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Demilitarization of the Siachen Conflict Zone: Concepts for Implementation and Monitoring

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Abstract

Pakistani and Indian militaries have been occupying the Siachen Glacier and surrounding regions for decades. Although a cease-fire is in place, continued occupation carries the risk of an inadvertent conflict, which could escalate into a full-fledged nuclear-backed confrontation. Political and military analysts in Pakistan and India now question the strategic significance of the Siachen Glacier and agree that under the right circumstances, military withdrawal from the Siachen Glacier region would not adversely affect either state. The difficulty lies in conducting the withdrawal in such a way that neither side feels vulnerable, and in maintaining the demilitarization in a way that can be verified. In this paper, the authors who have both held command responsibilities in the Siachen Glacier region present a process for conducting and verifying the demilitarization of the Siachen Glacier region. The authors discuss the role of monitoring and verification tools and their relevance to this border zone of conflict.

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Executive Summary

The Siachen Glacier and adjacent regions—a part of the larger territorial dispute between India and Pakistan that has its origins in the 1949 Karachi Agreement—has been occupied by the Pakistani and Indian militaries since 1984. The conflict has its genesis in the formulation of the cease-fire line in the 1949 Karachi Agreement. The text defines the cease-fire line in this area as running to map coordinate NJ 9842 and “. . . thence north to the glaciers.” The line was never demarcated. The Indian interpretation is that the current line of control (LOC) should run northeasterly from NJ 9842 along the Salto Range to the Chinese border. The Pakistani interpretation is that the LOC should run from NJ 9842 straight to the Karakoram Pass (KKP) on the Chinese border. Both nations have incurred heavy economic costs and casualties in this conflict. Both nations recognize the benefit of ceasing the conflict and demilitarizing the area. An informal cease-fire has held in Siachen and Kashmir since November 2003. Prior to the current cease-fire, combat consisted of small-scale clashes during the summer and the exchange of artillery fire. Aircraft have not played a combat role. Talks were first conducted during 1986–1998, and were restarted in 2004 as a topic in the Composite Dialogue.

The goal of this study is to develop a practical process for military disengagement in the Siachen conflict zone, leading to demilitarization. It draws on international precedents for establishing demilitarized zones (DMZ) as well as India-Pakistan precedents, such as the successful Chumik Glacier disengagement in 1989. It assumes that political consensus will eventually be reached and focuses on the operational steps necessary to implement disengagement and subsequent monitoring and verification. Disengagement must be based on general adherence with the Simla Agreement and be without prejudice to current or future agreements associated with Pakistan’s and India’s borders with China.

An outline of the disengagement strategy developed by this study follows:

- **Step 1: Formalize the current cease-fire understanding.** It would be of value formalize the current informal cease-fire agreement. Communication links between the Indian and Pakistani brigade and division headquarters should be established.
- **Step 2: Establish an *Uninhabited Zone (UZ)* around the Siachen Glacier and the Salto Range** (see Figure 9 in the main report for maps). No military personnel, stores, or facilities, nor any civilian residents are permitted in the UZ. Under the agreement, neither country will have administrative control of the UZ. No aerial overflight is permitted unless part of an agreed monitoring activity. The UZ established by the agreement is to be without prejudice to the Pakistan-China Border Agreement of 1963 and the known position of India. It does not affect India’s current patrolling in area under its control east of KKP. After the UZ has been fully established, the temporary presence of personnel in the UZ is permitted for the following activities:
 - scientific research by international organizations
 - restoration of the environment on the Siachen Glacier by international, Indian, and Pakistani staff
 - entry by licensed, agreed international mountaineering expeditions

Step 3: Establish a *Civilian Zone (CZ)* bordering the *Uninhabited Zone* (see Figure 9 in the main report). The CZ has two parts: one part east of the UZ (administered by India) and one part west of the UZ (administered by Pakistan). Civilian residents and activities are permitted, but no military or paramilitary personnel or facilities are permitted except under the following circumstances.

- Aerial overflight to monitor the agreement is permitted subject to agreed rules.
- Military or paramilitary forces may enter the CZ to perform relief operations associated with natural disasters.
- Personnel providing administrative support and physical security to monitoring activities are required under the conceptual agreement.
- Military or paramilitary personnel may continue to provide social services (e.g., medical, communications, and road construction) to the civilian population if those services were part of their duties prior to the agreement.

Adverse weather makes disengagement feasible only during the summer season. The Indian opinion that two to three summers are needed contrasts with the Pakistani opinion that only one summer is necessary. The major steps in disengagement are:

- Step 1: Withdraw medium artillery located in base camps. The withdrawal of artillery could potentially be implemented very soon after completion of the agreement even if this is during the winter.
- Steps 2–4: Redeploy from Northern, Central, and Southern sectors respectively. Forward and fire support posts
 - Declare interim assembly camps where troops from forward positions can concentrate, rest, and prepare for the next movement
 - Dismantle interim assembly camps after withdrawal
- Step 5: Withdraw from logistics camps on or near the glaciers
- Step 6: Dismantle logistics camps
- Step 7: Withdraw from base camps
- Step 8: Dismantle or convert base camps to scientific or civil use

After the DMZ is established, a secondary expansion of the DMZ, called DMZ-2 (see map in Figure 10 of the main report), along the demarcated LOC to where the line crosses the Shyok River would be a significant confidence-building measure. The establishment of the DMZ does not depend on the acceptance of this proposal, but it would set a precedent for future steps along the LOC. This establishment of DMZ-2 could occur during the summer following the completion of the establishment of the primary DMZ.

The conceptual disengagement agreement has two phases of monitoring and verification. First, the process of implementing disengagement will need to be monitored to verify that military personnel have departed and agreed facilities have been dismantled according to the agreed schedule. Second, after the DMZ is established, it is necessary to conduct long-term monitoring to verify that military personnel and equipment have not re-entered.

Monitoring the Disengagement Process

In this process, on-site monitoring will play a primary role and remote sensing will play a secondary role. A temporary facility should be established near the LOC where face-to-

face flag meetings can be held near the village of Siari (just west of where the LOC crosses the Shyok River).

Visual Observation in Place. The abandonment of forward posts within line of sight of each other is to be coordinated so each side can observe activities of the other.

Joint Aerial Reconnaissance. To confirm the abandonment of positions that are not within line of sight, a pair Indian and Pakistani helicopters will rendezvous at an agreed location and then fly together over the agreed sector to visually observe and photographically record withdrawal and dismantlement of posts. During a Joint Reconnaissance Flight, both sides have the right to request its representative land at a location within the sector to confirm withdrawal and dismantlement for facilities.

On-site Inspections. Scheduled visits to confirm the abandonment and dismantlement of base camps with road access will occur through the exchange of escorted observers.

Long-Term Monitoring of the DMZ.

The goal of long-term monitoring is to detect illicit reoccupation of positions within the DMZ. Monitoring to verify demilitarization of the Siachen conflict zone will need to continue until there is a comprehensive political settlement. The temporary facility for Flag Meetings at Siari should be considered for expansion into a Joint Monitoring Center (JMC) to support the function of the DMZ.

Illicit reoccupation could occur either by insertion of forces using helicopters or infiltration on the ground. The former is not a serious concern because such activities would be easily detectable and the requirement to establish an “air bridge” would be a major burden. Given these considerations, the focus of monitoring will be on ground-based logistic routes using a combination of remote monitoring, remote sensing, and on-site inspection. Given the terrain, there is only a small number of routes that India and Pakistan can use for logistics. Supplies are shipped from depots to base camps in or near the proposed DMZ. India uses a single base camp at Dzingrulma. Pakistan has a base camp at Askole (northern sector) and at Goma (central and southern sectors). At the base camps, supplies are broken into smaller loads and moved to forward logistic camps and posts by helicopters, jeeps, pack animals, and porters.

Remote Monitoring: Sensor-activated systems would be placed at Access Control Points to be established at Chumikchan on the road to Dzingrulma, Dansam on the road to Goma, and near Askole. Reports would be transmitted to the JMC.

Remote Sensing: Regularly scheduled aerial overflight of the DMZ with photographic and thermal imaging equipment is to be conducted using paired aircraft or a jointly crewed single aircraft. There would be an option to request an unscheduled flight to resolve questions of compliance that might arise. Commercial satellite imagery would play a supporting role with more frequent collection of images.

On-site Inspection: Scheduled on-site inspections of facilities in the UZ and CZ that have been converted to scientific use and former military facilities in the CZ that provide social services will be conducted.

Many strategic analysts in South Asia now question the strategic significance of the Siachen Glacier. Political will and innovative approaches are necessary to stop the

conflict in Siachen. This study concludes that disengagement is operationally feasible. Clearly, the demilitarization of Siachen is an idea whose time has come.

Acronyms

ABM	Anti-Ballistic Missile Treaty
ACP	access control point
ADIZ	Air Defense Information Zones
AGPL	Actual Ground Position Line
CFE	Conventional Armed Forces in Europe Treaty
CFL	cease-fire line
CMC	Cooperative Monitoring Center
CZ	Civilian Zone
DGMO	Director General of Military Operations
DMZ	demilitarized zone
HQ	headquarters
INF	Intermediate Range Nuclear Forces Treaty
JMC	Joint Monitoring Center
JWG	Joint Working Group
KKP	Karakoram Pass
km	kilometer
LOC	Line of Control
NATO	North Atlantic Treaty Organization
SALT	US-Soviet Strategic Arms Limitations Treaty
TPC	Tactical Pilotage Chart
UN	United Nations
UNIDIR	United Nations Institute for Disarmament Research
UZ	Uninhabited Zone

1. Strategic Context of the Siachen Conflict

1.1 History of the Dispute

Soon after their independence from Great Britain in August 1947, conflict between India and Pakistan arose over the future of Jammu and Kashmir. The two nations have fought three wars (1948, 1965, and 1971), several quasi-wars (Rann of Kachchh, Kargil, and Siachen), and fully mobilized in preparation for war twice (1987 and 2002). The ongoing conflict in the area of the Siachen Glacier began on 13 April 1984 when India airlifted troops to the Saltoro Range. The Glacier (nearly 50 miles long and ranging from 22,000 to 11,000 feet in elevation) is the highest battlefield in history. It has surpassed all other India-Pakistan conflicts in its duration. Both nations have incurred heavy economic costs and casualties in this conflict. More casualties have resulted from the extremely adverse conditions (hypothermia, avalanches, falling into crevasses, high-altitude illnesses, and accidents) than from combat. Figure 1 (based on a US Government map) illustrates the strategic location of the Siachen Glacier. Figure 2 shows the significant geographic, military, and political features in the Siachen region that will be described in forthcoming sections.



Figure 1. The Siachen Area Relative to India and Pakistan



Figure 2. Kashmir and Important Locations in the Siachen Glacier Area

The genesis of the Siachen conflict lies in the formulation of the cease-fire line (CFL) defined in the 29 July 1949 Karachi Agreement following the first India-Pakistan war.¹ In this agreement, the Truce Subcommittee of the United Nations Commission for India and Pakistan did not explicitly delineate the CFL all the way to the international border with China. The text of this agreement defines the CFL in this area as running from “. . . Chalunka (on the Shyok River), Khor, *thence north to the glaciers.*” Demarcation of the CFL revealed that there was no place or village named Khor from which the CFL could be fixed. In accordance with paragraph C of the Karachi Agreement, the official map number 1 was prepared using map reference NJ 980420 (one-inch scale) in the Shyok Valley. This point is commonly referred to as NJ 9842.² After the 1971 War, India and Pakistan agreed to retain territory captured across the CFL. These changes were recognized in the Simla Agreement of 2 July 1972, where the 1949 CFL was replaced with a new “Line of Control” (LOC). As in the 1949 and 1965 cease-fire agreements, the LOC was not delineated or demarcated beyond NJ 9842 because there had been no combat in this area and no troops were then deployed there.

This ambiguity in the text ultimately led to the current conflict that began in 1984. The Indian interpretation of the statement is that the LOC should run northeasterly from NJ 9842 along the Saltoro Range to the Chinese border. The Pakistani interpretation is that the LOC should run from NJ 9842 straight to the Karakoram Pass (KKP) on the India-China border (see Figure 3).

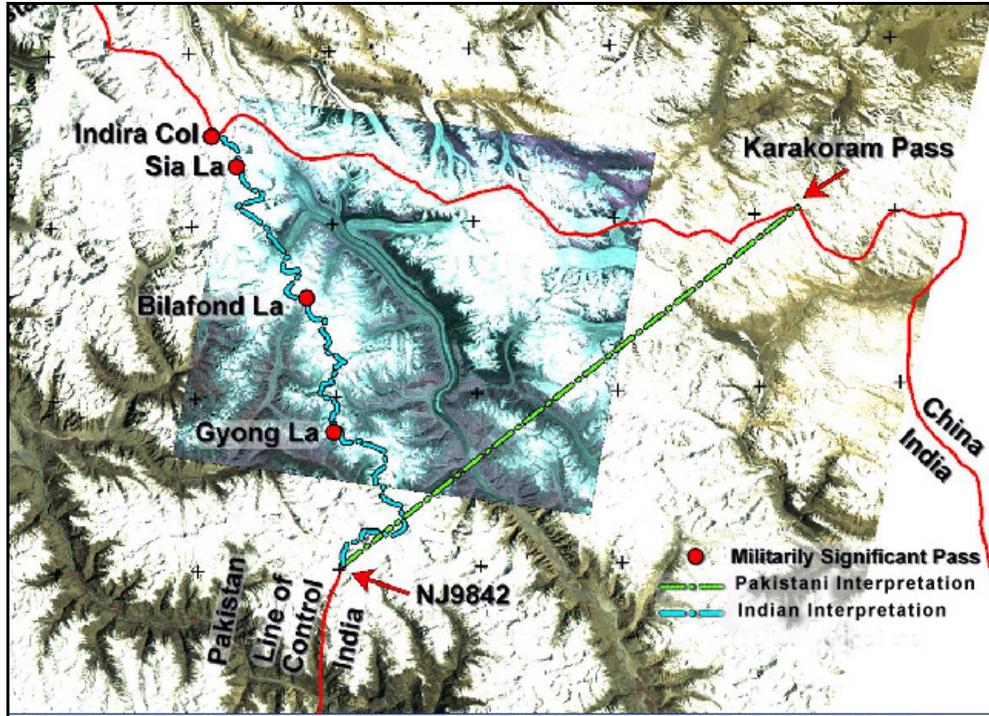


Figure 3. A Satellite Image of the Contested Area near the Siachen Glacier³

Pakistan and India have taken steps toward reducing tension in the Siachen area. On 25 November 2003, Pakistan proposed an informal cease-fire along the LOC, and India accepted the proposal. The cease-fire includes the Siachen conflict zone. A second encouraging step was the initiation of the Composite Dialogue process between India and Pakistan in January 2004. The Composite Dialogue process defined eight topics (including Siachen) that the two countries have agreed to address in working groups.

Although the Siachen conflict and territorial dispute are within Kashmir, it is significant that the Composite Dialogue Process separated Siachen from the larger issue of Kashmir. Of the security-related topics being addressed in this process, the Siachen dispute may offer the most potential for resolution. A key step toward resolution is disengagement and demilitarization of a mutually agreed area.

1.2 Project Goal

The goal of this project is to develop a suitable process for military disengagement in the Siachen area, leading to eventual demilitarization. This paper considers current political and military conditions but does not suggest how the present political differences might be overcome. It assumes that political consensus will eventually be reached and focuses on the operational steps necessary to implement military disengagement and subsequent monitoring and verification. The paper seeks answers to the following questions:

- What steps would constitute a practically feasible disengagement process?
- What would be a viable time frame for demilitarization?
- What should be the concept of unilateral and joint monitoring that is likely to be acceptable to both India and Pakistan?

- Which current and future unilateral and cooperative monitoring technologies and procedures can assist in the verification of demilitarization and help to build mutual confidence?

The regional authors, both of whom served in their respective armies in the Siachen and adjacent areas, joined together at the Cooperative Monitoring Center (CMC) of Sandia National Laboratories in Albuquerque, New Mexico, to research pragmatic answers to these questions. This project seeks to build on previous studies on Siachen, including two CMC Occasional Papers.^{4,5}

1.3 Indian Strategic Perspective

This section summarizes the historical Indian strategic perspective on the Siachen conflict. Under the Sino-Pakistan Frontier Agreement of March 1963, Pakistan transferred to China 5,180 square kilometer (km) of territory in Pakistan-controlled Kashmir just north of the Siachen area. India does not recognize the agreement and the transfer. After the agreement, China built the Karakoram Highway linking Xinjiang Province with the Northern Areas of Pakistan-controlled Kashmir and providing a port of entry. Indian defense analysts became concerned that Pakistan had aspirations to extend its boundary with China to the KKP by controlling the Siachen area. In a future conflict with India, control of the Siachen area might provide Pakistan with a route to capture the city of Leh and the region of Ladakh with a flanking attack. The conventional wisdom of the time included scenarios in which China might join this attack.

Although the demarcated portion of the LOC ends at NJ 9842, by the 1970s several world atlases had begun showing the LOC running in a northeasterly direction from NJ 9842 toward the KKP.⁶ Pakistani maps also began to show the LOC heading in a straight line from NJ 9842 to the KKP, implying that territory north of the line was under Pakistan's control.⁷ Indian suspicions were raised, and the government called this "cartographic aggression" on Pakistan's part. Suspicions deepened when the Indian government learned that Pakistan had begun issuing permits to international mountaineering expeditions to enter the Siachen area. Indian reconnaissance patrols were sent into the glaciers and returned with reports of the sporadic presence of Pakistani military personnel.

By early 1984, after intelligence reports indicated extensive Pakistani preparations to occupy the area, Prime Minister Indira Gandhi ordered the Indian army to occupy the Siachen Glacier to preempt its occupation by the Pakistan army in the summer of 1984. Indian forces were airlifted by helicopter to the Bilafond La and Sia La passes in the Salto Range beginning on 13 April 1984.

Since then, the Indian army has been in physical possession of most of the heights on the Salto Range west of the Siachen Glacier, while the Pakistan army has held posts at lower elevations of western slopes of the spurs emanating from the Salto ridgeline. The Indian army has secured its positions on the ridgeline, now called the Actual Ground Position Line (AGPL), at great cost, and does not want to pull back from them unless these positions are physically demarcated jointly on ground and map by both armies, similar to what was done in previous agreements establishing the CFL and LOC. The Indian army's view is that future violations must have a reference point. The reason for insisting on demarcation is that after the disengagement process begins, the locations of

the vacated posts cannot be disputed. The Pakistan army's intrusions into the Kargil district of Kashmir in 1999 have hardened the Indian stance on this topic. India finds it extremely difficult to accept verbal assurances from General Musharraf that the Pakistan army will not occupy posts vacated by the Indian army.

Therefore, in India's view, the natural sequence for a final settlement should be a permanent, mutually agreed cease-fire; demarcation of the AGPL on the ground and map; a joint verification agreement that can be practically implemented; redeployment to mutually agreed positions; and, finally, a political agreement to resolve the dispute. The greatest stumbling block to reaching agreement on demilitarization is Pakistan's refusal to allow demarcation of the present positions. From India's point of view, this is an inescapable first step. Only then can the two armies graduate to pulling out their troops.

1.4 Pakistani Strategic Perspective

This section summarizes the historical Pakistani strategic perspective on the Siachen conflict. In 2005, Pakistan Foreign Ministry spokesperson Jilani stated, "Siachen is perceived as a major act of Indian aggression."⁸ Consequently, in Pakistan, the Indian occupation is perceived as a violation of the Simla Agreement of 1972.

Pakistan had de facto control of the Siachen area northwest of the line defined by NJ 9842 and the KKP until the Indian occupation of 1984. The following facts substantiate Pakistan's position:

- Indian Prime Minister Jawaharlal Nehru's address to the Indian Parliament on 7 May 1962 acknowledging Pakistan's de facto control up to the KKP by stating, "the defense of which is under the actual control of Pakistan."⁹
- The Government of India's protest note of 10 May 1962 in reaction to the Government of Pakistan's communiqué issued on 3 May 1962 regarding entering into talks with China on the boundary issue. The protest note referred to the area west of the KKP as "... presently under Pakistan's unlawful occupation."¹⁰
- Indian Prime Minister Nehru's address to Parliament on 5 March 1963, again referring to Pakistan's actual control of the area by stating "It then reached the Karakoram Pass."¹¹
- Refusal to date of China "to discuss with India the area west of the KKP, which separated Baltistan (part of Pakistan's Northern Areas) from Indian-controlled Ladakh."¹²
- Delhi's protest to China "at this de facto recognition of Pakistan's control of Hunza and Baltistan" in the wake of the Sino-Pakistan Frontier Agreement.¹³
- No delineation of the CFL and LOC beyond NJ 9842 after the Tashkent Agreement (1966) and the Simla Agreement (1972), respectively. Colonel Zakir observed, "Despite India's strong position, India did not do it"¹⁴ (i.e., delineate beyond NJ 9842).
- Authorization of 21 mountaineering expeditions in the area by Pakistan from 1974–1984.¹⁵ This does not include expeditions to the Baltoro Glacier in 1958 to scale Chogolisa and to the Siachen Glacier in 1962 (with Pakistani participant R. Bashir) by the Academic Alpine Club of Kyoto.¹⁶

- The statement of Indian Prime Minister Rajiv Gandhi of 16 November 1989 tacitly acknowledged breach of the Simla Agreement, “We have recovered about 5,000 square kilometers of area from occupied Kashmir in Siachen.”¹⁷
- Protest notes of Pakistan’s Northern Area Military Headquarters of 21 August 1983 and 29 August 1983 regarding Indian intrusions in the area.¹⁸

From a geographical standpoint, the words “thence north to the *glaciers*” in the Karachi Agreement relate to the actual location of the glaciers in the area: the Siachen, Terram, Rimo, and Southern Rimo Glaciers, which are arrayed between NJ9842 and the KKP. This interpretation is consistent with the general direction of the LOC leading up to NJ 9842. The LOC is presented as extending from NJ 9842 to the KKP in many international books and atlases.¹⁹ Therefore joining two authentic points (i.e., NJ 9842 and the KKP, that were recorded in international agreements in 1949 and 1963 respectively) over an uninhabited area, through a notional line that was never claimed to be demarcated or delineated, is in fact a “cartographic expression” and not aggression in any sense of the word.

Pakistani analyst Nasim Zehra argues that the rules of engagement have to be spelled out, and goes on to state, “Peace will only flow from a sincere, principle-based and mutually beneficial approach to conflict resolution.”²⁰ “If India and Pakistan cannot solve a dispute over a chunk of ice that is of little strategic value,” asks Jalil Abbass Jilani, Pakistan’s Foreign Ministry spokesperson and one of the key diplomats in talks with India, “then how can we fix more complex issues like Kashmir?”²¹

1.5 Overcoming the Present Stalemate

Most Indian military and strategic analysts now agree that the Siachen Glacier does not have major strategic significance. Lt. General M. L. Chibber (ret.), who planned the occupation of Siachen (code-named Operation Meghdoot) in 1984, said flatly in an interview in December 2004 “Siachen does not have strategic significance.”²² Lt. General V. R. Raghavan (ret.), a former division commander in the Kargil and Siachen sectors and a former Director General of Military Operations (DGMO), also minimizes the military importance of Siachen in his 2002 book *Siachen: Conflict Without End*.²³ Yet Siachen invokes strong passions in India. Bharat Bhushan observed, “For most Indians, Siachen symbolizes unparalleled gallantry.”²⁴ The same is undoubtedly true in Pakistan. Dr. Stephen Cohen of the Brookings Institution has observed that both countries have used Siachen to wage a propaganda war as well as a shooting war, and has characterized the war as “a conflict unending caused by states unbending.”²⁵

India and Pakistan held seven rounds of bilateral talks on the Siachen conflict between 1986 and 1998. The question is often asked why the 1989, 1992, and 1998 negotiations did not result in an agreement. These negotiations failed for various reasons. The death of Pakistani President Zia in 1988 certainly stalled the process. A number of authors (Raghavhan, Noorani, Dixit, and Akhund) have written about these talks with somewhat conflicting accounts that cannot be fully reconciled without access to official records.

With the beginning of the Composite Dialogue Process in 2004, India and Pakistan have entered a new cycle of negotiations on the Siachen conflict. The eighth round of talks on 5–6 August 2004 assessed the ongoing cease-fire and agreed to have further negotiations.

The ninth round of talks on 26–27 May 2005 became deadlocked over the issues of India's insistence that the AGPL be demarcated on the ground and map and Pakistan's insistence that Indian troops must withdraw to pre-1972 positions before any meaningful discussions could take place. Pakistan holds the view that when the two armies withdraw their forces from the zone of conflict and agree to refrain from reestablishing any military presence in it, the original positions will become irrelevant. Talks on Siachen were again held on 23–24 May 2006 in New Delhi. The Indian delegation was headed by Defense Secretaries Shri Shekhar Dutt of India and that of Pakistan by Lt. Gen (Ret.) Tariq Ghazi. The press has reported that the two sides have come quite close to agreeing on a process of disengagement and demilitarization but very few details of the talks have emerged.

Only political direction at the highest level can resolve this deadlock. Dr. Raja Mohan, an Indian security analyst, observed that "In the current set-up, the civilian government has the final say and the decision should be political . . . The military has been used as an excuse to escape from taking the decisions that the political leadership should take."²⁶ The visit to Siachen by Indian Prime Minister Manmohan Singh on 12 June 2005, during which he called for the Siachen Glacier to become a "mountain of peace," may signal a willingness to take fresh approaches to resolution.²⁷ Pakistani President Pervez Musharraf is a bold leader who has demonstrated his ability to make tough decisions; these new circumstances may offer a chance to break the stalemate.

Given political will, several possibilities can be considered by both sides. Some Indian analysts, including former senior army officers, are of the opinion that India is now far more self-confident economically and more certain of its military power than even a decade ago, and that India can afford to take calculated short-term risks in the interest of long-term peace and security.²⁸ This group of Indian analysts believes that India could unilaterally declare its present positions in either a *note verbale* or a *non paper* and convey these positions to Pakistan, rather than insist that these positions be demarcated physically on ground and map. India could combine this approach with a caveat in the demilitarization agreement that India would retain the right to use military force at a point of its own choosing in the case of any future occupation of these positions by Pakistan. Yet another view holds that India could unilaterally publish a map showing its present positions in the Saltoro Range, make the map available to the public, and proceed to draw up a demilitarization agreement.

In the final analysis, Pakistan and India must also initiate the steps necessary to convince their people that it is in the interest of both nations to demilitarize the Siachen zone of conflict. This will create the right political climate for the successful negotiation of an agreement. Once there is public acceptance of the need for a military disengagement, the impediments holding up the process will be easier to overcome. Clearly, the demilitarization of Siachen is an idea whose time has come. Such an achievement will be a tremendous step toward bridging the trust gap.

1.6 A Possible Precedent: The Chumik Glacier Disengagement

India and Pakistan successfully disengaged their forces from the Chumik Glacier, which is located quite close to Siachen. Brig. (ret.) Asad Hakeem, one of the authors of this report, was personally involved in this disengagement process. There are lessons to be learned from this process. The most important one being that *it is possible* for India and

Pakistan to disengage their forces and remove them from a glacier. The operation is not well known and needs to be studied for insight into the risks, sustainability, and durability of a disengagement agreement between India and Pakistan. The other critical lesson is that field commanders are much more likely to reach an agreement that could be considered equitable to both sides. The Chumik Glacier disengagement was arrived at by field commanders and has continued to function and serve as a guide to what may be possible in the case of Siachen.

The Chumik Glacier (Chumik meaning spring in the Balti language) is an offshoot of Bilafond Glacier, and is about 4 miles in length. The Saltoro Ridge separates the Chumik Glacier from the Gyong and Siachen Glaciers. The heights east of the Chumik Glacier had been occupied by Pakistani forces since 1986; the heights dominate the approaches to Indian positions in the Gyong area.

In 1989 hostilities ensued between Indian and Pakistani forces, starting in February and ending in May. Both sides competed to occupy the highest points in the Chumik Glacier area to dominate each other's positions on the Saltoro ridge and adjacent areas. After several helicopter drops by Pakistan of soldiers and artillery to high positions (in the area informally known as Naveed Peak) in April (see location in Figure 5), and subsequent military engagements, both sides entered into negotiations in May.

After unsuccessful negotiations at a flag meeting on May 6, Brigadier Bokhari (Pakistan) and Brigadier Nanawatty (India) reached concurrence on May 13 regarding the withdrawal of forces from their current positions (photo in Figure 4 by Asad Hakeem). Pakistani forces were allowed to keep positions they occupied in 1986. The respective headquarters subsequently ratified the agreement reached by the field commanders. Operational aspects of disengagement were finalized at a Flag Meeting on May 20. The disengagement process from the Chumik Glacier started on May 21 and the agreement has held to the current time.

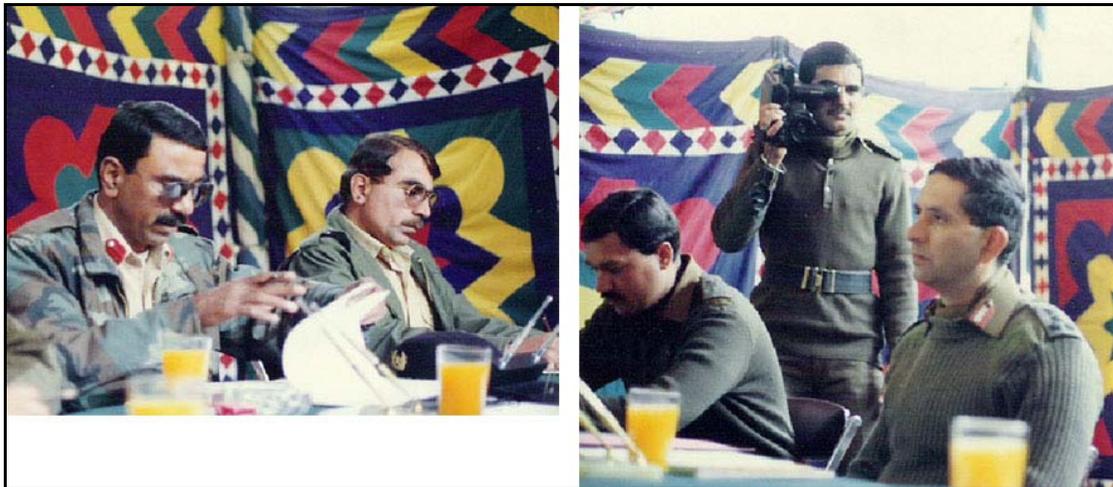


Figure 4. The May 13, 1989, Chumik Glacier Disengagement Flag Meeting



Figure 5. A Satellite-Based Topographic Map of the Chumik Glacier Area

2 The Process of Disengagement and Demilitarization

2.1 Definition of a Demilitarized Zone

Demilitarized zones (DMZ) have been used with varying degrees of success internationally during the 20th century to defuse or avert conflict. Generally, “demilitarized” means an area is converted to non-military use and, where feasible, returned to civilian use. The defining aspect of DMZs is the establishment of a physical area (a “zone”) that separates opposing military forces. A DMZ often lies astride a demarcation line that may become a de-facto international border. Sometimes the boundaries of this “no man’s land” are heavily guarded - as in the case of the Korean DMZ. DMZs also unintentionally become wildlife preserves because the land area enclosed by them is not inhabited. Certain rules associated with the zone are to be respected by all parties in order to avoid restarting hostilities. Compliance with these rules has been monitored both unilaterally and cooperatively by the warring parties. Monitoring by third parties, such as the United Nations (UN), has also played a role historically.

2.2 Military Operations in the Siachen Conflict Zone

Military operations in the Siachen Conflict Zone—including disengagement—are constrained by a number of factors including extremely rugged mountainous terrain, very high altitude, climatic conditions, and few navigable routes. Prior to the current cease-fire, actual combat consisted of small-scale clashes during the summer and the exchange of artillery fire. Helicopters are used for transport but aircraft have not played a combat role. Offensive actions resulting in large numbers of casualties last occurred in 1987 and 1992.

The Saltoro Range can be generally divided into three sectors. Each sector is normally held by a battalion (see map in Figure 6).

- In the Northern sector, Conway Saddle separates the Siachen and the Baltoro Glaciers. All famous peaks of mountaineers’ interest in the Baltoro Kangri (also known as Golden Throne) are to the north and west of Conway Saddle. Pakistan controls access to K2, Gasherbrum, and Masherbrum groups of peaks. This sector also houses the International Himalayan Expedition Camp that serves civilian climbers.
- The Central sector has the Sia La and Bilafond La passes through the Saltoro Range that provide access to the Siachen Glacier from the west. The Bilafond and Chumik Glaciers are the major glaciers on the western side of the Saltoro Range.
- The Southern sector encompasses Gyong La, Yarma La, and Chulung La passes and extends to the base of the Siachen Glacier where the Nubra River emerges.

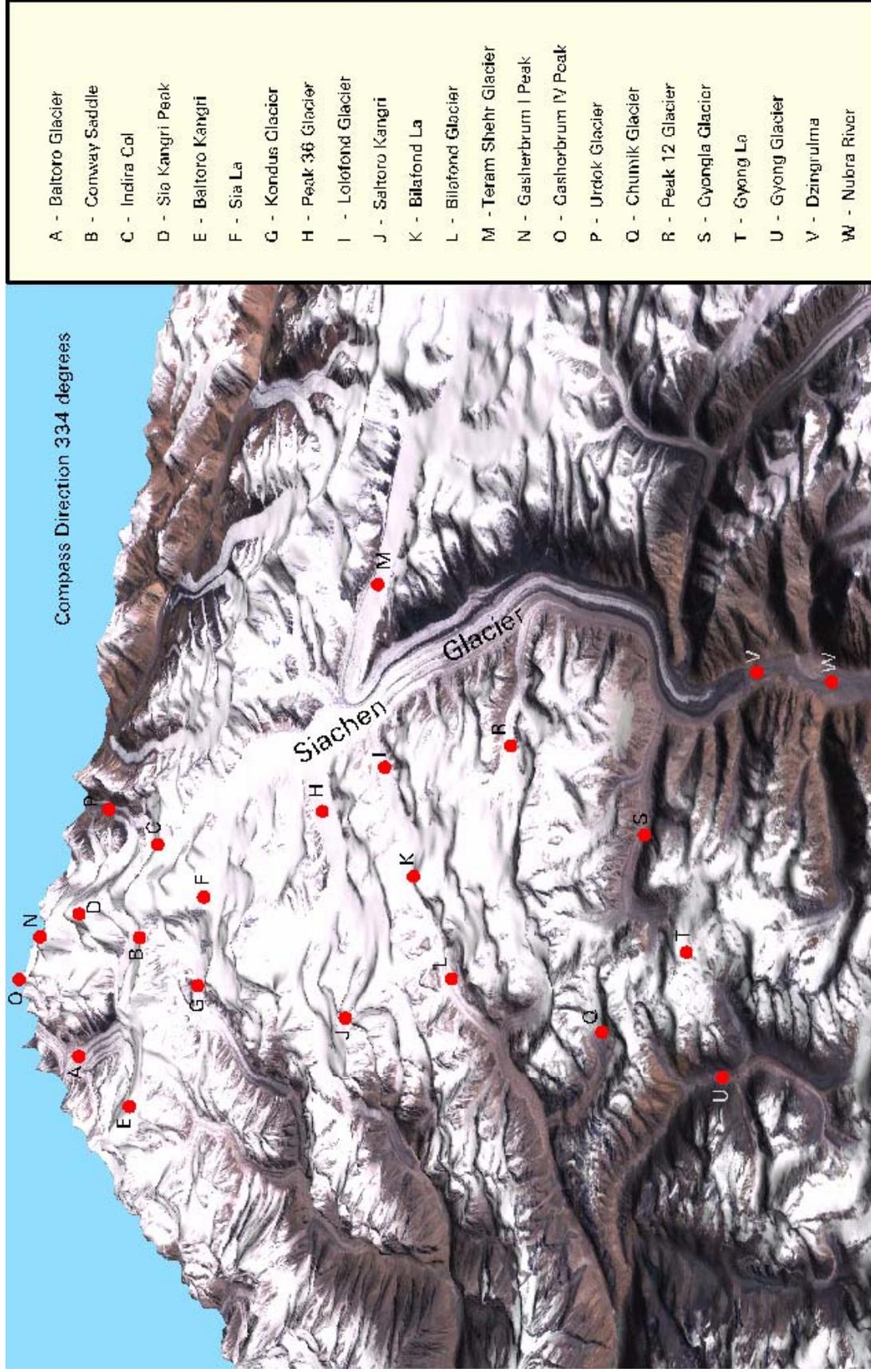


Figure 6. A Satellite-Based Topographic Map of the Siachen Glacier Area

The Indian Siachen brigade is headquartered at Partapur and the Pakistani Siachen brigade is headquartered in Khapalu (see map in Figure 2). The forward battle positions along the Saltoro ridgeline are composed of a series of small posts typically manned by 6 to 18 troops depending on the location. The exact number of posts is not known publicly but the Indian Army is estimated to have about 80 forward posts.²⁹ Many Indian and Pakistani posts are close enough to see each other. The highest posts in the area of Conway Saddle and Sia La are over 20,000 feet in elevation. Artillery support positions are located some distance behind the forward battle positions (see Figure 7). Logistic supply camps are also located behind the ridgeline in positions where they can support a set of forward posts.

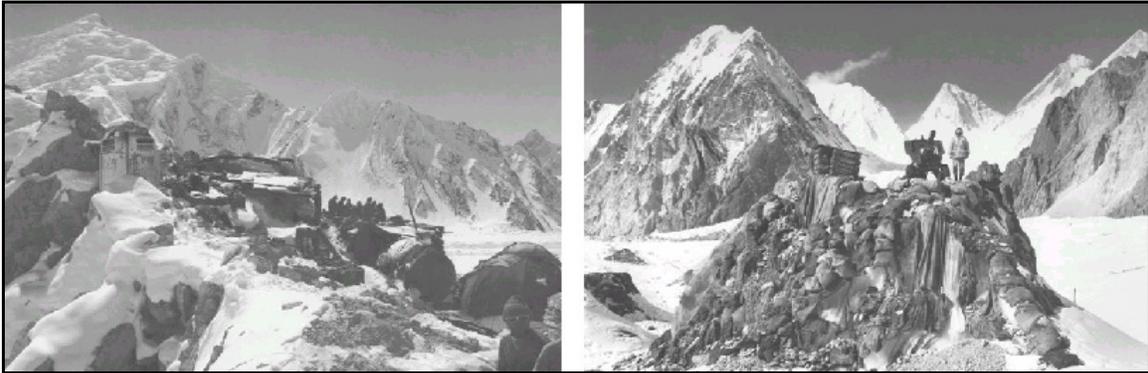


Figure 7. A Pakistani Forward Post and Artillery Position³⁰

Troops typically serve 1 to 3 months at a post, depending on the location, and rotate between posts from low to high altitude and back. Routine movement at very high elevations is difficult. Walking on glaciers with full combat loads is time consuming as well as hazardous due to the innumerable crevasses that dot the routes. Movement during winter is actually safer because the snow is harder and there is less risk of avalanches. Far more casualties have resulted from adverse weather, the altitude, avalanches, falls, and accidents than actual combat.

Logistics is the key to successful operations in the Siachen area and presents an ongoing problem for both armies. Supplies are shipped from central depots in each country to base camps in the Siachen area. On the Indian side, 10-ton supply trucks carry supplies from the railheads at Pathankot and Jammu through Srinagar, Kargil, and Leh over the Khardung Pass to the base camp at Dzingrulma (elevation 10800 feet). Supplies that will be airdropped are delivered by truck to the air bases in Leh and Thoise. On the Pakistan side, supplies are shipped from major depots in Rawapindi/Islamabad to Skardu and then by truck through the Shigar Valley to the base camp at Askole (northern sector) or through Khapalu and Dansam to the base camp at Goma (central and southern sectors). The Pakistani base camps are significantly smaller than the Indian base camp at Dzingrulma.

At the base camps, supplies are broken into smaller, more manageable loads and moved to logistics camps and forward posts in the Saltoro Range by lighter transport: helicopters, jeeps, pack animals, and porters. Pakistan has a significant advantage in

logistics because it has several relatively short supply routes. India, in contrast, has only a single land route to the Saltoro Range through Dzingrulma. Since there is no road beyond the base camp, soldiers and porters have to walk to and from their posts. The Indian Army has established a series of intermediate camps on the path to the Saltoro Range and a major logistics base on the Siachen Glacier known as Camp Kumar (elevation 15,840 feet). Snow scooters (also known as snow mobiles) are used to ferry supplies to forward areas from Camp Kumar and other logistic camps. The Indian Army has also constructed a small pipeline to deliver kerosene and aviation fuel to Camp Kumar from Dzingrulama.

Supplies are regularly air dropped to some posts that are largely inaccessible. The soldiers then carry the cargo packages to their posts from the drop zones. Sudden winds often cause cargo parachutes to drift away from the drop zones and be lost. The Indian Army relies much more heavily on aerial resupply than the Pakistan Army, given the 72-km distance from Dzingrulma to the top of the Siachen Glacier. India uses both fixed-wing aircraft, such as the AN-32, and cargo helicopters, such as the Mi-17. Dzingrulma is used as a forward base for helicopter operations while Leh and Thoise are used for fixed-wing aircraft. Pakistan also uses the Mi-17 for resupply of its highest posts near Conway Saddle from the airbase at Skardu. Land routes supply the rest. The Mi-17 can land, hover, or conduct running drops of supplies in excess of 18,000 feet elevation. However, it typically does not land because of operational safety rules and the difficulty in maintaining a large landing pad near Conway Saddle.

Only a light helicopter of French design used by both armies called the Cheetah (in India) or the Lama (in Pakistan) is capable of delivering troops and supplies directly to a post. Its cargo capacity is limited to only one or two passengers or about 100 kg of supplies. Figure 8 (photo by Asad Hakeem) shows a Lama helicopter operating in the Siachen region. This helicopter is able to land in remarkably small places and is also used to evacuate casualties. Helicopters in both armies are restricted from flying across ridgelines and therefore fly within the confines of valleys. Low clouds typically form around mid-day and make it unsafe to fly or land at helipads along the Glacier.

Winters are harsh and the road axes used for shipping supplies to the Siachen area are often closed for seven to eight months because of heavy snowfall. Air operations are also limited during the winter. Although storms are more frequent, flying during the winter has the advantage of colder, denser air resulting in better flight performance at high altitudes. The summer period is used for stockpiling rations, ammunition, fuel, batteries, clothing items, and other spares for consumption during the winter—a process called “winter stocking.” Units are rotated to and from Siachen duty during this period and soldiers have to work tirelessly to prepare for the upcoming winter.



Figure 8. A LAMA Light Helicopter Operating in the Siachen Conflict Zone

2.3 Establishing a Mechanism for Negotiating Disengagement

Once a political consensus is reached between the Indian and Pakistani leadership to demilitarize the Siachen conflict zone, the two armies will need to work out the modalities of the process. A Joint Working Group (JWG) chaired by the two DGMOs should be appointed for this purpose. It should comprise General Staff officers from the Directorates General of Military Operations and the field formations concerned (Headquarters [HQ] Northern Command of the Indian Army and HQ 10 Corps of the Pakistan Army). The two air forces should also be represented. The JWG could meet on alternate days on the Indian and Pakistani sides of the Wagah border crossing between the Indian state of Punjab and the Pakistani state of Punjab to define the modalities for disengagement. Representatives from the Ministries of External Affairs and Defence could also advise.

2.4 A Concept for Demilitarization

The goal of disengagement of the Pakistani and Indian armies is to create the conditions that will enable the establishment of a DMZ in the Siachen area. In military terms, the Siachen DMZ would be a geographic buffer zone intended to reinforce the existing cease-fire by physically separating the belligerents. The Siachen Area DMZ could also be combined with the concept of a *Peace Park*. Peace parks are transboundary areas that are formally dedicated to the protection and maintenance of biological diversity and natural and associated cultural resources, and to the promotion of peace and cooperation. Tourism, environmental restoration, and scientific research may be conducted in peace parks.

A step-by-step process premised on a formal cease-fire and a phased redeployment resulting in the complete demilitarization of the Siachen conflict zone will make it easier for the two governments to demonstrate that the gains are mutual. The strategy presented in this paper is based on several principles:

1. There should be general adherence with the provisions of the Simla Agreement,

2. An agreement for disengagement should be without prejudice to current or future agreements associated with Pakistan's and India's border with China and
3. A disengagement agreement should enable the civilian and scientific use of the Siachen area under international arrangements.

The Siachen DMZ is proposed to consist of both an *Uninhabited Zone* and a *Civilian Zone* illustrated in Figure 9 and defined in this section. To avoid the historical legacy of previous Siachen negotiations and to minimize the potential for misunderstanding, the authors deliberately chose to use different terms to describe the zones. The monitoring and verification procedures will be discussed in Chapter 3.

An outline of the disengagement and demilitarization strategy follows:

Step 1: Formalize the current cease-fire understanding. While there have been no major violations of the informal cease-fire since 25 November 2003, it would be of value to negotiate a formal Cease-fire Agreement as the first step of the disengagement process. These negotiations should commence immediately after a political agreement is reached and be concluded rapidly. To implement the cease-fire, communication links between the Indian and Pakistani brigade HQs in Partapur and Khapalu, respectively, and the Division HQs in Leh and Gilgit, respectively, should be established.

Step 2: Establish an Uninhabited Zone (UZ) around the Siachen Glacier and the Saltoro Range. Military personnel, stores, or facilities are not permitted in the UZ, nor will there be any civilian residents. Under the conceptual agreement, neither country will have administrative control of the UZ. There will be no aerial overflight unless it is part of agreed monitoring. The UZ established is to be without prejudice to the Pakistan-China Border Agreement of 1963 and the known position of India. It does not affect India's current patrolling in areas under its control east of KKP.

After the UZ has been fully established following a transition period during which military personnel leave their positions and dismantle facilities, the temporary presence of personnel in the UZ is permitted for the following activities (including administrative and logistic support):

- **Restoration of the environment on the Siachen Glacier by international, Indian and Pakistani staff under sponsorship of the United Nations Environmental Program.** Pollution on the Glacier will ultimately affect both countries adversely through the Nubra-Shyok-Indus River watershed. The environmental threat and its remediation will be discussed in a forthcoming section.
- **Scientific research by international organizations.** Indian and Pakistani researchers may participate in these organizations. The importance of the Siachen area for scientific research in glaciology, regional climate modeling, and high altitude ecology and has been described in a number of publications. This activity may also include the operation of a peace park.
- **Entry by licensed international mountaineering expeditions.** There are a number of peaks of mountaineering interest near the UZ, but relatively few in the UZ. The most likely destination in the UZ for mountaineers is Baltoro Kangri (Golden Throne). Expeditions have historically been organized by private companies or organizations and are composed primarily of citizens of countries

other than India and Pakistan—except for the guides and porters. Mountaineering expeditions would be licensed by the country in which they originate. Expeditions will depart from the same country from which they originated. An all-Pakistani or all-Indian expedition would not be permitted. The licensing country is required to notify the other country in advance if the destination of an expedition is in the UZ. Notification is also required in the unlikely event that an expedition crosses the UZ in route to a destination outside of the UZ. A liaison officer of the licensing country is to accompany an expedition and the other country has the option to send an observing officer as well. A useful military confidence-building measure would be to develop communication and operational procedures for cooperation in search and rescue actions associated with permitted activities in the UZ.

The UZ is outlined in red in Figure 9 and is based on major landmarks. It is defined by straight lines (unless otherwise agreed) connecting the points KKP – NJ 9842 (at approximately 34° 55" N, 76° 55" E) – Conway Saddle (inclusive—at approximately 35° 32" N, 76° 47" E) – Indira Col (inclusive – at approximately 35° 34" N, 77° 01" E) – the Pakistan/China border (at approximately 35° 35" N, 77° 03" E) – KKP (using the existing Pakistan/China border).

The line between NJ 9842 is marked as a dashed line to indicate that its exact parameters will need to be defined during technical talks between the respective militaries. The western orientation of the line is intended to include the respective forward positions of both armies within the UZ. The authors did not have access to information describing the current forward positions. The total area enclosed by the UZ and Civilian Zones (to be described in the next section) will result in the removal of military forces from the areas surrounding the Salto ridgeline.

Step 3: Establish a *Civilian Zone (CZ)* bordering the *Uninhabited Zone*. Civilian residents and activities are permitted. There are some precedents for civilian residence in DMZs. For example, both North and South Korea permit a civilian village to function near the Joint Security Area facility in Panmunjom. Another example is the zone defined by the Egypt-Israel Peace Treaty in the Egyptian Sinai along the border with Israel that permits civilian habitation, but forbids military deployment. No military or paramilitary personnel, stores, or facilities are to be permitted within the CZ except under the following limited and specific circumstances listed below:



Figure 9. A Map of the Conceptual DMZ

- Military or paramilitary forces may enter the CZ to perform relief operations associated with natural disasters (either by themselves or in coordination with international relief organizations). The October 2005 earthquake in Kashmir serves as an example. The occurrence of the natural disaster and a description of the planned entry (e.g., time of entry, destination, and route) are to be declared to the other country as soon as possible. If aircraft operations are conducted, they must be compliant with existing bilateral agreements regulating flight in border areas (e.g., the 1991 Agreement for Pre-Notification of Military Activities).
- Personnel providing administrative support and physical security to monitoring activities required under the conceptual agreement. Aerial overflight for the purpose of monitoring the agreement is permitted subject to agreed rules.
- Military or paramilitary personnel may continue to provide services (e.g., medical, communications, road construction, and maintenance) to the resident civilian population if those services were part of their duties prior to the agreement. Military and paramilitary personnel may also provide physical

security for civil activities conducted by the government if local police are unable.

The CZ has two parts: one part east of the UZ (administered by India) and one part west of the UZ (administered by Pakistan). The Pakistani portion of the CZ has greater civilian habitation than the Indian side of the CZ.

The CZ is outlined in blue in Figure 9 and is based on major landmarks. The eastern part of the CZ is defined by straight lines (unless otherwise agreed) connecting the points KKP – Warshi (at approximately 35° 03” N, 77° 20” E) – the west bank of Nubra River south to its junction with the Shyok River (at approximately 34° 35” N, 77° 33” E) – west along the north bank of the Shyok River to Chalunka (at approximately 34° 50”, 76° 58” E) – NJ 9842 – KKP (using the boundary of the previously defined UZ).

Notes on the formulation of the eastern CZ:

- The supply road from Leh to Dzingrulma crosses the Shyok River at a bridge near Khalsar, then travels along the east bank of the Nubra River until it crosses to the west side near Warshi.
- The Shyok and Nubra Rivers do not have a single point of juncture. Multiple streams join over a relatively broad area. The coordinate defined above is at the eastern edge of the juncture and above the flood plain.
- The paved road from Leh to military bases in Partapur and Thoise is located on the south side of the Shyok River and is excluded from the CZ. Only minor track is present on the north side of the Shyok.

The western part of the CZ is outlined in blue in Figure 9 and is defined by the point NJ 9842 – the village of Goma (inclusive) – the road from Goma to Dansam located just south of the Dansam River – the village of Dansam (inclusive) – Conway Saddle – NJ 9842 (using the boundary of the previously defined UZ).

2.5 Implementing the Military Disengagement

The modalities of disengagement must be practically feasible and politically acceptable. As a practical matter, extreme weather makes disengagement feasible only during the summer season—roughly May through September. Disengagement should be implemented from higher to lower positions. Both sides must accept some variability in the process due to adverse weather conditions that occur even in the summer.

Politically, it will be difficult for the Indian government, regardless of which party or coalition is in power, to justify a rapid withdrawal from the Glacier over a single summer as it might be construed as capitulation and may be exploited politically by the opposition parties as well some of the coalition partners. On the other hand, there are advantages to conducting the disengagement during a single summer while political will is strong in order to ensure irreversibility. Otherwise, there is the risk that a political event unrelated to the Siachen conflict may stall the disengagement process. The Indian perspective is that two to three summers will be necessary—in part because Indian forces have longer distances to withdraw. The Pakistani perspective is that disengagement during one summer is quite feasible.

The process of disengagement in the field is akin to the military operation known as “retirement”—a retrograde operation in which a force not in contact with an opposing force moves to the rear in an orderly manner. Unlike a combat maneuver, activities to achieve delay and deception do not play a role. The withdrawal of a unit for the purpose of disengagement goes through four overlapping phases.

- **Preparatory phase.** This phase conducts initial thinning-out of the deployed forces. Planning is initiated; quartering at the assembly area is prepared; warning orders are issued; and non-essential personnel, along with equipment and stores not needed for the next phase, are moved to the rear. Given that this retirement is announced and cooperative, artillery and mortars would be moved rearward in this phase.
- **Disengagement phase.** The withdrawal begins at the time specified in the sector by the battalion commander. Soldiers move from their fighting positions to their squad’s assembly area and then to sequentially higher unit assembly areas.
- **Security phase.** A rear party (perhaps 20–25% of the original number of forward deployed personnel) assists disengagement of the other unit elements, assumes responsibility for the unit’s sector, and protects the movement of the disengaged elements. The rear party initiates its withdrawal when the main body is at its designated assembly location, after a designated length of time, or on command from the battalion commander. It follows a similar plan as the unit’s main body. This phase ends when the rear party completes its movement to the rear.
- **Post-retirement phase.** This phase would include salvaging munitions and other supplies from dumps in the rear if they are not planned to be destroyed. Engineering troops may be needed for disposal.

Regardless of whether the disengagement is conducted over one or two summers, the steps in the disengagement process are the same. The following outlines the major steps in disengagement from Siachen:

- Step 1: Withdraw medium artillery located in base camps. Since these positions are located on roads, the withdrawal of artillery could potentially be implemented very soon after completion of the agreement, even if this is during the winter.
- Steps 2–4: Redeploy from Northern, Central, and Southern sectors respectively. Ammunition and heavy weapons that cannot be moved will be destroyed in-place. Forward and fire support posts
 - Declare interim assembly camps where troops from forward positions can concentrate, rest, and prepare for the next movement
 - Dismantle interim assembly camps after withdrawal
- Step 5: Withdraw from logistics camps on or near the glaciers
- Step 6: Dismantle logistics camps
- Step 7: Withdraw from base camps
- Step 8: Dismantle or convert base camps to scientific or civil use

2.6 An Option for Further Confidence Building

The extension of the two CZs along the LOC to the northern shore of the Shyok River would be a significant confidence-building measure and set a precedent for future steps along the LOC. The establishment of the DMZ just described does not depend on the acceptance of this action. This expansion of the DMZ, called DMZ-2, could occur during the summer following the completion of the establishment of the UZ and CZs.

The proposed area for DMZ-2 is not glaciated. It would reinforce the Siachen DMZ by reducing the chances of reoccupation and controlling access by civilians for grazing purposes. The area contains the Pakistani Army Qamar Subsector and the Indian Army Hanif Subsector and has been the scene of combat in the past.

DMZ-2 is shown in Figure 10 and would consist of an extension of the CZ. It is defined as: Chalunka (on the north bank of the Shyok River) – the north bank of the Shyok River to where the river and the LOC intersect (at approximately 34° 55" N, 76° 46" E) – Peak 1 (a ridge at approximately 35° 00" N, 76° 53" E) – Peak 2 (a 19,200 feet mountain top at approximately 35° 01" N, 76° 56" E) – NJ 9842 – Chalunka. The Indian and Pakistani administered areas of DMZ-2 would be south and north of the LOC respectively.



Figure 10. A Map of Conceptual Extension of the DMZ along the LOC (DMZ-2)

3 The Concept for Monitoring Siachen Disengagement and Demilitarization

3.1 The Objectives of Monitoring

“Trust but verify”³¹ is an oft-quoted statement of US President Ronald Reagan. Monitoring is the process of collecting information to verify that the parties to an agreement are abiding by its terms. Verification is a national political judgment based on information collected through monitoring. An effective monitoring mechanism builds trust, enhances the overall security environment, and ensures that the peace process does not become derailed. The building blocks for cooperative monitoring, painstakingly assembled during the Cold War, could have considerable utility if suitably adapted for monitoring a Siachen demilitarization agreement. For example, under the 1990 Conventional Armed Forces in Europe (CFE) Treaty signed between NATO and the erstwhile Warsaw Pact members, approximately 50,000 conventional heavy weapons were eliminated from Europe. “Under the CFE Treaty, monitoring and verification measures were the most extensive, intrusive, and complex of any modern arms control agreement.”³² In addition, the 1987 Intermediate Range Nuclear Forces (INF) Treaty “...permitted, through the exercise of treaty rights, the United States and the Soviet Union to conduct several hundred on-site inspections at operational missile sites, repair facilities, storage depots, training sites, and former missile production facilities.”³³

Monitoring can be conducted unilaterally by a country using national technical means with or without the knowledge and consent of the other parties. The US-Soviet Strategic Arms Limitations Treaty (SALT) and Anti-Ballistic Missile Treaty (ABM) were intended to be monitored unilaterally with the understanding that the other party would not take actions to interfere with such monitoring. The basic principle underlying cooperative or joint monitoring of an agreement is that the parties expect mutual gains by agreeing to jointly monitor the agreement, share agreed information, and have a mechanism to resolve disputes if they arise. Parties to a cooperative agreement accept a certain level of “intrusiveness.” Intrusiveness is an umbrella term used to describe access by foreign parties to national territory and facilities, the potential loss of information unrelated to the agreement, the disturbance of routine military and civilian activities in order to conduct agreed monitoring, and the political and public symbolism of directly cooperating with a recent adversary.

Although the previous examples relate to the former Cold War, cooperative monitoring has been used in regional contexts. Colonel Gideon Netzer wrote, “Cooperative border monitoring can help neutralize dangers, diminish conflict and reduce tension. Several agreements in the Middle East were aimed at stabilizing the sensitive security situation along the borders of neighboring countries, the most prominent of which were the Egypt-Israel Sinai disengagement agreements (1974 and 1975) and the Syria-Israel agreement on redeployment on the Golan Heights (1974).”³⁴ Similarly, the peace treaty signed between Jordan and Israel in 1994 specified the elements of security cooperation between these countries. Since then treaty has withstood several security incidents and has helped to defuse the potential for further violence.³⁵

A neutral party like the UN or another state acceptable to all parties can also monitor an agreement. India has historically rejected third-party participation in Kashmir because both India and Pakistan agreed to resolve the conflict bilaterally in the Simla Agreement of 1972. Pakistan, in contrast, would accept a constructive role by third parties. It has hosted the oldest UN ongoing peacekeeping mission, the UN Military Observer Group in India and Pakistan, in Kashmir since 1949.

The conceptual disengagement agreement for the Siachen conflict zone will require two phases of monitoring and verification. First, the process of implementing disengagement will need to be monitored to verify that military personnel have departed and agreed posts, logistics facilities, and base camps have been dismantled according to the agreed schedule. After disengagement is successfully completed and the DMZ established, it will be necessary to conduct long-term post-disengagement monitoring to verify that military personnel and equipment have not re-entered.

The primary monitoring mechanism for Siachen disengagement and demilitarization is assumed in this study to be bilateral and cooperative. In the conceptual agreement, both India and Pakistan will still have the right to continue their ongoing unilateral information collection in the Siachen area by their national technical means (e.g., side looking aerial reconnaissance, national satellites, signals collection, and radar) and are assumed to do so. Both the countries will need to agree that they will not interfere with the monitoring by national technical means of the other country as long as it is conducted consistent with recognized principles of international law.

3.2 Modalities for Monitoring

Modalities for monitoring fall into three functional categories that may or may not use technology.

3.2.1 On-site Inspection

On-site inspection is the oldest monitoring modality and dates back at least as far as the Treaty of Versailles ending World War I. Representatives of the inspecting party visit agreed sites of the inspected party to assess compliance—usually restrictions on the number/location of troops and number/type/location of heavy weapons. In its simplest application, on-site inspection consists using of the eyes and experience of the inspector to detect violations. In recent times, tools have been incorporated for specialized functions: notebooks, cameras/video, databases on portable computers, measurement and navigational equipment, chemical and radioactive material detectors, and chemical-biological-radioactive sampling equipment.

Given its intrusiveness, on-site inspection is typically conducted when a certain level of confidence has been developed between the protagonists (e.g., the US and Soviet Union during the 1980s) although this does not mean that significant mutual suspicions have been eliminated. On-site inspection has been imposed in some situations (e.g., on Germany in 1919 and on Iraq in 1991). Used cooperatively, on-site inspection can play a major role. As Harahan wrote, “The heart of verification was and remains on-site inspections under the CFE Treaty.”³⁶

3.2.2 Remote Monitoring

Remote monitoring is the integrated use of sensor, data processing, and communication technology to detect and report specified activity without a continuous presence by human inspectors. Sensors are capable of detecting various physical characteristics: vibration, magnetic properties, weight, heat, shape, emitted radiation, movement, acoustic, etc. After installation by inspectors, a remote monitoring system functions autonomously, although periodic visits are needed for maintenance. It may be designed to detect various types of specialized activity (e.g., a door opening, a piece of equipment being activated, or the entry of a person or vehicle into a defined zone). When an event of interest occurs that may be a violation of the agreement, a message is transmitted to a monitoring station in the inspecting country or organization. Depending on the context for the monitoring activity, a “monitoring station” could be a single computer, a room with analysis equipment, or a whole building (a “monitoring center”). Communication may be by telephone (wired or cellular), radio, the Internet, or a satellite link. Remote monitoring is generally considered less intrusive than on-site inspections for long-term monitoring because the inspected party can assure itself that the system only collects specific defined information. Depending on the specific location and function, remote monitoring may be cheaper than on-site inspections. A possible concern of the inspecting party is that the inspected party may break or otherwise tamper with the equipment to prevent it from reporting illicit activity. Another concern is that transmitted reports may be replaced by fake reports that report benign activity. Remote monitoring systems normally incorporate tamper protection devices to indicate cheating and cryptographic authentication of transmitted messages. Systems also report their state-of-health either periodically or when queried remotely by the inspecting party.

3.2.3 Remote Sensing

Remote sensing is the measurement of an object’s physical characteristics from a distance using reflected electromagnetic energy from that object. A simple film camera is an example of a remote sensing device in that the film reacts chemically to focused reflected light from an object. Sophisticated remote sensors can record features that are invisible to the human eye such as infrared light. They are also able to divide the reflected energy into narrow spectral components. Most sensors are passive, meaning they measure light reflected from the sun or emitted by the object such as infrared radiation. Radar is an example of an active sensor that transmits electromagnetic energy and then measures the reflected signal from an object. Radars typically measure the range and speed of an object. A special type, called synthetic aperture radar, can create a photograph-like image from the reflections and thus can operate at night or in bad weather.

Remote sensing equipment is typically installed on aircraft and satellites and is separated from measured objects by several miles (aircraft) to hundreds of miles (satellites). Satellites are very expensive and have been used by major powers for unilateral purposes for many years. Over the last decade, however, an international commercial industry has developed to sell images from privately owned satellites. Some of these have spatial resolutions as fine as 62 cm that enable analysts to examine vehicles and buildings in some detail. The availability of inexpensive, readily accessible, high-quality images offers a new monitoring tool for all countries. For example, the United Nations Institute for Disarmament Research (UNIDIR) and Sandia National Laboratories hosted a

workshop to study the potential uses of commercial satellite imagery for promoting peace and development in the Middle East.³⁷ The participants explored three main areas where remote-sensing technologies might be employed: arms control, economic development, and environmental and natural resources. In these three areas, the workshop found that commercial satellite imagery could play a very effective role in furthering multilateral cooperation.

3.3 Monitoring the Disengagement Process

The goal for India and Pakistan is to verify withdrawal of military personnel and dismantlement of military facilities in the DMZ under the mutually agreed schedule. Under the schedule, each side will announce when it has left a defined geographic area (e.g., a particular portion of the Northern Sector). Information will initially be shared through the new brigade- and division-level communication links established under Step 1 of the disengagement strategy (formalize the current cease-fire understanding). In addition, a temporary facility should be established near the LOC where face-to-face flag meetings can be held. A good location would be near the village of Siari (just west of where the Shyok River crosses the LOC). This location has road access from both sides and a large level area for a facility.

Cooperative monitoring will be conducted primarily by on-site inspection with a secondary role for remote sensing. Both sides will agree not to interfere with the other's unilateral national technical means.

Both the Pakistani and Indian armies have experience with on-site inspections as a result of their long-time participation in UN peacekeeping operations. To improve capability in hosting and conducting inspections for military disengagement, it would be useful if both countries sent observers to inspections and classes conducted by the Organization for Security and Cooperation in Europe for the CFE Treaty. Figure 11 shows a US Department of Defense photograph of a CFE on-site inspection in Russia.



Figure 11. A CFE Inspection being Conducted in Russia

3.3.1 Remote Sensing

Joint Aerial Reconnaissance. To confirm the abandonment of positions that are not within line-of-sight of both sides, a pair of Indian and Pakistani helicopters will rendezvous at an agreed location and then fly together over the agreed sector to visually observe and photographically record withdrawal and dismantlement of posts or logistics camps. Because human habitation on the glacier creates a heat signature, the use of hand-held or fixed thermal imagers (see examples in Figure 12) would improve confidence that structures are not occupied and that hidden structures are not present. In aerial search and rescue missions, hand-held thermal imagers have been used successfully.



Figure 12. Helicopter-Mounted (L3 Corp.) and Hand-Held (Agema) Thermal Imagers

Although focused on a different application, it is of interest to note that Air Marshal (retd.) Mohammad Arshad Choudhary of Pakistan and Air Marshal (retd.) K.C. Cariappa of India co-authored a detailed exposition of the role of cooperative aerial monitoring by India and Pakistan.³⁸

Commercial Satellite Imagery. Satellite coverage is possible every three to four days. Imagery with 62 cm to 1.0 meter spatial resolution has the ability to determine whether a large structure in a base camp has been dismantled. It has a limited ability to confirm the removal of medium artillery from prepared positions in base camps as called for in Step 1 of the disengagement process. Satellite coverage also has insufficient resolution to detect the presence small posts located on the glacier. Cloudy weather will impair the ability to use imagery.

3.3.2 On-site Inspection

Visual Observation in Place: The abandonment of Indian and Pakistani posts within line of sight of each other is to be coordinated so that each side can observe activities of the other from their positions.

Scheduled Onsite Visits to Military Facilities. Confirmation of the abandonment and dismantlement of base camp facilities at lower elevations with road or track access can occur through the exchange of escorted observers. The exchange of observers would take place at the flag meeting facility to be established at Siari. The observers would be escorted and transported by the host country to facilities defined by the abandonment schedule.

Unscheduled Visits to Remote Locations. During a joint reconnaissance flight by Indian and Pakistani helicopters, both sides have the right to request its representative land at a location within the observed sector to confirm withdrawal and dismantlement.

3.4 Long-Term Monitoring of the DMZ

The goal of long-term monitoring of the DMZ is to detect illicit reoccupation of positions within the DMZ (both the UZ and CZs). Monitoring to verify demilitarization of the Siachen conflict zone will need to continue until there is a comprehensive political settlement.

The temporary facility for flag meetings at Siari should be considered for expansion into a Joint Monitoring Center (JMC) to support the function of the DMZ. The JMC would still provide a location for face-to-face meetings by senior officers and government officials, but its function would also include preparation of declarations associated with the function of the DMZ, receipt of on-site inspection reports and data from remote monitoring and remote sensing activities, analysis of data and reports, and resolution of disputes that may arise. Continuing face-to-face interaction by the staff of the JMC would result in increased confidence between India and Pakistan. The lack of infrastructure at Siari is a problem and alternate locations should be considered as well.

The rugged terrain, high elevations, and frequently inclement weather in the Siachen area restrict options for illicit reoccupation. Logistics and weather restrain all military activities. No illicit entry by military forces is sustainable without a continuously functioning supply chain. Small-scale intrusions might occur undetected but they would be neither significant nor sustainable. Given these considerations, the focus of monitoring will be on ground-based logistics using a combination of remote monitoring, remote sensing, and on-site inspection.

Illicit reoccupation could also occur by rapid insertion of forces using helicopters. The use of aircraft (for other than monitoring purposes) is banned in the proposed DMZ, so their presence alone would be a clear violation of the agreement. Supporting a significant military force entirely by air without the current base camps for extended periods (an “air bridge”) is probably beyond the capability of both countries. Therefore, resupply over land routes would still be necessary. Reoccupation using helicopters also presents the immediate disadvantage of inserting troops who are not acclimatized to the extreme elevations in the Siachen area. Bitter experience has shown that this tactic would result in heavy casualties and a greatly reduced operational military capability. Major helicopter operations would be detectable by national technical means. Presumably, the other country would take direct action to stop flight activities, presenting the risk of conflict escalation.

Given the terrain, there is only a small number of routes that India and Pakistan can use for logistics. Therefore, monitoring these routes for activity (including the re-establishment of base camps) would be an objective of monitoring. Although there are theoretically many trails to the current forward positions occupied by the respective armies, the shipment of large quantities of supplies requires roads from major supply depots to base camps. Supplies delivered to the base camps supplies are repackaged in smaller loads and distributed to forward positions by various routes.

3.4.1 Remote Monitoring

Remote monitoring systems will be established at access control points (ACP) on roads to detect, assess, and report traffic to monitoring stations in Pakistan and India or at a JMC (to be discussed later). The system provides continuous coverage. As a practical matter, the monitoring system will need to be adapted to the weather conditions and infrastructure at the proposed ACP sites. Field testing of monitoring systems in a realistic environment prior to deployment is essential and should be the focus of a joint India-Pakistan technical working group.

The remote monitoring system could be configured in various ways using commercially available components. The general approach is that a sensor or combination of sensors detects and screens activity on the road. When the activity meets certain criteria, an image is taken and transmitted to a monitoring station. Given the remote location, the system must be self-sufficient in electrical power. In this remote mountainous area, communication will probably be by a commercial communications satellite. However, India and Pakistan might later cooperate to develop a communications infrastructure serving the entire DMZ. A diagram of a sensor-activated video remote monitoring system is shown in Figure 13.

The system in the example is configured to detect vehicles that pass the ACP. It uses a combination of a magnetic sensor (placed near the road) that detects the presence of steel, and a microwave break-beam sensor (placed across the road) that detects when the transmission between its transmitter and receiver is interrupted by a passing object. The system is programmed so that both sensors are required to be activated at the same time in order for an event to be reported. This provides redundancy and acts to screen out false positives, such as an animal passing through the break-beam sensor.

The alarm system is installed a short distance from a digital video camera. Solar cell panels recharge batteries that provide power for both the alarm and camera systems. When the sensors activate, they send a radio signal to a receiver on the camera system commanding the camera to take images. The images are then transmitted to a server at the monitoring station. In this example, the system uses radio transmission to a receiver antenna or a radio repeater station for further transmission. It is possible to use different communication modalities in combination. For example, if the facility with the receiver antenna has Internet access, the transmission could be sent to the monitoring station using the Internet.

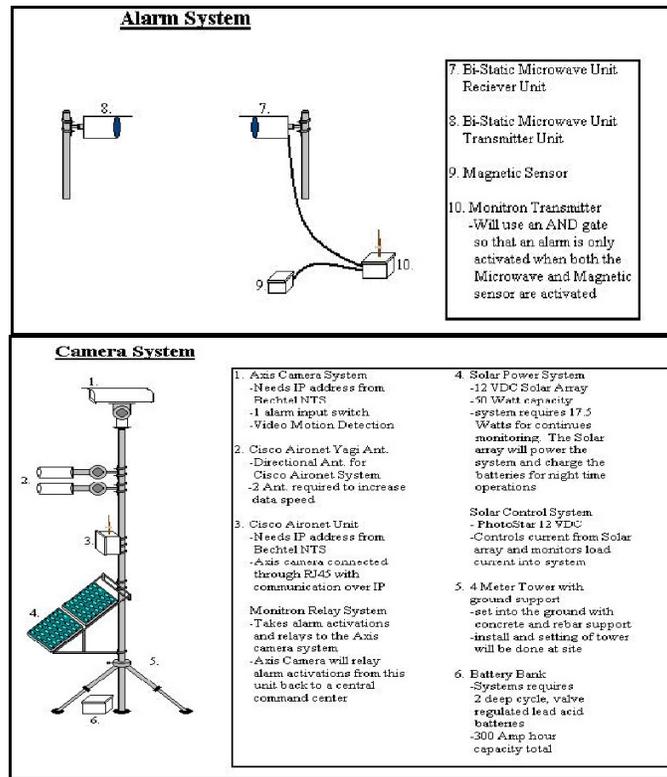


Figure 13. An Example of a Sensor-Activated Remote Monitoring System

All Indian ground-based logistics flow through the large base camp at Dzingrulma. Dzingrulma is located at the base of the Siachen Glacier within the proposed UZ. It is located in a deep valley and is served by a single road from the south. Figure 14 is a Quickbird commercial satellite image that shows part of the base containing storage areas and helicopter landing pads.

The road to Dzingrulma passes through steep terrain that acts as a natural chokepoint. An ACP will be established to monitor traffic on the highway and provide assurance that Dzingrulma is not being reactivated. A natural location for the ACP and remote monitoring system is the bridge located near Chumikchan just north of Warshi in the CZ (see Figure 15). There is little potential for bypass at this location.



Figure 14. A Quickbird Satellite Image of the Indian Base Camp at Dzingrulma



Figure 15. A Satellite Image of the Bridge Crossing to Dzingrulma near Chumikchan

The logistic routes are more complex on the Pakistani side. Supplies are shipped from Skardu by truck through the Shigar Valley to the base camp at Askole (northern sector) or along the Shyok River through Khapalu and Dansam to the base camp at Goma (central and southern sectors). At the base camps are multiple trails to forward areas. The Pakistani side has lower elevation and a larger civilian population than the Indian side. Figure 16 is a satellite image that illustrates the terrain and major Pakistani routes. Figure 17 shows a satellite image of the base camp in Goma.

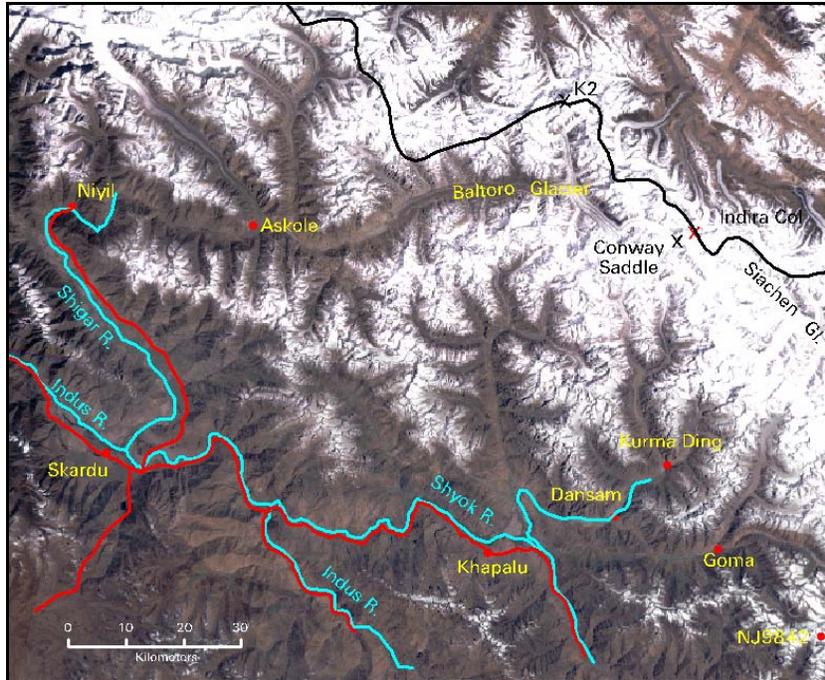


Figure 16. A Satellite Image of Logistics Routes to Pakistani Bases in the Siachen Area



Figure 17. A Quickbird Satellite Image of the Pakistani Base Camp at Goma

The roads to Goma and the forward bases in Gyari (east of Goma) and Kurma Ding (near Kharkondus) all traverse a bridge over the Dansam River in Dansam (see Figure 18). This bridge is an excellent location for an ACP and remote monitoring system. There is little potential for bypass at this location.

The road from Niyil to Askole and the Baltoro Glacier passes through a narrow Shigar River valley. It presents similar opportunities for an ACP near Askole.

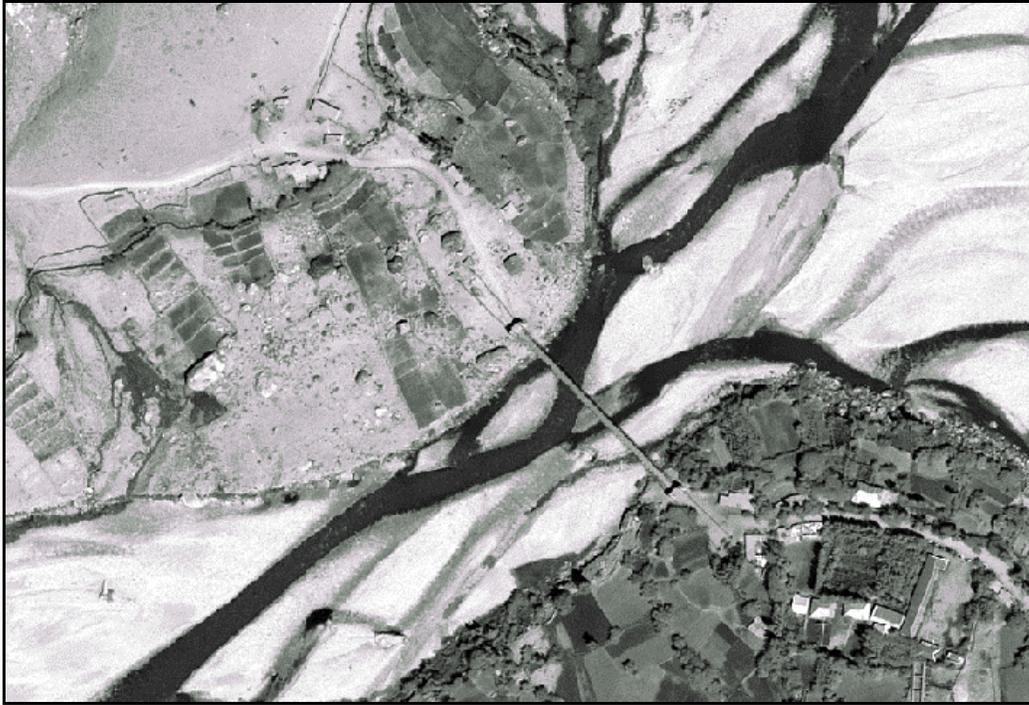


Figure 18. A Quickbird Image of the Road Bridge to Goma over the Dansam River

3.4.2 Remote Sensing

Cooperative aerial overflight can play a significant role in monitoring the DMZ for signs of military reoccupation. International precedents for cooperative aerial overflight include the multilateral Open Skies Treaty (Europe and North America) and a bilateral agreement between Hungary and Romania. Aerial overflight has several advantages over satellite-based monitoring:

- the time and route can be scheduled as needed
- it can circle a feature of interest
- it has the ability to fly under cloud cover that blocks a satellite's view
- the lower altitude can result in imagery with higher spatial resolution than satellite
- certain imaging technologies (thermal imaging, synthetic aperture radar) become practical

The disadvantage is that aerial overflight is more intrusive and requires access to national airspace. The higher cost of operating an aircraft compared to purchasing commercial satellite images is another consideration.

The authors recommend that the practice of joint flights with photographic and thermal imaging equipment instituted to monitor the disengagement process be continued. These flights could be paired aircraft or a jointly crewed single aircraft (the countries could alternate in providing an aircraft). These flights would be regularly scheduled. There would be an option to request an unscheduled flight to resolve questions of compliance that might arise. The practice of landing on request to investigate a site need not be

continued. The use of a jointly crewed fixed wing should be investigated. The potential advantages of fixed-wing aircraft over light helicopters are greater safety, higher speed, and the ability to carry a broader array of remote sensing equipment.

A weakness of conventional imaging equipment is that they do not function well at night or in bad weather. Synthetic aperture radar has the ability to create images in all light and weather conditions, which is a great advantage in Siachen. Commercial systems with spatial resolutions of 1.0 meter are available. Its use in the Siachen may be problematic because of the reflective properties of the jagged snow and ice on the surface of the glacier. India and Pakistan (potentially with international experts) should initiate a technical working group to assess the utility of this technology in the Siachen area.

Commercial satellite imagery can play a supporting role by frequently and inexpensively collecting images to detect medium- and large-scale construction activity that may be indications of military preparations.

3.4.3 On-Site Inspection

Existing base camps and facilities in the DMZ might be able to support scientific and environmental cleanup activities (discussed in Section 4) and could be converted to this use. Therefore, as the camps may not be completely dismantled, on-site inspections will be required to verify their use for non-military purposes. The Antarctica Treaty provides a precedent—an international team regularly inspects scientific facilities on the continent to verify that no military hardware is present.

The CZs pose some special requirements. Some Pakistani military and paramilitary organizations and facilities provide health care and other social services to the civilian population. This practice does not appear to be significant in areas of the DMZ currently controlled by India, given the extremely low civilian population. Since these dual-purpose facilities (such as at Goma) will not be completely dismantled, on-site inspections will be needed to verify their continuing benign nature. Inspectors will cross at the Flag Meeting site in Siari and be escorted and transported by the host country to agreed locations and facilities.

4 Conclusions

Political will and innovative approaches are necessary to stop the conflict on Siachen. As we have discussed and presented here, disengagement is operationally feasible and has been shown to work in prior experiences between India and Pakistan, such as at the Chumik Glacier.

The Composite Dialogue Siachen Working Group needs to expand its discussions on options for disengagement and monitoring. We have sketched the broad outlines of such options in this study, which can be the basis for further discussion and study. Detailed negotiations will be needed to decide the exact boundaries of the proposed DMZ, the time frame for withdrawals, and monitoring technologies to be used.

We believe that the post-disengagement use of the DMZ should be devoted to international scientific and mountaineering activities. The environmental restoration of the Siachen and neighboring glaciers is a matter of national urgency for both India and Pakistan.

Many military and strategic analysts in South Asia now question the strategic significance of the Siachen Glacier. Pakistan and India must initiate the steps necessary to demonstrate to their people that it is in the interest of both nations to demilitarize the Siachen zone of conflict. This will create the right political climate for the successful negotiation of an agreement. Clearly, the demilitarization of Siachen is an idea whose time has come.

Disengagement in the Siachen Conflict Zone could serve as a precedent for the entire LOC. Starting with the somewhat less contentious issue of Siachen, India and Pakistan may well come to reach compromises and a solution to the entire Kashmir region.

References

- ¹ “Agreement between Military Representatives of India and Pakistan regarding the Establishment of a Cease-fire Line in the State of Jammu and Kashmir,” 29 July 1949, *Annex 26 of UNCIP Third Report – S/1430 Add 1 to 3*.
- ² Colonel Muhammad Zakir, *Siachen Glacier: the World’s Highest Battlefield*, 2nd ed. in Urdu (Baltistan, Pakistan: Baltistan Academy, Ali Abad Skardu, 1991), 76.
- ³ Image by Sandia National Laboratories and the University of New Mexico Earth Data Analysis Center
- ⁴ Samina Ahmed and Varun Sahni, *Freezing the Fighting: Military Disengagement on the Siachen Glacier*, CMC Occasional Paper, SAND 98-0505/1 (Sandia National Laboratories, March 1998).
- ⁵ Kent Biringer, *Siachen Science Center: A Concept for Cooperation at the Top of the World*, CMC Occasional Paper, SAND 98-0505/2 (Sandia National Laboratories, March 1998).
- ⁶ Several analysts cite the US Department of Defense as the origin of the practice of drawing a straight line from NJ 9842 to the KKP. About 1967, the Defense Mapping Agency produced a new Tactical Pilotage Chart (TPC) for aviation use. These maps identify national Air Defense Information Zones (ADIZ) for flight planning purposes. The map used a straight line to separate Indian and Pakistani ADIZs. The line from NJ 9842 was a different color than the rest of the CFL and there were written caveats stating these lines were not official boundaries and should not be interpreted as such. The TPC map, however, appears to have been copied by other map makers without this limitation.
- ⁷ Actually Pakistan was never in “control” of this inhospitable area as General Zia ul-Haq, President of Pakistan, himself admitted while speaking on 24 September, 1987: “Siachen is not part of Pakistan ... it was a no-man’s land ...”. See Major B. A. Prasad, “Siachen: The War of Sanguine Intransigence,” *Combat Journal*, August 1993, p. 9 cited from *The Week*, “Bloody Battle on the Glacier,” 8–14 November 1987.
- ⁸ Tim McGirk with Aracind Adiga, “War at the Top of the World,” *Time Asia Magazine* 166 (2) (11 July 2005). <http://www.time.com/time/asia/covers/501050711/story.html>
- ⁹ Zakir, *Siachen Glacier*, p 83.
- ¹⁰ Ibid.
- ¹¹ Ibid.
- ¹² W. M. Dobell, “Ramifications of the China-Pakistan Border Treaty,” *Pacific Affairs* 37 (3) (Autumn 1964), p. 285.
- ¹³ Dobell, “Ramifications,” p. 285.
- ¹⁴ Zakir, *Siachen Glacier*, p. 80.
- ¹⁵ Ibid, 81–82.
- ¹⁶ Toshiaki Sakai, “History: Academic Alpine Club of Kyoto.” <http://www.aack.or.jp/english/history.htm>
- ¹⁷ A. G. Noorani, “The Siachen Impasse,” *Frontline*, Volume 19 - Issue 23, November 09 – 22, 2002.
- ¹⁸ V. R. Raghavan, *Siachen: Conflict Without End* (New Delhi: Penguin Books India, 2002), 49–50.
- ¹⁹ Among the sources that show this extension of the LOC are Neville Maxwell’s book *India’s China War*, Goode’s *World Atlas Fifteenth Edition 1978*, *Times Atlas of the World 1980* and 1988, Rand McNally Goode’s *World Atlas of the World 1992*, the *Oxford Encyclopedic World Atlas of 2000*, and P. L. Lakhnupal, *Essential Documents and Notes on the Kashmir Dispute*, 2nd ed. revised and enlarged (Delhi: International Books, 1965).

- ²⁰ Nasim Zehra, "Pakistan and India Need to Spell Out Rules of Engagement," *Aljazeera* (28 August 2004), <http://www.aljazeera.info>
- ²¹ McGirk with Adiga, "War at the Top."
- ²² P. Sawhney and G. Wahab, "Siachen War Will Not End," *Force*, 2 (4) (December 2004): 10–18.
- ²³ Raghavan, *Siachen: Conflict*, 49–50.
- ²⁴ Bharat Bhushan, "Tabul, Sir Creek and Siachen: Competitive Methodologies," *South Asian Journal* (January–March 2005).
- ²⁵ Stephen Cohen, foreword to *Siachen: Conflict Without End* by Lt. General V. R. Raghavan (New Delhi: Penguin Books India, 2002). (quote from p. vii)
- ²⁶ Satyabrat Sinha, "Siachen (Saltoro)-Towards Resolution" *Institute of Peace and Conflict Studies* (9 July 2005). <http://www.ipcs.org/whatsNewArticle1>
- ²⁷ "PM's Address to the Troops at the Partapur Base Camp, Siachen (June 12, 2005)," The Office of the Prime Minister of India, transcripts of speeches, <http://pmindia.nic.in/speech/content.asp?id=136>
- ²⁸ This line of thinking emerged during a seminar on the demilitarization of Siachen held at the Observer Research Foundation, New Delhi, on 12 May 2005.
- ²⁹ Sawhney and Wahab, "Siachen War Will Not End"
- ³⁰ Photos by Pakistan Interservices Public Relations, <http://ispr.gov.pk>
- ³¹ Joseph P. Harahan and John C Kuhn, *On Site Inspections Under the CFE Treaty*, The On-Site Inspection Agency, United States Department of Defense, Washington D.C. 1996, p 45.
- ³² *Ibid*, p. 1.
- ³³ Joseph Harahan, "On-Site Inspections Under the INF Treaty," The On-Site Inspection Agency, United States Department of Defense, Washington D.C., 1993, p. 2.
- ³⁴ Colonel Gideon Netzer, "A Generic Model for Cooperative Border Security," Cooperative Monitoring Center Occasional Paper 9, Sandia National Laboratories, Albuquerque, NM, March 1999, p. 14.
- ³⁵ *Ibid*.
- ³⁶ Harahan and Kuhn, p. 1.
- ³⁷ UNIDIR report, 1999.
- ³⁸ Air Marshal (ret.) Mohammed A. Chaudhry and Air Marshal (ret.) K.C. Cariappa (Retd), How Cooperative Aerial Monitoring Can Contribute to Reducing Tensions Between India and Pakistan, SAND 98-0505/22, December 2001, Cooperative Monitoring Occasional Paper/22, Sandia National Laboratories, Albuquerque, NM.

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