspections can be requested for *suspected* undeclared sites). Agreements should ideally contain provisions for periodic updating of declared - site lists and the procedures by which evidence of suspected new sites can be presented and resolved.

On-Site Inspection in Perspective. Lewis Dunn and Amy Gordon have identified four factors which influence the ease of clandestinely producing treaty limited items or carrying out prohibited activities under an OSI regime:[235]

- the ease with which other sites could be reconfigured to produce, service, or house treaty limited items or activities;
- how readily undeclared facilities or activities could be disguised;
- how much effort would be needed to avoid detection if an attempt were made to misuse an inspected facility or site; and
- the extent to which dual use items are limited.

[235]. Dunn and Gordon, *On-Site Inspection*, p. 24.

Even if no OSI regime is capable of detecting all instances of noncompliance at every possible site, all types of OSI can certainly impede the efficient conduct of noncompliant activities. As can be said of any arms control agreement, whether or not a state cares about "being caught" depends upon its commitment to at least maintaining the appearance of compliance. If commitment is sufficiently strong, a state will be deterred, at a minimum, from blatantly violating the terms of an agreement. Skirting legality or loophole-stretching may be less indicative of imminent treaty "breakout" than of a desire to impose unilateral interpretations of treaty language while on the whole remaining committed to the arms control regime. OSI certainly complicates the more obvious attempts at treaty violation, assuming, of course, that the facilities of greatest arms control significance fall within the ambit of an OSI regime.

Treaty Mechanics: Facilitating Compliance

Monitoring, which consists of the collection of data pertinent to arms control agreements, comprises the technical portion of the verification process. Previous discussion of potential South Asian arms limitations has emphasized negotiated provisions to enhance the ease of monitoring for verification purposes. The verification process also involves compliance assessment, or using the "hard" data generated by monitoring to assess whether parties to an agreement are abiding by its terms. Compliance assessment is an unavoidably political pursuit, dependent as it is on judgments about the consonance between monitoring data and human interpretations of what a treaty requires its signatories to do or not do. Compliance, in short, "is the actual practice of arms control."[236]

Just as an agreement may incorporate negotiated provisions for enhancing technical monitoring capabilities, it might also establish mechanisms for resolution of noncompliance charges or disputes over treaty language, and specify sanctions in the event of treaty breaches. Multilateral experience with compliance mechanisms, such as the Agency for the Prohibition of Nuclear Weapons in Latin America (OPANAL) of the Treaty of Tlatelolco, and the U.S.–Soviet bilateral experience, the SALT Standing Consultative Commission (SCC) in particular, offer valuable "lessons" in compliance diplomacy. Additionally, whether an agreement is a formal treaty or tacit understanding, the specificity of treaty language, or its adaptability to new technological developments are all factors which impinge on the efficacy of compliance.

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[236]. Gloria Duffy, *Compliance and the Future of Arms Control* (Stanford, Calif.: Stanford University Center for International Security and Arms Control, 1988), p. 2.

Formal Treaties or Tacit Understandings?

All of the negotiated arms control measures discussed earlier entail rather detailed provisions for verification procedures. Informal or tacit agreements, in contrast, are appropriate for arms control situations in which noncompliance is fairly obvious or evidence for it is easily obtainable through unilateral monitoring or intelligence methods.[237] "Parallel unilateral actions" (or inaction) might also be considered a form of tacit understanding.[238] India and Pakistan have both abstained from conducting nuclear explosive tests since 1974. R.V.R. Chandrasekhara Rao contends that the incentives for abstention from testing are such that each country wishes to avoid being the first to break the "moratorium."[239] Perhaps, but as neither India or Pakistan has made a formal commitment to abstain from nuclear explosive testing, each retains the incentives to continue its nuclear weapons research, albeit short of detectable nuclear testing. Tacit understandings, or apparent parallel unilateral actions provide no means of resolving "compliance" disputes; rules that are not mutually defined and acknowledged can hardly be broken. Moreover, evidence of "noncompliance" obtained through unilateral intelligence cannot legitimately be considered anything other than espionage.

In addition to delineating rights, obligations, procedures for monitoring and compliance, and definitions of noncompliance, formal treaties also establish baselines for comparing subsequent compliance behavior. Mutually agreed and defined ground rules facilitate predictability in arms control and military relations.[240] The existence of formal, contractual obligations can promote observance of the rules by institutionalizing commitment to the arms control process. By institutionalizing commitment, especially if mechanisms for consultation and amendment are included, formal arms control agreements can foster continuity of cooperative action.

Treaty Language: Narrow Precision or "Flexible Ambiguity"?

Precision of definition would seem essential for promoting compliance with treaty provisions. Clearly defined terms and narrowly circumscribed obligations can certainly help discourage the unilateral "reinterpretations" which often inspire compliance disputes. But an effective arms control regime also maintains a delicate balance between precision and "flexible ambiguity" that extends a treaty's reach to future technological and strategic developments. Adherents to a strict interpretation

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237. Richard Bilder and Russell Hardin, "Formal Treaties and Tacit Agreements: An Exchange," *Bulletin of the Atomic Scientists* (April 1985): 51.

238. Ibid.

239. R. V. R. Chandrasekhara Rao, "India, Pakistan Racing to be Last," *Bulletin of the Atomic Scientists* (November 1987): 33.

240. Bilder and Hardin, "Formal Treaties and Tacit Agreements," p. 52.

of the 1972 ABM Treaty contend that it precludes testing of Strategic Defense Initiative systems and component technologies; the Reagan Administration's "new interpretation" of the treaty argued that post-1972 technologies do not come under the aegis of the treaty's bans on testing and deployment of ABM systems or components.[241]

A country's negotiators may also prefer some ambiguity in treaty language if it preserves some flexibility in military activities. The U.S., for example, argued for a less-than-precise definition of "launchers" during the SALT II negotiations because a more restricted definition would likely preclude certain MX basing options.[242] In a South Asian arms control regime this kind of creative ambiguity would ideally be avoided, but the regime should be sufficiently flexible if it is to be capable of accounting for modes of nuclear weapons deployment not presently available to either India or Pakistan, such as mobile IRBM systems. Simultaneously, a South Asian arms control regime must define what is restricted in terms precise enough to minimize exploitation of gray areas.

Treaty Adaptability

Obviously, no arms control negotiator can foresee every potential strategic or technological contingency, nor can any agreement be completely free of interpretation disputes as its provisions are put into practice. The achievement of the proper mix of precision and flexibility of language is difficult between even the most cooperative of parties. The effective use of consultative fora and procedures for treaty amendment can help compensate for shortcomings in treaty language. Treaties lacking such provisions are prone to obsolescence. They are also highly vulnerable to "tit for tat" noncompliance spirals because no formal, confidential channel for mutual resolution of conflicting interpretations of treaty obligations exists. Article XIII of the ABM treaty established the Standing Consultative Commission, one of the functions of which is to "consider, as appropriate, possible proposals for further increasing the viability of this treaty, including proposals for amendments in accordance with the with the provisions of this treaty."[243] To date, the SCC has not been used for treaty amendment purposes. Rather, it has been employed primarily as a means of implementing SALT agreements and resolving compliance questions.[244] The SCC has also been given responsibility for the ABM Treaty's formal review procedures

241. Duffy, *Compliance and the Future of Arms Control,* chap. 6.

242. Robert Einborn, "Treaty Compliance," *Foreign Policy* 45 (Winter 1981–82): 39.

243. ABM Treaty, Article XIII.

244. Sidney Graybeal and Michael Krepon, "Improving the Utility and Effectiveness of the Standing Consultative Commission," in Krepon and Umberger. eds., *Verification and Compliance,* p. 241.

established by Article XIV.[245] During the Nixon, Ford, and Carter Administrations the SCC was an effective problem solving forum in which several rather contentious compliance disputes were resolved to the apparent satisfaction of both sides.[246] Successful SCC resolution of U.S. allegations of Soviet testing of SA-5 radars "in an ABM mode" is frequently cited as an example of the utility of consultative mechanisms for clarifying ambiguous treaty language.[247] The effectiveness and limitations of bilateral consultative mechanisms, using the SCC as a model, is discussed subsequently.

Risks and Usefulness of Unilateral Clarifications

A statement by one party clarifying its interpretations or position regarding certain treaty provisions can serve to establish the bounds of what is considered acceptable treaty behavior and may help encourage compliance by a counterpart.[248] The beneficial aspects of unilateral clarifications are most likely realized if they are presented during treaty negotiations or as part of a mutual post-treaty effort to secure accommodation of conflicting views.

If consultation and negotiation has failed to render a mutually satisfactory reading of treaty language, subsequent submission of unilateral statements is more likely to widen the rift than to promote acquiescence by the other side. This is especially so if unilateral clarifications represent an effort to undo previously agreed but ambiguous treaty provisions.[249] Imprecise SALT I specifications of silo dimensions, an ineffectual attempt to define "heavy missiles," prompted the U.S. to issue its understanding of what was restricted by this provision. Ignoring the U.S. clarification, the Soviet Union proceeded with deployment of "heavy" SS-19 ICBMs in converted SS-11 silos. Apparently the Soviet Union had also made known during the SALT negotiations their intention to replace the SS-11 missiles with SS-19s.[250] The Ford and Carter Administrations did not consider the SS-19 to constitute a treaty violation, even though it "violated" the U.S. unilateral clarification. However, the Reagan

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245. Dan Caldwell, "The Standing Consultative Commission: Past Performance and Future Possibilities," in Potter, ed., *Verification and Arms Control,* p. 222.

246. Duffy, *Compliance and the Future of Arms Control* , chap. 8 and 10.

247. Ibid., pp. 172–173; Graybeal and Krepon, "Improving the Utility and Effectiveness of the Standing Consultative Commission," in Krepon and Umberger. eds., *Verification and Compliance,* pp. 245–246; Caldwell, "The Standing Consultative Commission: Past Performances and Future Possibilities," in Potter, ed., *Verification and Arms Control,* pp. 223–224.

248. Schear, "Cooperative Measures for Verification," in Potter, ed., *Verification and Arms Control,* pp. 23–24.

249. Stephen Flanagan, "Safeguarding Arms Control," in Krepon and Umberger, eds., *Verification and Compliance,* p. 234 .

250. Graybeal and Krepon, "Improving the Utility and Effectiveness of the Standing Consultative Commission," in Krepon and Umberger, eds., *Verification and Compliance,* p. 244.

Administration's 1984 General Advisory Committee report included this incident in its list of past Soviet acts of treaty noncompliance.[251]

If a treaty lacks a mechanism for consultation in the event of such disputes, or if one is established but a negative political atmosphere precludes its effective use, unilateral clarifications provide the most obvious option for parties to communicate their views regarding treaty obligations to counterparts. But the incentives in such a situation to reinterpret treaty provisions to accommodate military planning and new weapons programs, or to respond reactively to a counterpart's reinterpretations are great. If treaties are to retain any meaning as cooperative ventures parties must abide by their provisions as negotiated, unless amended by mutual agreement.[252]

Public or Private Compliance Diplomacy?

The Reagan Administration's "public confrontation" style of SALT compliance diplomacy stands in marked contrast to the quiet SCC "problem solving" approach of its predecessors.[253] The risks of public compliance diplomacy are well illustrated by this contrast; intransigence and a spiraling downturn in arms control relations are the more likely consequences, especially if noncompliance charges are presented in a polemical and accusatory manner. No country wants to be seen by the world as bowing to a rival's presumptions of guilt.

Equally important is the confidentiality afforded to sensitive military information by a private consultative forum. Public release of sensitive information would exacerbate any reluctance of parties to exchange data vital to resolving compliance disputes.

Nevertheless, there is some justification for making less sensitive information about the results of consultative sessions available to the public. The executives of parliamentary democracies such as India and Pakistan should be obliged to inform their constituents and parliaments about treaty implementation matters. An informed electorate is integral to sustaining domestic support for current or future arms control efforts. Unclassified summaries of India–Pakistan or regional treaty consultative commission activities and net assessments of *both* sides' compliance records presented in an objective, problem-solving style would help to dispel the mystery and

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251. Mark M. Lowenthal, "Verification: Soviet Compliance With Arms Control Agreements", *Congressional Research Service Issue Brief*, March 13, 1985, pp. 3, 6–7.

252. Robert W. Bucheim and Dan Caldwell, "The U.S.–USSR Standing Consultative Commission: Description and Appraisal," in Paul Viotti, ed., *Conflict and Arms Control* (Boulder, Colo.: Westview, 1986), p. 138.

253. Duffy, *Compliance and the Future of Arms Control*, chap. 8.

misconceptions likely to arise from arms control secrecy.[254] Detailed, classified versions can be provided to relevant parliamentary committees. In the U.S., classified accounts of substantive SALT SCC agreements and issues are sent by the president to six Congressional committees.[255] Regulation eight of the SCC Memorandum of Understanding stipulates, however, that the actual proceedings of the SCC are not to be made public unless expressly agreed by the SCC Commissioner.

Compliance Sanctions and "Safeguards"

In contrast to decisions rendered by domestic courts of law, no arms control police exist to enforce bilateral treaty parties to comply with their obligations. The conspicuous lack of effective sanctions and enforcement mechanisms in the event of a counterpart's noncompliance is perhaps one of the most intractable weaknesses of bilateral arms control efforts. Multilateral arms control agreements, such as the NPT, permit more options for applying sanctions to violators. Noncompliant NPT parties may lose their status as an IAEA member state[256] and other parties might agree to embargo exports of nuclear technology or assistance to the offending state.

In the bilateral arms control case, unilateral action is the only viable sanction. Arms control "safeguards" have been suggested in the U.S.–Soviet context as "measures designed to encourage compliance with arms control agreements and/or to provide for a party's security against violations or the collapse of an accord."[257] Proponents of safeguards contend that the fear of detection is an insufficient deterrent to noncompliance; the U.S. must be prepared to respond with concrete, compensatory actions capable of negating any military gains accruing from Soviet noncompliance. Regarding the ABM Treaty and concerns of potential Soviet noncompliance, in 1979 Secretary of Defense Harold Brown proposed "an aggressive [ABM] R&D program to guard against Soviet [ABM Treaty] breakthrough . . . and to encourage their compliance with the treaty."[258]However, responding in kind to perceived violations,

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254. Einborn, "Treaty Compliance," pp. 44–46; Graybeal and Krepon, "Improving the Utility and Effectiveness of the Standing Consultative Commission," in Krepon and Umberger, eds., *Verification and Compliance*, pp. 254–256.

255. Duffy, *Compliance and the Future of Arms Control*, chap. 8, p. 164; Mark M. Lowenthal, "U.S. Organization for Verification," in William Potter, ed., *Verification and SALT*, pp. 83–89.

256. Julie Dahlitz, *Nuclear Arms Control With Effective International Agreements* (London: George Allen & Unwin, 1983), p. 185. To date there has been no case of IAEA application of such sanctions to any NPT party state or any non-NPT Agency member state. Inspections of Iraq after the Gulf war, for the purpose of finding and destroying "weapons of mass destruction," were carried out by a special UN commission for the purpose of imposing UN sanctions.

257. Flanagan, "Safeguarding Arms Control," in Krepon and Umberger, eds., *Verification and Compliance*, p. 215.

258. Report of Secretary of Defense Harold Brown to the Congress with FY 1980 Budgets, FY 1981 Authorization Request and FY 1980–84 Defense Programs (GPO, January 25, 1979), pp.

especially if changes in treaty limited military activities are called for, is likely to generate tit-for-tat noncompliance exchanges that may quickly spiral out of control. As Stephen Flanagan states, "[i]t has proved very difficult in practice to identify military safeguards that genuinely encourage compliance with various limitations rather than simply drive the other parties to undertake hedges that ultimately undermine the goals and purpose of an accord."[259]

Functions, Structures, and Guidelines for Bilateral Consultative Fora

In light of the previous discussion, the most fruitful means of resolving compliance and interpretation disputes is mutual consultation within a treaty-mandated institution established for such a purpose. Within South Asia, such an institution is best exemplified by the Permanent Commission of the 1960 India–Pakistan Indus Waters Treaty, comprised of one representative from each country, plus a neutral member to mediate deadlocks (see earlier discussion on the Indus Waters Treaty). The effectiveness with which the Permanent Commission has resolved disputes over use of the Indus and its tributaries offers an unparalleled regional model for future India–Pakistan agreements. Outside the region, the U.S.–Soviet Standing Consultative Commission comprises the preeminent example of the structure and functioning of a consultative mechanism for implementing bilateral arms limitations agreements. The U.S.–Soviet Standing Consultative Commission comprises the preeminent example of the structure and functioning of a consultative mechanism for implementing bilateral arms limitations agreements. Useful guidelines for enhancing the effectiveness of bilateral consultative fora also derive from the U.S.–Soviet SCC experience.

Purposes of an SCC. As well as considering compliance questions and potential treaty amendments the SCC was mandated by the ABM treaty as a forum for the voluntary provision of data by either party considered "necessary to assure confidence in compliance," consideration of questions "involving unintended interference" with NTM, proposals for additional arms control measures and possible "changes in the strategic situation" that may affect treaty provisions. A consultative commission established by an India–Pakistan or India–China arms limitations agreement could perform similar tasks with perhaps added responsibilities for mutual oversight of the procedural implementation of cooperative verification measures as OSI. The depository and analysis of IAEA-like material accountancy reports required for verifying fissile materials production restrictions might be undertaken by a special

126–127, cited in William R. Harris, "A SALT Safeguards Program," in Potter, ed., *Verification and SALT*, p. 132.

259. Flanagan, "Safeguarding Arms Control," in Krepon and Umberger, eds., *Verification and Compliance*, p. 223.

consultative commission technical advisory group. The Memorandum of Understanding implementing the SALT SCC provides for the creation of working groups composed of technical advisers for addressing specific issues. Some of the advisory groups established by the SCC have dealt with topics unrelated to the SALT agreements; chemical weapons, a comprehensive nuclear test ban and conventional arms transfers are some examples.[260]

In general, identical databases on treaty limited items and activities might be maintained and upgraded by consultative commission staff in each country. This would create a technical library available for commissioners' reference during compliance resolution negotiations. Discussion and negotiation of common understandings regarding nuclear and conventional conflict prevention or CBMs is another potential function of an India–Pakistan SCC. One function such a consultative commission should avoid, however, is crisis management. Linking arms control and crisis resolution processes in this manner is likely to exacerbate the former's vulnerabilities to the prevailing political climate.

SCC Structure. The U.S. and Soviet national components of the SALT SCC are each composed of a Commissioner, Deputy Commissioner, an Executive Secretary, a Deputy Executive Secretary and specialist advisers from various national government agencies and cabinet departments.[261] Within the U.S., instructions for its SCC delegation are the product of an interactive process between relevant agencies and departments. Final authority for the actions of U.S. SCC Commissioners is granted by the White House through the National Security Council.[262] Indian and Pakistani SCC components might be similarly organized as an interministerial body receiving its instructions from the Prime Minister's NSC equivalent. The most important consideration regarding the structure and operations of an India–Pakistan consultative commission would be its ability to function independently of individual ministry interests. The Prime Minister must be the mediator of any intragovernmental conflicts concerning SCC delegation instructions rather than the politically strongest agency head or cabinet minister.

Guidelines for Effective Use of Bilateral Consultative Mechanisms. Sidney Graybeal and Michael Krepon and others[263] have posed a number of recommendations for enhancing effective functioning of the U.S.– Soviet Standing

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[260]. Dahlitz, *Nuclear Arms Control*, p. 151.

[261]. Bucheim and Caldwell, "The U.S.–USSR Standing Consultative Commission: Description and Appraisal," in Paul Viotti, ed., *Conflict and Arms Control*, p. 136.

[262]. Duffy, *Compliance and the Future of Arms Control*, p. 164.

[263]. Graybeal and Krepon, "Improving the Utility and Effectiveness of the Standing Consultative Commission," in Krepon and Umberger, eds., *Verification and Compliance*, p. 223, pp. 248–256; Duffy, *Compliance and the Future of Arms Control*, chap. 8 and 10; Einborn, "Treaty Compliance," pp. 39–47.

Consultative Commission. Most of these suggestions derive from the apparent breakdown of SALT consultative mechanisms in the early 1980s with the advent of a more confrontational American approach to U.S.–Soviet arms control. These "lessons" are equally relevant to countries, such as India and Pakistan, considering potential arms control measures and may be summarized as follows:

- Compliance questions should be addressed by the SCC first, rather than at higher levels or in other fora. India is likely to be especially sensitive to the latter, as evinced by its irritation with Pakistan's ritual raising of the Kashmir issue in other than strictly bilateral contexts.
- Bring issues to SCC attention in a routine and timely manner, before they spiral out of control. If at all possible, notify the counterpart SCC commissioner of upcoming issues in advance. Advance notification can facilitate more timely resolution of disputes.
- Use the expertise of the SCC delegation to help prevent ambiguous language in future arms control agreements that can engender compliance disputes.
- Avoid characterizing compliance disputes as violations until such disagreements have been adequately examined and discussed within the SCC. Prior to raising an issue in the SCC, delegations should be thoroughly prepared and the factual basis of their positions as accurate as possible.
- Avoid linking the resolution of unrelated compliance issues—address each issue individually on its own merits. The linkage of bilateral issues irrelevant to the arms control regime to progress in SCC negotiations should be especially avoided.

Multilateral Consultative Fora

Multilateral arms limitations regimes generate a peculiar set of compliance concerns, if only because of the greater administrative complexities involved. In a multilateral context compliance issues and disputes are more visible, lending greater opportunities for "politicization" of consultative mechanisms. Wide disparities in capabilities and influence between parties to a multilateral agreement can create an imbalance of incentives to abide by treaty obligations.[264]

For a South Asian regional nuclear arms limitations regime, such as an NWFZ, this imbalance is significant. If Bangladesh were to justifiably request an inspection of India's BARC reprocessing plant, would India feel compelled to cooperate? An

[264]. James Schear, "Compliance Diplomacy in a Multilateral Setting," in Krepon and Umberger, eds., *Verification and Compliance*, pp. 262–263.

Indian commitment to an NWFZ regime would hopefully carry with it a desire to maintain at least an appearance of cooperation. As the largest, most militarily powerful regional state (other than China) India may be concerned that a South Asian NWFZ would provide smaller states a forum for "ganging up" against it,[265] perhaps by harassing it with frivolous inspection requests. Because India and Pakistan are the only specifically South Asian states with any significant nuclear technological infrastructure, the bulk of NWFZ routine and special inspection efforts will be aimed at them. In such a context of asymmetries, a South Asian NWFZ must incorporate procedural and administrative mechanisms to ensure an equality of incentives to comply.

Very little practical experience with the implementation of compliance and consultation procedures exists for the two established NWFZs: special inspections have not commenced under the Tlatelolco regime, and no apparent compliance questions have yet arisen within the South Pacific NFZ. Nevertheless, these regional nuclear arms limitations regimes provide models for the possible structure of South Asian NWFZ compliance and consultation mechanisms.

Compliance Reporting, Coordination, and Administration Procedures under the Treaties of Tlatelolco and Raratonga. While the IAEA performs routine inspections for both the Treaties of Tlatelolco and Raratonga, each treaty has established rather different mechanisms for reporting, coordinating compliance concerns of parties, and for the administration of special inspections.[266]

For the Treaty of Tlatelolco, the Organization for the Prohibition of Nuclear Weapons in Latin America (OPANAL) performs the task of receiving and disseminating biannual compliance reports submitted by treaty parties. Parties can request that OPANAL carry out special inspections, of either counterparts or of their own nuclear facilities if deemed necessary to allay compliance concerns. Copies of special inspection reports are forwarded by OPANAL to both the UN and the Organization of American States (OAS). The OPANAL Secretary General can request a party to submit a special report regarding compliance concerns as well. A treaty

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265. The Indian Government expressed similar concerns about Bangladeshi President Ziaur Rahman's 1980 proposal for a South Asian regional cooperation organization. The resulting South Asian Association for Regional Cooperation incorporated a "unanimity principle," whereby no decisions will be taken by SAARC without a vote of unanimous consent among member states. See Pran Chopra, "From Mistrust to Cooperation," in Pran Chopra, et. al., eds., *The Future of South Asia* (New Delhi: Macmillan; Centre for Policy Research, 1986), p. 41.

266. The following discussion is derived from the Treaty of Tlatelolco and The South Pacific Nuclear Free Zone Treaty; David Freestone and Scott Davidson, "Nuclear Weapon Free Zones," in Istvan Pogany, ed., *Nuclear Weapons and International Law*, pp. 190–192 and 199–201. For a concise comparison of the Treaties of Tlatelolco and Raratonga, see the *Arms Control Reporter* (September 1985): 456 D1–D2. South Pacific Nuclear Free Zone Treaty reprinted in same issue, pp. 456. D3–D9.

party may also request OPANAL to convene a General Conference if thought warranted by the findings of a special inspection. The General Conference in turn makes recommendations to the inspected state. In the event that treaty violations have been found, the General Conference will report its concerns to the UN, the OAS, and where appropriate, the IAEA.

The Raratonga Treaty, in contrast, establishes no permanent agency for verification and compliance administration. Instead, the Director of the South Pacific Bureau for Economic Cooperation and Development, the Secretariat to the South Pacific Forum, a regional organization established in the 1970s, receives and circulates routine compliance reports submitted by treaty parties. The Director also compiles annual reports on the status of the treaty and other matters, including noncompliance charges and investigations. The Treaty of Raratonga provides for a Consultative Committee, convened by the Director at the request of any party "for consultation and cooperation on any matter arising in relation to [the] treaty or for reviewing its operation."[267]

Unlike the Treaty of Tlatelolco, complaints procedures under the South Pacific NFZ require parties with compliance concerns to first make them known to the offending state. Only after that state has had an opportunity to respond and explain are noncompliance charges taken to the Director for consideration by the Consultative Committee. The Consultative Committee will then provide the state a further opportunity to resolve compliance concerns to first make them known to the offending state. Only after that state has had an opportunity to respond and explain are noncompliance charges taken to the Director for consideration by the Consultative Committee. The Consultative Committee will then provide the state a further opportunity to resolve compliance concerns. If still unsatisfied, the Committee will appoint three special inspectors, after consulting with the states involved in the dispute. Inspection reports are then distributed to all treaty parties. In the event of a definitive treaty violation a South Pacific Forum meeting of all parties is promptly called.

Guidelines for a South Asian NWFZ. James Schear has suggested several guidelines to facilitate the effective functioning of multilateral arms control compliance and consultation arrangements.[268] These recommendations plus the examples of the Treaties of Raratonga and Tlatelolco described above could provide a general "compliance framework" for a South Asian NWFZ:

- Under a multilateral treaty regime, compliance diplomacy is probably best facilitated by a permanent verification and consultation institution, especially if significant disparities exist between parties with regard to items or activities that

267. South Pacific Nuclear Free Zone Treaty, Article X.

268. Schear, "Compliance Diplomacy in a Multilateral Setting," in Krepon and Umberger, eds., *Verification and Compliance*, p. 223, pp. 273–278.

the treaty aims to control. The South Pacific NFZ may be an exception to this "rule": a high degree of regional consensus regarding the goals of a South Pacific NFZ,[269] and a general absence of nuclear capabilities have permitted the use of a previously established regional cooperation organization. The South Asian Association for Regional Cooperation (SAARC) is probably too fragile politically to contend effectively with the extra burdens of NWFZ verification and compliance in the manner of the South Pacific Forum. Furthermore, the member states of SAARC have explicitly agreed to exclude "bilateral and contentious" issues from discussion in SAARC fora.[270] However, SAARC technical and scientific committees might contribute regional expertise and training of inspectors.

• Permitting bilateral consultation between parties outside the permanent verification and compliance institutions may help to prevent politicization of these institutions. In particular, India and Pakistan may in some instances be more amenable to resolving alleged noncompliance through this quiet, less public route.

• Exposure to the higher visibility of multilateral compliance and consultation mechanisms might act as an effective sanction in the event of actual treaty violations, and discourage "harassment by inspection." Annual reports, available to all treaty parties, might detail the number of inspections and the states requesting them, and inspection findings. However, the use of public diplomacy as a sanction against treaty violators must be done prudently. For example, participants in fact-finding sessions should be barred from publicly announcing their positions on a counterpart's compliance behavior before a judgment is rendered.

• Treaty parties should agree, at the negotiation stage, to guidelines, rules and procedures for the content and presentation of evidence when justifying inspection requests. Parties charged with noncompliance should be allowed to offer evidence and explanations before special inspections are carried out, though in some instances timely access may be compromised. Invitational inspections to allay compliance questions might be encouraged, but specific procedures regarding the conduct of these are necessary to avoid intentionally misleading "guided tours."

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269. Greg Fry, "A Nuclear Weapons Free Zone for the Southwest Pacific: Prospects and Significance," *Strategic and Defense Studies Centre Working Paper*, No. 75 (Canberra: Australian National University, September 1983), pp. 6–11.

270. Imtiaz H. Bokhari, "South Asian Regional Cooperation," *Asian Survey* 25 (4) (April 1985): 376; for a discussion of scientific and technical cooperation within the SAARC framework see R. R. Subramaniam, "A Technological Base for South Asia Regional Cooperation," in Babhani Sen Gupta, ed., *Regional Cooperation and Development in South Asia*, Vol. I (New Delhi: South Asia Publishers; Centre for Policy Research, 1986), pp. 210–225.

Summary of Main Points: Chapter IV

Various unilateral and negotiated measures can facilitate the monitoring of specific kinds of nuclear weapons activities. The main types of cooperative measures with greatest relevance to South Asia are baseline data exchanges, transparency measures, designation measures, and on-site inspection (OSI).

Data Exchanges

The primary purpose of the mutual exchange of data relevant to the provisions of an arms control agreement is to create a baseline for comparison with data collected through subsequent monitoring. The mutual provision of data and its periodic updating can itself be a significant confidence building measure. However, databases do not stand alone as effective verification measures, and precise definition of what information is to be provided is essential.

Transparency Measures are mainly intended to enhance the visibility of treaty limited items or activities to NTM observation. In South Asia, transparency measures might be applied to agreements banning the production of ballistic missiles but permitting the production of space launch vehicles. For example, restricting the encryption of space launch vehicle telemetry could comprise an important cooperative verification measure for assuring the peaceful intent of Indian or Pakistani space programs.

Designation Measures are designed to effectively focus observation through NTM by localizing treaty limited items or activities. For South Asian arms control, designation measures are relevant for agreements covering such activities or items as: civilian space program activities, permitted conventional weapons, such as tactical munitions or very short range missiles having a dual capability, and confidence building measures restricting military exercises or troop deployments to areas circumscribed by agreement. Restricting space program activities, for example, to well-defined designated sites could substantially ease the monitoring essential for discerning whether these activities are in compliance with a ban on IRBM production or testing.

On-Site Inspection

In South Asia, for production agreements other than complete shutdowns of nuclear materials or ballistic missile "factories," on-site inspection would afford rather high monitoring confidence, especially if coupled with NTM. There are several approaches to OSI, depending on the kind of arms- limitations agreement.

Routine inspections are *expected* inspections; they are limited to declared facilities and are carried out in accordance with a predetermined, mutually agreed schedule.

Routine OSI are primarily for demonstrating continuing compliance with an agreement, rather than a means of confirming suspected noncompliance.

Because routine inspections generally do not proceed from an a priori assumption of noncompliance, routine inspection regimes are least prone to politically motivated abuse and the easiest to negotiate.

Undeclared facilities, even if used for entirely legitimate purposes, are obviously not subject to inspection under a routine OSI regime and can thus be a valid source of compliance concerns. Treaty provisions for periodic updatings of databases and declared site lists would permit the incorporation of new facilities, including those detected by unilateral NTM, within the verification regime.

For *special inspections (short notice or challenge inspections),* advance notification, if given at all, is measured in hours or days, and both declared and undeclared sites might be subject to inspection depending on treaty provisions. The sensitivity of short notice or challenge inspections to the prevailing political climate derives from their "nonroutine" nature. Requiring justification for an inspection request could mitigate some of the most adversarial aspects of special inspections and the use of annual inspection quotas could discourage unwarranted inspection demands.

Some special inspection regimes, such as the U.S.–Soviet INF Treaty and the 1986 Stockholm CSBM Accords, do not require justification of inspection requests. Annual inspection quotas could discourage unwarranted inspection demands, though an uncooperative state might contrive to exhaust its counterpart's inspection quota by provoking it with "apparent" violations. The need to furnish justification for a special inspection, on the other hand, could seriously hamper timely access, and compromise intelligence.

In addition to quotas, two other negotiated qualifications can serve to mitigate potential political abuse of special inspections and allay fears of sensitive information loss: limiting inspections to a list of declared sites drawn up by mutual agreement., and the inclusion of a right of refusal. Again, for declared-site inspections to be maximally effective, provision must be made for periodic revision and expansion of declared-site lists as warranted by new developments.

Invitational inspections comprise a type of special inspection useful for compliance diplomacy purposes. Voluntary invitations to inspect can be extended by states desiring to allay compliance concerns about facilities not covered by routine or short notice inspection regimes. While the public diplomacy aspects of invitational inspections are especially susceptible to exploitation, these kind of inspections might be employed as an important compliance-dispute resolution mechanism.

Treaty Mechanics: Facilitating Compliance

Just as an agreement may incorporate negotiated provisions for enhancing technical monitoring capabilities, it might also establish mechanisms for resolution of

noncompliance charges or disputes over treaty language, and specify sanctions in the event of treaty breaches. Multilateral experience with compliance mechanisms, such as the Agency for the Prohibition of Nuclear Weapons in Latin America (OPANAL) of the Treaty of Tlatelolco, and the U.S.–Soviet bilateral experience, the SALT Standing Consultative Commission (SCC) in particular, offer valuable "lessons" in compliance diplomacy. Additionally, whether an agreement is a formal treaty or tacit understanding, the specificity of treaty language, or its adaptability to new technological developments are all factors which impinge on the efficacy of compliance.

Formal Treaties or Tacit Agreements? Informal or tacit agreements are appropriate for arms control situations in which noncompliance is fairly obvious or evidence for it is easily obtainable through unilateral monitoring or intelligence methods. In addition to delineating rights, obligations, procedures for monitoring and compliance, and definitions of noncompliance, *formal treaties* also establish baselines for comparing subsequent compliance behavior. Mutually agreed and defined ground rules facilitate predictability in arms control and military relations. The existence of formal, contractual obligations can promote observance of the rules by institutionalizing commitment to the arms control process. *By institutionalizing commitment, especially if mechanisms for consultation and amendment are included, formal arms control agreements can foster continuity of cooperative action.*

Treaty Language: Narrow Precision or "Flexible Ambiguity. Clearly defined terms and narrowly circumscribed obligations can certainly help discourage the unilateral "reinterpretations" which often inspire compliance disputes. But an effective arms control regime also maintains a delicate balance between precision and "flexible ambiguity" that extends a treaty's reach to future technological and strategic developments. *A South Asian arms control regime should be sufficiently flexible if it is to be capable of accounting for modes of nuclear weapons deployment not presently available to either India or Pakistan, such as mobile IRBM systems*. Simultaneously, a South Asian arms control regime must define what is restricted in terms precise enough to minimize exploitation of gray areas.

Treaty Adaptability: Consultative Fora. The achievement of the proper mix of precision and flexibility of language is difficult between even the most cooperative of parties. The effective use of consultative fora and procedures, like the ABM Treaty's Standing Consultative Commission(SCC), for treaty amendment can help compensate for shortcomings in treaty language. Treaties lacking such provisions are prone to obsolescence. They are also highly vulnerable to "tit for tat" noncompliance spirals because no formal, confidential channel for mutual resolution of conflicting interpretations of treaty obligations exists. During the Nixon, Ford, and Carter Administrations the SCC was an effective problem solving forum in which several

rather contentious compliance disputes were resolved to the apparent satisfaction of both sides. The experience of the SCC can serve as a useful model of compliance diplomacy in action for any future South Asian arms-limitations regime.

Unilateral Clarifications. A statement by one party clarifying its interpretations or position regarding certain treaty provisions can serve to establish the bounds of what is considered acceptable treaty behavior and may help encourage compliance by a counterpart.·The beneficial aspects of unilateral clarifications are most likely realized if they are presented during treaty negotiations or as part of a mutual post-treaty effort to secure accommodation of conflicting views. If consultation and negotiation has failed to render a mutually satisfactory reading of treaty language, subsequent submission of unilateral statements is more likely to widen the rift than to promote acquiescence by the other side. This is especially so if unilateral clarifications represent an effort to undo previously agreed but ambiguous treaty provisions. If treaties are to retain any meaning as cooperative ventures parties must abide by their provisions as negotiated, unless amended by mutual agreement.

Public or Private Compliance Diplomacy? A public, "confrontational" style of compliance diplomacy is more likely to result in intransigence and a spiraling downturn in arms control relations, especially if noncompliance charges are presented in a polemical and accusatory manner. Equally important is the confidentiality afforded to sensitive military information by a private consultative forum. Public release of sensitive information would exacerbate any reluctance of parties to exchange data vital to resolving compliance disputes. Nevertheless, there is some justification for making less sensitive information about the results of consultative sessions available to the public. The executives of parliamentary democracies such as India and Pakistan should be obliged to inform their constituents and parliaments about treaty implementation matters. An informed electorate is integral to sustaining domestic support for current or future arms control efforts.

Compliance Sanctions and "Safeguards." The conspicuous lack of effective sanctions and enforcement mechanisms in the event of a counterpart's noncompliance is perhaps one of the most intractable weaknesses of bilateral arms control efforts. For bilateral arms control, unilateral action is the only viable sanction. Proponents of arms control "safeguards" contend that the fear of detection is an insufficient deterrent to noncompliance; parties must be prepared to respond with concrete, compensatory actions capable of negating any military gains accruing from noncompliance by counterparts. However, responding in kind to perceived violations, especially if changes in treaty limited military activities are called for, is likely to generate tit-for-tat noncompliance exchanges that may quickly spiral out of control.

Functions, Structures, and Guidelines for Bilateral Consultative Fora

The most fruitful means of resolving compliance and interpretation disputes is mutual consultation within a treaty-mandated institution established for such a purpose. The U.S.–Soviet Standing Consultative Commission comprises the preeminent example of the structure and functioning of a consultative mechanism for implementing bilateral arms limitations agreements. Useful guidelines for enhancing the effectiveness of bilateral consultative fora also derive from the U.S.–Soviet SCC experience.

• A consultative commission established by an India–Pakistan or India–China arms limitations agreement could perform tasks similar to the U.S. SCC with perhaps added responsibilities for mutual oversight of the procedural implementation of cooperative verification measures as OSI. The depository and analysis of IAEA-like material accountancy reports required for verifying fissile materials production restrictions might be undertaken by a special consultative commission technical advisory group.

• In general, identical databases on treaty limited items and activities might be maintained and upgraded by consultative commission staff in each country. This would create a technical library available for commissioners' reference during compliance resolution negotiations. Discussion and negotiation of common understandings regarding nuclear and conventional conflict prevention or CBMs is another potential function of an India–Pakistan SCC. *One function such a consultative commission should avoid, however, is crisis management*. Linking arms control and crisis resolution processes in this manner is likely to exacerbate the former's vulnerabilities to the prevailing political climate.

• The most important consideration regarding the structure and operations of an India–Pakistan consultative commission would be its *ability to function independently of individual ministry interests*. The Prime Minister must be the mediator of any intragovernmental conflicts concerning SCC delegation instructions rather than the politically strongest agency head or cabinet minister.

• Other guidelines for compliance-dispute resolution and SCC operation that are especially germane to the South Asian context include:

(i) *Compliance questions should be addressed by the SCC first*, rather than at higher levels or in other fora. India is likely to be especially sensitive to the latter, as evinced by its irritation with Pakistan's ritual raising of the Kashmir issue in other than strictly bilateral contexts.

(ii) *Avoid linking the resolution of unrelated compliance issues*—address each issue individually on its own merits. The linkage of bilateral issues irrelevant to the arms control regime (for example, Kashmir) to progress in SCC negotiations should be especially avoided.

Multilateral Consultative Fora

Multilateral arms limitations regimes generate a peculiar set of compliance concerns, if only because of the greater administrative complexities involved. In a multilateral context compliance issues and disputes are more visible, lending greater opportunities for "politicization" of consultative mechanisms. Wide disparities in capabilities and influence between parties to a multilateral agreement can create an imbalance of incentives to abide by treaty obligations.

• *For a South Asian regional nuclear arms limitations regime, such as an NWFZ, this imbalance is significant.* As the largest, most militarily powerful regional state (other than China) India may be concerned that a South Asian NWFZ would provide smaller states a forum for "ganging up" against it, perhaps by harassing it with frivolous inspection requests. Because India and Pakistan are the only specifically South Asian states with any significant nuclear technological infrastructure, the bulk of NWFZ routine and special inspection efforts will be aimed at them. In such a context of asymmetries, a South Asian NWFZ must incorporate procedural and administrative mechanisms to ensure an equality of incentives to comply.

• Under a multilateral treaty regime, compliance diplomacy is probably best facilitated by a permanent verification and consultation institution, especially if significant disparities exist between parties with regard to items or activities that the treaty aims to control. *The South Asian Association for Regional Cooperation (SAARC) is probably too fragile politically to contend effectively with the extra burdens of NWFZ verification and compliance in the manner of the South Pacific Forum.* Furthermore, the member states of SAARC have explicitly agreed to exclude "bilateral and contentious" issues from discussion in SAARC fora. However, SAARC technical and scientific committees might contribute regional expertise and training of inspectors.

• Permitting bilateral consultation between South Asian NWFZ parties outside the permanent verification and compliance institutions may help to prevent politicization of these institutions. In particular, India and Pakistan may in some instances be more amenable to resolving alleged noncompliance through this quiet, less public route.

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